

3
EDITION

Medical-Surgical Nursing

Concepts and Practice

deWit Stromberg Dallred



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About the Text

Medical-Surgical Nursing: Concepts & Practice is written specifically for the LPN/LVN student who must be educated to work within a variety of settings, including hospitals, long-term care facilities, rehabilitation institutes, ambulatory clinics, psychiatric agencies, physicians' offices, and home care agencies. All of the most common adult medical-surgical disorders are covered, but particular attention is devoted to disorders most prevalent in our society. Special consideration is given to the elderly population, those with chronic illnesses, and others in long-term care settings.

This text builds on—but does not repeat—the concepts and skills presented in a fundamentals of nursing course. Many states are expanding LPN/LVN scope of practice, via certification, to include administration of intravenous (IV) fluids and medications, but others do not. Information on IV therapy is included within this text so that schools in states where such certification is possible will have the necessary educational materials.

With the expanding and changing role of the LPN/LVN there is an even greater need for **critical thinking** and the development of **clinical judgment**. These crucial skills are stressed throughout the clinical chapters and again in the Study Guide.  **Evidence-based practice** is designated with a special icon so students come to understand that the foundation of nursing care is in research. Although evidence-based practice research within the nursing community is still developing, medical evidence-based research—on which nurses often base patient  teaching—is abundant. **Best practices** are highlighted throughout the narrative with an icon to emphasize cutting-edge information related to interventions.

The **nursing process** and its application to nursing care is an organizing principle throughout, and patients' needs are presented as the focus of nursing care. There is an emphasis on practical **assessment—including data collection**—to determine problems, monitor for the onset of complications, and evaluate the effectiveness of care. Data collection from the geriatric patient requires greater ability to elicit pertinent information from the patient and family, and the achievement of this skill is a major focus in this text. The text emphasizes the role of LPN/LVNs in data collection to assist the RN in choosing appropriate **nursing diagnoses** or formulating problem statements for each patient. Many health care agencies are not using NANDA-I nursing diagnoses and are utilizing problem statements instead. Agencies that use a collaborative care plan do not use nursing diagnoses at all. The NCLEX-PN® Examination no longer uses NANDA-I nursing diagnoses. For these reasons, this text provides problem statements and the option of choosing NANDA-I nursing diagnoses from the NANDA-I list on the inside back cover. The nursing care plans provide both the problem statement and a NANDA-I nursing diagnosis to accommodate programs that require nursing diagnoses on student care plans.

Planning holistic care must include consideration of the patient's cultural background and its impact on perception of health, illness, and health practices. **Implementation of nursing actions** is the heart of patient care and LPN/LVN practice. Nursing actions presented are specific, comprehensive, and organized by common care problems to decrease repetition of information within a chapter. This helps the student master concepts rather than memorize facts. Further interventions are discussed with each disorder as appropriate, and **safe practice** is emphasized throughout the text. Additional focal points are using **expected outcomes** and **evaluating** nursing care to ensure that those outcomes and goals have been met.

Patient teaching for health promotion and self-care is a basic function of the LPN/LVN. Each clinical chapter points out ways in which nurses can teach the public how to prevent many of the problems discussed. Self-care guidelines for the major disorders are presented, and relevant *Healthy People 2020* objectives have been identified and are incorporated on the Evolve website.

LPN/LVN nurse practice acts do not encompass **delegation** as a function. With a few exceptions, only RNs can delegate, although in many situations LPN/LVNs can **assign** tasks. Collaboration with other health care workers and the use of basic management skills to provide coordinated, cost-effective patient care is essential. In this text we particularly speak to the LPN/LVN management role in working with nursing assistants and assigning tasks appropriately.

Pedagogical Features

Special pedagogical features throughout the text help you teach your students to understand the chapter content and apply it in practice:

- The text has been thoroughly updated with the new **NCLEX-PN® Test Plan** in mind.
- Competencies identified through the **Quality and Safety Education for Nurses (QSEN) initiative**—and the associated knowledge, skills, and attitudes (KSAs)—have been integrated into the content and were a continual focus during the writing of this text and its ancillaries.
- The Joint Commission's **National Patient Safety Goals** are highlighted to help students integrate safety measures and quality controls into their practice, and **Safety Alerts** remind students of specific safety concerns.
- The Joint Commission's **National Quality Core Measures** and the Institute for Healthcare Improvement's (IHI) **bundles** are described as additional measures for providing safe, effective, and quality care.
- The purpose of **Healthy People 2020** as a nationwide health improvement agenda is explained, and goals related to specific patient problems are available on the Evolve site for students. Other **Health Promotion** boxes throughout the text also emphasize the importance of health promotion, disease prevention, and reduction of health care costs.
- **Evidence-based practice** is designated with a special icon so that the student will see the thrust of nursing toward a foundation based in research.
- **Overview of Anatomy and Physiology** at the beginning of each system introduction chapter provides basic information for understanding the body system and its disorders. Normal physiologic changes associated with aging are presented for each body system.
- **The Nursing Process** provides a consistent framework for the disorders chapters.
- Separate **Theory** and **Clinical Practice objectives** highlight the chapter's main learning goals.
- **Concept Maps** found in disorders chapters are designed to help students visualize difficult material and to illustrate how a disorder's multiple symptoms, treatments, and side effects relate to each other.
- End-of-chapter **Review Questions for the NCLEX® Examination** include **multiple choice** and **alternate-format questions**, and an extensive set of Interactive Review questions for the NCLEX® Examination are located on the Evolve website for students.
- The easily understandable **writing style** is aimed at gaining and retaining student attention to reading assignments.
- The term “patient” is used rather than “client” because that is what is still used in hospitals. “Resident” is used for those in long-term care facilities.
- The use of “he” and “she” for patient, physician, and nurse varies from chapter to chapter to emphasize the diversity among these populations.
- An **English-as-a-Second Language (ESL) consultant** reviewed each chapter to make the text more user-friendly and understandable for the student with limited proficiency in English. A section in each chapter of the *Study Guide* has been designed to assist this student to more easily master the chapter content and to enhance English skills.
- **Bolded text** throughout the narrative emphasizes key concepts and practice.

Organization of the Text

Unit I addresses medical-surgical nursing settings, nursing roles and issues, health care trends, assignment considerations, the nursing process, measures related to safe and effective care, and critical thinking. **Unit II** covers all the key medical-surgical nursing topics, including fluids and electrolytes, surgical patient care, infections, pain, cancer, palliative care, and a separate chapter on chronic illness, rehabilitation, and the interdisciplinary health care team. **Units III through XIV** cover all the body systems and their most common disorders, each unit beginning with a system overview, followed by specific disorders chapters. **Unit XV** addresses emergency and disaster management—including bioterrorism—as well as trauma and shock. **Unit XVI** is entirely devoted to mental health nursing and includes information on anxiety and mood disorders, eating disorders, cognitive disorders, thought and personality disorders, and substance abuse.

Content covering legal and ethical issues, nutrition considerations, care of the older adult, communication, cultural diversity, complementary and alternative therapies, patient teaching, home care, health promotion, and assignment and delegation have been integrated as appropriate rather than including individual chapters on these subjects. End-of-life issues and palliative care are presented at the end of [Chapter 8: Care of Patients With Cancer](#). **Chronic illness and rehabilitation care** are growing areas, and [Chapter 9](#) addresses the differences in care approaches and nursing care for these individuals as well as the interaction of the interdisciplinary health care team. **The care of patients with HIV/AIDS has been condensed and combined** into [Chapter 11: Care of Patients With Immune and Lymphatic Disorders](#), and the chapters that cover cardiac content (17 through 20) have been rearranged and augmented. [Chapters 45 through 48](#) have been updated using DSM-5 criteria. In [Chapter 45](#) an entire section has been added on PTSD, its assessment and treatment. The section on suicide assessment and prevention has been expanded.

LPN Threads

The third edition of *Medical-Surgical Nursing: Concepts & Practice* shares some features and design elements with other Elsevier LPN/LVN textbooks. The purpose of these *LPN Threads* is to make it easier for students and instructors to use the variety of books required by the relatively brief and demanding LPN/LVN curriculum. The following features are included in the *LPN Threads*.

- A **reading level evaluation** is performed on every manuscript chapter during the book's development to increase the consistency among chapters and ensure the text is easy to understand.
- The **full-color design, cover, photos, and illustrations** are visually appealing and pedagogically useful.
- **Objectives** (numbered) begin each chapter and provide a framework for content and are especially important in providing the structure for the TEACH Lesson Plans for the textbook.
- **Key Terms** with phonetic pronunciations and page number references are listed at the beginning of each chapter. Key terms appear in color in the chapter and are defined briefly, with full definitions in the **Glossary**. The goal is to help the student reader with limited proficiency in English to develop a greater command of the pronunciation of scientific and nonscientific English terminology.
- A wide variety of **special features** relate to critical thinking, clinical practice, health promotion, safety, patient teaching, complementary and alternative therapies, communication, home health care, delegation and assignment, and more. Refer to the To the Student section of this introduction on pp. xvi to xvii for descriptions.
- **Critical Thinking Questions** presented at the end of each chapter and with Nursing Care Plans give students opportunities to practice critical thinking and clinical decision-making skills with realistic patient scenarios. Answers are provided in the Student Resources section on the Evolve website.
- **Key Points** at the end of each chapter correlate to the objectives and serve as a useful chapter review.
- A full suite of **Instructor Resources** is available, including TEACH Lesson Plans and PowerPoint Slides, Test Bank, Image Collection, Open-Book Quizzes, and Answer Keys.
- In addition to consistent content, design, and support resources, these textbooks benefit from the advice and input of the **Elsevier LPN/LVN Advisory Board** (see p. xii)
- Teaching and Learning Package

For the Instructor

The comprehensive and free Evolve Instructor Resources with TEACH Instructor Resource include the following:

- **Test Bank** with approximately 1400 multiple-choice and alternate-format questions with correct answer, rationale, textbook page reference, topic, step of the nursing process, objective, cognitive level, and NCLEX® category of client needs
- **TEACH Instructor Resource** with Lesson Plans and PowerPoint Slides with Audience Response System Questions that correlate each text and ancillary component
- **Image Collection** that contains all the illustrations and photographs in the textbook
- **Open-Book Quizzes** for each chapter that you can administer during class for pre- or post-lecture evaluation or as take-home assignments
- **Answer Keys** for Open-Book Quizzes and the *Study Guide*
- **Suggestions for Working with English as a Second Language (ESL) Students**

For the Student

The Evolve Student Resources include the following assets:

- **Animations** depicting anatomy, physiology, and pathophysiology
- **Answers and Rationales** for in-text Review Questions for the NCLEX® Examination
- **Answer Guidelines** for Critical Thinking Questions and Think Critically boxes
- **Audio Clips** of heart and lung sounds
- **Audio Glossary** with pronunciations in English and Spanish
- **Bibliography and Suggested Readings**
- **Additional Content** including Skills, Skill Performance Checklists, Patient Teaching guidelines, Nursing Care Plans, and more
- **Calculators** for determining body mass index (BMI), body surface area, fluid deficit, Glasgow coma score, IV dosages, and conversion of units
- **Clinical References**, including forms, checklists, tools, and relevant *Healthy People 2020* goals for specific patient problems
- **Fluids and Electrolytes Tutorial**
- **Helpful Phrases for Communicating in Spanish**
- **Interactive Review Questions for the NCLEX® Examination**
- **Supplemental Image Collection**
- **Video clips** of patient assessment

The *Study Guide* (sold separately) is a valuable supplement to help students understand and apply the textbook content. There is an emphasis on **priority setting and decision making** throughout the chapters. Varied question and activity types provide students with learning tools for reinforcement and exploration of text material. Terminology, Short Answer, multiple choice and alternate-format Review Questions for the NCLEX® Examination, Critical Thinking Activities, and a special section called *Steps Toward Better Communication*—written by an ESL specialist—appear in most chapters. Other activity types include Completion, Identification, Review of Structure and Function, Priority Setting, and Application of Nursing Process. The Study Guide review questions, and an Answer Key is provided for instructors on the Evolve website.

To the Student

Reading and Review Tools

- **Objectives** introduce the chapter topics.
- **Key Terms** are listed with page number references, and difficult medical, nursing, or scientific terms are accompanied by simple phonetic pronunciations. Key terms are considered essential to understanding chapter content and are defined within the chapter. Key terms are in color the first time they appear in the narrative and are briefly defined in the text, with complete definitions in the [Glossary](#).
- Each chapter ends with a *Get Ready for the NCLEX® Examination!* section that includes (1) **Key Points** that reiterate the chapter objectives and serve as a useful review of concepts; (2) a list of **Additional Resources** including the Study Guide, Evolve Resources, and Online Resources; (3) an extensive set of **Review Questions for the NCLEX® Examination** with answers located in Appendix D and Answers and Rationales on Evolve; and (4) **Critical Thinking Questions** with Answer Guidelines located on Evolve.
- **Reader References** in the back of the text cite evidence-based information and provide resources for enhancing knowledge. An expanded **Bibliography** and **Suggested Readings** are available on Evolve.

Chapter Features

Assignment Considerations address situations in which the RN delegates tasks to the LPN/LVN or when the LPN/LVN assigns tasks to nurse assistants as allowed by each state's nurse practice act.

Think Critically boxes encourage students to synthesize information and apply concepts beyond the scope of the chapter.

Home Care Considerations focus on post-discharge adaptations of medical-surgical nursing care to the home environment.

Elder Care Points address the unique medical-surgical care issues that affect older adults and provide suggestions for assessment (data collection) and particular interventions for the long-term and home care patient.

Focused Assessment boxes are located in each body system overview chapter and include history taking and psychosocial assessment, physical assessment, and guidance on how to collect data/information for specific disorders.

Clinical Cues provide guidance and advice related to the application of nursing care.

Nursing Care Plans, developed around specific case studies, include nursing diagnoses with an emphasis on patient goals and outcomes and questions to promote **critical thinking**. Additional nursing care plans are available on the Evolve site.

Safety Alerts emphasize the importance of maintaining safety in patient care to protect patients, family, health care providers, and the public from accidents, spread of disease, and medication-related issues.

Health Promotion boxes emphasize healthy lifestyle choices, preventive behaviors, and screening tests.

Medication tables provide quick access to information about medications commonly used in medical-surgical nursing care.

Cultural Considerations explore select specific cultural preferences and how to address the needs of a culturally diverse patient and family.

Nutrition Considerations related to nursing care for specific disorders address the need for holistic care.

Patient Teaching boxes include step-by-step instructions and self-care guidelines.

Communication boxes provide guidance in therapeutic communication skills in realistic patient care situations.

Legal and Ethical Considerations present pertinent information about the legal issues and ethical dilemmas that may face the practicing nurse.

Complementary and Alternative Therapies boxes contain information on how nontraditional treatments for medical-surgical conditions may be used to complement traditional treatment.

Bonus Content, Clinical References, and other materials available on **Evolve** are referenced with icons in the margins where related text appears.

Animations depicting anatomy, physiology, and pathophysiology available on Evolve are referenced with icons in the margins where applicable.

Video clips of patient assessment available on Evolve are referenced with icons in the margins where applicable.

Evidence-Based Practice icons highlight current references to research in nursing and medical practice.

Best Practice icons highlight current information related to interventions.

Acknowledgments

We appreciate the help of our contributor Trena Rich. Thanks also go to the reviewers whose comments helped us to refine and clarify content as needed.

Thanks to the following people for their hard work and dedication to prepare a great ancillary package with the textbook. Thanks to Mark Matusiak for revising the Open Book Quizzes and to Courtney Moore for updating the Test Bank. Thank you to Jennifer Ponto for updating the accompanying Virtual Clinical Excursions. We thank all previous ancillary writers for their contributions to earlier editions: Larry Manalo, Kim Cooper, and Kelly Gosnell.

We also thank Thomas Sadowski who did a phenomenal job with the ESL review and suggestions in previous editions of this work. He evaluated every chapter in the text and Study Guide and provided recommendations for making information more understandable for the ESL students.

Thanks to Southwestern Washington Medical Center for allowing us to photograph within their facility. Their patients, staff, and administration are so willing to help with whatever they can for the education of nursing students. Jack Sanders is a talented, creative, professional photographer whose beautiful photos are seen throughout this book. Ginger Navarro was a wonderful and efficient photo coordinator and her help was invaluable.

Thanks to Nancy O'Brien, Senior Content Strategist, and Laura Goodrich and Heather Rippetoe, Content Development Specialists, at Elsevier who have brought this project to fruition. Their dedication and friendship have kept the project on track. Mary Stueck, Senior Project Manager, makes the production process pleasurable. Her sense of humor always gets us through the tough parts and lightens the days. Mary is extremely good at her job. The updated design of the book, which follows the Threads design of other Elsevier LPN/LVN texts, was provided by Renée Duenow. Brittany Clements, Marketing Manager, has applied creative ideas to promote the book among students and instructors.

Teaching nursing has been one of the most exciting and gratifying phases of our lives. We hope this textbook and its ancillaries make your job as an instructor easier and class preparation more time-efficient. May your students find excitement and joy in learning and applying the information you impart in the clinical setting.

Susan C. deWit

Holly K. Stromberg

Carol Vreeland Dallred

UNIT I

Medical–Surgical Nursing Settings

OUTLINE

Chapter 1 Caring for Medical-Surgical Patients

Chapter 2 Critical Thinking and the Nursing Process

CHAPTER 1

Roles of the LPN/LVN

Today you have an exciting, evolving role as an LPN/LVN. Roles include caregiver, educator, collaborator, **advocate**, leader, and delegator. As a caregiver, you perform treatments, give medications, and provide care to meet patients' basic needs. You gather data to assist in planning and evaluating care. You assist patients with exercise and help them to obtain sufficient rest, all while keeping their environment neat, clean, and orderly. Therapeutic communication and **active listening** (listening with concentration and focused energy) are incorporated into your care. You give objective and thorough end-of-shift reports and document objectively about the care given and the status of patients.

Clinical Cues

If a patient declines morning care (bath, brushing teeth, etc.), you can be flexible and fit it in elsewhere in your day, as time allows. Leaving care to be performed by the next shift is not acceptable practice, because it burdens the oncoming staff. Listen to the patient's reasons for not wanting care. If it appears that care really is being refused for that complete day, talk with the staff nurse or charge nurse about it. Although the patient does have the right to refuse care, many times if the benefits of care are explained, you can gain the patient's cooperation. Conferring with more experienced team members can help a new nurse determine when the routine can be altered in the patient's best interests.

As an educator you provide health teaching to patients and their significant others to maintain wellness or promote healing. An important aspect of nursing care is to show patients and families how to care for themselves or care for loved ones to prevent complications, restore health, and prevent further illness. You teach basic hygiene and nutrition to promote good health. Examples of teaching include reinforcing what the registered nurse or **provider** advises regarding scheduled diagnostic tests, upcoming surgery, how to treat a wound, or how to change a dressing, while addressing the patient's questions and concerns. Other teaching activities concern how to take prescribed medication, what side effects to report, and the self-care activities and lifestyle changes required to promote rehabilitation and independence. You contribute to the discharge plan by reinforcing discharge instructions and providing information to patients about community resources and self-help groups.

Think Critically

How could you reinforce dietary teaching for a patient newly diagnosed with diabetes?

As a collaborator, you interact with other members of the health care team to provide the patient with an integrated, comprehensive plan of care ([Figure 1-1](#)). You work closely with the RNs and nursing assistants to ensure that all aspects of the patients' basic needs are met. When you share information with the team members, the team can best use the expertise and experience of the various members. You assist in recognizing when a patient is experiencing complications and intervene to maintain patient safety. You assist with the discharge plan and deliver discharge instructions and teaching.

Quality and Safety

The Institute of Medicine (IOM) in *Health Professions Education: A Bridge to Quality* (2003) identified the following five competencies:

1. Provide patient-centered care.
2. Collaborate with the interdisciplinary health care team.
3. Implement evidence-based practice.
4. Use quality improvement in patient care.
5. Use informatics in patient care.

A study noted in the *Journal of Patient Safety* states “between 210,000 and 440,000 patients in the hospital suffer some type of preventable harm that contributes to their death” (James, 2013). The Quality and Safety Education for Nurses (QSEN) initiative added *safety* as a separate competency to the IOM set. Specific knowledge, skills, and attitudes have been identified to assist with the development of the competencies incorporated into nursing curriculum.

Patient-centered care means that the patient is a full partner in decisions about his care. Compassionate and coordinated care should be planned and delivered with respect and consideration for the patient's preferences, values, and needs. Collaboration with the interdisciplinary (ID) team requires open communication, mutual respect, and shared decision making. An important member of the ID team is the care manager, who may be a designated nurse or a social worker within the hospital. The case manager strives to work with the ID team to provide quality and cost-effective services and resources so that positive patient outcomes are achieved.

Evidence-Based Practice (EBP)

Evidence-based practice uses the best current evidence from research findings to make decisions about patient care. Evidence data are drawn from quality-improvement practices, management initiatives such as those from The Joint Commission (TJC), and professional organization standards. There are five steps in the process of developing evidence-based practice standards. The implementation of evidence-based practice must consider the patient's unique circumstances and preferences. Nurses must continually seek scientific evidence that supports best patient outcomes.

Quality Improvement

Nurses use data from completed interventions to monitor the outcomes of the care delivered by various processes and then use the resulting data to design methods of quality improvement. Each accredited health care agency has a continuous quality improvement (CQI) program in place that sets standards for care ([Figure 1-3](#)). These standards are based on standards for nursing practice set by the American Nurses Association, the AHA, and TJC. Nursing units have a CQI committee to do periodic audits of charts to determine whether standards of care are being upheld and to what extent compliance is occurring. The goal is to find discrepancies and continually improve the safety and quality of patient care systems ([QSEN Institute, 2014](#)). Medical-surgical nurses are expected to do the following:

- Identify indicators to monitor the quality and effectiveness of care delivered.
- Gather and evaluate data to monitor the effectiveness of care.
- Recommend ways to improve care.
- Implement activities to improve care.

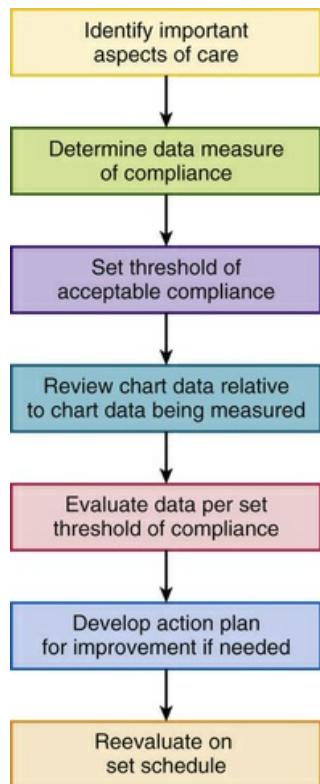


FIGURE 1-3 Continuous quality improvement process.

Informatics

Using information and technology to communicate, manage knowledge, prevent or mitigate error, and support decision making comprises informatics (QSEN Institute, 2014). The key components of informatics are communication, documentation, electronic data access, and data use. The electronic medical record (EMR), or electronic health record (EHR), is at the heart of informatics. The EMR is central to documenting nursing and interdisciplinary care and patient health data.

Central hospital or agency computers store all data and connect to the Internet to allow searches for information on disease processes, medications, diagnostic tests, current care guidelines, and evidence-based practice research. Mobile devices are now common among health care professionals for data access and team communication through text or e-mail. Many health professionals carry tablets or smart phones to access data and to communicate with other team members.

Safety

Every nurse should consider safety during every patient interaction. Patients are vulnerable to injury when they are ill or incapacitated in the hospital. The NCSBN has identified areas in which nursing practice can improve safety. Clear communication of patient data and clinical assessments is one area. Using SBAR (Situation, Background, Assessment, and Recommendation) technique when communicating with other members of the team is one way to promote clarity and safety.

Be attentive to the National Patient Safety Goals (see Table 1-1). It is vitally important that you prepare medications in a quiet atmosphere and use the “Six Rights of Medication Administration” and nursing responsibilities when administering medications to patients. You must know the purpose, action, side effects, and nursing implications of each medication to be given. Evaluation of the medication’s effect is often given insufficient attention. Always check orders carefully before performing a procedure. To ensure patient safety as well as your own, rigorously adhere to infection control guidelines at all times and use proper equipment and methods to lift and turn patients to avoid injuries. Always check electrical equipment before use. Report unsafe practices and self-report errors to promote a safer environment. Follow core measures that are in place to prevent infection to promote better patient outcomes.

Health Care Today

Biomedicine

Biomedicine is the dominant health system in the United States and focuses on symptoms. The goal of biomedicine is to find the cause of disease and to eliminate or correct the problem. However, many Americans use methods that focus on the whole body—and not exclusively on symptoms—when treating disease. Holistic medicine, or **holistic care**, incorporates a variety of measures and techniques to treat the whole person.

Complementary and Alternative Medicine

Complementary (used in conjunction with biomedical treatments) **and alternative** (substituted for biomedical medicine) **medicine (CAM)** focuses on assisting the body's own healing powers and restoring body balance. The National Center for Complementary and Alternative Medicine (NCCAM) of the National Institutes of Health (NIH) researches and evaluates the effectiveness and safety of CAM therapies. Natural medicines often have not undergone scientific studies to determine correct doses, side effects, or risk of interactions with other medicines or foods. Patients need to be reminded that all herbals and supplements need to be included when they are asked for a list of drugs taken.

Healthy People 2020

Healthy People 2020 is a health promotion and disease prevention initiative by the U.S. Department of Health and Human Services aimed at improving the health of people in the United States by promoting longer, healthier lives. The four overarching goals are as follows:

1. Attain high-quality, longer lives free of preventable disease, disability, injury, and premature death.
2. Achieve health equity, eliminate disparities, and improve the health of all groups.
3. Create social and physical environments that promote good health for all.
4. Promote quality of life, healthy development, and healthy behaviors across all life stages.

Individuals, groups, and organizations must work together to incorporate the goals of *Healthy People 2020* into current programs, education, special events, publications, and meetings. Every LPN/LVN has the responsibility to educate patients about healthy lifestyles and to work with their communities through education for health promotion. You can also model healthier lifestyles for your patients by not smoking, maintaining healthy eating habits, and exercising.

Financing of Health Care

Health Insurance: The Affordable Care Act, Medicare, and Medicaid

It is helpful to understand a little about payment methods, because it is important to keep **cost containment** in mind when delivering nursing care. Health insurance, like any type of insurance, spreads risk among a group of insured individuals. The young and the healthy generally do not have claims for as many health care services as older adults. When the fee structure is equivalent for all, the young and healthy subsidize (support) the sick and older people covered by the insurance provider. The Affordable Care Act (ACA) is based on this assumption. The effect of those who choose to remain uninsured or who are underinsured on the health care system remains to be seen. Many younger people may choose to pay the lower-cost fine rather than pay for insurance.

The traditional method of financing health care services, **fee-for-service**, involves direct reimbursement by an insurance company to a provider (a licensed health care person such as a physician, dentist, or nurse practitioner) whose health care services are covered by a health insurance plan. To improve coverage of costs, insurance providers charge a **deductible** (the yearly amount an insured person must spend out-of-pocket for health care services **before** the insurance provider will begin to pay for services), a **copayment** (the amount an insured person must pay at the time of an office visit, for a prescription, or for hospital service), and **coinsurance** (once a deductible is met, the percentage of the total bill paid by the insured person). The insurance company subtracts the amount the patient must pay from the total bill, and then pays the remainder to the provider.

The intention of the ACA, also known as Obama-care, is to provide insurance for everyone so they can obtain the necessary care to achieve the *Healthy People 2020* goals (**Box 1-3**). The ACA mandates began implementation by enabling children younger than 26 years of age to continue to be included on their parents' health care policies and by making it illegal for insurance companies to deny coverage to people with preexisting conditions, who previously were unable to obtain health insurance. Various parts of the ACA will be implemented over the coming years. Health care exchanges have been formed to provide coverage for all people who do not have access to health insurance. A large percentage of covered individuals will receive a subsidy for their insurance premiums from the government because their income is below a certain level. There are many controversial aspects to the ACA, and the cost is under great debate. As time goes on and it becomes more clear what works and what needs to be altered within the 1300-page law, expect to see changes.

Box 1-3

Major Goals of the Affordable Care Act

- Ensure affordable, quality health coverage for all Americans.
- Improve patient safety and quality of care.
- Invest in prevention of illness and promotion of wellness for Americans.
- Guarantee a choice of health care providers and health insurance plans.
- Prevent a cap on lifetime insurance limits.
- Require large employers to provide insurance for employees.

Medicare is a federal public insurance program that helps to partially finance health care for everyone older than 65 years (and their spouses), who have at least a 10-year (40 quarters) record in Medicare-covered employment, and who are citizens or permanent residents of the United States. Coverage is also given to people younger than 65 years who have end-stage renal disease or are

permanently and totally disabled. Those eligible because of age or disability are entitled, by law, to the benefits of Medicare programs. In November 2003, Congress passed the Medicare Prescription Drug, Improvement, and Modernization Act, which is the largest expansion of Medicare since it was enacted in 1965 (**Box 1-4**). The ACA contains a long list of reform provisions to contain Medicare costs. Medicare A covers hospital and durable medical equipment expenses. Part B of Medicare covers out-of-hospital expenses. Medicare Part C involves **managed care** providers. Part D is the Medicare drug program that covers a portion of prescription expenses. There are monthly premiums for Parts B, C, and D, as well as deductibles and copay amounts. Many patients with Medicare purchase a private supplemental health insurance policy to help pay for expenses not paid by Medicare.

Box 1-4

Basic Components of Medicare

Medicare Part A

- Is available without cost to those eligible for the program.
- Helps pay for inpatient hospital care, including drugs, supplies, laboratory tests, radiology, and the intensive care unit.
- Covers 20 days after hospitalization at a skilled nursing facility care for rehabilitation services, home health care services under certain conditions, and hospice care.
- Does not pay for nursing home custodial services (e.g., patients only needing help with activities of daily living or feeding), private rooms, telephones, or televisions provided by hospitals or skilled nursing facilities.

Medicare Part B

- Is similar to a major medical insurance plan and is funded by monthly premiums based on income.
- Requires a deductible and pays 80% of most covered charges. The remaining 20% of charges are the responsibility of the patient.
- Helps pay for medically necessary providers' services; outpatient hospital services (including emergency department visits); ambulance transportation; diagnostic tests, including laboratory services and mammography and Pap smear screenings; and physical therapy, occupational therapy, and speech therapy in a hospital outpatient department or Medicare-certified rehabilitation agency.
- Does not pay for most prescription drugs, routine physicals, services not related to treatment of illness or injury, dental care, dentures, cosmetic surgery, routine foot care, hearing aids, eye examinations, or glasses.

Medicare Part C

- Refers to Medicare Advantage plans, such as HMOs or regional PPOs.
- Provides Part A, B, and D benefits to people who elect this type of coverage instead of the original fee-for-service program.

Medicare Part D

- Refers to the outpatient prescription drug benefit.
- Is available to all Medicare enrollees in the original fee-for-service program for an additional monthly fee.

The **Medicaid** program, which is funded jointly by the federal and state governments, provides medical assistance for eligible families and individuals with low incomes and few resources. Each state establishes its own program services and requirements, including eligibility. Proportionally, Medicaid is the second largest item in state budgets (Box 1-5). The program is meant to cover the population of people considered under the Federal Poverty Line (FPL). Some states have elected an option under the ACA to expand Medicaid to 138% of the FPL. Many people just above the FPL are working families who do not have insurance. This population is the “working poor” and is who the ACA aims to address. The ACA has contributed to considerable expansion of the Medicaid programs, which will increase the states' expense in future years.

Box 1-5

The Medicaid Program

- Medicaid is the second largest item in state budgets and covers more than 50 million low-income children and individuals, many in working families.
- Medicaid is the largest source of health insurance for children in the United States. The Children's Health Insurance Program (CHIP) supplements Medicaid in some states by providing coverage for children from lower-income families who do not qualify for Medicaid.
- Medicaid is the primary source of health and long-term care coverage for low-income individuals with disabilities or chronic illnesses and those who need mental health services and substance abuse treatment.
- Medicaid covers services that Medicare does not cover for low-income Medicare beneficiaries, including long-term care and vision and dental care. Medicare beneficiaries who are also enrolled in Medicaid are known as *dual eligibles*.

Cost Containment

The driving force today in all health care facilities is cost containment (holding costs to within fixed limits, while remaining competitive in the health care marketplace). Health care agencies are interested in improving their agency's “bottom line” with business principles that reduce waste and inefficiency. Consumers would like the cost of health care to be reduced while high-quality care and service are maintained. Service, quality, and cost control are attributes of health care that need to be understood and considered in all clinical situations (Box 1-6).

Box 1-6

LPN/LVN Role in Containing Health Care Costs in the Work Setting

1. Charge out all supplies and equipment used in each patient's care; discontinue charges for equipment as soon as use has ended.
2. Follow facility policy for documenting all patient care for reimbursement.
3. Organize patient care for effective and efficient use of time. It is less expensive to do something right the first time.
4. Implement nursing care to help prevent complications and catch signs of complications.

The federal government was the first group to try to stop the skyrocketing cost of health care. In 1983 the Health Care Financing Administration (now the Centers for Medicare and Medicaid Services [CMS]) adopted a system called **diagnosis-related groups (DRGs)**, or illness groups. This system pays hospitals a flat rate for Medicare services, and hospitals know in advance how much

they will be reimbursed by this **prospective payment system (PPS)**. Under the DRG system, the fee the government will pay for hospitalization depends on the DRG category (illness). Hospitals receive a flat fee for each patient's DRG category, **regardless of length of stay in the hospital**; thus hospitals have an incentive to treat patients and discharge them as quickly as possible. If the hospital keeps the patient longer than the government's fee will cover, and the patient cannot be reclassified in the DRG system, the hospital must absorb the difference in costs. However, if the acute care facility can treat the patient for less than the guaranteed reimbursement amount, **the facility can keep the difference in payment as profit**. Because Medicare patients, like all patients, are discharged sooner from hospitals than they were in the past, extended care units or skilled care facilities and home care are commonly used to continue convalescence. With the goal of improving quality of care and saving millions of taxpayer dollars each year, Medicare will not cover specific *preventable* conditions of hospitalized patients ([Box 1-7](#)).

Think Critically

Should Medicare pay for new, expensive technological procedures developed to treat common medical problems of older adults? Should cost-effectiveness enter the picture for treating Medicare patients? Explain the reasoning behind your answer.

Box 1-7

Health Care–Associated Conditions Not Paid for by Medicare or Medicaid

The conditions listed are those that are acquired during hospitalization and are considered preventable.

- Foreign object left in the patient after surgery
- Air embolism
- Blood incompatibility
- Stages III and IV pressure ulcers
- Falls and trauma (fractures, dislocations, intracranial injuries, crushing injuries, burns, electrical shocks)
- Poor glycemic control (diabetic ketoacidosis, nonketotic hyperosmolar coma, hypoglycemic coma, secondary diabetes with ketoacidosis, secondary diabetes with hyperosmolarity)
- Catheter-related urinary tract infection
- Vascular catheter–associated infection
- Surgical site infection after coronary artery bypass graft, particularly mediastinitis (infection in the chest), or after bariatric surgery, gastroenterostomy, laparoscopic gastric restrictive surgery, or orthopedic procedures
- Deep vein thrombosis or pulmonary embolism after total knee replacement or hip replacement
- Surgical site infection after cardiac implantable electronic device insertion
- Iatrogenic pneumothorax with venous catheterization

Data from Centers for Medicare Services (CMS): Medicare program: General information, 2014. Retrieved from <http://www.cms.gov/Medicare/Medicare-General-Information/MedicareGenInfo/index.html>.

Another measure aimed at cost containment is **capitation**, an alternative for fee-for-service payment. It involves a set monthly fee charged by the provider of health care services for each

member of the insurance group for a specific set of health care services. If services cost more than the monthly fee, the provider absorbs the cost of those services. At the end of the year, if any money is left over from the unused portions of monthly fees, the health care provider keeps this remainder as a profit.

Managed care is a type of group health insurance developed to provide quality health care with cost and care use controls. This is accomplished by paying providers to care for groups of patients for a set capitation fee and by limiting services. Medical necessity and the appropriateness of health care services are monitored by a use review system. Types of managed care systems include **health maintenance organizations (HMOs)** and **preferred provider organizations (PPOs)**. This option is used by both Medicare and private insurance companies.

Providing Holistic Care

Holistic nursing care involves being aware of and attending to the physiologic, psychological, social, cultural, and spiritual needs of patients. Data for many of these needs can be collected, and interventions carried out, while care and treatments are administered. Assisting with bathing, feeding, ambulating, and other physical care provides an opportunity to find out about dimensions of the patient's life beyond physical problems. Use time with the patient constructively. Data gathering guidelines are presented in [Chapter 2](#).

Promoting a Therapeutic Nurse-Patient Relationship

The focus of the nurse-patient relationship is on the patient's problems and needs. The relationship is therapeutic, because it provides the patient with the help needed for healing or for a return to wellness. In comparison, a social relationship lacks goals, exists primarily for pleasure, and meets the needs of each person in the relationship. You need to maintain a therapeutic relationship when working with patients and avoid using patient contact to meet personal needs (e.g., the need to be liked, for friendship, or for approval). Develop awareness of your own personal needs and separate them from the patient's needs. A therapeutic nurse-patient relationship ends when the patient has completed treatment or therapy.

A patient who is physically ill is also affected emotionally by the illness or injury. It is not unusual for patients to display behavior that is not their usual manner. Patients' emotional needs and the resulting behaviors are usually temporary and related to the stresses of illness. Occasionally, patient behavior is related to underlying disorders that will benefit from a psychiatric consultation or treatment (see [Chapters 45 through 48](#)). Even patients whose primary illness is physical rather than psychological can sometimes express emotional discomfort through **dependent** (inability or unwillingness to do tasks for oneself), withdrawn, hostile, or manipulative behavior. They may act in ways that are confusing and are uncomfortable for a nurse who is not prepared to act therapeutically.

It is easier to deal with patients' behaviors if their responses to particular situations are understood. Your task is to recognize that patients' behavior results from their current situation. Appropriate nursing responses require kindness, understanding, and sometimes firmness. People may become childlike and fearful when they are ill, or act as if they are unaffected by their illness. Patients appreciate having someone available to guide them through their ordeal in a therapeutic manner.

Think Critically

When assigned to a patient recuperating from major surgery who is displaying very dependent behavior, how can you help to promote a return to independence?

Inability to assume personal responsibilities can be a source of worry for patients and may interfere with a positive outcome after illness or surgery. Some patients are caring for aging parents; are grandparents who play an active, daily role in caring for grandchildren; or are single parents with young children. If a patient lives alone, pet care may be a concern. Patients who are employed might have used available sick leave, may not have health insurance, or may carry a high insurance deductible that is a concern. Patients enrolled in an educational program might be concerned about having to drop a course or leave a program because of time lost to hospitalization, diagnostic tests, or restrictions such as not being able to drive. Conversing with these patients in a therapeutic manner may help them identify their concerns and begin problem solving.

Think Critically

What effect would your admission today for an emergency appendectomy have on your life? How could you resolve your concerns? Who could help you in this situation?

Establishing Trust

To develop a therapeutic relationship, trust needs to be established between the patient and nurse. In today's health care system, time with patients is limited and each patient contact must be efficiently used. Knock before entering the room, give your name, identify yourself as a nursing student or LPN/LVN student, and give the reason for your visit. Explain how long you will be on duty, inform the patient when to expect meals to arrive and the approximate time providers may visit, and so on. Explain what care will be given on the shift and when it will be offered. Many older patients are not accustomed to the informality of having strangers address them by their given (first) name. Clarify how the patient would like to be addressed. Put the patient at ease with a pleasant, unhurried approach.

Using Empathy

An important part of the nurse-patient relationship is the nurse's ability to demonstrate empathy. No one can know or feel what another experiences. **Empathy** involves accurately perceiving the patient's feelings and understanding their meanings, even though the nurse cannot experience the same emotional effect of these feelings, and displaying appreciation for what the other person is feeling.

An empathetic nurse conveys the interpretation of the patient's feelings back to the patient, for validation of accuracy. In this way, the patient's feelings are valued and accepted as legitimate. An example of an empathetic statement by the nurse is, "You appear to be upset about your surgery tomorrow." In contrast, sympathy involves entering into feelings with patients and is displayed by showing sorrow and pity. An example of a sympathetic statement by the nurse is, "You poor thing. I had that surgery." Patients judge their health care experiences by the nature of the help they receive.

Using Therapeutic Communication

Communicate at the level of the patient's understanding. Active listening helps the patient express needs and feelings. Ask patients what they think and actively listen to their answers, concerns, and fears by rephrasing the message when the patient is finished to verify that you understand. Avoid judging the message or the patient. Make sure the patient's and your verbal and nonverbal communication are congruent. Avoid forming a response while the patient is speaking. Answer all of the patient's questions, when possible. Admit when you do not know the answer to a question, and find out and deliver the answer as soon as possible. The focus needs to be the physical and mental well-being of patients. Thank the patient for cooperation and attention as appropriate.

Maintaining Patients' Self-Esteem

A major problem for patients of any age during illness or debilitation is the loss of self-esteem. Avoid referring to a patient by the illness or diagnosis; instead refer to the patient by name. Identify the strengths of patients and find a way to support those strengths and thereby sustain their self-esteem. Allowing patients to perform what self-care they can manage and praising them for any effort with activities of daily living or rehabilitation exercises helps rebuild self-esteem. Nurses and providers are especially important in providing encouragement.

Think Critically

Have you observed a patient being treated in a less than respectful manner? How did it make you feel? How would you have treated the patient to preserve or build self-esteem?

Ensuring Pain Control

Many nursing actions help to decrease patient stress, but pain control is an especially important action. Anticipate patients' pain control needs before they are expressed—for example, administer prescribed pain medication before painful procedures. After surgery, regularly assess for pain and medicate as needed per orders. Patients with chronic disease often need regular medication for pain relief. Assess the need for further pain medication before the next dose is due and determine whether the medication is effective. If the pain medicine is not doing its job, approach the provider and ask for an order change. Use adjunctive measures for pain control such as distraction. Provide whatever comfort measures you can, such as a straightened bed or a massage for added relief.

Touch can be reassuring, calming, and encouraging to patients. In this era of threats of sexual harassment, some nurses may be afraid to touch patients. Ask if touch is okay or touch an arm or a hand and watch the patient's reaction to see if this gesture is acceptable. Be aware of cultural taboos about being touched. Touch that is therapeutic can range anywhere from a friendly touch on the shoulder to massage or exercise of joints. Touch has been shown to effectively help manage pain in patients experiencing illness or disease.

Older Adult Care Points

- Treat older adults with respect. Do not assume a mental impairment is present unless one is stated by the health care provider in the chart. Speak at a normal volume, with a medium to low pitch, and enunciate clearly.
- Be certain glasses and/or hearing aids are in place before beginning an interaction.
- Display patience and plan extra time, because it might take older adults longer to accomplish usual tasks or to formulate answers to questions.
- Give information slowly, and ask for feedback to evaluate understanding. Supply printed material when possible.
- Have the patient answer questions rather than allowing other family members or friends to answer.
- Include the older adult in decision making and care planning.

Meeting Cultural Needs

Health care must accommodate patients of many cultural backgrounds. Patients may think and behave differently because of social class, religion, ethnic background, minority group status, marital status, or sexual preference. Avoid making judgments about people who are culturally different from you. You should be open-minded and **nonjudgmental**, take differences at face value, accept people as they are, and give high-quality care. **Transcultural nursing** is recognizing cultural diversity and delivering nursing care that is sensitive to the particular needs of the patient and family. To do this you must develop cultural competence through knowledge of various cultures and by being sensitive to issues and preferences related to culture, race, gender, sexual orientation, social class, and economic situation. Cultural competence requires examining your own values, attitudes, beliefs, and prejudices; keeping an open mind; and attempting to look at the world through the perspectives of diverse cultures.

Think Critically

Can you give examples of judgmental behaviors you observed in staff members during your clinical rotation?

The philosophy of **individual worth** is the belief in the uniqueness and value of each human being. Nurses need to realize that individuals have the right to live according to personal beliefs and values **as long as those beliefs and values do not interfere with the rights of others and are within the law**. Applying information to all individuals in a group can lead to assumptions, which are called **stereotypes**. A stereotype is a generic simplification used to describe all members of a group, without exception. Stereotyping is an element of profiling and provides an expectation that all individuals in a group will act in a particular way in a given situation. Profiling ignores individual differences. Members of any group or culture may not wholly observe the values and practices of their culture. Information about cultural groups can help explain—but cannot predict—individual behavior.

Cultural Considerations

Examples of Cultural Preferences

- People from the Philippines may be shy and feel awkward in unfamiliar surroundings. They may give little direct eye contact. A family member should be allowed at the bedside at all times. The patient may be reluctant to venture out of the room to ambulate.
- Many Cambodians believe that the soul resides in the head, and it is inappropriate to touch their heads without permission. Ask before touching the head when changing head dressings or administering eyedrops.
- Hmong from Southeast Asia prefer their own relatives as interpreters and may not trust a hospital-employed interpreter. The interpreter should be of the same sex as the patient, as neither Hmong men nor women may discuss or admit to intimate problems to an interpreter of the opposite sex.

When disease strikes, people may blame pathogens (germs), spirits, or an imbalance in the body. Some cultural groups have folk medicine rituals or special procedures to address maladies (e.g., rubbing the skin with the edge of a coin to release the toxins causing illness). Some groups have special individuals who are charged with curing disease (provider, herbalist, shaman, or curandero). Some groups believe that special foods, food combinations ("cold" foods for "hot" illness), or herbs (Echinacea, feverfew) can prevent or cure illnesses. Others see no relationship between the diet and health. Some patients consider the prevention of illness as an attempt to control the future; they may wonder about the necessity to see a health care provider for preventive care (e.g., immunizations). Different beliefs of patients need to be respected.

Meeting Spiritual Needs

Spirituality incorporates the beliefs and values that provide strength and hope, awareness of self (including inner strengths), and understanding of life's meaning and purpose. Patients have a spiritual self with spiritual needs and may use spiritual practices to meet those needs. Examples of personal spiritual practices may include gardening, reading inspirational books, listening to music, meditating, praying, communing with nature, practicing breathing techniques, volunteering, expressing gratitude, and counting blessings.

Spirituality and *religion* are related terms but they do not have the same meaning. Religion attempts to formalize and ritualize spiritual beliefs. Some patients fulfill spiritual needs by belonging to a religious denomination. Concrete symbols, such as books, pictures, icons, herb packets, beads, statues, jewelry, and other objects, can affirm patients' connection with their belief in a higher power. The value of patients' rituals and religious practices is determined by their faith and is not subject to scientific evidence. Spirituality, on the other hand, does not necessarily include religion.

Crisis situations often surface in acute health care situations. Patients' beliefs and values can profoundly affect their response to these crises, attitude toward treatment, and rate of recovery. The need for spiritual care for patients and families may be intensified by hospitalization, pain experiences, chronic or incurable disease, terminal illness, or the death of a loved one. The pastoral care team allies with nurses in providing spiritual care for patients. Follow agency policy for arranging visits of patients' clergy or spiritual advisors, when such visits are desired, and provide private time for spiritual or religious practices.

Getting Ready for the NCLEX® Examination!

Key Points

- Medical-surgical nursing is a vast nursing specialty that involves several roles for LPN/LVNs.
- Qualities and skills needed by LPN/LVNs for medical-surgical nursing include upholding clinical practice standards, providing safe patient care, teaching patients, communicating effectively, working as a collaborative member of the health care team, advocating for the patient, and displaying leadership.
- Assignment involves allocating tasks to unlicensed personnel—when those tasks are within their job descriptions.
- Delegation involves designating to unlicensed personnel duties that are in the job description of the LPN/LVN, are within the boundaries of the NPA, and are advisable considering the patient situation.
- The most common site of employment for LPN/LVNs as a charge nurse is a nursing home or long-term care facility.
- Each state's NPA defines what the LPN/LVN legally can and cannot do in practice, including delegating from the position of charge nurse. LPN/LVNs use evidence-based practice, quality improvement measures, informatics, and safety practices to enhance the quality and safety of nursing care.
- Health care today includes biomedicine, complementary and alternative medicine practices, and the *Healthy People 2020* initiative.
- The ACA, Medicare, and Medicaid are examples of government-sponsored health insurance in the United States.
- To help curb rising health care costs, the federal government adopted the payment system of DRGs as part of Medicare.
- In another measure to cut costs, preventable hospital-acquired problems will not be reimbursed by Medicare.
- Holistic care includes awareness of the physical, psychological, social, cultural, and spiritual needs of patients when planning and delivering care.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- American Nursing Informatics Association, www.ania.org
- *Healthy People 2020*, www.healthypeople.gov
- National Association for Practical Nurse Education and Service, <http://napnes.org/drupal-7.4/>
- National Council of State Boards of Nursing (NCSBN), www.ncsbn.org/Joint_statement.pdf
- National Federation of Licensed Practical Nurses (NFLPN), www.nflpn.org/practice-standards4web.pdf
- National Center for Complementary and Alternative Medicine (NCCAM), <http://nccam.nih.gov/>

Review Questions for the NCLEX® Examination

1. Which of the following is within the role of the LPN/LVN? (*Select all that apply.*)

1. Admitting a patient on a medical-surgical unit.
2. Changing a dressing on a postoperative patient.

3. Assessing a patient whose condition has deteriorated.
4. Collaborating with the physical therapist on how to motivate the patient to ambulate.
5. Advocating for a patient with a physician when prescribed pain medication is insufficient.
6. Teaching the patient about the side effects of a new medication.

NCLEX Client Need: Safe and Effective Care Environment; Coordinated Care

2. What should be the *first* thing considered before delegating a specific task? (*Priority setting.*)

1. Know whether the task is within the scope of practice of the LPN/LVN.
2. Be aware of the nursing assistant's competency and experience.
3. Seek approval from the facility administration.
4. Determine the stability of the patient's condition.
5. Provide adequate explanation and oversight of the task.

NCLEX Client Need: Safe and Effective Care Environment: Coordinated Care, Concepts of Management and Supervision

3. In caring for patients with pressure ulcers, which task would be most appropriate to assign to the nursing assistant?

1. Providing assistance in making dietary choices, including fluids
2. Participating in determining the appropriate type of wound care
3. Repositioning the patient every 2 hours
4. Describing the condition of the wound and any drainage

NCLEX Client Need: Safe and Effective Care Environment: Coordinated Care, Concepts of Management and Supervision

4. The LPN/LVN in the hospital practices under the state's Nurse Practice Act, the Standards of Practice, and the _____. (*Fill in the blank.*)

NCLEX Client Need: Safe and Effective Care Environment: Legal Responsibilities

5. QSEN prepares the nurse to: (*Select all that apply.*)

1. carry out nursing tasks efficiently for a group of patients.
2. consider safety factors at all times when delivering care.
3. apply evidence-based practice to the care of patients.
4. use informatics to collaborate and communicate with the health care team.
5. note ways that quality of care might be improved.
6. assign tasks to UAP on the team in a timely manner.

NCLEX Client Need: Safe and Effective Care Environment

6. In the process of developing evidence-based practice, after developing and asking a clinical question, the next step is to:

1. apply valid, relevant evidence in practice.
2. use data to improve safety.
3. evaluate outcomes based on evidence.
4. search for and collect sources of evidence.

NCLEX Client Need: Safe and Effective Care Environment: Performance Improvement

7. One way nurses apply National Patient Safety Goals to patients is to:

1. report signs of infection in a patient's wound immediately.
2. use two ways to identify patients each time before administering a medication.
3. educate patients about the purpose and side effects of each medication.
4. use lift equipment to get patients out of bed and into a chair.

NCLEX Client Need: Physiologic Integrity: Reduction of Risk Potential

8. The reason that Medicare will not pay for care for a deep vein thrombosis on a patient in the

hospital after knee replacement is:

1. the patient was considered at risk for this problem.
2. the deep vein thrombosis is considered preventable.
3. Medicare is working hard to lower costs of the program.
4. the patient's private insurance will cover the costs.

NCLEX Client Need: Safe and Effective Care Environment: Coordinated care, Performance Improvement

9. Which statement, made by a LPN/LVN during a patient interaction, indicates a therapeutic response?

1. "I am sorry for your loss. I just lost my mother last year."
2. "Try putting on some ointment before dressing the wound."
3. "Are you saying that your cast is uncomfortable? Tell me more about your discomfort."
4. "I understand. I do not like surgery either."

NCLEX Client Need: Mental Health Concepts: Therapeutic Communication

10. The nurse finds a confused patient with a history of falls attempting to get out of bed. To maintain the patient's self-esteem and safety, the nurse's intervention should be to:

1. apply physical restraints to keep the patient in bed.
2. administer sedatives per doctor's order.
3. install a bed alarm to notify staff.
4. ascertain what the patient is searching for.

NCLEX Client Need: Safety and Infection Control: Restraints and Safety Devices

Critical Thinking Questions

Scenario A

Rosa, a student, is about to graduate as an LPN/LVN. She wants to begin searching for a job within her community. In looking at local advertisements, she notices that some are for RNs and some for LPN/LVNs.

1. What type of employment and duties require an RN rather than a new LPN/LVN?
2. When seeking employment in a long-term care facility or a rehabilitation facility, what type of positions might be available for LPN/LVNs?
3. What is the overall requirement for an LPN/LVN no matter where she or he works?

Scenario B

Hector Pulido, age 75, who has pneumonia, was surprised at the aloofness of the admission clerk as she “entered” him into the electronic system during his first hospital experience. Two personnel who assisted him to his assigned room called him “Hector.” Neither introduced themselves or indicated the role they played in his admission. While he was wearing a patient gown that did not fit his large frame and waiting for a nurse to interview him, people kept coming into his room without knocking. One asked his wife if he drank coffee or tea with his meals. That night, the sound of televisions, the click and beep of machines, and staff talking in the halls prevented him from getting a good night’s sleep.

1. List the things that went wrong with Mr. Pulido's admission-day experience.
2. Describe how you would have made his admission day a better experience.
3. Explain the reasons for the things you chose to do differently.

Scenario C

The United States federal government is faced with budget problems resulting in large deficits and the need to reduce spending. Congress suggests reducing spending by making cuts in the Medicare and Medicaid programs. The congressional representative for your district asks for your opinion and your rationale in response to each of the following questions:

1. Should Medicare pay the cost of coronary bypass surgery for an active 85-year-old person?
2. Should Medicaid pay for care in an extended care facility for an 88-year-old person who has had a stroke and is long-term comatose?
3. Should Medicare or Medicaid pay for lifestyle prescription drugs (e.g., Viagra) for men eligible for these programs?

CHAPTER 2

Critical Thinking and the Nursing Process

Objectives

Theory

1. Illustrate how critical thinking affects clinical judgment.
2. Explain what characteristics are necessary to think critically.
3. Correlate how problem solving and decision making are a part of critical thinking.
4. Discuss the LPN/LVN standards for medical-surgical nursing practice.
5. Explain three fundamental beliefs about human life as the basis for nursing process.
6. Distinguish how critical thinking, clinical reasoning, and clinical judgment are applied to the nursing process.

Clinical Practice

7. Identify factors that influence critical thinking during patient care.
8. Provide a clinical example of how nursing process is used in the care of medical-surgical patients.
9. Demonstrate each of the following techniques of physical examination: inspection and observation, olfaction, auscultation, and percussion.
10. Include the patient in formulation of the nursing care plan.
11. Use clinical reasoning to prioritize care for a specific patient.
12. Prepare a prioritized list for beginning-of-shift assessment for a specific patient.

KEY TERMS

- auscultation** (ăw-skūl-TĀ-shūn, p. 20)
- clinical judgment** (KLĪN-ĕ-kāl JŪJ-měnt, p. 15)
- congruent** (kōn-GRŪ-ĕnt, p. 20)
- critical thinking** (p. 15)
- data collection** (DĀ-tă, p. 17)
- evaluation** (ih-văl-ū-Ā-shūn, p. 26)
- expected outcomes** (p. 25)
- focused assessment** (p. 21)
- goals** (p. 25)
- implementation** (ĭm-plī-měn-TĀ-shūn, p. 17)
- inspection** (p. 20)
- interdisciplinary (collaborative) care plans** (kō-LĂB-ĕr-ă-tīv plănz, p. 26)
- NANDA-I** (NĂN-dă-Ī, p. 23)

nursing diagnosis (p. 23)
nursing interventions (p. 25)
nursing process (p. 17)
objective data (öb-JĚK-tív DĀ-tă, p. 18)
observation (p. 20)
olfaction (öl-FÄK-shün, p. 20)
palpation (päl-PĀ-shün, p. 20)
percussion (pěr-KŪ-shün, p. 21)
planning (p. 17)
priority setting (p. 23)
subjective data (süb-JĚK-tív DĀ-tă, p. 18)

Critical Thinking and Clinical Judgment

Critical thinking is a method for solving problems. It is directed, purposeful mental activity by which you evaluate ideas, construct plans, and determine desired outcomes. *Reasoning* is a synonym used for critical thinking. In nursing practice, critical thinking incorporates the scientific method and uses clinical reasoning to make reliable observations and to draw sound conclusions from obtained data. Developing critical thinking skills is a lifelong process and improves over time with experience. **Clinical judgment** is the result of critical thinking applied to clinical situations.

Critical thinking applied to clinical judgment in practical/vocational nursing can be described as being the following:

- Purposeful, informed, and outcome focused (results oriented), requiring careful identification of patient problems, issues, and risks, and making accurate decisions about what is happening, what needs to be done, and what the priorities are for patient care
- Driven by patient, family, and community health care needs
- Based on principles of nursing process (Box 2-1) and the scientific method

Box 2-1

Characteristics of the Critical Thinker

- Maintains an open mind and a questioning attitude
- Recognizes his own biases and limitations
- Is persistent in seeking solutions
- Separates relevant information from irrelevant information
- Recognizes inconsistencies in data gathered
- Identifies missing information
- Considers all possibilities
- Assumes an empathetic attitude
- Uses an organized and systematic approach to problems
- Verifies accuracy and reliability of data
- Considers all possible solutions before making a decision
- Admits what he does not know
- Reasons logically
- Strives for excellence and improvement
- Draws valid conclusions from the evidence or data
- Sets priorities and makes carefully considered decisions
- Is flexible, realistic, creative, humble, honest, curious, and insightful
- Focused on using both logic and intuition and based on knowledge, skills, and the professional experience of the LPN/LVN
- Guided by standards and ethical codes of the following organizations:

- National Association of Practical Nurse Education and Service, Inc. (NAPNES) *Standards of Practice for Licensed Practical/Vocational Nurses* (see Appendix on *evolve*) and *Code of Ethics*
- National Federation of Licensed Practical Nurses, Inc. (NFLPN) *Nursing Practice Standards for the Licensed Practical/Vocational Nurse* (see Appendix on *evolve*) and *The Code for Licensed Practical/Vocational Nurses*
- Interested in strategies that make the most of human potential (e.g., using individual strengths) and compensating for problems created by human nature (e.g., overcoming the powerful influence of personal beliefs, values, and prejudices)
- Committed to constantly reevaluating, self-correcting, and striving to improve (e.g., practicing skills, learning new skills, attending classes and workshops, and reading nursing journals) (Alfaro-Lefevre, 2013; [Hill and Howlett, 2013](#))

Think Critically

Can you list three examples in which you might use critical thinking in the classroom?

Critical thinking is most effective when the brain is purposefully engaged—for example, attentively listening to a report at the beginning of the shift and thinking about how you will apply the information you have gained. Observe the critical thinking activities that take place among the nurses during the report as they collaborate in solving a patient-related problem. Observe the same elements later in the shift as nurses make decisions about patient care issues or about when to notify the provider of a problem or a need for a change of orders. Consider the following when receiving a report:

- What will I be expected to do for my assigned patients?
- What are the priorities of nursing care for each patient?
- What areas need further clarification?
- What procedures can be done independently, and which require supervision?

Examine your thinking and the thinking of others, and apply the knowledge to patient care. Critical thinking is based on science and scientific principles and includes the following:

- Collecting data in an organized way
- Verifying data
- Looking for gaps in information
- Analyzing the data

As a nurse, you must access, understand, recall, and use information as the basis for critical thinking in the clinical area. A sound knowledge base is essential to critical thinking, and that base will grow throughout your nursing education. Critical thinking allows the nurse to apply learned knowledge and principles to different patient care situations.

Factors That Influence Critical Thinking and Nursing Care

Attitude

A major factor in learning to apply critical thinking is attitude. The critical thinker is humble and recognizes that he does not have all the answers; he also recognizes that his perceptions may be clouded by personal values and beliefs. The critical thinker makes an effort to consider evidence that is presented objectively.

Communication Skills

The critical thinker communicates effectively both orally and in writing. He reflects on thoughts before speaking and presents information in a clear, concise manner. The critical thinker listens attentively. When documenting, he clearly conveys to other health team members what was planned, the patient's reaction to any care offered or provided, and whether expected outcomes were met (Box 2-2).

Box 2-2

Actual Examples of Student Charting (Unclear Communication)

- Vaginal packing out. Dr. Heffle in.
- Dr. Jones in. Had large, formed brown stool.
- On the second day the knee was better, and on the third day it disappeared.
- She is numb from the toes down.
- Patient was alert and nonresponsive.

It is helpful to identify a nurse who is skilled at thinking critically and who can communicate clearly both verbally and through charting. This person can serve as a mentor to you as you learn to apply critical thinking and knowledge. The most effective mentor will be one who coaches by asking questions, rather than someone who merely provides answers.

Many other factors influence your critical thinking, such as your personality, age or maturity, prejudices and biases, past experience, and situational factors such as anxiety, stress, and fatigue.

Think Critically

When listening to the report on a patient, what constitutes attentive listening? How does critical thinking help you obtain all the data you need to care for the patient?

Problem Solving and Decision Making

The ability to problem solve and make decisions is integral to critical thinking. Incorporating scientific knowledge and research into nursing requires a consistent, logical method to solve problems. Using the scientific method, one first defines the problem, then gathers information, analyzes the information, and develops solutions (Box 2-3). Next a decision is made about which solution to use; then **implementation** of the solution occurs. Evidence-based research findings are considered when choosing actions to implement the solution.

Box 2-3

Steps in the Problem-Solving Process

1. Define the problem clearly.
2. Consider all possible alternatives as solutions to the problem.
3. Consider the possible outcomes, both positive and negative, for each alternative.
4. Predict the likelihood of each outcome occurring.
5. Choose the alternative with the best chance of success and least chance of undesirable outcomes.

Adapted from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4. St. Louis, 2014, Mosby.

Integrating Critical Thinking and the Nursing Process

Critical thinking, clinical reasoning, and clinical judgment are integral to the nursing process. It is essential to know the boundaries of the role of the LPN/LVN in your state. If in doubt about the role of the LPN/LVN in the nursing process, direct your questions to your state's board of nursing. According to NCSBN research, all U.S. states and territories identify a scope of practice for either LPNs or LVNs. However, the scope of practice allowed varies widely. Most LPN/LVN scopes of practice stipulate a directed role under the supervision of an RN, but scopes of practice differ in the areas of care **planning**, assessment, intravenous therapy, teaching, and delegation from state to state ([Hill and Howlett, 2013](#)).

The NCSBN has clearly defined the LPN/LVN role in the nursing process. What does your state's NPA indicate about the role of the LPN/LVN?

Think Critically

What questions do you have regarding clarification of the Nurse Practice Act?

Nursing process is the language of nursing. It is an orderly way to assess a patient's response to current health status and to plan, implement, and evaluate the patient's response to nursing care. It is a way to communicate to all nursing personnel what is to be done and who is to do it, during all shifts. Nursing process provides a way to make changes in patient care if progress is not being made. The nursing process builds on a patient's strengths and creates a partnership between the nurse and patient whenever possible. The goal of the nursing process is to alleviate, minimize, or prevent real or potential health problems[®] ([Box 2-4](#)).

Box 2-4

Four Phases of the Nursing Process for LPN/LVNs

1. **Data Collection:** Assist the RN by systematically gathering and reviewing information about the patient and communicating it to appropriate members of the health care team.
2. **Planning:** Assist the RN in the development of expected outcomes and interventions for a patient's plan of care.
3. **Implementation:** Provide planned nursing care to accomplish expected outcomes.
4. **Evaluation:** Compare actual outcomes of nursing care to expected outcomes and assist with updating the nursing care plan.

Applying LPN/LVN Standards in Medical-Surgical Nursing

The five basic steps of the nursing process are (1) assessment (data collection), (2) nursing diagnosis, (3) planning, (4) implementation, and (5) evaluation. The LPN/LVN assists the RN with steps 1, 3, 4, and 5. The RN is responsible for formulating the problem statements in step 2 from the assessment data obtained from all sources.

Assessment (Data Collection)

The purpose of **data collection** is to have a relevant database from which patient problems and potential problems may be identified. Data collection provides the basis for developing a problem list, from which problem statements or nursing diagnoses will be developed. The RN is responsible for the initial admission assessment, but the LPN/LVN may be asked to assist with parts of it. The LPN/LVN is responsible for ongoing assessment for assigned patients.

The LPN/LVN acts in a more independent role when participating in data collection (assessment) and during the implementation phase of the nursing process. LPN/LVNs systematically gather and review data about the patient and communicate their findings to appropriate members of the health care team. A complete database includes a thorough health history®, physical assessment, psychosocial assessment, and cultural and spiritual assessments. Many sources are used to compile a complete database for the patient. Most health care facilities use a standardized form for the **admission assessment**. Both **subjective data** (data that the patient gives that cannot be seen or felt by another, such as pain) and **objective data** (data that can be verified by sight, smell, touch, or sound) are included.

If there is an immediate life-threatening problem, determine immediately what action must be taken and if additional expertise is needed to deal with the problem. Once the patient's physical condition is stabilized, a formal care plan can be developed (*Nursing Care Plan 2-1*).

* Nursing Care Plan 2-1

Care of the Patient With Imbalanced Nutrition

Scenario

Mr. Nielson, age 82, was admitted because of continued loss of weight and weakness. He is a frail-looking man who walks slowly and with hesitation. The patient has experienced loss of appetite, loss of weight, and loss of energy since his right lung lobectomy 3 years ago.

Problem Statement/Nursing Diagnosis

Altered nutrition/*Imbalanced nutrition: less than body requirements, related to loss of appetite and weakness and weight loss*

Supporting Assessment Data

Objective: Height 5'9", weight 128 lb, loss of 35 lb

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will eat 1500 calories of soft diet and drink 2000 mL of liquids each 24-hr period.	Serve six small meals at 8 A.M., 10 A.M., noon, 2 P.M., 4 P.M., and 6 P.M.	Small, attractively arranged soft diet of favorite foods will entice patient to eat without feeling too full.	By day 2, patient will be able to consume 1000 calories in a 24-hr period.
	Assist patient to chair using minimal assistance.	Sitting up encourages proper digestion.	Sitting up for all meals.
	Encourage self-feeding. Assist only if needed. Assess preferred diet.	Encourages independence. Patients eat more when presented with food they prefer.	Feeding self. Prefers chicken, mashed potatoes, gravy, creamed peas, and lemon pie.
	Set up tray for easy reach.	Preserves strength and helps patient overcome weakness.	Trays set up. Continue plan.
By day 4, patient will be able to remove lids and cut most of meat.	Open packages and milk carton. Remove lids. Cut meat.	Helps conserve energy.	Continue plan.
By day 2, patient will drink 1000 mL during 24-hr period.	Offer 240 mL of liquids at 6 A.M., 9 A.M., 11 A.M., 3 P.M., 5 P.M., 7 P.M., and 9 P.M. Vary choices with apple juice, orange juice, lemon-lime drink, tea, ice cream, water, and gelatin. Record time, amount, and liquids taken.	A variety of favorite liquids in small amounts, alternating between meals, will be easier to consume. Verifies amount of liquid consumed.	Intake: 500 mL this shift.
Patient will verbalize increased energy and spend more time awake during the day.	Collect data on amount of hours patient is awake and the length and number of naps.	Provides objective data as a baseline.	Patient states that he feels more energetic and will decrease the length of morning and afternoon nap times to 30 min each.

Critical Thinking Questions

1. What practical methods can you use to entice the patient to eat, without actually feeding him?
2. What are measures that you can use to encourage activity, without tiring the patient excessively?

Sources of Information for the Database

Admission forms, history, and physical.

An admission form generally⁸ accompanies a patient to the unit. The admission form covers basic information such as the patient's name, reason for admission, and other important information. If the patient has been hospitalized in the past, previous records may be sent to the unit. The medical diagnosis will guide you in collecting assessment data and in identifying patient problems. Check to see if results of preliminary laboratory work, radiographs, or other test results are included. If available, read the current information before entering the patient's room; knowing current information will enhance your critical thinking and observation skills during your initial patient contact (and will keep you from repeating obvious questions).

Think Critically

How many sources can you identify that would provide information for a nursing database on a patient who has been admitted to a long-term care facility?

Interview.

Ask patients what they think is their major problem or "chief complaint." Other questions concern the present level of pain, when the last bowel movement occurred, problems with urination or appetite, difficulty sleeping, and whether patients have any additional concerns or complaints. The patient is the primary source of current information and knows more about the problem than anyone else.

Focused Assessment

General Interview Guide

Social Assessment

- Are you married?
- Who lives with you?
- What kind of work do you do?
- Are you a member of a church or belong to any organizations?
- Do you have health insurance?
- How are things at home if you are not there while in the hospital?
- Are there any medical problems that are common in your family?
- Have you had previous surgeries or serious injuries?
- In your life now, who is helpful to you?
- What prescription drugs do you take? What over-the-counter medicines or supplements?
- Do you smoke? How much?

- Do you drink alcohol? How often do you drink and how much?
- Are you allergic to any drugs? Foods? Other substances?
- What do you like to eat? Describe yesterday's meals and snacks.

Physical Assessment

- Why were you admitted here?
- What health problems do you have?
- Do you routinely see doctors? If so, for what?

Review of Systems (Ask questions regarding the following)

Head and Neck

Frequent headaches; dizziness, ringing of the ears, hearing problems; visual problems, glaucoma, cataracts, glasses or contact lenses; surgery of the brain, eyes, or ears; frequent colds; nasal allergies; sinus infections; frequent sore throats; hoarseness; trouble swallowing; swollen glands; mouth sores; date of last dental examination; history of thyroid problems; use of a hearing aid; difficulty sleeping; napping

Chest

Male and female: Cough, sputum production; asthma, wheezing, frequent bronchitis; history of pneumonia; tuberculosis, exposure to tuberculosis; exposure to occupational respiratory hazards; palpitations, chest pain; shortness of breath; history of heart problems, murmurs, hypertension; anemia; surgery

Female: Frequency of breast examinations; date of last mammogram; nipple discharge; breast lumps

Abdomen (Gastrointestinal Tract)

Indigestion; pain; nausea; vomiting; excessive thirst or hunger; frequency of bowel movements; change in bowel movements; rectal bleeding; black or tarry stools; constipation; diarrhea; excessive gas; hemorrhoids; history of gallbladder or liver problems

Genitourinary (Inquire With Cultural Sensitivity)

Male and female: Problems with urination; up at night to urinate; dribbling of urine; history of urinary tract infection; stones

Female: Sexual activity; sexual problems; menstrual cycle and any problems; last menstrual period; bleeding between periods or after menopause; vaginal discharge; date of last Pap smear; history of sexually transmitted infections or vaginal disorders

Male: Sexual activity; genital problems; penile discharge; history of sexually transmitted infections; sexual problems

Extremities and Musculoskeletal System

Joint pain or stiffness; back problems; muscle pain; limited range of motion; vascular problems in legs or arms; easy bruising; skin lesions; history of phlebitis; thrombophlebitis; gout, osteoarthritis, rheumatoid arthritis, fractures, injury

Psychological Assessment

- Are you experiencing anxiety? Depression?
- Do you have unusual memory problems?
- Do you have difficulty thinking?
- Are you ever confused?

If for some reason the patient is incapacitated, secondary sources of information are useful (e.g.,

spouse, significant other, relative, friend, or patient advocate). The secondary source can also help verify information that was provided by the patient. **Box 2-5** provides suggestions for interviewing. The remainder of the admission form is filled out and includes the status of advance directives, assessments for fall risk, pain level, pressure ulcer risk, nutrition requirements, and ability to perform activities of daily living. Psychosocial, cultural, and spiritual assessment data are gathered as well.

Older Adult Care Points

Plan extra time for an interview with a patient who is older. An older person who is ill may think and speak more slowly than expected, may have a hearing loss, and often has a longer health history to relate than does a younger person.

Box 2-5

Interview Suggestions

- Introduce yourself to the patient by name and as an LPN/LVN student.
- Be respectful.
- A patient is entitled to be addressed by her surname. Do so, unless the patient asks you to address her differently.
- Pull up a chair so that the patient can see you at her eye level and can hear you clearly.
- Speak slowly and clearly.
- Ask your questions without dropping your voice at the end of the sentence. Be alert to any hearing difficulty the patient may have.
- Give time for the patient to respond.
- Attempt to resolve incongruence between body language and responses.
- Ask for clarification if you are unsure what the patient means by a particular statement or response.
- Summarize for the patient what you think you heard during the interview.
- Ask the patient for any corrections or additions.

After obtaining a list of current medications from the patient or transferring facility, a medication reconciliation form to identify[®] and prevent **polypharmacy** (multiple drugs prescribed for the same condition by different providers) is filled out. Medication reconciliation also reduces the risk of medication order errors and adverse interactions between drugs. Patient allergies and medications—prescription, over-the-counter, and herbal preparations and supplements—are included on the form, which is reviewed by both the provider and the pharmacist. Patients need to know that the information gathered will be recorded and used in planning their care.

Physical assessment.

Physical data collection usually begins with measuring the patient's blood pressure, pulse, respiration, temperature, weight, and height. **Accuracy is essential.** Data collection correlates current readings with the baseline data, with trends of past readings, with the patient's current clinical status, and with any medical care that has been provided. Such data yield significant information about the patient's condition and response to medication and other treatments. Complete assessments are performed daily.

Inspection and observation.

Inspection (looking) and **observation** (looking and noting) are important aspects of nursing assessment. Use your eyes to pick up clues about the patient's physical and mental condition. Note the patient's facial expression, posture, grimaces, movements, and whether answers are **congruent** (match the feeling tone of what is said verbally). Inspect the hair, skin, nails, and oral mucous membranes for data about hydration and dental hygiene. Observe the patient's state of personal care. Is the hair combed, and are the nails clean and reasonably trimmed? Is there anything in the room that gives evidence of support systems, family, or friends?

Olfaction.

Olfaction (smelling) can provide data about a patient's personal hygiene, as well as clues to possible illness. The sweet, fruity odor of acetone can be indicative of diabetic acidosis. The smell of newly mown clover can be present with hepatic coma. The smell of alcohol indicates the patient has been drinking. Sometimes patients with acute alcoholism may smell like aftershave, mouthwash, vanilla, Sterno, or other substances that contain a high percentage of alcohol. Foul or metallic mouth odors usually indicate poor oral hygiene or periodontal disease. Odor from the nose may be indicative of chronic sinusitis with postnasal drip or an obstruction in the nasal passages.

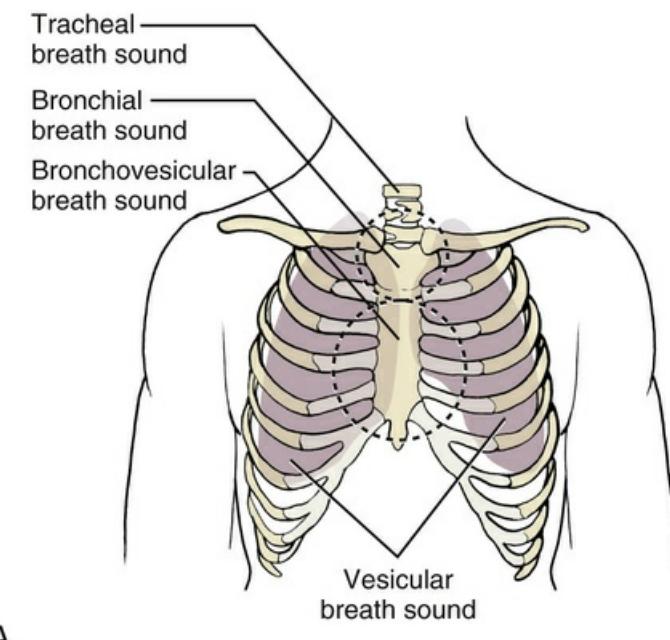
Patients who have anemia, an endocrine problem, or a central nervous system abnormality may be trying to cover up unpleasant body odor with bath powder or heavy perfume. An unpleasant genital odor may indicate an infection, poor hygiene, or insufficient fluid intake (commonly found in female patients in long-term care facilities). Without additional attention, body areas that are unattended may become reddened, irritated, and sometimes infected.

Palpation.

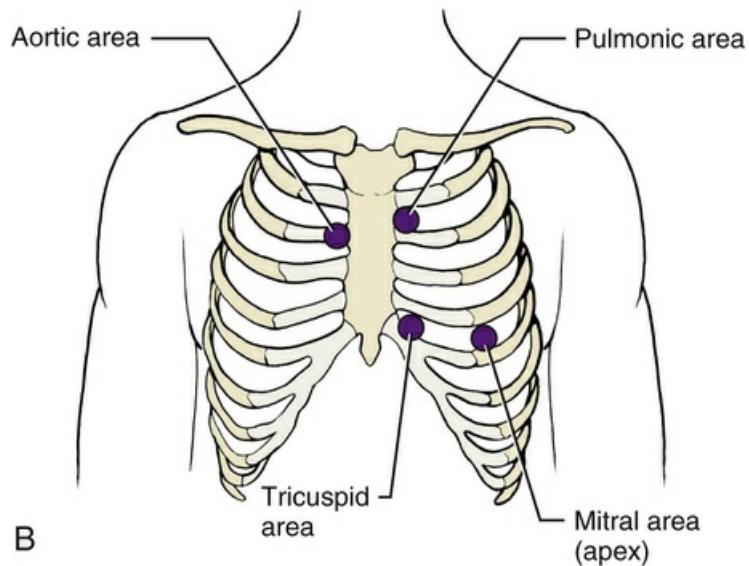
Palpate (touch) the patient's skin to determine whether it feels healthy or is coarse, dry, swollen, cold, or clammy. Dryness may be related to dehydration, and swelling may indicate edema (fluid in the tissues). If you depress the skin with your fingers and your touch leaves pitting (indentation) on the skin, edema is present. Measure and record the depth of pitting and the length of time the tissue remains indented. **Palpation** of the skin can provide additional information. Cold extremities may indicate poor circulation. Hot tissue may be the result of localized inflammation, and you will want to examine the area more carefully. Use your fingertips, not your thumb, to palpate the pulses. Use the flat of the hand to palpate the abdomen to determine whether it is soft or hard and whether there are any tender areas. Palpate the breasts for abnormal growths. Premenopausal women may have masses in their breasts, making it difficult to determine which lumps are significant (this is a good time to ask assistance from your instructor, the staff RN, or the clinical nurse specialist).

Auscultation.

Auscultation (listening) is an important skill in gathering data. Listen to the sounds of the patient's breathing—with a stethoscope and without a stethoscope. You may hear wheezing from constricted bronchi or stridor caused by a partial airway obstruction. Listening to the quality of a patient's cough will determine whether it is dry or moist. With the stethoscope, the sounds are amplified and you can auscultate normal, abnormal, or adventitious breath sounds ([Figure 2-1](#)). Listen to the apical pulse at the apex of the heart and on the abdomen for bowel sounds; listen carefully in each quadrant ([Figure 2-2](#)).



A



B

FIGURE 2-1 A, Place the stethoscope on the bare skin at these locations to hear the lung sounds. B, Place the stethoscope at the apex of the heart (56th intercostal space) to listen to the apical pulse.

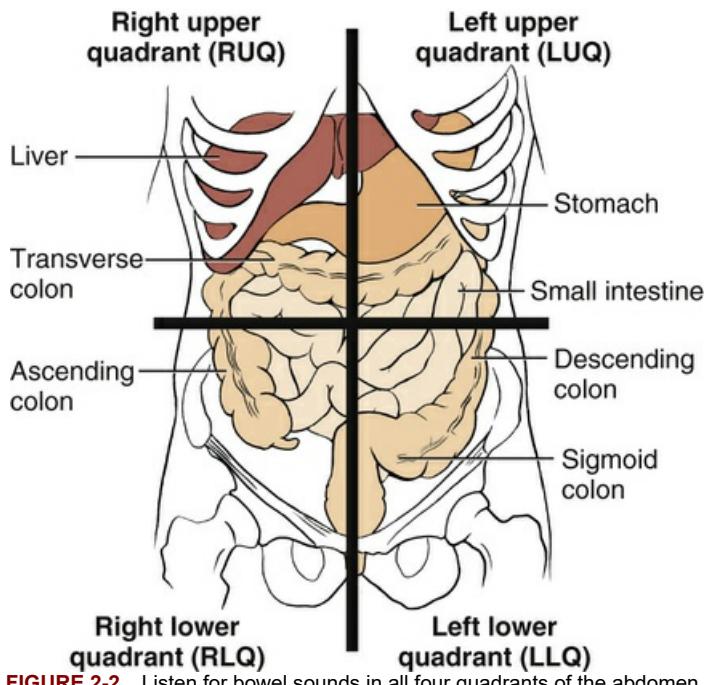


FIGURE 2-2 Listen for bowel sounds in all four quadrants of the abdomen.

Percussion.

Percussion consists of using light, quick tapping on different surfaces of the body to tell the size, location, and density of different organs, especially in the chest, abdomen, and kidney areas. Percussion of the abdomen will reveal areas of excessive gas in the bowel.

Daily Focused Assessment (Data Collection)

A daily **focused assessment**, usually performed at the beginning of the shift, is directed to areas in which the patient is experiencing health problems. This assessment augments the admission assessment of the patient and is based on the identified problems, data from the report, and medical diagnoses and treatment. Many hospitals have standardized assessment forms for collecting head-to-toe data on the patient. Information from reviewing the patient's chart and care plan is used to identify areas in which focused assessment data should be collected. Ask for a demonstration of an appropriate head-to-toe assessment.

Focused Assessment

Beginning-of-Shift Assessment

Physical Review*

- Assess the patient's level of consciousness (LOC), including the patient's ability to respond quickly and appropriately and orientation to person, place, and time. Refer to the Glasgow Coma Scale in [Chapter 21](#) for patients with neurologic problems.
- Check the patient's ability to think (mentate) by asking questions within the client's capacity (e.g., Who is the president?).
- Observe the skin color and texture and degree of moisture.
- Note the appearance of the eyes.
- Measure the vital signs (temperature, pulse, respiration, and blood pressure). Note the rhythm and strength of the pulse, rhythm and depth of respiration, and respiratory effort.

- Ask the patient to describe any pain. Determine the location, severity, quality, and precipitating and alleviating factors.
- Auscultate the chest using the stethoscope. Listen for breath sounds, noting normal, abnormal, and adventitious breath sounds. Listen at the apex of the heart, checking for regularity of rhythm. Auscultate the apical pulse for 60 seconds to count the rate and note the rhythm of the heartbeat. It is difficult for a new nurse to pick up extra heart sounds, but you can determine whether there is an increase or decrease in the heart rate.
- Assess the skin turgor (elasticity) by gently lifting the skin on the upper chest with your thumb and forefinger and observing the speed with which it snaps back when you let go.
- Observe the contour of the abdomen (e.g., flat, round, distended).
- When the patient is in a supine position or low Fowler's position, auscultate bowel sounds in all four quadrants.
- Gently palpate the abdomen with the palm side of the fingers, noting whether the abdomen is soft or firm. Also ask the patient whether she experiences any pain or discomfort, indicating areas of tenderness. Inquire about appetite and weight changes.
- Assess the patient's bowel and bladder status. Note the time of patient's last bowel movement (from the chart or by asking the patient) and whether or not flatus is being passed. Review the intake and output (I&O) for the past 24 hours. Observe and palpate the pubic area to assess bladder distention, especially if there is a discrepancy between the current and previous I&O. If the patient has an indwelling catheter, observe the characteristics of the urine in the drainage tube and the rate of drainage.
- Ask the patient to move each extremity. Observe the ability to actively move the joints through the range of motion and the coordination of the movements. If the patient is unable to actively move any joints, assist the patient with passive motion and note the degree of flexibility. Ask the patient to move extremities against resistance, to determine extremity strength. The nurse can also determine the patient's level of cooperation and ability to follow directions during the exercises.
- Compare the peripheral pulses bilaterally.
- Note the presence of any edema.

Tubes and Equipment Status

- Intravenous catheter:** Condition of site; fluid in progress, rate, additives; time next fluid is to be hung
- Nasogastric tube:** Suction setting; amount and character of drainage; patency of tube; security of tube
- Urinary catheter:** Character and quantity of drainage; tubing not positioned underneath patient
- Dressings:** Location; drains in place; wound suction devices; amount and character of wound drainage
- Pulse oximeter:** Intact probe; readings
- Patient-controlled analgesia pump:** Properly functioning; correct medication infusing; amount of solution remaining
- Traction:** Correct weight; body alignment; weights hanging free
- Equipment:** Applied properly; functioning as ordered

*The physical review may include a head-to-toe assessment based on the patient's needs.

Chart Review

The face sheet of the chart provides demographic data such as address, marital status, insurance coverage, age, date of birth, occupation, significant others, and emergency contact information. The provider's history, physical examination, progress notes, and results of diagnostic tests give an overview of the patient's total health status and provide a summary of current health problems and progress toward resolving them. Allergy information should be identified as part of the admission information and displayed prominently on the front of the chart and at other locations as required by the facility's policies and procedures. The current provider's orders provide a clue as to the plan for that day (tests or treatments).

The medication profile sheets or medication administration record (MAR) list the routine and as-needed (PRN) medications and provide documentation of medication administration. Consultation sheets or nursing documentation include narrative notes and flow sheets that describe care provided to the patient and the patient's response to that care. Reviewing the nursing documentation provides a comprehensive picture of the patient's needs and will assist in preparing for beginning patient care.

Older Adult Care Points

You walk into your patient's room and find that Mr. Nethers, age 72, has been restrained because he pulled out his oxygen tube, IV line, and urinary catheter earlier in the morning. He has also attempted to get out of bed several times. Yesterday he was alert and had a lucid conversation with you. Mr. Nethers had surgery yesterday after you left the unit to go to class, and you see in the documentation that he has been receiving codeine for pain. You recall when you looked up medications that codeine could have a severe behavioral side effect, especially for an older patient. You inform the medication nurse of your observations and ask that the provider be consulted before giving additional doses.

Diagnostic Test Results

Review laboratory and test data to identify general concerns and to confirm assessment findings. Particularly note test data related to the patient's problems that indicate improvement or a complication.

Other Resources

Course textbooks are a primary resource; other texts, journal articles, and the Internet can provide a wealth of information. Handheld devices with downloaded electronic books (e.g., medical-surgical, drug, and laboratory texts) provide instant access to clinical resources. Because there is no control over information placed on the Internet, resources should be evaluated carefully. Your instructor, pharmacists, dietitians, social workers, occupational therapists, physical therapists, physicians, and other specialists can provide valuable information about specific aspects of the patient. Work to gain a comprehensive picture of the patient's situation, diagnoses, medications, and potential actions for care.

Analysis and Nursing Diagnosis

The LPN/LVN reports data collection findings to the RN and assists in verifying, categorizing, and grouping the collected data in a logical order. The LPN/LVN also assists in analyzing the data to determine significant relationships among data, patient needs, and problems. A **prioritized** list of patient problems is developed. The focus is on actual and potential patient problems that can be addressed with independent nursing interventions. From the analysis, the RN chooses problem statements or uses nursing diagnoses from the current list from **NANDA-I** (see the inside back cover). Many facilities do not use NANDA-I nursing diagnoses. They use problem statements on care plans or they use interdisciplinary care plans with medical diagnosis listed.

Nursing care is based on the **priority** of patient problems. High-priority problems are dealt with first, and lower priority problems are dealt with as time permits. The problem statements or

nursing diagnoses are based on all of the available patient data, including—but not limited to—the nursing assessment (subjective and objective) data, diagnostic test data, and the medical diagnosis. Placing a problem statement/nursing diagnosis in the care plan means that the nurse is accepting accountability for accuracy of the statement. Permitting a problem to continue without designating a problem statement can lead to patient harm (Alfaro-Lefevre, 2013).

Think Critically

What is important in choosing the correct problem statement for a care plan? How would you determine that a problem statement/nursing diagnosis on a facility care plan is appropriate for the patient?

It is important to differentiate between a problem statement or **nursing diagnosis** and a medical diagnosis. The provider is concerned with health problems that can be treated with surgery, medications, and other forms of therapy provided or prescribed by the provider. Problem statements/nursing diagnoses identify the patient's response to an illness or a health condition. Nursing practice addresses physical, psychological, social, cultural, and spiritual comfort and well-being; the prevention of complications; and patient education. Nursing care focuses on preventing, minimizing, and alleviating specific health problems. Although the provider is responsible for managing medical problems, the nurse often uses clues from the medical diagnosis to identify patient problems and to develop accurate nursing problem statements/diagnoses.

When using NANDA-I diagnoses, NANDA-I-approved stems are based on an analysis of available data. These approved stems label the patient problems that can be independently treated using nursing interventions. Other components of a NANDA-I nursing diagnosis make statements specific to the patient's situation, and direct the planning and implementation phases of the nursing process. A complete NANDA-I nursing diagnosis includes the problem (NANDA-I stem), the etiology (related causes of the problem), and the signs and symptoms (evidence of the problem).

The etiology component describes the known or suspected cause or causes of a problem (e.g., a patient's ineffective breathing patterns could be related to etiologies of reduced lung capacity, anxiety, or pain). The signs and symptoms of the problem describe the subjective and objective evidence of the problem (i.e., the diagnosis is supported [evidenced] by the assessment data). To follow our example, a patient's ineffective breathing pattern might be evidenced by a statement of shortness of breath, or by the observation of dyspnea (difficulty breathing), changes in respiratory rate or rhythm, or decreased oxygen saturation levels. The following NANDA-I diagnosis statement might be derived from the data: *Ineffective Breathing Pattern related to abdominal incision pain as evidenced by shallow respirations and low pulse oximeter readings (89% to 92%)*. The problem statement “Altered breathing pattern” may be used instead of a nursing diagnosis.

Actual problems are problems that the patient currently exhibits, and documentation should include all three components of the diagnosis statement (problem, etiology, signs and symptoms). Sometimes the patient does not currently exhibit evidence of actual problems, but the data demonstrate that a problem could occur—these situations describe potential problems. NANDA-I potential problem statements begin with the phrase “risk for” and include the NANDA-I stem and the etiology. An example of a potential problem is: *Risk for Deficient Fluid Volume related to vomiting and diarrhea*. In this example, the patient is not currently showing signs of dehydration, but is at risk because of the fluid loss associated with vomiting and diarrhea. A problem statement could be “Potential fluid deficit.” By identifying potential problems, the nurse is alerted to take preventive measures, rather than wait for a problem to materialize before taking action. Most facilities do not use NANDA-I nursing diagnoses, but the LPN/LVN may be expected to be familiar with the NANDA-I list of nursing diagnoses.

Setting Priorities of Care

Priority setting is a method of handling problems and tasks according to the importance (priority) of the patient's problems. Maslow's hierarchy of needs is one way to prioritize patient problems and nursing care (Figure 2-3). Other factors to consider are safety and involvement of the patient (see Chapter 1). Problem statements/nursing diagnoses are listed on the care plan in order of priority. The need to sustain life, such as an airway and breathing, must be attended to immediately, even before a formal care plan is developed. All possible patient problems might not be included in the

initial plan. As problem statements/nursing diagnoses are dealt with successfully, they are modified or discontinued. Other problems are added to the plan as they arise.

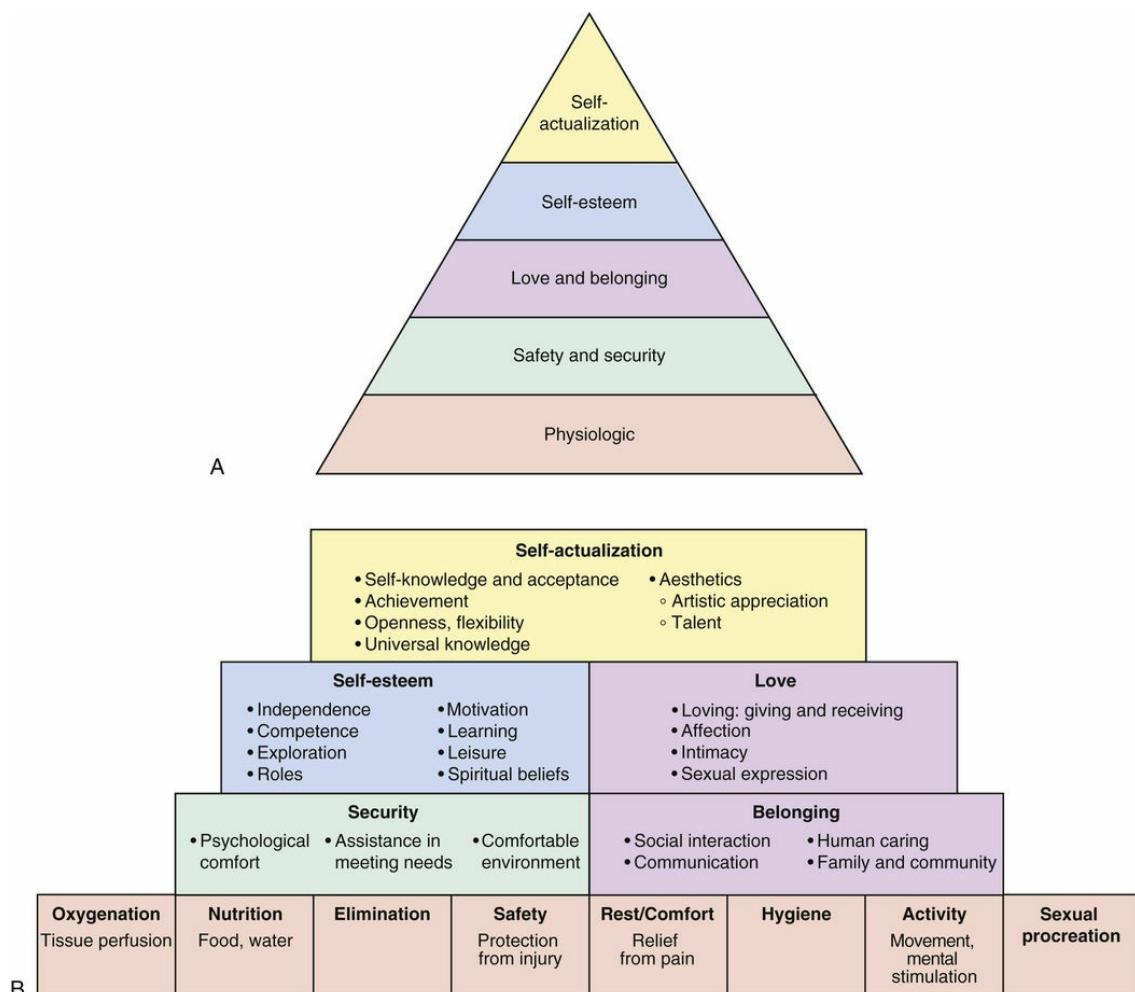


FIGURE 2-3 A, Maslow's hierarchy of needs. B, Evolving hierarchy of needs adapted by nursing to help determine priorities of care. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4. St. Louis, 2014, Elsevier.)

Planning

LPN/LVN standards of care indicate that the LPN/LVN will use the nursing process in planning nursing care and will assist the RN in the identification of health goals, outcomes, and interventions for a patient's plan of care. For a care plan to be effective, the patient should be involved in determining which problems are most important. Data regarding what the patient is willing and able to do to improve the situation and what education is needed are also gathered for the care plan. Sometimes, something that you might consider minor is very important to the patient.

Goals and Expected Outcomes

All goals or expected outcomes, set together by the patient and the nurse, must be patient-centered, be realistically achievable, be measurable, and include a time frame within which they will be met. Goals and expected outcomes relate to (1) restoring health when there is a health problem and (2) promoting health when the patient's resources can and should be directed at regaining or maintaining health. For example, the patient is eager to learn how to live with the diagnosis of diabetes. The patient needs to be instructed about the illness, how to monitor the glucose level, what action is needed to stabilize the glucose level, how to administer insulin or oral medication,

how to maintain a supportive diet, what kinds and what frequency of exercise are appropriate, how to prevent infections, and when to seek additional medical help.

Goals state a general intent about what the patient will achieve. **Expected outcomes** describe a specific result expected at a certain point in time. The terms are used interchangeably in some agencies, although the American Nurses Association prefers the term *outcome* to describe what the patient, not the nurse, will do. An outcome is written as “*The patient will....*” Patient input is important to establish motivation to accomplish the outcome. Outcome statements are derived from the signs and symptoms included in the problem statements. The word *patient* is used as the subject of the statement. The outcome statements are written with a subject, an action verb, conditions or modifiers, and the criterion (standard) for desired performance. Expected outcomes should include the following:

- Patient activity that can be observed, or patient knowledge that can be assessed. Consider how “the patient will select [*action verb—can be measured or observed*] low-sodium foods from a list” provides a better indicator of knowledge than “the patient will understand [*passive verb*] a low-sodium diet.”
- A description of how the patient's behavior will be measured, including the accuracy and quality of performance, and the time frame within which the objective is to be met.

Nursing Interventions

Nursing interventions are nursing actions and patient activities chosen to achieve the goals and expected outcomes. Evidence-based practice research is considered to locate best practices for the type of interventions that are appropriate for each problem statement/nursing diagnosis. Independent nursing interventions can be initiated and implemented without a provider's order. Dependent actions are ordered by the provider. Chosen interventions are listed on the nursing care plan.

Prioritizing Delivery of Care

Prioritizing care is the most important step in planning competent, timely patient care. Prioritizing of care includes when to give medications, measure vital signs, monitor blood glucose, change dressings, check IVs, and so on. Prioritizing also includes identifying which tasks are urgent and which tasks can wait. An urgent task would be medication administration on schedule, whereas a nonurgent task would be ambulating the patient.

Nursing students often have only one or two patients assigned to them for clinical care. After graduation, the norm is four to six patients. During low staffing, expect the number of assigned patients to increase. Once you receive your assignments:

- Review the patient's chart, computer printout, or whichever system is used for patient information.
- Look up required drug information for each routine and PRN drug listed, including IV solutions and additives.
- List focused assessments you will make and data you will collect, both at intervals and before you go off duty.
- List procedures that will be performed and a list of equipment for each.
- Attend report and make additional notes, and question what you do not understand.
- Make rounds on all your assigned patients (unless a bedside report was given). Seeing the patient alerts you to changes that need immediate attention.
- Consider a plan for your shift, including when the patient might be out of the unit for a test, when medications are due, when meals are served, when physicians usually make rounds, what time physical therapy or respiratory therapy might be working with the patient, treatments that are ordered, and when a spouse might arrive to visit. Consider when patient teaching might be worked in and when you might chart and revise the care plan if needed.

Priority setting is a skill that must be developed to work efficiently and safely. During prioritizing, it should become apparent if there is a need to assign some tasks to others.

Implementation

LPN/LVN standards require providing care within the scope of practice to accomplish established goals. Standardized care plans are frequently found on medical-surgical units and include generic nursing care for commonly encountered patient problems. The standardized plan is not individualized for a specific patient. However, problems and/or interventions can be added or deleted if they are not appropriate for the patient. An individualized plan of care is more thorough, because it is developed for a specific patient.

Distinguish which activities to carry out, and which activities the patient must learn to do to gain independence. Sometimes when you are exceptionally busy, it seems faster to do an activity for the patient—for example, feeding a patient who needs to learn to feed herself. The interventions listed in the care plan should indicate that the caregiver is to sit beside the patient and encourage her verbally, as needed. In this way the patient will gain independence by eventually feeding herself.

Staff Communication Regarding Care

Communication among staff members occurs in numerous ways throughout the day. Sometimes staff communication must be immediate to communicate urgent and relevant data that were discovered during an assessment of the patient. Urgent data are usually communicated verbally and may require immediate action. Use the SBAR format for communicating information (**Situation, Background, Assessment, Recommendation**).

Charting occurs on nurses' notes, treatment flow sheets, MARs, and activity flow sheets. Nurses also might chart on common charting forms with other health care providers. Health care facilities are moving to electronic documentation and records management. An electronic health record (EHR) is a computerized comprehensive record of a patient's history and care across all facilities and admissions (deWit and O'Neill, 2014). For the sake of security, health care providers use passwords to obtain information from the record or to record new information.

Think critically about what needs to be documented and be succinct in recording the information. Follow agency policy for the method of documentation to be used (e.g., problem-oriented record, focus charting, or charting by exception).

Legal and Ethical Considerations

Privacy and Protected Health Information

Other clinicians such as the dietitian, respiratory therapist, and social worker contribute documentation to the patient's chart. Information provided by these clinicians completes the comprehensive picture of the patient. You must keep all information you gather private.

Any protected health information from a patient's chart must be carefully guarded to avoid violating the confidentiality component of the Health Insurance Portability and Accountability Act (HIPAA). Information that is retained by a student for educational purposes must be devoid of identifying information. Student preparation paperwork that contains protected health information must be destroyed before leaving the facility according to the policies and procedures of the facility.

Report is conducted at the change of shifts according to facility protocol to ensure continuity of care for the patients. On some medical-surgical units, all the staff members listen to report on all of the patients, the advantage of which is that all of the nurses and nursing assistants are aware of the needs of every patient. Other units use an individualized report system in which a nurse receives report on assigned patients only. Walking rounds are another method for change-of-shift report in which nurses go to patients' rooms and the departing nurse and patient describe what happened during the previous shift. They discuss what the departing nurse and patient see as priorities for the next shift. It is more time-consuming than other methods, but walking rounds provide a sense of partnering for the patient, and the arriving nurse has an opportunity to see and hear the patient before beginning care. It is especially helpful and saves time if the arriving nurse has the computer care plan in hand during report.

Think Critically

How will you use the patients' care plans to effectively receive and give report? What are the items

to which you will pay greatest attention, or that you will emphasize?

Evaluation

The LPN/LVN standards require comparison of **actual** outcomes of patient care to the **expected** outcomes. This comparison is known as **evaluation**. Evaluation begins as soon as a nursing plan is implemented. To make the comparisons needed for evaluation, collect data with every patient contact, think critically about how the patient is progressing in response to nursing actions, and determine whether there is a way to improve care. Daily evaluation is part of the natural flow of nursing process, regardless of the time frame established for patient outcomes. The collected and documented data demonstrate a patient's progress toward meeting the expected outcomes. If the data show a lack of progress toward meeting the expected outcomes with planned interventions, the interventions should be reviewed and revised.

Interdisciplinary (Collaborative) Care Plans

Interdisciplinary (collaborative) care plans require input from all health team members involved in patient care. The collaborative care plan is developed using the interdisciplinary focus of each professional (e.g., nurse, social worker, occupational therapist, recreational therapist). A separate care plan for each profession is considered repetitious. The focus of interdisciplinary planning is on patient problems rather than on nursing diagnoses, making the language used in the plan common to all professions. Interdisciplinary care plans have the following characteristics:

- The patient's medical diagnosis is used, rather than a problem statement or nursing diagnosis.
- Observations (data collected) are shared among all providers involved in the care of the patient.
- A problem list is developed and prioritized. The patient's statement of problems that led to admission is considered. **Priority is given to lifesaving or physiologic needs.**
- A shared care plan is created, identifying specific and shared responsibilities for all professions represented.
- The plan is discussed with the patient (when possible) or patient advocate. The team plays a supportive role during implementation of the plan.
- Documentation of progress is usually on a common form or computer record to allow easy access for all team members involved with the patient.
- Evaluation is ongoing, with periodic in-depth evaluation by the team on agreed-on dates. Interventions are deleted, added, and changed as needed.

Get Ready for the NCLEX® Examination!

Key Points

- Critical thinking generates new ideas and judges the worth of those ideas. Critical thinking prompts the LPN/LVN to ask what could be improved and what measures would prevent further harm to the patient.
- Clinical judgment is a proactive reasoning skill that uses critical thinking in the clinical area to determine the appropriate actions to take in specific situations.
- Factors that influence critical thinking and the decisions about nursing care include our culture, personal motivation, attitude, and verbal and written communication ability.
- Nursing process is an advanced problem-solving method used to collect and analyze data to plan, implement, and evaluate patient care in an orderly way.
- Goals and expected outcomes are patient centered and describe what the patient will achieve.
- Receiving a patient assignment and preparing a preliminary care plan before beginning patient care is considered safe practice for student nurses.
- Techniques of physical examination used by the LPN/LVN include inspection and observation, olfaction, palpation, percussion, and auscultation. Nurses need to be aware of common laboratory and other diagnostic tests and their relationship to common illness. Laboratory and diagnostic tests also provide a way to track the effectiveness of treatments and the emergence of side effects of medications.
- Staff communication takes place both verbally and by charting. Urgent communication is done verbally, and as soon as possible.
- Interdisciplinary (collaborative) care plans are used in health facilities where one plan for all disciplines works best.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- Critical thinking, <http://www.criticalthinking.org/pages/critical-thinking-to-think-like-a-nurse/834>
- Critical thinking in nursing, <http://www.frontrange.edu/Academics/Academic-Departments/Larimer-Campus/Nursing/Larimer-Nursing-Critical-Thinking-in-Nursing.aspx>
- Critical thinking and the nursing process, <http://nursing.advanceweb.com/Continuing-Education/CE-Articles/critical-thinking-at-the-bedside.aspx>
- Nursing care plans, <http://www.nursingdegrees.com/nursing-resources/careplan>

Review Questions for the NCLEX® Examination

1. Which critical thinking skill is important to apply when formulating a nursing care plan?
 1. Having the nursing assistant help with assessment.
 2. Reading the history and physical in the chart.
 3. Analyzing the data to determine appropriate nursing diagnoses.
 4. Including the patient in formulating the care plan.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

2. Critical thinking is useful to the nursing process because it:

1. can provide a better outcome for the patient.
2. simplifies the planning process for the nurse.
3. allows the patient to have input to the plan.
4. directly communicates the plan to others.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

3. The assessment technique of percussion is used by the nurse to:

1. determine whether lung sounds are normal.
2. assess for air in the intestine.
3. check for abdominal rigidity.
4. assess the degree of abdominal pain.

NCLEX Client Need: Physiologic Adaptation: Alterations in Body Systems

4. Assessing a patient's sleep patterns should include which aspect(s)? (*Select all that apply.*)

1. Family history of sleep disorders
2. Rituals associated with sleep
3. Feelings of restfulness
4. Diet choices
5. Urinary habits

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

5. When caring for an older woman who developed a 5-cm pressure ulcer on her sacrum because of being immobilized and incontinent, an appropriate expected outcome for the problem of altered skin integrity would be:

1. "Patient will be able to ambulate to the bathroom with minimal assistance."

2. "Turning and repositioning schedules will be provided for the staff."
3. "Patient will demonstrate a decrease in size of the ulcer within 1 week."
4. "Family will be able to provide protein-rich foods during the hospital stay."

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

6. Assessing a risk for falls would be considered a high priority for a patient with a problem of:
 1. Altered skin integrity due to repair of umbilical hernia
 2. Altered mobility due to knee arthritis
 3. Altered nutrition due to weight of 265 lb
 4. Altered self-care due to extreme weakness

NCLEX Client Need: Physiologic Integrity: Alterations in Body Systems

7. The nurse is collecting data from an older patient with a history of fractures who has just had gallbladder surgery. Along with a focused assessment, the nurse should include:
 1. determining orientation to person, place, and time.
 2. auscultating for a heart murmur.
 3. checking pulse oximetry.
 4. testing passive and active range of motion.

NCLEX Client Need: Physiologic Integrity: Alterations in Body Systems

8. When evaluating patient understanding regarding the use of an incentive spirometer, which statement confirms a need for more teaching?
 1. "I will inhale as deeply as possible each time I use the spirometer."
 2. "I need to slightly tilt the incentive spirometer to reduce effort."
 3. "To monitor progress, I will record the top volume achieved."

4. "I need to seal my lips around the mouthpiece."

NCLEX Client Need: Integrated Processes: Teaching and learning

9. Using critical thinking, choose the nursing actions that should be implemented when addressing the needs of an older patient with the problem diagnosis of *Altered nutrition due to poor dentition?* (*Select all that apply.*)

1. Encourage more fluid intake if not contraindicated by the medical condition.
2. Inspect the oral cavity and the condition of mucous membranes and teeth.
3. Assist with swallowing.
4. Initiate speech therapy and a dietitian consult.
5. Monitor daily caloric intake and weekly weights.
6. Provide mouth care three times a day.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

10. When evaluating for side effects of the action of "administer anticoagulant," which patient statement(s) would strongly correlate with a side effect problem? (*Select all that apply.*)

1. "I have noticed some blood streaking in my bowel movements."
2. "I have been embarrassed by frequent, uncontrollable gassiness."
3. "My urine has been cloudy with an odd aroma."
4. "I readily bruise whenever I bump into anything."
5. "I notice some blood when I floss my teeth."

NCLEX Client Need: Physiologic Integrity: Pharmacological Therapies/Expected Actions/Outcomes

Critical Thinking Questions

Scenario A

Review the section on Critical Thinking and Clinical Judgment. Consider how the critical thinking points discussed have helped you learn clinical judgment.

1. Describe an example from personal experience explaining how you used critical thinking and

clinical judgment in a situation involving a patient, a patient's family member, or a friend.

2. Is there more you could have done, or could it have been done in a better way?
3. Did your action prevent harm to the person?

Scenario B

Mr. Nash is 68 years old and describes himself as a tough guy. He is currently on bed rest with his right leg in traction. He fell from his roof while adjusting the satellite dish. His main theme is, "What do I have to do to get out of here?" Although grumpy, Mr. Nash's positive attribute is that he will do whatever will get him released from the hospital. "I've got to smell my own air and I want my evening beer!" Problem statement in his chart is *Altered mobility due to right leg in traction*.

1. Write an example of a patient-centered expected outcome for Mr. Nash that is realistic, time referenced, and measurable.
2. Plan nursing interventions to meet the expected outcome you have written.

Scenario C

Because no jobs are currently available in the medical-surgical unit at the local hospital, you have applied at the mental health facility. You know that your medical-surgical observation skills will be useful in data collection (assessment). The mental health facility uses interdisciplinary care plans.

1. Explain the major differences in a nursing process–focused plan and an interdisciplinary plan.
2. What is the responsibility of each medical specialist for developing and carrying out the interdisciplinary plan?

Scenario D

You are assigned to a mixed medical-surgical nursing unit for your student assignment. You have arrived half an hour early (at 6:30 A.M.) to begin preparation for patient care on the medical-surgical unit at the local hospital. Your assignment involves the following four patients:

Patient 1: Scheduled for abdominal surgery at 10 A.M.; arrives during report and says she was held up in traffic

Patient 2: Newly diagnosed with diabetes, requiring blood glucose readings before each meal with a sliding scale diabetic teaching

Patient 3: Total knee replacement 2 days ago; is scheduled for physical therapy (PT) at 10 A.M.

Patient 4: Has pneumonia; admitted during the night; oxygen at 4 L/min via nasal cannula; has an oxygen saturation monitor

1. Which tasks are priorities?
2. How soon before surgery should the preoperative preparation start?
3. What time is glucose monitoring performed, and does the patient receive insulin based on the glucose reading?
4. When are IVs assessed?
5. What is required for preparation for PT?
6. Which patients need a full assessment and which need a focused assessment?
7. Does Patient 3 require a dressing change and, if so, when?

UNIT II

Medical–Surgical Patient Care Problems

OUTLINE

- Chapter 3 Fluids, Electrolytes, Acid-Base Balance, and Intravenous Therapy
- Chapter 4 Care of Preoperative and Intraoperative Surgical Patients
- Chapter 5 Care of Postoperative Surgical Patients
- Chapter 6 Infection Prevention and Control
- Chapter 7 Care of Patients With Pain
- Chapter 8 Care of Patients With Cancer
- Chapter 9 Chronic Illness and Rehabilitation

CHAPTER 3

Fluids, Electrolytes, Acid-Base Balance, and Intravenous Therapy

Objectives

Theory

1. Explain the various functions fluid performs in the body.
2. Describe the body's mechanisms for fluid regulation.
3. Review three ways in which body fluids are continually being distributed among the body's fluid compartments.
4. Distinguish the signs and symptoms of various electrolyte imbalances.
5. Discuss why older adults have more problems with fluid and electrolyte imbalances.
6. Describe the disorders that cause specific fluid and electrolyte imbalances.
7. Compare the major causes of acid-base imbalances.
8. Apply interventions to correct an acid-base imbalance.
9. Discuss the steps in managing an intravenous infusion.
10. Explain the measures used to prevent the complications of intravenous therapy.
11. Identify intravenous fluids that are isotonic and when they are used.
12. Interpret the principles of intravenous therapy.

Clinical Practice

13. Assess patients for signs of dehydration.
14. Correctly assess for and identify edema and signs of overhydration.
15. Apply knowledge of normal laboratory values to recognize electrolyte imbalances.
16. Perform interventions to correct an electrolyte imbalance.
17. Determine whether a patient has an acid-base imbalance.
18. Execute measures to prevent the complications of intravenous therapy.
19. Compare interventions for the care of a patient receiving total parenteral nutrition with those for a patient undergoing intravenous therapy.

KEY TERMS

acidosis (äh-si-DÖ-sis, p. 39)
active transport (ÄK-tiv, p. 32)
aldosterone (äl-DÖS-tér-ön, p. 30)
alkalosis (äl-kä-LÖ-sis, p. 43)
anions (ÄN-ī-önz, p. 39)
antidiuretic hormone (ADH) (än-ti-dī-ū-RĚT-ik HÖR-mōn, p. 30)
ascites (äh-SI-tēz, p. 39)
atrial natriuretic peptide (ANP) (p. 30)
carpopedal spasm (späzm, p. 43)
cations (KÄT-ī-önz, p. 39)
dehydration (dē-hī-DRÄ-shün, p. 33)
diffusion (dī-FÜ-zhün, p. 31)
edema (ěh-DĒ-mă, p. 37)
electrolytes (ěh-LĚK-trō-līts, p. 32)
extracellular (ěks-trä-SËL-ū-lär, p. 30)
filtration (fil-TRÄ-shün, p. 32)
hydrostatic pressure (hī-drō-STÄ-tik PRĚ-shür, p. 32)
hypercalcemia (hī-pěr-käl-SË-mē-ăh, p. 43)
hyperchloremia (hī-pěr-klör-Ē-mē-ăh, p. 44)
hyperkalemia (hī-pěr-kä-LĒ-mē-ăh, p. 43)
hypermagnesemia (hī-pěr-mäg-në-SË-mē-ăh, p. 44)
hypernatremia (hī-pěr-nä-TRĒ-mē-ăh, p. 39)
hyperphosphatemia (hī-pěr-fös-fä-TĒ-mē-ăh, p. 44)
hypertonic (hī-pěr-TÖN-ik, p. 32)
hyperventilation (hī-pěr-věn-ti-LÄ-shün, p. 48)
hypovolemia (hī-pěr-vō-LĒ-mē-ăh, p. 37)
hypocalcemia (hī-pō-käl-SË-mē-ăh, p. 43)
hypochloremia (hī-pō-klör-Ē-mē-ăh, p. 44)
hypodermoclysis (hī-pō-děrm-ök-LÍ-sis, p. 54)
hypokalemia (hī-pō-kä-LĒ-mē-ăh, p. 42)
hypomagnesemia (hī-pō-mäg-në-SË-mē-ăh, p. 44)
hyponatremia (hī-pō-nä-TRĒ-mē-ăh, p. 39)
hypophosphatemia (hī-pō-fös-fäw-TĒ-mē-ăh, p. 44)
hypotonic (hī-pō-TÖN-ik, p. 32)
hypovolemia (hī-pō-vō-LĒ-mē-ăh, p. 38)
hypoxemia (hī-pök-SË-mē-ăh, p. 48)
insensible (in-sen(t)-sē-bēl, p. 32)
interstitial (in-těr-STISH-äl, p. 31)
intracellular (in-trä-SËL-ū-lär, p. 30)
intravascular (in-trä-VÄS-cü-lär, p. 32)
ions (ī-önz, p. 32)
isotonic (ī-sō-TÖN-ik, p. 32)
ketoacidosis (kē-tō-ă-si-DÖ-sis, p. 47)
osmolality (öz-mō-LÄ-li-tē, p. 39)
osmosis (öz-MÖ-sis, p. 32)
stridor (STRĪ-dör, p. 48)
tetany (TĚT-ă-nē, p. 43)
transcellular (träns-SË-lü-lär, Box 3-1 p. 31)
turgor (TÜR-gör, p. 33)

More than half of the human body's weight is water. Throughout life there is a gradual decline in the amount of body water. An infant's body is approximately 77% water, and an older adult's body is about 45% water. Women's bodies have less water than men's. **The older adult and the very young are more likely to experience severe consequences with even minor changes in their fluid**

balance. Fatty tissue does not contain as much water as other tissues; thus the greater the amount of fat in the body, the less the percentage of body water. Maintaining a healthy weight is important in regulating the body's percentage of water. Keeping body fluids within a normal range is especially necessary, because for every cell of every organ, life processes take place within fluid. The nutrients needed for life, reproduction, and the normal functioning of a cell must be dissolved or suspended in water, and the largest part of each cell is fluid. For all of the cell's life processes to take place, there must be a continuous exchange of water, glucose, oxygen, nutrients, electrolytes, and waste products. Water in the body has four main functions:

1. Be a vehicle for the transportation of substances to and from the cells
2. Aid heat regulation by providing perspiration, which evaporates and cools the body
3. Assist in maintenance of hydrogen (H^+) balance in the body
4. Serve as a medium for the enzymatic action of digestion

[Table 3-1](#) shows sources of water and avenues of a body's water loss.

Table 3-1
Sources of Water and Avenues of Water Loss

SOURCE	24 HOURS (AVERAGE INTAKE)	AVENUE OF LOSS	AMOUNT OF LOSS (AVERAGE OUTPUT)
Oral fluids	1500 mL	Urine	1500 mL
Food	800 mL	Perspiration	400 mL
Metabolism	200 mL	Feces	200 mL
Total	2500 mL	Expired air	400 mL

Modified from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.

Distribution and Regulation of Body Fluids

Pathophysiology

Body fluids are continually in motion, moving in and out of the blood and lymph vessels, through the spaces surrounding the cells, and through the bodies of the cells themselves. Fluid within the cell is considered to be in one compartment (**intracellular**) and fluid outside the cell in another (**extracellular**) (Figure 3-1). The three types of extracellular fluid (ECF) and body fluid distribution are shown in Box 3-1. Excretion of the body's fluid is mainly achieved through the kidney. Control of fluid balance is managed by:

- **Osmoreceptors** in the hypothalamus sense the internal environment and promote the intake of fluid (thirst mechanism) when needed.
- **Antidiuretic hormone (ADH)**, released by the posterior pituitary, controls how much fluid leaves the body in the urine and causes reabsorption of water from the kidney tubules.
- **Aldosterone** and **atrial natriuretic peptide (ANP)** regulate the reabsorption of water and sodium ions from the kidney tubules.
- Baroreceptors in the carotid sinus and aortic arch detect pressure changes that indicate an increase or decrease in blood volume and stimulate the sympathetic or parasympathetic nervous system to return the pressure to normal.

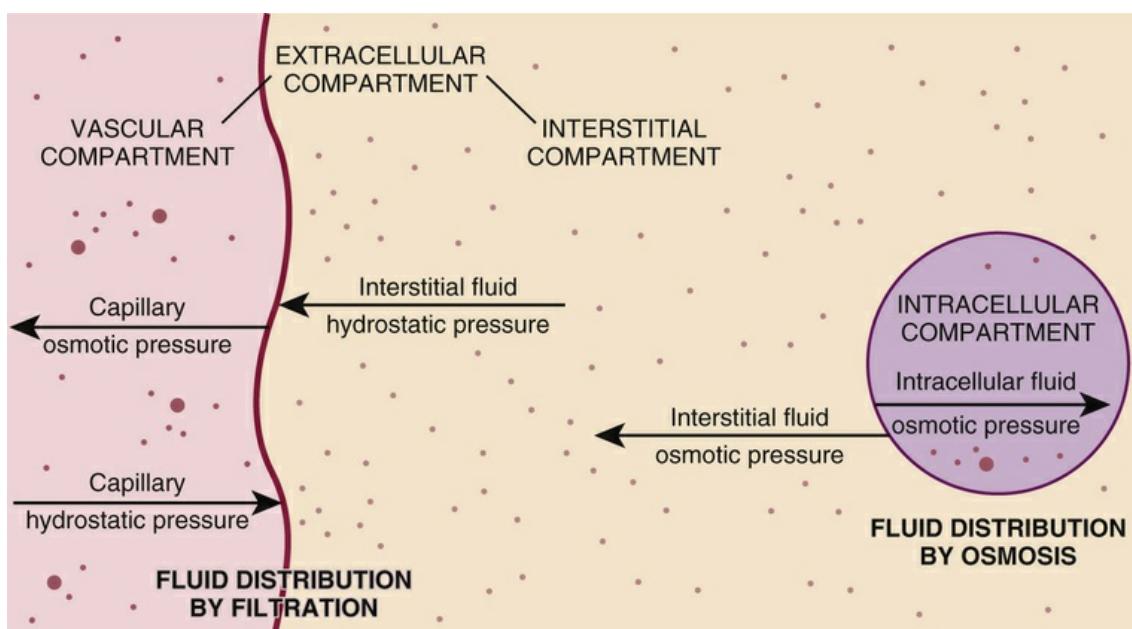


FIGURE 3-1 Factors that influence body fluid distribution.

Box 3-1

Body Fluid Distribution

Extracellular Fluid (Outside of Cells)

- Approximately one third of total body water
- Transports water, nutrients, oxygen, waste, etc., to and from the cells
- Regulated by renal, metabolic, and neurologic factors

- High in sodium (Na^+) content

Intravascular Fluid

- Fluid within the blood vessels
- Consists of plasma and fluid within blood cells
- Contains large amounts of protein and electrolytes

Interstitial Fluid

- Fluid in the spaces surrounding the cells
- High in Na^+ content

Transcellular Fluid

- Includes aqueous humor; saliva; cerebrospinal, pleural, peritoneal, synovial, and pericardial fluids; gastrointestinal secretions; and fluid in the urinary system and lymphatics

Intracellular Fluid (Within Cells)

- About two thirds of total body fluid
- Fluid contained within the cell walls; most cell walls are permeable to water
- High in potassium (K^+) content

Modified from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.

Pain, nausea, and stress can also cause the release of ADH by the pituitary. When the ECF volume is low, or when sodium concentration is elevated, the adrenal cortex releases aldosterone, which causes reabsorption of sodium from the renal tubules. The **renin-angiotensin-aldosterone system** regulates the release of aldosterone. Renin is released when there is decreased blood flow to the kidney. Baroreceptors in the atrium of the heart detect fluid overload and stimulate the myocardium to release ANP. ANP helps protect the body from fluid overload by increasing sodium excretion. Where sodium goes, water follows.

To be normally distributed within the body, water and the substances suspended or dissolved in water must move from compartment to compartment. As blood flows through the capillaries, fluid and solutes can move into the **interstitial** spaces, where the cells of the body can exchange nutrients and wastes. Several processes accomplish the movement of fluids, electrolytes, nutrients, and waste products back and forth across the cell membranes ([Figure 3-2](#)).

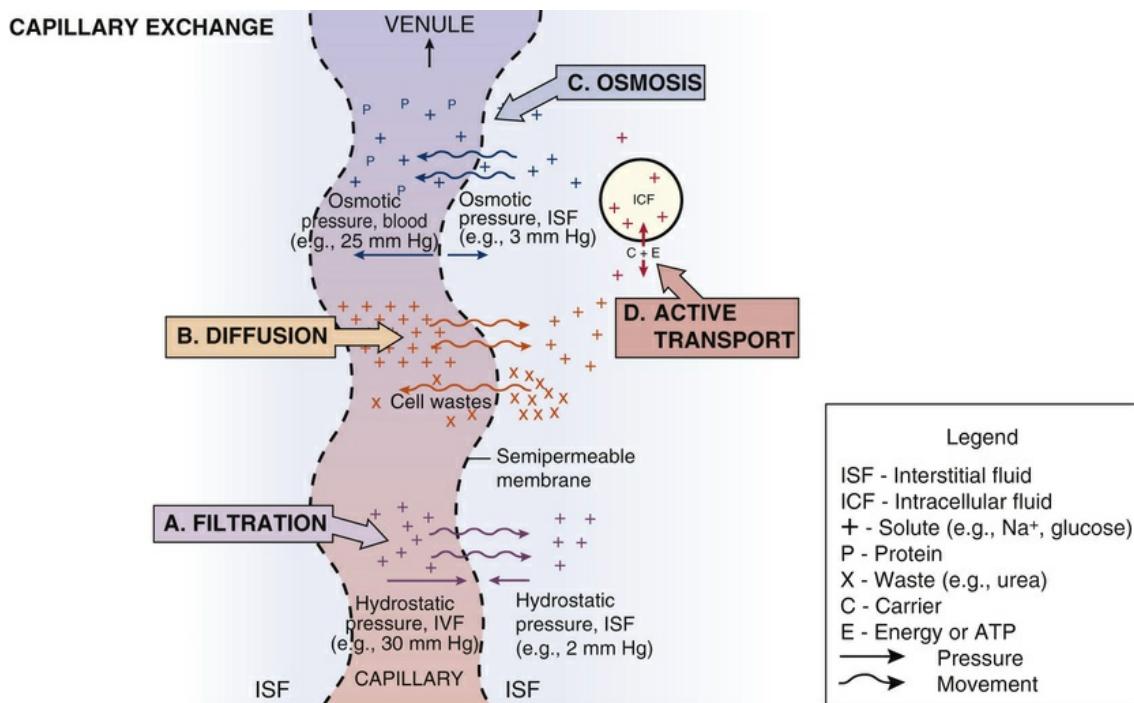


FIGURE 3-2 Movement of water and electrolytes between compartments. (From Gould BE: *Pathophysiology for health professions*, ed. 4, Philadelphia, 2011, Saunders.)

Movement of Fluid and Electrolytes

Passive Transport

Diffusion.

Diffusion is the process by which substances move across the membrane until they are evenly distributed in the available space. As the plasma moves along a capillary, large amounts of fluid filter through pores in the capillary walls. The fluid moves into and out of the capillaries by filtering through the permeable capillary wall or cell membrane walls. A capillary hydrostatic pressure inside the capillary pushes against its membrane. **When the solution on one side of the membrane is more concentrated than the solution on the other side of the membrane, the particles in the more concentrated solution travel through the membrane to the less concentrated side in an attempt to equalize the concentration of the two solutions.** Diffusion is possible because of kinetic motion, which diffuses the molecules in the intracellular fluid (ICF) and the plasma. The molecules literally bounce off one another, mixing and stirring the body fluids.

Diffusion is a spontaneous mixing and moving that allows the exchange of molecules, **ions** (electrically charged particles), cellular nutrients, wastes, and other substances dissolved or suspended in body water. The direction of water flow depends on which side of the membrane has the greatest concentration of solutes. Substances will move from a high to a low concentration until the concentration on both sides of the membrane is equal. This is called *movement down a concentration gradient*. **Glucose, oxygen, carbon dioxide, water, and other small ions and molecules move by diffusion, which is a process of equalization.**

Diffusion may occur by movement along an electrical gradient as well. The attraction between particles of opposite charge and the repellent action between particles of like charge create an electrical gradient. Many intracellular proteins have a negative charge that tends to attract the positively charged sodium and potassium ions from the ECF.

Osmosis.

Osmosis is the movement of pure solvent (liquid) across a membrane. **Water moves by osmosis.** When there are differences in concentration of fluids in the various compartments, osmotic pressure (what holds fluid in the vascular space) will move water from the area of lesser concentration of solutes to the area of greater concentration until the solutions in the compartments are of equal

concentration. The process takes place via a **semipermeable membrane**—a membrane that allows some substances to pass through but prevents the passage of other substances. **Fluid moves between the interstitial and intracellular and between the interstitial and intravascular compartments by osmosis.**

When living cells are surrounded by a solution that has the same concentration of particles, the water concentration of the ICF and the ECF will be equal. Such a solution is termed **isotonic** (of equal solute concentration). If cells are surrounded by a solution that has a greater concentration of solute than the cells, the water in the cells will move to the more concentrated solution, and the cells will dehydrate and shrink. The solution is **hypertonic** (of greater concentration) in relation to the cells. If the cells are surrounded by a solution that has less solute than the cells, the solution is **hypotonic** (of less concentration) in relation to the cells. The particles within the cells exert osmotic pressure and draw water inward through the semipermeable membrane. The cells swell from the extra fluid (overhydrate). These concepts are important to the administration of IV fluids (see discussion later in this chapter). Solutions are classified as isotonic, hypertonic, or hypotonic according to their concentration of **electrolytes** and other solutes.

Think Critically

Can you describe to a classmate the difference between osmosis and diffusion?

Filtration.

Filtration is the movement of water and solutes through a semipermeable membrane as a result of a pushing force on one side of the membrane. The pumping action of the heart creates **hydrostatic pressure** (pressure exerted by fluid) within the capillaries. Hydrostatic pressure causes fluid to press outward on the vessel. Water and electrolytes move through the capillary wall to the interstitial fluid. Filtration occurs in the kidney, where waste substances and excess water are eliminated.

Active Transport

In contrast to diffusion, osmosis, and filtration, **active transport** requires cellular energy, which can move molecules into cells regardless of their electrical charge or the concentrations already in the cell. **Active transport may move substances from an area of lower concentration to an area of higher concentration.** The energy source for the process is adenosine triphosphate (ATP). ATP is produced during the complex metabolic processes in the body's cells. Enzyme reactions metabolize carbon chains of sugars, fatty acids, and amino acids, yielding carbon dioxide, water, and high-energy phosphate bonds. **Amino acids, glucose, iron, hydrogen, sodium, potassium, and calcium are moved through the cell membrane by active transport.** The “sodium pump” is the mechanism by which sodium and potassium are moved into or out of the cell via active transport.

Fluid Imbalances

Pathophysiology

Healthy people maintain fluid balance by drinking sufficient fluids and eating a balanced diet each day. Solid foods contain up to 85% water, and water is also produced in the body as a by-product of metabolism. **The healthy kidney balances the amount of substances entering and leaving the blood, helping to maintain normal concentrations of fluid and electrolytes.** Illness affects fluid balance in many ways. The patient may be unable to ingest food or liquids, there may be a problem with absorption from the intestinal tract, or there may be a kidney impairment that affects excretion or reabsorption of water and electrolytes. Any disease that affects circulation (e.g., heart failure) will ultimately affect the distribution and composition of body fluids. Extra fluid is lost when the metabolic rate is accelerated, such as occurs in fever, thyroid crisis, burns, severe trauma, and states of extreme stress. Perspiration can account for a fluid loss of up to 2 L/hr in an adult. For every degree of fever on the Celsius scale, an **insensible** (unaware of) water loss of 10% may occur. Perspiration and water lost in respiration are insensible losses. When the weather is hot and dry, water loss from the body is greater. Patients on mechanical ventilators, those with rapid respirations, and those with severe diarrhea or excessive amounts of fistula drainage also lose greater quantities of water. **Any seriously ill patient is at risk for a fluid and electrolyte imbalance.**

A fluid imbalance exists when there is an excess (too much) or a deficit (too little) of water in the body. When this occurs, there will be an accompanying imbalance in the substances dissolved in body water. When considering sodium imbalances, **it is important to remember that water follows sodium in the body, through osmosis.** The sodium concentration causes an osmotic pull, and water will go to where the sodium concentration is highest.

Think Critically

Can you give an example of active transport taking place within the body?

Deficient Fluid Volume

Patients at risk for deficient fluid volume are those who are unable to take in sufficient quantities of fluid because of impaired swallowing, extreme weakness, disorientation or coma, or the unavailability of water, and patients who lose excessive amounts of fluid through prolonged vomiting, diarrhea, hemorrhage, diaphoresis (sweating), excessive wound drainage, or diuretic therapy.

When a fluid deficit occurs, water moves from the cells into the interstitial and intravascular spaces. This movement of water out of the cells causes **dehydration** of the cells. Dehydration is treated by administering fluid orally, intravenously, or through feeding or gastrectomy tubes. For patients who will be unable to take in fluids or food on their own for an extended period, a feeding tube must be placed or total parenteral nutrition (TPN) started (see [Chapter 29](#)). Signs and symptoms of dehydration are presented in [Box 3-2](#). **Turgor** (degree of elasticity) is checked by gently pinching up the skin over the abdomen, forearm, sternum, forehead, clavicle, or thigh ([Figure 3-3](#)). In a person with normal fluid balance, the pinched skin will immediately fall back to normal when released. If a fluid deficit is present, the skin may remain elevated or tented for several seconds. However, because pinching the skin to measure fluid deficit also measures skin elasticity, this test is not a valid indicator of fluid status in older adults, whose skin is often inelastic and routinely tents when pinched. In infants, dehydration is evident by sunken fontanelles.

Clinical Cues

The most accurate measure of fluid gain or loss for any age group is weight change. A weight gain or loss of 2.2 lb (1 kg) in 24 hours indicates a gain or loss of 1 L of fluid.

Older Adult Care Points

Fluid volume deficit is a common problem in older adults. There is an age-related decline in total body water and a decrease in thirst sensation and taste that causes older adults to become dehydrated more easily. If urinary incontinence is a problem, the person becomes reluctant to drink extra fluids. Thirst is a late sign of dehydration in older adults.

Box 3-2

Signs and Symptoms of Dehydration and Overhydration

Signs and Symptoms of Dehydration

- Thirst
- Poor skin turgor
- Weight loss
- Weakness
- Complaints of dizziness
- Postural hypotension
- Decreased urine production
- Dark, concentrated urine
- Dry, cracked lips and tongue
- Dry mucous membranes
- Sunken, soft eyeballs
- Thick saliva
- Dry, scaly skin
- Flat neck veins when lying down
- Rapid, weak, thready pulse
- Elevated temperature $\geq 100.6^{\circ}$ F (38.1° C)
- Increased hematocrit
- High urine specific gravity with low volume

Signs and Symptoms of Overhydration

- Weight gain
- Slow, bounding pulse
- Elevated blood pressure
- Firm subcutaneous tissues
- Possibly edema
- Possibly crackles in lungs on auscultation

- Lethargy, possibly seizures
- Possibly visible neck veins when lying down
- Decreased serum sodium
- Decreased hematocrit from hemodilution
- Low urine specific gravity with high volume



FIGURE 3-3 Testing tissue turgor. (From Jarvis C: *Physical examination and health assessment*, ed. 4, Philadelphia, 2004, Saunders.)

Many older adults rely on laxatives and enemas to clear the bowel. This practice can cause fluid volume deficit along with sodium and potassium loss. **Fluid volume deficit contributes to constipation and orthostatic hypotension with related dizziness and falls and makes the person more susceptible to infection.**

A furrowed, dry tongue that is not the result of drug therapy indicates a fluid deficit. If the person has fever, this adds to the fluid loss. Because of the fluid and accompanying electrolyte losses, the person may become confused. Offering the patient small amounts of liquid and electrolyte solution frequently—if fluid can be kept down—helps prevent additional problems.

Clinical Cues

Measure the blood pressure and pulse in the lying, sitting, and standing positions. A systolic blood pressure drop of 20 mm Hg accompanied by a pulse rate increase of 10 beats per minute (bpm) at 1 minute after the position change suggests a fluid volume deficit. This is termed *orthostatic* or *postural hypotension*.

Nursing Management

Provide an adequate fluid intake for those who are unable to do this for themselves. Include the patient's preferences for liquids on the plan of care. The patient should receive fruit juices, bouillon, and any other nutritious liquid tolerated ([Nursing Care Plan 3-1](#)).

Nursing Care Plan 3-1

Care of the Patient With Deficient Fluid Volume

Scenario

Mrs. Cabot, age 78, is admitted to the hospital after 3 days of vomiting and diarrhea. She is confused, disoriented, dehydrated, and very weak.

Problem Statement/Nursing Diagnosis

Fluid volume deficit/*Deficient Fluid Volume related to fluid loss and inability to take in sufficient fluids*

Supporting Assessment Data

Subjective: Hx of vomiting and diarrhea for 3 days; unable to keep anything in stomach. Had eaten food at a church picnic on a hot day.

Objective: Furrowed tongue, tenting of skin on sternum, thick saliva, and dry mucous membranes; 3-lb weight loss from normal. Urine sp. gr. 1.030; scant urine; temp. 101.4° F (40° C).

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation*
Diarrhea and vomiting will stop within 24 hr.	Medicate with antiemetic as ordered.	Antiemetic should stop vomiting.	IM injection of Hydroxyzine given Z-track as ordered. Has not vomited in last hour.
Patient will be able to eat normally before discharge.	Initiate IV therapy as ordered.	IV therapy will replenish fluids and electrolytes in the body.	IV fluids infusing. Site clean, dry without redness.
Fluid balance will be reestablished within 72 hr.	Monitor IV site and fluid every hour.		
	Initiate I&O recording.	I&O record provides data to determine degree of fluid imbalance.	Two liquid stools. Continue plan.
	Keep patient clean and dry.		
	Reduce odors in room to decrease nausea.	Odors contribute to nausea.	No odor in room.
	Provide assistance to bathroom as needed.	Assistance helps prevent falls in weak patients.	Assistance provided ×4.
	Protect perianal skin with ointment as ordered.	A barrier cream or ointment will protect the perianal skin from excoriation from diarrhea.	Perianal skin slightly reddened.
	When vomiting stops, administer medication for diarrhea as ordered.	Medication will slow or stop the diarrhea.	Took diphenoxylate/atropine tab with a sip of Gatorade.
	When able to take PO fluids, offer sips of electrolyte solution, and progress to a clear liquid diet.	Small sips of fluid are easier to keep in the stomach. Electrolyte solution replenishes low electrolytes.	Taking sips of a sports drink designed to replenish carbohydrates and electrolytes.
	Offer mouth care after vomiting and at least q2hr.	Mouth care promotes comfort and reduces nausea.	Mouth care provided.
	Monitor mucous membrane status and skin turgor.	Provides data about rehydration status.	Mucous membranes more moist.
	Weigh daily.		
	Monitor electrolyte values.	Provides data about electrolyte imbalances.	Laboratory results not back yet. Continue plan.

*Evaluation data must be documented in the medical record.

Critical Thinking Questions

1. What would be other concerns that should be addressed in her care plan?
2. What do you think is the cause of her confusion and disorientation?

Key: Hx, history; I&O, intake and output; IM, intramuscular; IV, intravenous; PO, oral; sp. gr., specific gravity; temp., temperature.

A common cause of excessive fluid loss is abnormally rapid excretion of intestinal fluids, such as occurs from vomiting and diarrhea.

Assignment Considerations

Increasing Fluid Intake

If a nursing assistant or unlicensed assistive personnel (UAP) is available to assist, **assign** the task of increasing fluid intake to that person. Work out a timed plan to help the patient with regular, periodic intake of fluids by mouth. Ask that the patient drink 4 oz of fluid every hour. Advise of any safety precautions regarding difficulty swallowing or need for assistance.

Think Critically

Why is it important to the body's function to administer fluid and electrolytes during a fever?

Nausea and Vomiting

Nausea is a feeling of discomfort or an unpleasant sensation vaguely felt in the epigastrium and abdomen. It is a symptom of illness and is often accompanied by vomiting. Nausea is experienced when nerve endings in the stomach and other parts of the body are irritated. Irritated nerve endings in the stomach send messages to the part of the brain that controls the vomiting reflex; however, nerve cells in other parts of the body can trigger the same response. Pain can trigger the nausea-

vomiting mechanism. Nausea and vomiting are automatic responses of the involuntary autonomic nervous system to unpleasant stimuli.

■ Complementary and Alternative Therapies

Preventing Nausea

Sea bands (acupressure wristbands) are very helpful to many people who suffer from nausea and vomiting. They are available at most drugstores. Ginger tea and ginger ale are another alternative therapy that has proven helpful, as are small pieces of ginger candy.

Nausea and vomiting may occur from gastrointestinal irritation from foods, viruses, radiation of the mucosa, and some drugs and other chemicals. Certain types of anesthetics may trigger nausea, as may pregnancy.

■ Safety Alert

Prolonged Vomiting

Prolonged vomiting can lead to sodium and potassium deficits and metabolic alkalosis because of the loss of electrolytes and stomach acids.

The patient may complain of nausea or feeling “sick to my stomach,” of queasiness, abdominal pain, epigastric discomfort or burning, and vomiting. The patient may also exhibit pallor; mild diaphoresis; cold, clammy skin; or excessive salivation and may attempt to remain quiet and motionless. **If vomiting occurs, the vomitus should be observed for odor, color, contents (e.g., undigested food), and amount.** Noting and recording vomiting patterns, conditions that trigger vomiting, and quality of nausea as described by the patient can be helpful in planning treatment.

Medical treatment for nausea consists of administering one of the antiemetic drugs (Table 3-2). Antihistamines, sedatives and hypnotics, anticholinergics, phenothiazines, and other drugs are used to control nausea and vomiting. The patient is given nothing by mouth (kept NPO) until vomiting has stopped; afterward, the patient is allowed clear liquids, progressing slowly to a regular diet. Sips of carbonated drinks at first are usually tolerated well.

■ Table 3-2

Drugs Commonly Prescribed to Treat Vomiting and Diarrhea

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Antiemetics			
Hydroxyzine (Vistaril, Atarax) Promethazine (Phenergan)	Antihistamine-antiemetic used to stop nausea and vomiting Depresses the central nervous system (CNS)	Give by Z-track injection. Never give IV (except promethazine) or subcutaneously. Monitor vital signs. Check compatibility before mixing with other drugs. Monitor for dizziness and hypotension. Observe for urinary retention.	Avoid concurrent alcohol ingestion or other CNS depressants. Avoid activities that require alertness. Raise patient slowly to prevent dizziness. Avoid prolonged sunlight.
Prochlorperazine maleate (Compazine)	Blocks chemoreceptor trigger zone, which in turn acts on vomiting center Stops nausea and vomiting	Monitor vital signs and for respiratory depression, especially in older adults. Check compatibilities before mixing with other drugs. Watch for seizures, muscle stiffness, and other negative reactions.	Avoid hazardous activities; avoid alcohol and other CNS depressants. Avoid urine may be pink to reddish brown. Avoid the sun or use sunscreen and protective clothing. Report bleeding, rash, bruising, blurred vision, or clay-colored stools.
Ondansetron (Zofran)	Blocks serotonin peripherally, centrally, and in the small intestine	Monitor for extrapyramidal signs (shuffling gait, tremors, grimacing, rigidity). Observe for rash or bronchospasm.	Report diarrhea, constipation, rash, change in respiration, or discomfort at IV insertion site.
Metoclopramide (Reglan, Metozolv)	Decreases reflux, stimulates stomach emptying, and raises threshold of chemoreceptor trigger zone	Monitor for extrapyramidal symptoms with IV administration. Assess for rash. Monitor renal function, blood pressure, and heart rate.	Report involuntary eye, facial, or limb movements. Avoid alcohol.
Antidiarrheals			
Diphenoxylate atropine (Lomotil)	Slows intestinal motility. Slows or stops diarrhea.	Assess bowel pattern and monitor for constipation. Discontinue if not effective after 2 days of treatment.	Do not use alcohol or CNS depressants. Do not exceed the prescribed dosage. May be habit forming. Avoid hazardous activities.
Loperamide HCl (Imodium)	Works on intestinal muscles to decrease peristalsis; reduces volume and increases stool bulk Slows or stops diarrhea	Monitor stools and for electrolyte imbalances. Monitor for dehydration. Discontinue if not effective after 2 days of treatment.	Drowsiness may occur; do not operate machinery. Do not take other over-the-counter preparations.
Kaolin-pectin (Kaopectate)	Decreases gastric motility and water content of stool; acts as absorbent and demulcent	Monitor bowel pattern. Monitor for dehydration and electrolyte imbalances.	Do not exceed recommended dosage. Shake suspension well. Take other medications 2 hr before or after administration.

Bismuth subsalicylate (Pepto-Bismol)	Inhibits prostaglandin synthesis responsible for gastrointestinal hypermotility; stimulates absorption of fluid and electrolytes Prevents or stops diarrhea	Monitor bowel pattern. Do not give to children younger than 3 yr.	Shake liquid before using. The tongue may darken and stools may turn black. Do not take other salicylates along with this medication. Stop taking if diarrhea has not stopped in 2 days.
Camphorated opium tincture (paregoric)	Opiate that acts to decrease intestinal motility	Controlled substance. Addictive with long-term use. Monitor bowel function. May cause nausea and vomiting.	Do not exceed prescribed dosage. Causes CNS depression; do not operate machinery.

Nursing Management

Have the patient lie down and turn his head to one side, or have the patient sit and lower his head between his legs so that vomitus is not aspirated into the respiratory tract. Hold an emesis basin close to the side of the face. Use a cool, damp washcloth to wipe the patient's face and the back of the neck. Have the patient breathe through the mouth. Provide mouth care after the episode. Sucking on ice chips helps reduce nausea in some patients. A quiet, cool, odor-free environment helps calm nausea. If nausea and vomiting persist, observe for dehydration.

Older Adult Care Points

Older patients must be rehydrated cautiously. Any patient who has a cardiac problem is at risk for fluid overload from IV infusions. If a liter of fluid infuses too fast, it can cause the patient to go into heart failure. **If an IV infusion falls behind, do not make up for lost time by infusing fluid at a rate faster than ordered.**

Diarrhea

Diarrhea is defined as the rapid movement of fecal matter through the intestine. Frequent, watery bowel movements, abdominal cramping, and general weakness characterize diarrhea. Diarrheic watery stools often contain mucus and are blood streaked. It is the consistency rather than the number of stools per day that is the hallmark of diarrhea. In some cases the number can be as high as 15 to 20 liquid stools. If the condition is chronic, the patient can suffer from dehydration, malnutrition, and anemia. During diarrhea, patients absorb nutrients poorly and lose water and electrolytes. These electrolytic substances—especially the potassium needed by the body to prevent alkalosis—are lost in large amounts by patients with diarrhea.

Most diarrhea is related to local irritation of the intestinal mucosa, especially irritation caused by infectious agents, such as *Salmonella*, *Clostridium difficile*, and *Escherichia coli*; by gastrointestinal irritation; and by chemicals. Chronic and prolonged diarrhea is typical of such disorders as ulcerative colitis, irritable bowel syndrome, allergies, lactose intolerance, and nontropical sprue. Recently gluten intolerance has been recognized to cause gastrointestinal disorders, and sensitivity to gluten includes alternate bouts of diarrhea and constipation in its list of symptoms. Obstruction to the flow of intestinal contents, such as from a tumor or a fecal impaction, also can produce diarrhea. Considerable potassium and sodium are lost during diarrhea.

To rest the intestines and stomach of a patient with acute diarrhea, limit the intake of foods. Once oral feedings are allowed, begin clear liquids and progress to bland liquids and then solid foods of increased calories and high-protein, high-carbohydrate content. Give rehydrating solutions containing glucose and electrolytes first. **Avoid iced fluids, carbonated drinks, whole milk, roughage, raw fruits, and highly seasoned foods.**

Medications prescribed for diarrhea depend on the cause of the disorder and the length of time the condition has been present (see Table 3-2). Mild cases usually respond well to kaolin and bismuth preparations (e.g., Kaopectate), which coat the intestinal tract and make the stools firmer. Bismuth subsalicylate (e.g., Pepto-Bismol) is the recommended treatment for “traveler’s diarrhea”; when given in advance of travel, bismuth subsalicylate may prevent this type of diarrhea. Diarrhea caused by infections may be treated with drugs that are specific for the causative organism. Depending on the organism responsible, it is sometimes advisable to allow the toxins to be eliminated naturally from the body, so drugs may not be given initially. Bowel sounds are likely to be gurgling and tinkling sounds that come in waves and are hyperactive. Note and record the bowel sounds and number of stools during the shift and the characteristics of each stool and any associated pain.

Think Critically

If a patient has food poisoning and suffers from vomiting and diarrhea, what type of fluid and electrolyte imbalance may the patient develop?

Nursing Management

Nursing measures for diarrhea aim to provide physical and mental rest, prevent unnecessary loss of water and nutrients, protect the rectal mucosa, and eventually replace lost fluids. Diarrhea can be associated with nervous tension and anxiety. The patient often is embarrassed by the condition and inconvenienced by frequent trips to the bathroom or the need to request a bedpan. This emotional stress only serves to make the condition worse. Help break the vicious cycle by maintaining a calm and dignified manner, accepting and understanding the patient's behavior, and providing privacy and a restful environment for the patient.

Think Critically

How would you assess a patient with diarrhea for signs of dehydration?

Excess Fluid Volume

An excessive amount of **body water** usually occurs first in the extracellular compartment, because this is where water enters and leaves the body. When people become ill, they may receive more water than they excrete, which can happen if they receive IV fluid too quickly, are given tap water enemas, or are persuaded to drink more fluids than they can eliminate. These situations lead to fluid volume excess, and the patient is likely to develop **water intoxication**.

Impaired elimination, such as occurs in renal failure, is a major cause of fluid volume excess (see Box 3-2). An objective measure of water excess and circulatory overload is the hematocrit. The hematocrit measures the percentage of red blood cells in a volume of whole blood. When fluid volume excess occurs, **hypervolemia** (excessive blood volume) may also occur. Hypervolemia elevates blood pressure.

Clinical Cues

Normal hematocrit values range from 35 to 54 mL of red blood cells per 100 mL of whole blood, depending on age and sex. If there is an excess of water, the proportion of red blood cells to milliliters of blood will be lower, and the hematocrit will be below the normal values because of dilution by the water.

Urine concentration provides another clue to the fluid status. Urine concentration is commonly measured by specific gravity and compared with the specific gravity of distilled water, which is 1.000. Urine contains urea, electrolytes, and other substances, so its specific gravity will exceed 1.000 and ranges between 1.003 and 1.030. The average range is 1.010 to 1.025.

Edema

Edema is associated with the retention of water, sodium, and chloride and is defined as an accumulation of freely moving interstitial fluid (fluid surrounding cells). Look for puffy eyelids and swollen hands. Edema also can occur in body cavities, as in the peritoneal cavity (ascites) and the cranial cavity. The accumulation of body fluids can affect almost all of the tissue spaces (**generalized edema**). Alternatively, fluid accumulation can affect a limited area (**localized edema**). Generalized edema occurs when the body's mechanisms for eliminating excess sodium fail. Edema becomes life-threatening when accumulated fluids overload the circulatory system, as in congestive heart failure, and when fluids accumulate in the lungs, as in pulmonary edema.

Four general causes of edema are (1) an increase in capillary hydrostatic pressure, (2) a loss of plasma proteins, (3) obstruction of lymphatic circulation, and (4) an increase in capillary permeability.

Increased hydrostatic pressure causes pulmonary edema. A loss of plasma proteins decreases osmotic pressure in the vascular system, causing fluid to leak from the vessels, leading to edema. A

tumor or infection can damage a lymph node, or lymph nodes may be removed during cancer surgery. When lymph nodes are removed during mastectomy surgery, lymph may accumulate in the tissues, resulting in **lymphedema**.

When an inflammatory response or infection occurs, histamine and other chemical mediators are released from the cells involved in the tissue injury. These chemicals cause increased capillary permeability, and more fluid moves into the interstitial spaces. Proteins leak into the interstitial spaces also, decreasing the osmotic pressure in the capillaries. Protein in the interstitial spaces holds fluid there rather than moving that fluid back into the capillaries. When fluid shifts from the vascular space (from the plasma) to the interstitial space, dehydration and **hypovolemia** (too little blood volume) can occur. The occurrence of the shift of fluid is termed *third spacing* and may occur with extensive trauma, burns, peritonitis, intestinal obstruction, nephrosis, sepsis, or cirrhosis of the liver in which there is an increase in capillary hydrostatic pressure or increased capillary membrane permeability.

Think Critically

What characteristics would you expect to find in a urine specimen from a patient who is dehydrated? How would it differ from a urine specimen from a patient who has a fluid volume excess?

Localized edema often occurs with inflammation. Localized edema usually is nonpitting, does not come and go, and is characterized by tight, shiny skin that is stretched over a hard and red area. Causes of localized edema include trauma, allergies, burns, obstruction of lymph flow, and liver failure.

Dependent edema is noted in the feet, ankles, and lower legs, or in the sacral region of patients confined to the bed or chair. Dependent edema is an effect of gravity and therefore can be somewhat relieved by elevating the affected body part 18 inches (or above heart level, when possible) and by repositioning the patient frequently. Pitting edema is common in patients with dependent edema. The name is derived from the fact that pressing a fingertip against the swollen tissue can create a pit or depression. **To check for pitting edema, press your thumb into the patient's skin at a bony prominence, such as the tibia or malleolus, and hold for 5 seconds.** If the depression, or "pit," remains for a while after the pressure is released, the patient has pitting edema. Assessing the severity and progress of pitting edema in the feet and ankles (pedal edema) can be done more accurately by rating the findings and comparing assessments from one shift to another (Figure 3-4).

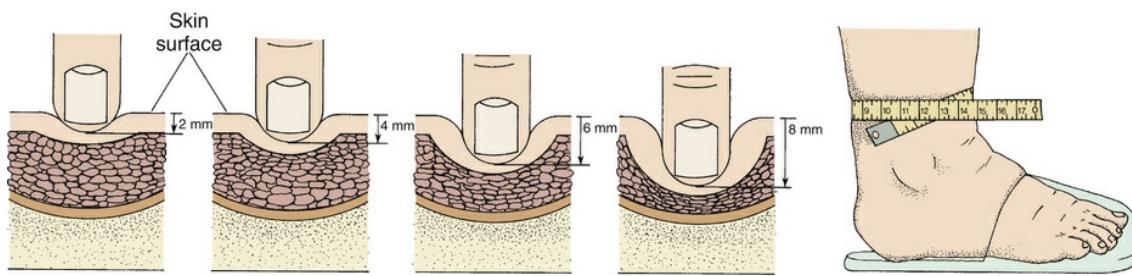


FIGURE 3-4 Measuring pedal edema.

The scale used for rating pedal edema is:

1+ Mild pitting—slight indentation with no perceptible swelling of the leg
2+ Moderate pitting—indentation subsides quickly, foot is perceived as mildly swollen
3+ Deep pitting—indentation remains for a short time and leg looks swollen
4+ Very deep pitting—indentation lasts a long time and leg is very swollen

Treatment.

Treatment of a fluid imbalance involves correcting the underlying cause and assisting the body to rebalance fluid content. For conditions of edema, fluid may be restricted or diuretic drugs may be administered to facilitate excretion of the excess fluid. A diuretic is a drug that prompts the kidneys

to increase the excretion of fluid. Bed rest may be ordered to facilitate fluid excretion, because the kidneys function best when the body is supine.

A low-sodium diet is initiated. Elastic stockings or sequential compression devices are ordered for foot and leg edema. Intake and output (I&O) recording is requested.

Think Critically

Can you describe the assessments you would make to determine whether your 68-year-old patient is experiencing edema?

Home Care

It is important to teach patients with a fluid deficit and their family how to measure fluid I&O and how to keep a log of the amounts. The patient should be encouraged to take small amounts of liquid every hour while awake. If the patient has been vomiting, it is better to let carbonated beverages go flat before drinking them, to decrease stomach distention.

If an older adult has been vomiting considerably for several hours or has had constant diarrhea without fluid intake, a visit to the emergency department is necessary so that IV fluids can be given to prevent serious dehydration.

A patient with fluid excess should be weighed daily and a chart kept. The patient and family should be taught how to assess edema and to record findings. If edema is worsening or weight is increasing, the provider should be notified.

Osmolality

Nonelectrolyte solutes include protein, urea, glucose, creatinine, and bilirubin. Along with the electrolytes, these solutes contribute to the **osmolality** (concentration of the solution determined by the number of solutes in it) of the body fluid. Osmolality controls water movement and the body fluid distribution in the intracellular and extracellular compartments. Potassium maintains the osmolality of the ICF. Sodium controls the osmolality of the ECF. Normal osmolality of body fluids is 280 to 294 milliosmoles per kilogram (mOsm/kg).

Think Critically

Why should you watch for signs of fluid imbalance in any patient who has a serious infection or who has suffered considerable physical trauma?

Electrolytes

Some molecules, when placed in solution, undergo a separation of their atoms into electrically charged ions. These molecules are called **electrolytes** because their atomic particles are capable of conducting an electrical current. The molecules of electrolytes break up into atomic particles that are either negatively charged (**anions**) or positively charged (**cations**). For example, when sodium chloride (table salt) is dissolved in body water, its molecules separate into sodium ions, which are positively charged (Na^+), and chloride ions, which are negatively charged (Cl^-).

Because electrolytes are electrically charged, they are chemically active. This chemical activity allows for the creation of an electrical impulse across the cell membrane, making possible the transmission of nerve impulses, contraction of muscles, and excretion of hormones and other substances from glandular cells. Thus electrolytes are essential to the normal functioning of the body.

Electrolyte Imbalances

Electrolytes have many functions in the body. To determine whether there is an electrolyte imbalance, you must know the normal range for each electrolyte (Table 3-3). Many disorders can cause a shift in electrolytes and thus an imbalance—with too much or too little of an electrolyte circulating in the bloodstream or inside the cells of the body.

Table 3-3
Normal Ranges and Functions of Major Electrolytes

ELECTROLYTE	NORMAL RANGE	SI* UNITS	FUNCTION
Sodium (Na^+)	135-145 mEq/L	135-145 mmol/L	Major cation of the extracellular fluid Major role in regulation of water balance Regulates extracellular fluid volume through osmotic pressure Water follows sodium concentration in the body Essential to the transmission of nerve impulses and helps maintain neuromuscular irritability Important in controlling contractility of the heart Helps maintain acid-base balance Aids in maintenance of electroneutrality
Potassium (K^+)	3.5-5.0 mEq/L	3.5-5.0 mmol/L	Major intracellular cation Important to nerve transmission and muscle contraction Helps maintain normal heart rhythm Helps maintain plasma acid-base balance
Calcium (Ca^{2+})	8.4-10.6 mg/dL	2.10-2.65 mmol/L	Involved in formation of bone and teeth Necessary for blood coagulation Essential for normal nerve and muscle activity
Magnesium (Mg^{2+})	1.3-2.1 mg/dL	0.65-1.05 mmol/L	Necessary for building bones and teeth Necessary for nerve transmission and involved in muscle contraction Plays an important role in many metabolic reactions, where it acts as a cofactor to cellular enzymes
Phosphate (PO_4^{3-})	3.0-4.5 mg/dL	1.0-1.5 mmol/L	Necessary for formation of adenosine triphosphate (ATP) Cofactor in carbohydrate, protein, and lipid metabolism Activates B-complex vitamins
Chloride (Cl^-)	96-106 mEq/L	96-106 mmol/L	Helps maintain acid-base balance Important to formation of hydrochloric acid for secretion to the stomach Aids in maintaining plasma electroneutrality
Bicarbonate (HCO_3^-)	22-26 mEq/L	23-29 mmol/L	A buffer that neutralizes excess acids in the body Helps regulate acid-base balance

*International System of Units.

Modified from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.

Sodium Imbalances

Hyponatremia.

Hyponatremia, a deficit of sodium in the blood (Na^+ less than 135 mEq/L), is the most common electrolyte imbalance. Hyponatremia can occur from either a sodium loss, an inadequate intake of dietary sodium, or an excess of water. Decreased secretion of aldosterone results in sodium loss. Congestive heart failure, liver disease with **ascites** (abnormal accumulation of fluid within the peritoneal cavity), and chronic renal failure result in excessive water retention—without concurrent sodium retention—and this results in hypervolemia combined with hyponatremia. Decreased osmotic pressure in the extracellular compartment may cause a fluid shift into the cells. A decrease in blood pressure may occur. The average intake of sodium is 4 to 5 g/day. If there is a problem with water balance, sodium may be restricted in the diet. The consequence of hyponatremia is impaired nerve conduction. Table 3-4 presents the signs and symptoms, risk factors, and nursing interventions for hyponatremia.

Table 3-4
Electrolyte Imbalances and Nursing Interventions

SERUM VALUE	SIGNS AND SYMPTOMS	CAUSES AND RISK FACTORS	NURSING INTERVENTIONS
Sodium (Normal Range: 135-145 mEq/L)			
Hyponatremia <135 mEq/L	Central nervous system and neuromuscular changes resulting from failure of swollen cells to transmit electrical impulses Fatigue, lethargy, headache, mental confusion, altered level of consciousness, anxiety, coma, anorexia, nausea, vomiting, muscle cramps, seizures, decreased sensation, and decreased blood pressure (BP)	Inadequate sodium intake, as in patients on low-sodium diets Excessive intake or retention of water (kidney failure and heart failure) Loss of bile, which is rich in sodium, as a result of fistulas, drainage, gastrointestinal surgery, nausea and vomiting, and suction Loss of sodium through burn wounds Administration of intravenous (IV) fluids that do not contain electrolytes	Restrict water intake as ordered for patients with congestive heart failure, kidney failure, and inadequate antidiuretic hormone production. Liberalize a low-sodium diet. Closely monitor patient receiving IV solutions to correct hyponatremia. Replace water loss with fluids containing sodium.
Hypernatremia >145 mEq/L	Dry mucous membranes, taut skin turgor, intense thirst, flushed skin, oliguria, and possibly elevated temperature Weakness, lethargy, irritability, twitching, seizures, coma, intracranial bleeding	High-sodium diet, inadequate water intake as in a comatose, mentally confused, or debilitated patient Excessive sweating, diarrhea, failure of kidney to reabsorb water from urine Administration of high-protein, hyperosmotic tube feedings and osmotic diuretics	Encourage increased fluid intake. Measure intake and output (I&O). Give water between tube feedings. Restrict sodium intake. Monitor temperature.
Potassium (Normal Range: 3.5-5.0 mEq/L)			
Hypokalemia <3.5 mEq/L	Abdominal pain, paralytic ileus, gaseous distention of intestines Cardiac dysrhythmias, muscle weakness, decreased reflexes, paralysis, urinary retention, increased urinary pH, lethargy, confusion, electrocardiogram (ECG) changes	Inadequate intake of potassium-rich foods Loss of potassium in urine when kidneys do not reabsorb the mineral Loss of potassium from intestinal tract as a result of diarrhea or vomiting, drainage from fistulas, or overuse of gastric suction Improper use of diuretics	Instruct patients (especially those taking diuretics) about foods high in potassium content; encourage intake. Observe closely for signs of digitalis toxicity in patients taking this drug. Teach patients to watch for signs of hypokalemia. Administer potassium chloride supplement as ordered. Monitor I&O and cardiac rhythm.
Hyperkalemia >5.0 mEq/L	Muscle weakness, fatigue, hypotension, nausea, paresthesias, paralysis, cardiac dysrhythmias, ECG changes	Kidney failure, decreased kidney function Intestinal obstruction that prevents elimination of potassium in the feces Addison disease, digitalis toxicity, uncontrolled diabetes mellitus, insulin deficit, crushing injuries, and burns Overuse of potassium-containing salt substitute, or overuse of potassium-sparing diuretic	Decrease intake of foods high in potassium. Increase fluid intake to enhance urinary excretion of potassium; provide adequate carbohydrate intake to prevent use of body proteins for energy. Carefully administer proper dose of insulin to diabetic patients. Instruct patient in proper use of salt substitutes containing potassium.
Calcium (Normal Range: 8.4-10.6 mg/dL)			
Hypocalcemia <8.4 mg/dL	Paresthesias, abdominal cramps, weak pulse, decreased BP, seizures, muscle spasms, tetany, hand spasm, positive Chvostek sign, positive Troussseau sign, cardiac dysrhythmia, wheezing, dyspnea, difficulty swallowing, colic, cardiac failure, excessive blood transfusions	Metastatic cancer Inadequate dietary intake of calcium and vitamin D Impaired absorption of calcium from intestinal tract, as in diarrhea, sprue, or overuse of laxatives and enemas containing phosphates (phosphorus tends to be more readily absorbed from the intestinal tract than calcium and suppresses calcium retention in the body) Hyposecretion of parathyroid hormone (the parathyroid regulates calcium and phosphorus levels)	Encourage adults to consume sufficient calcium from cheese, broccoli, shrimp, and other dietary sources. Have 10% calcium gluconate solution at bedside of patient having thyroidectomy in case of surgical damage to the parathyroid glands. Give all oral medicines containing calcium 30 min before meals to facilitate absorption.
Hypercalcemia >10.6 mg/dL	Anorexia, nausea, abdominal pain, constipation, muscle weakness, oliguria, confusion Renal calculi, pathologic fractures, dysrhythmias, cardiac arrest	Excess intake of calcium, as in patient taking antacids indiscriminately Excess intake of vitamin D Conditions that cause movement of calcium out of bones and into extracellular fluid (e.g., bone tumor, multiple fractures) Tumors of the lung, stomach, and kidney and multiple myeloma Immobility and osteoporosis	Administer diuretics as prescribed to increase urinary output and calcium excretion. Monitor I&O; encourage high fluid intake (3000-4000 mL/day).
Magnesium (Normal Range: 1.3-2.1 mEq/L)			
Hypomagnesemia <1.3 mEq/L	Insomnia, hyperactive reflexes, leg and foot cramps, twitching, tremors Seizures, cardiac dysrhythmias, positive Chvostek sign, positive Troussseau sign, vertigo, hypocalcemia, hypokalemia	Chronic malnutrition, chronic diarrhea Bowel resection with ileostomy or colostomy Chronic alcoholism Thiazide diuretic use Prolonged gastric suction Acute pancreatitis Biliary or intestinal fistula Osmotic diuretic therapy Diabetic ketoacidosis	Provide diet counseling to help at-risk patients increase their level of magnesium (e.g., milk and cereals). Monitor IV infusions of magnesium closely. Monitor I&O.
Hypermagnesemia >2.1 mEq/L	Hypotension, sweating and flushing, nausea and vomiting Muscle weakness, paralysis, respiratory depression Cardiac dysrhythmias	Overuse of antacids and cathartics containing magnesium Aspiration of sea water, as in near-drowning Chronic kidney failure	Teach patients to avoid abuse of laxatives and antacids; instruct patients with renal problems to avoid over-the-counter drugs that contain magnesium. Encourage fluid intake to increase urinary excretion of magnesium if not contraindicated. Monitor I&O. Administer diuretics as ordered.
Phosphate (Normal Range: 3.0-4.5 mg/dL)			
Hypophosphatemia	Confusion, seizures, numbness, weakness, possible coma Chronic state: rickets and osteomalacia	Vitamin D deficiency or hyperparathyroidism Use of aluminum-containing antacids	Assess for vitamin D deficiency, hyperparathyroidism, or overuse of aluminum-containing antacids.
Hyperphosphatemia	Anorexia, nausea, vomiting	Renal insufficiency	Assess for restlessness, confusion, chest pain, and cyanosis. Monitor respirations. Check all electrolyte levels.

Modified from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.

Hypernatremia.

Hypernatremia occurs when the sodium level rises above 145 mEq/L. Water loss from fever, respiratory infection, or watery diarrhea is the usual cause. The body tries to correct the situation by conserving water through reabsorption in the renal tubules. Another cause of hypernatremia is the

excessive administration of sodium bicarbonate for the treatment of **acidosis** (excess acid or depletion of alkaline substances in the blood and body tissues). Good tissue turgor and firm subcutaneous tissues can be observed during hypernatremia. Hypernatremia causes an osmotic shift of fluid from the cells to the interstitial spaces, causing a cellular dehydration and interruption of normal cell processes. **Sodium intake is restricted for patients with hypernatremia** (see [Table 3-4](#)).

■ Nutrition Considerations

Foods High in Sodium*

- | | |
|---|---|
| <ul style="list-style-type: none">• Buttermilk• Canned meats or fish• Canned soups• Canned vegetables• Casserole and pasta mixes• Catsup• Cheese (all kinds)• Delicatessen meats• Dried fruits• Dried soup mixes• Foods containing monosodium glutamate (MSG)• Frozen vegetables with sauces• Gravy mixes | <ul style="list-style-type: none">• Ham• Hot dogs• Olives• Pickles• Prepared mustard• Preserved meats• Processed foods• Salted nuts• Salted popcorn• Salted snack foods• Softened water• Soy sauce• Tomato or vegetable juice |
|---|---|

* Check all packaged food labels for sodium content.

Potassium Imbalances

Hypokalemia.

Hypokalemia occurs when the potassium level falls below 3.5 mEq/L and has a variety of causes. Hypokalemia can cause serious problems. See [Table 3-4](#) for risk factors, signs and symptoms, and interventions for hypokalemia.

It is important to teach patients taking diuretics that are not potassium sparing to increase potassium in the diet, take potassium supplements as prescribed, and watch for signs of hypokalemia.

Severe hypokalemia (K^+ less than 2.5 mEq/L) may cause cardiac arrest. Extra potassium must be given to help correct an imbalance.

■ Nutrition Considerations

Common Foods High in Potassium

- | | |
|--|---|
| <ul style="list-style-type: none">• Apricots• Avocado• Baked potato with skin (small)• Banana (1 med)• Cantaloupe ($\frac{1}{4}$ med)• Dates, chopped• Figs• Honeydew melon ($\frac{1}{4}$ med)• Mango | <ul style="list-style-type: none">• Orange juice• Orange (1 med)• Pinto beans ($\frac{1}{2}$ cup)• Prune juice ($\frac{1}{2}$ cup)• Prunes• Raisins, seedless• Spinach• Tomatoes• Winter squash |
|--|---|

■ Safety Alert

Intravenous Potassium

Urine output must be at least 30 mL/hr before intravenous (IV) potassium is administered. Intravenous potassium must always be diluted before administration and is never given as a “push” (rapid, undiluted) injection.

Hyperkalemia.

Hyperkalemia occurs when the serum potassium level rises above 5.0 mEq/L. The mechanical disruption of cell membranes causes a shift of potassium from the ICF to the ECF. This shift happens when extensive tissue damage occurs from burns or crush injuries. **Hyperkalemia can cause life-threatening cardiac dysrhythmia.**

Calcium Imbalances

Hypocalcemia.

Hypocalcemia occurs when the calcium level drops below 8.4 mg/dL. Hypocalcemia results from disorders in which there is a shift of calcium into the bone. Removal or injury of the parathyroid glands during thyroidectomy causes parathyroid hormone deficiency and consequent hypocalcemia. Conditions that cause **alkalosis** (excess of alkaline or decrease of acid substances in the blood and body fluids) may cause hypocalcemia. Hypocalcemia in renal failure results from retention of phosphate ions, which causes a loss of calcium ions. In addition, during renal failure, vitamin D is not activated, causing the loss of absorption of calcium from the intestinal tract.

- Calcium ions are needed for a variety of metabolic processes and enzyme reactions, including for blood clotting. Calcium deficit upsets the stability of nerve membranes, causing abnormalities in nerve conduction and muscle contractions. **Carpopedal spasm** (also called Trousseau sign), hyperactive reflexes, Chvostek sign, and **tetany** (skeletal muscle spasm in which the muscles are in sustained contraction and causing spasm) may occur. Laryngospasm may occur if the deficit is severe (see [Table 3-4](#)).
- Check for Trousseau and Chvostek signs when calcium or magnesium deficit are a possibility. To test for Trousseau sign, place a blood pressure cuff on the arm, inflate above systolic pressure, and hold for 3 minutes; if a spasm of the hand occurs, the reaction is positive ([Figure 3-5](#)). Tapping the facial nerve about an inch in front of the earlobe assesses Chvostek sign. A unilateral twitching of the face is a positive response ([Figure 3-6](#)). Test deep tendon reflexes by tapping a partially stretched muscle tendon with a percussion hammer. The extent of the reflex is scored from 0 to 4+, with 0 representing no response, 2+ a normal response, and 4+ a hyperactive response.

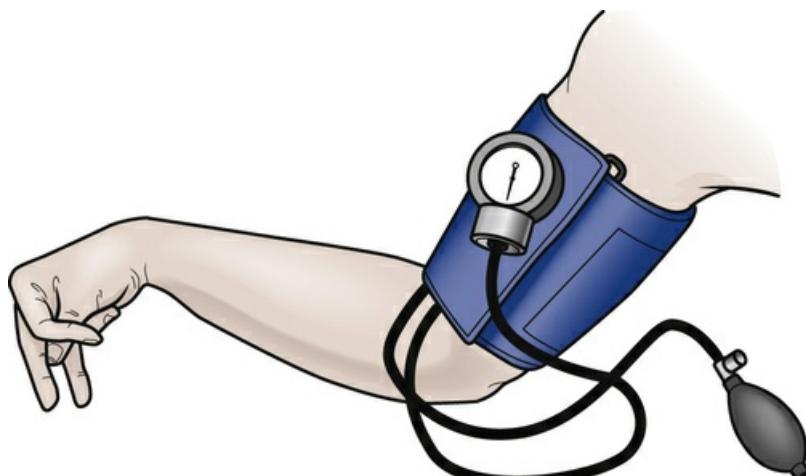


FIGURE 3-5 Palmar flexion (carpopedal spasm) indicating positive Trousseau sign in hypocalcemia. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.)



FIGURE 3-6 Facial muscle response indicating positive Chvostek sign in hypocalcemia. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.)

Hypercalcemia.

Hypercalcemia occurs when the serum calcium level is above 10.6 mg/dL. This can occur during periods of lengthy immobilization, when calcium is mobilized from the bone, or when an excess of calcium or vitamin D is taken into the body. See [Table 3-4](#) for signs and symptoms, risk factors, and interventions. Administer diuretics to increase calcium excretion, and encourage high fluid intake.

Magnesium Imbalances

Hypomagnesemia.

Hypomagnesemia occurs when the serum level drops below 1.3 mEq/L and usually is present when hypokalemia and hypocalcemia occur. Magnesium is important in deoxyribonucleic acid (DNA) and protein synthesis and in many enzyme reactions. Magnesium imbalances are rare but can be caused by a variety of factors (see [Table 3-4](#)).

Hypermagnesemia.

Hypermagnesemia is present when the serum level is above 2.1 mEq/L. It can occur in the presence of renal failure or from overuse of magnesium-containing antacids and cathartics. Hypermagnesemia is rare.

Anion Imbalances

Because of electroneutrality, imbalances of chloride, phosphate, and bicarbonate accompany cation imbalances. **Hypochloremia** (a chloride level below 95 mEq/L) is associated with hyponatremia. Hypochloremia can also occur with severe vomiting and is seen as a compensatory decrease in acid-base disorders. **Hyperchloremia** (a chloride level above 103 mEq/L) that coincides with hypernatremia is a form of metabolic acidosis. **Hypophosphatemia** occurs when the phosphate level falls below 3.0 mg/dL. Hypophosphatemia may result from use of aluminum-containing antacids that bind phosphate, vitamin D deficiency, or hyperparathyroidism. **Hyperphosphatemia** (a level above 4.5 mg/dL) commonly occurs in renal failure. See [Table 3-4](#) for signs and symptoms of phosphate imbalance.

Acid-Base System

Physiology

It is crucial to maintain acid-base balance, because cell enzymes function within a very narrow pH range (7.35 to 7.45). To understand the concept of acid-base balance and how it is maintained in the body fluids, you should be familiar with some basic facts about biochemistry and the terms commonly used in discussions of hydrogen ion concentration (Box 3-3).

Box 3-3

Some Chemistry Facts Related to Acid-Base Balance

- An **acid** is a substance capable of giving up a hydrogen ion during chemical exchange.
- A **base** is a substance capable of accepting a hydrogen ion.
- Acids react with bases to form water and a salt.
- A reaction of an acid and a base to form water and a salt is a *neutralization reaction* because *both the acid and the base are neutralized*.
- Acids react with carbonates and bicarbonates to form carbon dioxide gas.
- The term *pH* refers to the concentration of hydrogen (H) in a solution. The “p” represents a **negative logarithm**, which is an inverse proportion. This means that **the higher the concentration of hydrogen ions in a solution, the lower the pH**. A higher pH indicates the opposite, that is, a lower concentration of hydrogen ions.
- A chemically neutral solution has a pH of 7.0.
- **The pH of the body's fluids is normally somewhat alkaline (between 7.35 and 7.45).**
- A pH below 7.25 or above 7.55 is considered life-threatening.
- A pH below 6.8 (**acidosis**) or above 7.8 (**alkalosis**) usually is fatal.
- A blood pH of 7.4 indicates a ratio of 1 part carbonic acid to 20 parts bicarbonate (base).
- Acidosis is the result of either a loss of base or an accumulation of acid.

Nutrients in the blood diffuse into the cells, where various metabolic processes take place. Metabolic wastes, including acids, from those cellular processes diffuse back from the cells to the blood. The following three mechanisms control or try to rebalance pH:

- Buffer pairs—groups of chemicals that absorb excess acids or excess bases—circulating in the blood respond to pH changes quickly. The bicarbonate–carbonic acid buffer system is responsible for more than half of the buffering. Three other buffer systems in the body include the phosphate, hemoglobin, and protein systems.
- The respiratory system alters breathing rate and depth. Because carbon dioxide dissolves in the blood and combines with water to form carbonic acid, retaining or blowing off carbon dioxide helps retain or eliminate acids from the body.
- The kidneys change the excretion rate of acids and the production and absorption of bicarbonate ion. The kidneys are slow to compensate but are the most effective compensating mechanism (Figure 3-7).

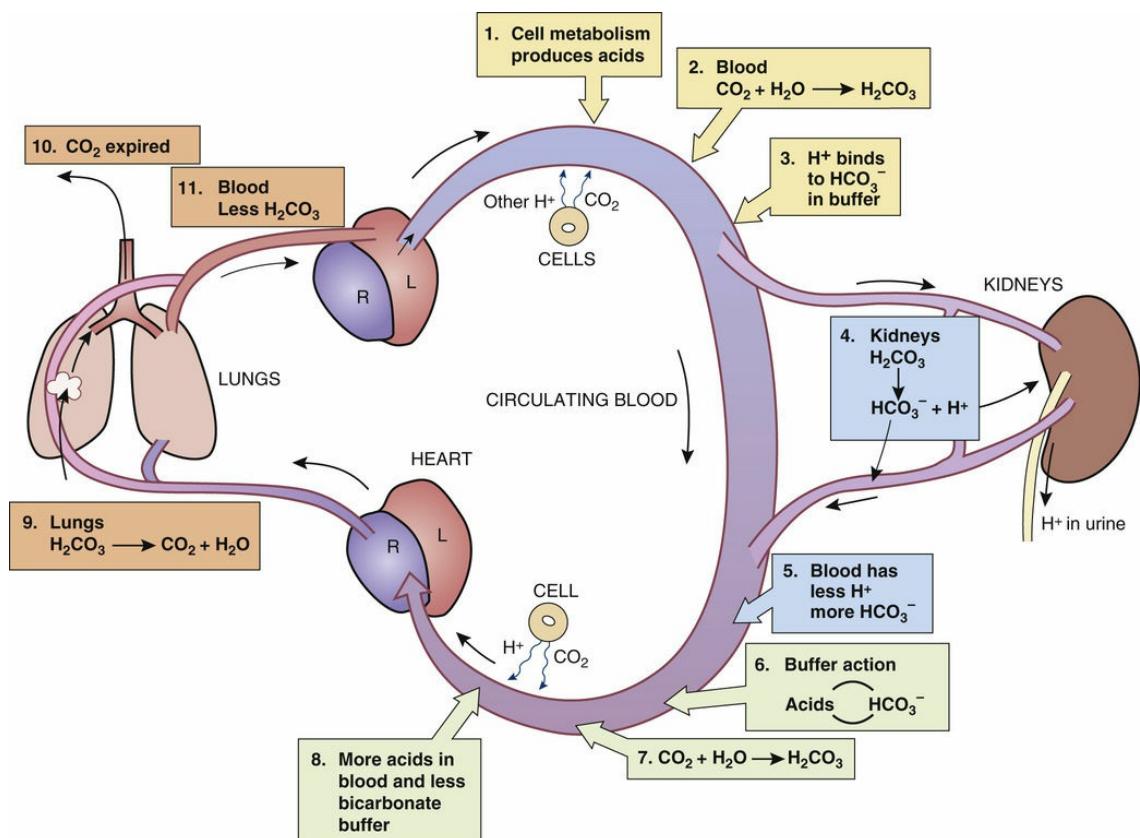


FIGURE 3-7 Regulation of acid-base balance by chemical buffers, respiratory system, and renal system. (From deWit SC: *Fundamental concepts and skills for nursing*, ed. 2, Philadelphia, 2005, Saunders.)

The bicarbonate–carbonic acid buffer system links an acid (carbon dioxide) with water and a base (bicarbonate ion). A buffer is a substance that increases the amount of acid or alkali in the solution to produce a unit change in pH. The balance of the bicarbonate ions and carbonic acid ions is controlled by the respiratory system and by the kidneys. The carbon dioxide produced by cell metabolism diffuses into the blood. There carbon dioxide reacts with water and forms carbonic acid. The carbonic acid dissociates (separates) to form hydrogen ions and bicarbonate ions, as needed. The process can be reversed in the lungs, freeing up carbon dioxide so it can be expired along with water, thereby reducing the total acid in the body.

Enzymes in the kidney promote the formation of hydrogen ions, which are excreted in the urine while the bicarbonate ions are returned to the blood. The kidneys, through the influence of aldosterone, can exchange hydrogen ions for sodium ions. Acids can be removed in the kidney by combining them with ammonia and other basic chemicals. Urine pH can vary from 4.5 to 8.0 as kidney compensation occurs.

Acid-Base Imbalances

Pathophysiology

Most of the body's metabolic activities produce carbon dioxide gas, which moves from the tissues into the blood, where it combines with water to form carbonic acid ($\text{CO}_2 + \text{H}_2\text{O} = \text{H}_2\text{CO}_3$). The body deals with this constant manufacture of acid in a number of ways so that the correct ratio of carbonic acid to bicarbonate can be maintained and an alkaline environment provided for normal cellular activities. If the ratio is not maintained, the acid-base balance is upset. The pH will either fall below the normal range and acidosis will occur, or pH will rise above normal range and alkalosis will be present. As long as the ratio of carbonic acid to bicarbonate is maintained at 1 : 20, the pH remains within normal limits. In a respiratory imbalance, the lungs retain or "blow off" (excrete) carbon dioxide (CO_2). In **hypoventilation**, the lungs do not eliminate enough CO_2 , and CO_2 remains in the body, unites with water, and forms carbonic acid. The opposite is **hyperventilation**, in which too much CO_2 may be blown off.

The kidneys are the principal organs of control in maintaining a normal pH during metabolic activities because they either reabsorb or excrete bicarbonate. If they eliminate too much bicarbonate, acidosis will develop. Conversely, if they fail to eliminate enough bicarbonate and allow it to be reabsorbed into the bloodstream, alkalosis will develop.

In the presence of respiratory acidosis, the kidneys will retain and manufacture more bicarbonate than normal so it is available to neutralize the excess acid. However, this is a slow process that takes from a few hours to several days. In the presence of respiratory alkalosis, the kidneys will increase their excretion of bicarbonate. In response to metabolic acidosis, the patient will involuntarily hyperventilate to remove CO_2 so it is not available to produce carbonic acid. If metabolic alkalosis develops, the patient will hypoventilate to retain the supply of carbon dioxide.

The foregoing information on acid-base balance, hydrogen ion concentration, and the carbon dioxide–bicarbonate ratio does not represent an in-depth explanation. Many complex chemical activities are involved in maintaining an internal environment that must be slightly alkaline for normal body function.

Because acidosis and alkalosis are common to a great variety of medical and surgical illnesses and conditions, the chapters on specific illnesses will address associated problems of acid-base imbalance.

The four types of acid-base imbalances are shown in **Table 3-5**. To determine whether an acid-base imbalance exists, the pH, PaCO_2 , and HCO_3^- are measured by arterial blood gas analysis. Imbalances may be acute or chronic. **An initial change in carbon dioxide is nearly always the result of a respiratory disorder. Metabolic disorders show an initial change in bicarbonate ions.** Three control mechanisms continually work together to maintain acid-base balance: the respiratory system, the kidneys, and the bicarbonate buffer system. When an imbalance occurs, the lungs and kidneys try to **compensate** by working to bring the pH back toward normal limits.

Table 3-5
The Four Acid-Base Imbalances

IMBALANCE	CAUSES	BLOOD GAS VALUES
Respiratory acidosis	Slow, shallow respirations	pH < 7.35
	Respiratory congestion or obstruction	$\text{PaCO}_2 > 45 \text{ mm Hg}$
Metabolic acidosis	Shock (poor circulation)	pH < 7.35
	Diabetic ketoacidosis	$\text{HCO}_3^- < 22 \text{ mEq/L}$
	Renal failure	
	Diarrhea	
Respiratory alkalosis	Hyperventilation	pH > 7.45
		$\text{PaCO}_2 > 35 \text{ mm Hg}$
Metabolic alkalosis	Vomiting	pH > 7.45
	Excessive antacid intake	$\text{HCO}_3^- > 26 \text{ mEq/L}$
	Hypokalemia	

From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.

Arterial Blood Gas Analysis

Studies of the percentages of gases (oxygen and carbon dioxide) in the blood and the hydrogen ion concentration (pH) are useful in assessing the status of both respiratory and metabolic acid-base imbalances. Blood gas studies are valuable indicators of a patient's progress toward recovery, or lack of it. Blood gas analyses reflect the ability of the lungs to exchange oxygen and carbon dioxide, the effectiveness of the kidneys in balancing retention and elimination of bicarbonate, and the effectiveness of the heart as a pump. The results of analyses of arterial blood gases (ABGs) are reported as follows:

- **Pao₂:** Partial pressure (P) exerted by oxygen (O₂) in the arterial blood (a). The normal value is 80 to 100 mm Hg; it indicates the amount of oxygen carried in the blood.
- **Paco₂:** Partial pressure of carbon dioxide in the arterial blood. The normal value is 35 to 45 mm Hg; it indicates the amount of carbon dioxide in the blood.
- **pH:** An expression of the extent to which the blood is alkaline or acid. The normal value is 7.35 to 7.45.
- **SaO₂** (also abbreviated **O₂ Sat.**): Percentage of available hemoglobin that is saturated (Sa) with oxygen, that is, the ratio of the amount of oxygen that is combined with hemoglobin to the total amount of oxygen the hemoglobin can carry. The normal value is 94% to 100%.
- **HCO₃⁻:** The level of plasma bicarbonate; an indicator of the metabolic acid-base status. The normal value is 22 to 26 mEq/L.
- **Base excess or deficit:** Indicates the amount of blood buffer present. Alkalosis is present when this value is abnormally high. Abnormally low values indicate acidosis. Alkalosis is measured in "+" or "-" values.

Respiratory Acidosis

An increase in carbon dioxide levels occurs in a variety of disorders. It is seen in the following conditions:

- Acute problems such as airway obstruction, pneumonia, asthma, chest injuries, or pulmonary edema
- Chronic obstructive pulmonary disease (COPD), such as emphysema
- With opiate use that depresses the respiratory rate

Think Critically

What could you do to help prevent respiratory acidosis in a home care patient who has pneumonia?

A patient with COPD is most likely to develop acute acidosis when an infection of the respiratory tract further impairs breathing capacity and the removal of carbon dioxide. Signs and symptoms of respiratory acidosis include complaints of increasing difficulty in breathing, a history of respiratory obstruction (acute or chronic), dyspnea, weakness, dizziness, restlessness, sleepiness, and change in mental alertness.

The treatment for respiratory acidosis is establishment or maintenance of an airway. A tracheostomy or the insertion of an endotracheal tube may be necessary. Oxygen administration may be needed, and the assistance of a mechanical ventilator may be required. Conservative treatment is by postural drainage, deep-breathing exercises, bronchodilators, and antibiotics if indicated. Care must be taken when administering certain drugs that depress the respiratory center, including narcotics, hypnotics, and tranquilizers.

The patient must be watched closely for respiratory and cardiac arrest. Should either occur, it will be necessary to maintain respiration and circulation artificially through cardiopulmonary resuscitation.

Clinical Cues

In patients with COPD, the respiratory drive mechanism is altered, and oxygen can act as a respiratory depressant. Oxygen should be administered with great care to these patients (no more

than 2 to 3 L/min) because it can cause respiratory arrest.

If a patient's history is unknown, oxygen is begun at a rate of 2 to 3 L/min until it is determined that a higher flow rate can be tolerated.

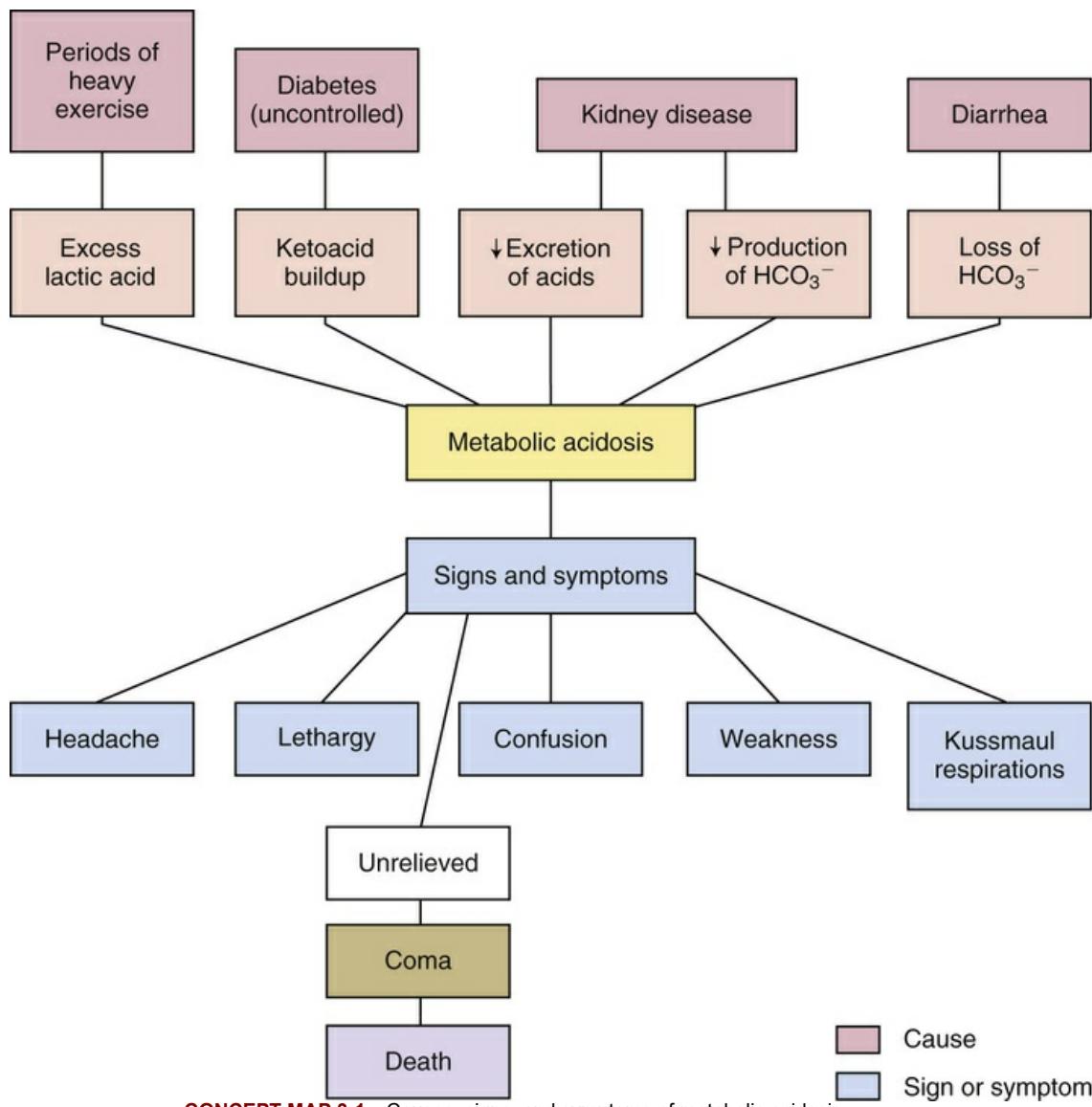
Metabolic Acidosis

An excessive loss of bicarbonate ions or an increased production or retention of hydrogen ions leads to metabolic acidosis. The main causes of metabolic acidosis include:

- Excessive loss of bicarbonate ions from diarrhea
- Renal failure
- Diabetic ketoacidosis
- Hyperkalemia

In diabetes mellitus, insulin insufficiency leads to excessive burning of fats, and the end product is fatty acids. When more energy than usual is expended, as in athletic competition, lactic acid builds up in the body as oxygenation of tissue falls. In kidney disease there is decreased excretion of acids and decreased production of bicarbonate. The increased buildup of acids causes metabolic acidosis.

The symptoms of metabolic acidosis include weakness, lethargy, headache, and confusion ([Concept Map 3-1](#)). If the acidosis is not relieved, these symptoms progress to stupor, unconsciousness, coma, and death. The breath of the patient may have a fruity odor from the ketone bodies ([ketacidosis](#)). Vomiting and diarrhea may occur and aggravate the metabolic imbalance because of the loss of fluids and electrolytes, which are essential to restoring the acid-base balance. When compensatory mechanisms are working to correct metabolic acidosis, the patient may have deep, rapid breathing (Kussmaul respirations) and may secrete urine with a low pH.



Treatment of metabolic acidosis is aimed at the underlying cause. Insulin is administered if the patient is in diabetic ketoacidosis. Dialysis may be necessary to correct the problem in a patient with kidney failure. **Immediate treatment of severe metabolic acidosis requires administration of IV bicarbonate or lactate.**

Respiratory Alkalosis

Alkalosis is less common than acidosis. **Hyperventilation** (a rapid respiratory rate) results in respiratory alkalosis. Hyperventilation is usually caused by:

- Anxiety
- High fever
- An overdose of aspirin

Patients hyperventilate for a variety of reasons, including **hypoxemia** (insufficient oxygen, which triggers an automatic increase in respiration), reactions to certain drugs, pain, and panic. The overzealous use of mechanical ventilation also can cause hyperventilation, when too much CO₂ is blown off. Head injuries may also lead to hyperventilation. **Symptoms of respiratory alkalosis include deep, rapid breathing, tingling of the fingers, pallor around the mouth, dizziness, and spasms of the muscles of the hands.**

Treatment for hyperventilation addresses the underlying disorder. The person may breathe

through a re-breather mask temporarily, mixing the excessively exhaled carbon dioxide with oxygen so that carbon dioxide is reinhaled. If the underlying cause of respiratory alkalosis is panic, treatment is aimed at preventing further hyperventilation and helping the patient reestablish a normal level of carbon dioxide in the blood. Sedatives may be given to calm the patient. To aid in the retention of carbon dioxide, the patient may be instructed to hold the breath, or to breathe into a paper sack and re-breathe the carbon dioxide just exhaled. This recycling of carbon dioxide can eventually restore normal carbonic acid levels in the blood.

Metabolic Alkalosis

Metabolic alkalosis follows a loss of hydrochloric acid from the stomach. Causes include the following:

- Vomiting
- Extensive gastrointestinal suction
- Hypokalemia
- Excessive use of antacids with bicarbonate

Hypokalemia causes metabolic alkalosis, because the kidney retains K^+ while excreting H^+ .

Other causes include drainage from intestinal fistula; diuresis resulting from potent diuretics that increase potassium loss in the urine; and steroid therapy, which causes retention of sodium and chloride and loss of potassium and hydrogen.

Symptoms of metabolic alkalosis include such neurologic signs as irritability, disorientation, lethargy, muscle twitching, tingling and numbness of the fingers, and convulsions and respiratory manifestations such as slow, shallow respirations; decreased chest movements; and cyanosis. In addition, there may be symptoms of potassium and calcium depletion. If alkalosis progresses, tetany will occur, with resulting seizures and coma. Tetany is characterized by severe muscle cramps, carpopedal spasms, laryngeal spasms, and **stridor** (a shrill, harsh sound on inspiration).

Treatment is directed at correcting the underlying cause and attempting to restore the body fluids to a less alkaline state. Fluids and electrolytes are replaced orally and parenterally as needed. Emergency measures include the administration of an acidifying solution, such as ammonium chloride. [Figure 3-8](#) compares the causes, physiologic effects, and compensatory mechanisms for acidosis and alkalosis.

Think Critically

Can you identify the type of imbalance that might result from (1) rapid respiratory rate, (2) out-of-control diabetes, (3) renal failure, and (4) eating antacids for a nervous stomach?

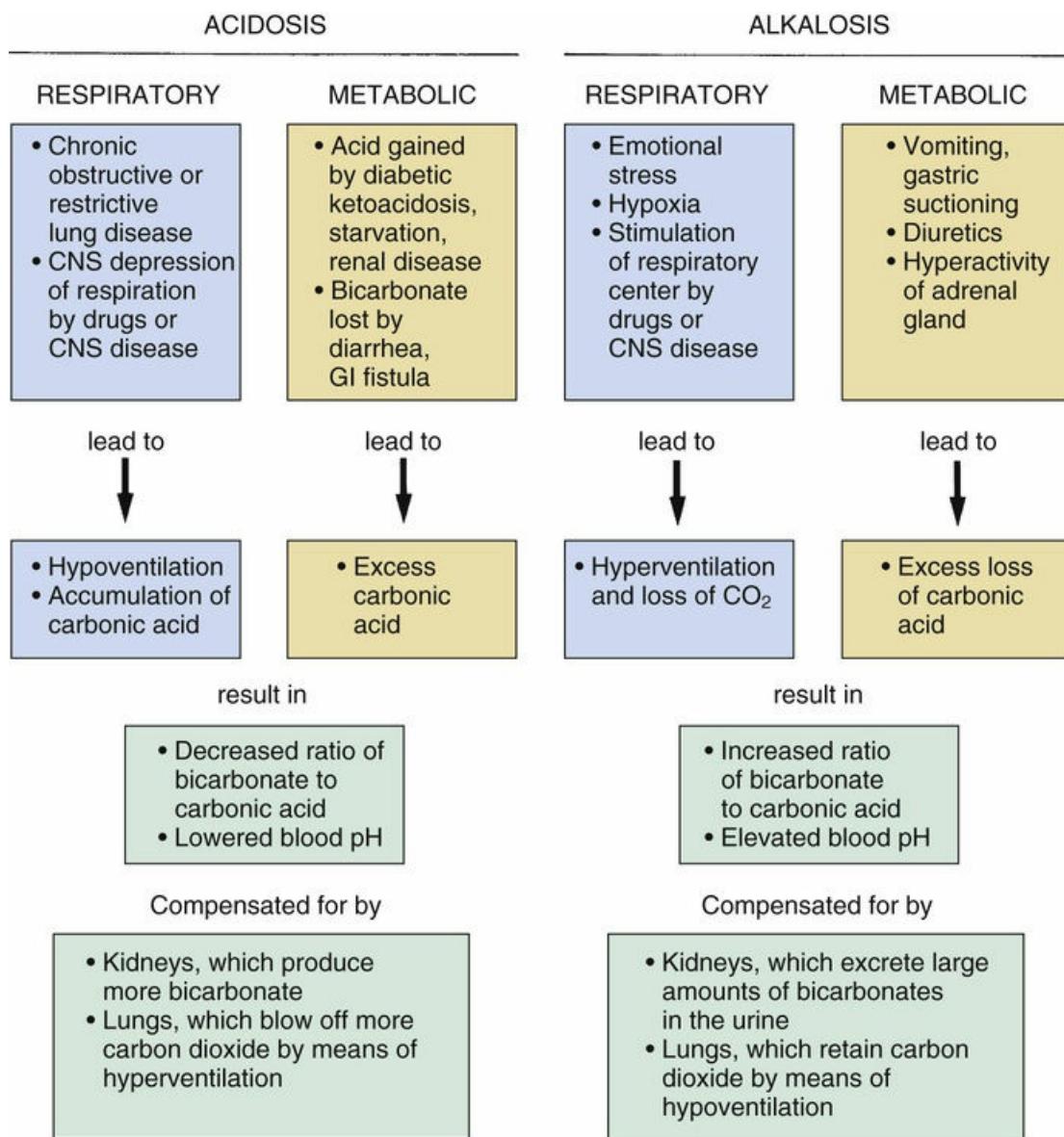


FIGURE 3-8 Comparison of causes, physiologic effects, and compensatory mechanisms for acidosis and alkalosis. CNS, Central nervous system; GI, gastrointestinal. (From deWit SC: *Fundamental concepts and skills for nursing*, ed. 2, Philadelphia, 2005, Saunders.)

Home Care

For the home care patient, teach about the requirements for fluid intake or restriction. Monitor adherence to sodium restriction by periodically checking the patient's food intake. Obtain feedback to be certain the patient understands the instructions. Collaborate with the patient on the plan of care to obtain patient compliance.

When acid-base imbalance occurs, control of the underlying disorder is a priority. Blood gases are monitored, and oxygen and electrolytes are administered as needed. Nursing measures to improve pulmonary function are instituted as appropriate.

Think Critically

What measures could assist a patient who is in metabolic acidosis to restore acid-base balance?

Intravenous Fluid Therapy

Administering fluids through the veins is the most common means by which water, electrolytes, nutrients, and some drugs may be given when oral intake is not possible or must be supplemented. Intravenous therapy is often used when a fluid deficit is present or when there are electrolyte imbalances. Intravenous fluids may also be used to help reestablish acid-base balance. Medications are administered in an IV solution when rapid action is required. TPN is used for administering nutrients to patients with gastrointestinal problems who cannot take in nutrients in any other way.

Some terms related to the concentration of an IV fluid and its effect on cells include:

- **Isotonic:** A solution that has the same osmotic pressure as ICF. Body cells can be bathed in an isotonic solution without net flow of water across the cell membrane.
- **Hypotonic:** A solution that has a lower osmotic pressure (is less concentrated) than that of body fluids. Cells bathed in a hypotonic solution will swell as water passes from the less-concentrated solution across the cell membrane and into the cell. **Note: Sterile distilled water is hypotonic and is never added to an IV solution.**
- **Hypertonic:** A solution that has a higher osmotic pressure than that of body fluids. Cells bathed in a hypertonic solution will shrink as water passes out of the cell into the fluid surrounding it.

An example of an isotonic solution is 0.9% normal saline. Hypotonic solutions are those with less than 5% glucose or with anions less than 150 mEq/L. Fluids commonly used in IV therapy are presented in **Table 3-6**.

Table 3-6
Commonly Prescribed IV Solutions

SOLUTION	TONICITY	mOsm/kg	GLUCOSE (g/L)	INDICATIONS AND CONSIDERATIONS
Dextrose in Water				
5%	Isotonic	278	50	Provides free water necessary for renal excretion of solutes Used to replace water losses and treat hyponatremia Provides 170 calories/L Does not provide any electrolytes
10%	Hypertonic	556	100	Provides free water only, no electrolytes Provides 340 calories/L
Saline				
0.45%	Hypotonic	154	0	Provides free water in addition to Na^+ and Cl^- Used to replace hypotonic fluid losses Used as maintenance solution, although it does not replace daily losses of other electrolytes Provides no calories
0.9%	Isotonic	308	0	Used to expand intravascular volume and replace extracellular fluid losses Only solution that may be administered with blood products Contains Na^+ and Cl^- in excess of plasma levels Does not provide free water, calories, other electrolytes May cause intravascular overload or hyperchloremic acidosis
3.0%	Hypertonic	1026	0	Used to treat symptomatic hyponatremia Must be administered slowly and with extreme caution because it may cause dangerous intravascular volume overload and pulmonary edema
Dextrose in Saline				
5% in 0.225%	Isotonic	355	50	Provides Na^+ , Cl^- , and free water Used to replace hypotonic losses and treat hyponatremia Provides 170 calories/L
5% in 0.45%	Hypertonic	432	50	Same as 0.45% NaCl except provides 170 calories/L
5% in 0.9%	Hypertonic	586	50	Same as 0.45% NaCl except provides 170 calories/L
Multiple Electrolyte Solutions				
Ringer's solution	Isotonic	309	0	Similar in composition to plasma except that it has excess Cl^- , no Mg^{2+} , and no HCO_3^- Does not provide free water or calories Used to expand the intravascular volume and replace extracellular fluid losses
Lactated Ringer's (Hartmann's) solution	Isotonic	274	0	Similar in composition to normal plasma except does not contain Mg^{2+} Used to treat losses from burns and lower gastrointestinal tract May be used to treat mild metabolic acidosis but should not be used to treat lactic acidosis Does not provide free water or calories

Modified from Lewis SM, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.

Blood-related fluids that are given IV include whole blood; packed cells from which the plasma has been removed, leaving only the red blood cells; and plasma. Whole blood is sometimes given to replace blood that has been lost through hemorrhage. Packed cells may be administered to patients with anemia or some other blood disorder, or to patients who cannot tolerate a large volume of fluid very well, such as those with renal disease or heart failure. Plasma is given to increase blood volume (as in shock), to provide protein, and to treat disorders of coagulation.

In the treatment of shock, **plasma expanders** are administered to increase the volume of plasma. Examples of plasma expanders are low-molecular-weight dextran, albumin, Hespan, and Plasmanate. Blood disorders and blood product administration are further presented in [Chapter 16](#).

Nursing Responsibilities in Administering Intravenous Fluids

Responsibility for the safe and effective administration of IV fluids rests with every member of the nursing staff.

Legal and Ethical Considerations

Intravenous Therapy Guidelines

Check your state's nurse practice act to determine what aspects of IV therapy, if any, your state will allow the LPN/LVN to perform. With the continuation of the nursing shortage, a few states have expanded their LPN/LVN practice act to allow licensed LPN/LVNs to perform a variety of IV therapy functions. Other states are considering expanding their practice acts accordingly.

As with any therapeutic measure, IV therapy is not without its hazards to the patient. Many complications can be avoided through careful handling of equipment and meticulous monitoring of the patient's reaction to the fluids being administered. Maintaining sterility is paramount.

Safety Alert

Intravenous Line Connection Safety

When connecting an IV solution or disconnecting a line, always trace the line to where it connects to the patient to make certain that it is an IV line and connects to an IV device. Many mistakes have been made when IV fluids have been connected to the wrong device.

The four goals of nursing care for a patient receiving an IV infusion are to (1) prevent infection, (2) minimize physical injury to the veins and surrounding tissues, (3) administer the correct fluid at the prescribed time and at a safe rate of flow, and (4) observe the patient's reaction to the fluid and medications being administered ([Box 3-4](#)).

Box 3-4

The Six Rights Applied to Intravenous Therapy

Be sure you have:

1. The right solution with or without additives as ordered; the correct solution to follow what has been infusing
2. The right dose (amount) of solution and additive as ordered
3. The right route (peripheral intravenous [IV], peripherally inserted central catheter [PICC], central line, port)
4. The right time (to infuse)
5. The right patient as identified with two identifiers
6. The right documentation

Additionally:

- Teach the patient the reason for administration of the fluid and/or drug and signs and symptoms of problems to report to you.
- Check for drug and latex allergies.
- Be aware of potential interactions with IV medications or irrigating solutions.

- Maintain sterility of all solutions, tubing, and connections.

All equipment and fluids used for IV therapy must be sterile and safe for administration. **Before any plastic bag or bottle of solution is added to an IV set, it must be checked for leaks and possible contamination.**

Safety Alert

Intravenous Solution Safety

A plastic bag of solution may be squeezed to check for leaks. Any solution that is discolored or has small particles, a white cloud, or film in it should not be used. If there is no vacuum in a bottle when it is opened, the solution may be contaminated. Gently invert the bag or bottle and hold it up to the light so you can see if there are any particles floating in it.

When a new bottle of fluid or additional medication is added to an IV infusion already in progress, strict surgical asepsis must be observed because there is a danger of introducing bacteria into the patient's blood system. Because of the danger of incompatibility, it is essential to check each drug and each solution to be certain they can be mixed. Your pharmacist is a good resource to consult. **Always wash your hands just before handling IV fluids and equipment. The port on the IV tubing into which the administration set of a piggyback medication is to be attached must be carefully and thoroughly wiped with a fresh alcohol swab, scrubbing thoroughly for 15 seconds, before the tubing is attached to the container.**

There should be a clear occlusive (airtight) dressing over the IV insertion site. The edges of the dressing should adhere to the skin on all sides. Tubing should be secured so that accidental pulling on the tubing will not affect the IV cannula. Dressings are changed according to agency protocol, but usually are changed at least every 72 hours. If a dressing becomes loose, soiled, or contaminated, it should be removed and a new dressing applied ([Box 3-5](#)). Label tubing and dressing with the date.

Box 3-5

Intravenous Therapy Guidelines

- **Keep intravenous (IV) fluid sterile.** Make sure that everything coming in contact with the solution is sterile, including the inside surface of the cannula hub and all connecting points between the bag and drip chamber and between the tubing and the needle.
- **Protect the cannula site from contamination to prevent possible infection.** An airtight, transparent dressing is used over the cannula site.
- **Keep tubing free of air.** Clear tubing of air before connecting to the cannula. Do not allow the current bag to run dry before changing to the next one.
- **Hang fluids at the correct height.** Fluids flow through the tubing by the force of gravity. If there is negative pressure in the IV line, blood will flow back into the tubing. Keep the bag of fluid sufficiently above the level of the cannula site to maintain flow, but avoid having it too high because this significantly increases the effect of gravity.
- **Carefully regulate the rate of flow.** If the IV infusion is behind schedule, do not open up the clamp and run in a large amount of fluid at one time to catch up. Rather, recalculate either (1) the span of time for the infusion or (2) the rate of drops per minute for the fluid to run at the ordered rate.
- **Track intake and output when a patient is receiving IV fluids or blood.** Keep accurate intake and output records and compare intake with output over 24 hours.

- **The solution to run in first should be hung the highest.** When a second bag is attached piggyback to a primary IV line, lower the primary bag without clamping the tubing so it will begin to flow when the piggyback has run in. Attach the piggyback beneath the roller clamp on the primary tubing.
- **Assess the site frequently for signs of complications.** Infiltration, swelling at the IV site, irritation of the vein, formation of a clot stopping the flow, or systemic reaction should be identified quickly. Signs of infiltration are pain or discomfort at the site caused by dislodgement of the needle or puncture of the vein. Vital signs should be taken several times a day to detect early signs of infection or adverse reaction.

Go to Evolve for step-by-step Skills related to IV therapy.

The site of venipuncture should be watched closely for signs of inflammation. Redness, swelling, and heat in the area should be reported, because they are possible signs of phlebitis. Chills and elevated body temperature may indicate a bacterial infection. **Table 3-7** presents the potential complications of IV therapy.

Table 3-7
Complications of Intravenous Therapy and Nursing Interventions

COMPLICATION	SIGNS AND SYMPTOMS	NURSING INTERVENTIONS
Local		
Infiltration	Arm swollen, tender, cool to touch; IV catheter may or may not have blood return	Remove IV catheter and restart IV infusion in the other extremity.
Extravasation	Pain at insertion site, tender and cool to touch, IV flow slows, edema, burning, pale, fluid leaking around catheter Tissue sloughing may occur in 1-4 wk	Stop infusion immediately. If drug is involved, aspirate from short cannula. Then remove the IV catheter after injecting an antidote through the IV catheter if one is available, and restart in the other extremity. Apply cold compresses if not contraindicated. Photograph site. Monitor site for 24 hr. Provide written instructions for patient and family.
Phlebitis	Vein hard with skin red, swollen, tender, warm Blood return present IV infusion may or may not be sluggish	Remove IV catheter, document; apply warm, moist pack to the IV site. Restart IV infusion in other extremity. Monitor frequently.
Thrombophlebitis	Site red, tender, warm IV infusion sluggish	Never irrigate the IV catheter; remove the IV catheter, notify the provider, restart IV infusion in opposite extremity. Apply cool compresses initially, followed by warm compresses.
IV site skin infection	Site hot, red, painful but not hard or swollen IV infusion sluggish	Remove IV catheter, restart in opposite extremity, change entire administration system. Clean site with alcohol. Apply warm compresses. May send tip of catheter for culture.
Venous spasm	Slowing of infusion rate Cramping or pain at or above the insertion site Numbness in the area Inability to withdraw peripherally inserted central catheter (PICC) or midline catheter	Slow infusion rate and apply warm compresses. Do not apply tension to catheter or forcibly remove it. Encourage consumption of warm liquids. Keep extremity covered and dry.
Nerve damage	Tingling, "pins and needles" feeling, or numbness at or below the catheter insertion site	Immediately stop the cannula insertion if patient complains of severe pain. If sensations do not go away once the catheter is secured, remove the catheter.
Catheter embolus	Decrease in blood pressure (BP); pain along vein; weak, rapid pulse; cyanosis of nail beds; loss of consciousness	Remove IV catheter and inspect, place a tourniquet high on limb of IV site, notify provider, obtain x-ray, prepare for surgery to remove pieces.
Systemic		
Infection	Fever, chills, general malaise	Change the infusion system, notify the provider, obtain cultures as ordered.
Severe shock	Light-headedness or dizziness, flushed face, irregular pulse, decreased BP, loss of consciousness, cardiac arrest	Stop the infusion, notify the provider, monitor vital signs frequently. Run dextrose 5% in water at a keep-vein-open rate.
Circulatory overload	Shortness of breath, tachypnea, increased BP, moist cough, crackles, puffiness around eyes and dependent edema	Elevate head of the bed, keep patient warm, assess for edema, slow the infusion rate; notify the provider. Administer oxygen and diuretic as ordered.

When an IV infusion is discontinued, the tubing is clamped, all tape is removed, and the needle or catheter is gently, but quickly, withdrawn using *Standard Precautions* (see Chapter 6). Check to be sure the catheter has been completely removed and the tip is intact. A dry, sterile gauze is held on the site with enough pressure to control the leakage of blood and avoid the formation of a hematoma. If possible, raise the patient's limb for a minute or two to drain blood from the site of insertion and help prevent leakage of blood from the punctured vein.

A safety goal of The Joint Commission requires that at least two patient identifiers (neither identifier being the patient's room number) must be used whenever IV fluid is administered. You should check the patient's armband with the medication administration record for the correct name and the correct agency identification number, and then ask the patient to state his name.

Safety Alert

Six Rights for Intravenous Therapy

The IV administration of fluids requires the same safety precautions as any other medication. Follow the Six Rights and the additional rules for drug administration (see [Box 3-4](#)). The label must be read and compared with the order or the MAR three times to ensure that the correct solution is being given to the correct patient. The patient's ID band must be checked each time a solution is administered. Use two patient identifiers before administration.

Calculating and Regulating the Rate of Flow

Rate of flow is an important factor in safe and effective IV therapy. Intravenous setups should be checked once every hour, to be certain that the fluid is running correctly and that there are no problems. When possible, use an IV pump that is set for the specific rate of flow to administer IV fluids. Intravenous pumps, although not infallible, keep IV fluids flowing at the desired rate and act as safeguards should a problem arise. **Even when an IV pump is used, you must check to see that it is delivering the solution accurately, as prescribed.** Principles that affect the rate of flow for IV infusions **not** administered by a pump are as follows:

- The higher the container is placed above the level of the patient's heart, the faster the rate of flow, because gravity affects flow.
- The fuller the container, the faster the rate of flow.
- The more viscous (thicker) the fluid, the slower the flow; for example, packed red cells will flow more slowly than 5% dextrose in water.
- The larger the diameter of the needle and tubing, the faster the flow.
- The higher the pressure within the vein, the slower the flow. As an infusion progresses and the veins become fuller, the IV solution may drip more slowly.
- Fluid will pass through a straight tube faster than through one that is coiled or hanging below the level of the cannula.

There usually is a chart available to determine the number of drops that should be given per minute to administer a given amount of fluid in a specified time. The IV tubing package will contain information about the number of drops the set will deliver per milliliter. If a chart is not available, calculate the number of drops per minute to be infused. To check the rate of flow, you must know how many drops should pass through the drip chamber in **1 minute**.

Once the number of drops per minute has been set and the IV infusion is flowing, the IV setup must be checked at 30- to 60-minute intervals to be sure that it continues to flow at the prescribed rate. As explained in the list of principles that affect the rate of flow, a number of factors can speed up or slow down the infusion.

Older Adult Care Points

Older people and those with either renal or cardiac conditions cannot tolerate rapid administration of fluids. Check IV infusions for these patients every 30 minutes.

If the IV infusion slows down and has not been checked and readjusted for some time, **no attempt should be made to "catch up"** by speeding up the rate of flow beyond that ordered. This can lead to circulatory overload and a volume excess that may produce pulmonary edema in susceptible people. [Table 3-8](#) presents points to check when an IV solution will not run at the prescribed rate.

Clinical Cues

Whenever a patient who is receiving an IV infusion is out of bed, recheck the drop rate once he is back in bed. The fluid drop rate often changes when the patient is up and moving around.

Think Critically

How would you calculate the rate of flow for an order for "1000 mL of D₅W (dextrose 5% in water) over 8 hours" using a drip set that delivers 15 drops (gtt)/mL? How would the rate differ if the drip set delivers 20 gtt/mL? How would you calculate the flow rate for an order for "250 mL NS [normal

saline] at 50 mL/hour" using a microdrip set (60 gtt/mL)?

Table 3-8

Troubleshooting Intravenous Infusion Flow

CHECK	RATIONALE
Height of infusion container	Patient may have changed position. The container should be at least 36 inches above the heart.
System vent	The air vent, required for infusing with glass bottles, may be absent or occluded, which will prevent the flow.
Position of tubing	Tubing may be kinked, obstructing flow. Tubing may be hanging below the bed, interfering with the gravity flow.
Position of the extremity where the site is located	Flexion of the extremity may have compressed the vein, slowing the flow.
Any possible obstruction to flow	A protective device on the limb may be too tight. Tape may be compressing the circumference of the extremity.
When filter was changed	The filter may be occluded.
Position of the cannula within the vessel	The cannula may be lying against the vessel wall, obstructing flow. Slightly turning the cannula to reposition the tip may cure the problem.
If other measures have not opened the line, attempt to aspirate blood from the cannula	A small clot may be obstructing the cannula. Aspiration may withdraw the clot.

Intravenous Intake

The total amount of IV fluid infused during the shift is calculated at the end of the shift. For example, if the beginning count is 350 mL (in the container at the beginning of the shift), and the 350 mL is infused during the shift, then (during the same shift) a new solution of 1000 mL is added and some additional infusion takes place, we calculate as follows:

	COUNT	INFUSED
Count at beginning of shift	350 mL	
New solution added at 11:30	1000 mL	350 mL
Count left at end of shift	525 mL	475 mL
Total amount of IV intake for shift		825 mL

■ Safety Alert

No Margin for Error

Intravenous therapy may become such a commonplace procedure to nurses that they are tempted to be complacent about it. However, it should never be thought of as a routine procedure that requires little attention. Any fluid or medication that enters a vein has an immediate effect. There is no margin for error in its administration.

Flushing As-Needed Locks or Central Intravenous Lines

Flushing the catheter or line prevents contact and reactions between the fluid that was last infused and incompatible drugs. Flushing the catheter or line maintains patency of the lumen. Either normal saline alone or normal saline followed by a heparin solution is used.

Before using a PRN lock, flush the catheter according to agency policy to determine patency (openness) of the lumen and to flush out any heparinized solution. The procedure will depend on the type of valved catheter or positive fluid-displacement needleless device in place. When flushing the catheter, apply slow, gentle pressure to the syringe plunger. **If you feel any resistance, stop the procedure immediately.** Proceeding may force a clot into the venous circulation that will become an embolus that could cause severe damage to the patient. Aspirate for a brisk blood return from the catheter lumen, and then flush the blood from the catheter with the flush solution. Depending on the length of the catheter that is in place, 3 to 10 mL of normal saline is used.

■ Safety Alert

Flushing Intravenous Catheters

Do not use more than 30 mL of bacteriostatic normal saline within a 24-hour period to flush the catheter. Always use single-dose vials or syringes of solution for flushing. **Do not use a multiple-dose vial for this purpose, because it may be contaminated and could cause infection.**

PRN locks and catheters should be flushed immediately after use or whenever an IV piggyback medication infusion is completed. Delay in disconnecting the intermittent infusion administration

set and flushing the lock could allow blood backflow into the catheter lumen, because the infusion pressure drops lower than the venous pressure when the infusion is complete. In such a case, a clot can form, occluding the lumen. **Be aware of when an intermittent infusion should be completed, and at the appropriate time be at the bedside prepared to remove the piggyback infusion set and to flush the PRN lock.**

Clinical Cues

When heparinized saline is required to keep the lumen of a catheter patent, use a volume of the solution that is equal to twice the volume of the catheter lumen with the extension set or connectors added on. This will usually be between 5 and 10 mL; check your facility's policy.

Providing Central Line Care

If a gauze dressing is in place, provide site care every 24 to 48 hours per agency protocol. Transparent dressings require site care every 3 to 7 days. Every central line dressing should be examined once each shift, and the dressing should be changed if it is soiled. Central line dressing change and site care are sterile procedures. O'Grady et al (2002) developed guidelines for preventing catheter-related infections. The old  dressing is removed using gloves. A Central Line Bundle (series of interventions) has been developed by the Institute for Healthcare Improvement (IHI) to prevent infection from central lines. It has five components: optimal site selection, chlorhexidine skin antisepsis, hand hygiene, maximal barrier precautions, and daily review of line necessity with prompt removal if it is not needed (IHI, 2013).

Blood drawing.

 Drawing blood from a central line is not recommended unless venipuncture is not advisable. If a blood draw is performed, use strict aseptic technique. It is preferable to use needleless connectors and vacuum tubes, rather than a needle and syringe or vacuum tube with needle.

Subcutaneous infusion.

Subcutaneous infusion is often used in home care or during hospice palliative care. Subcutaneous therapy is useful when the patient cannot tolerate oral medications, when injections are too painful, or when vascular access is too difficult to obtain. Pain management is the primary use, although several other types of drugs are infused in this manner.

Hypodermoclysis (the slow infusion of isotonic fluid into subcutaneous tissue) may be used for small volumes of fluid. Generally, the front and sides of the thighs, the hips, the area under the clavicle, and the upper abdomen are usual sites for hypodermoclysis. A butterfly needle or a special subcutaneous infusion device is used to provide access for the hypodermoclysis fluid.

Epidural infusion.

Epidural infusion is used to administer medication for pain control or for anesthesia (see Chapter 7).

Partial or total parenteral nutrition.

Many patients with fluid and electrolyte imbalances are nutritionally depleted. Partial parenteral nutrition (PPN) is given when a patient cannot maintain an adequate nutritional status with oral intake. PPN is given through a large peripheral vein in the arm. If sufficient nutrition cannot be delivered by oral intake and PPN, or by enteral feedings, TPN is begun. Figure 3-9 shows placement of a peripherally inserted central catheter and of a central venous catheter.

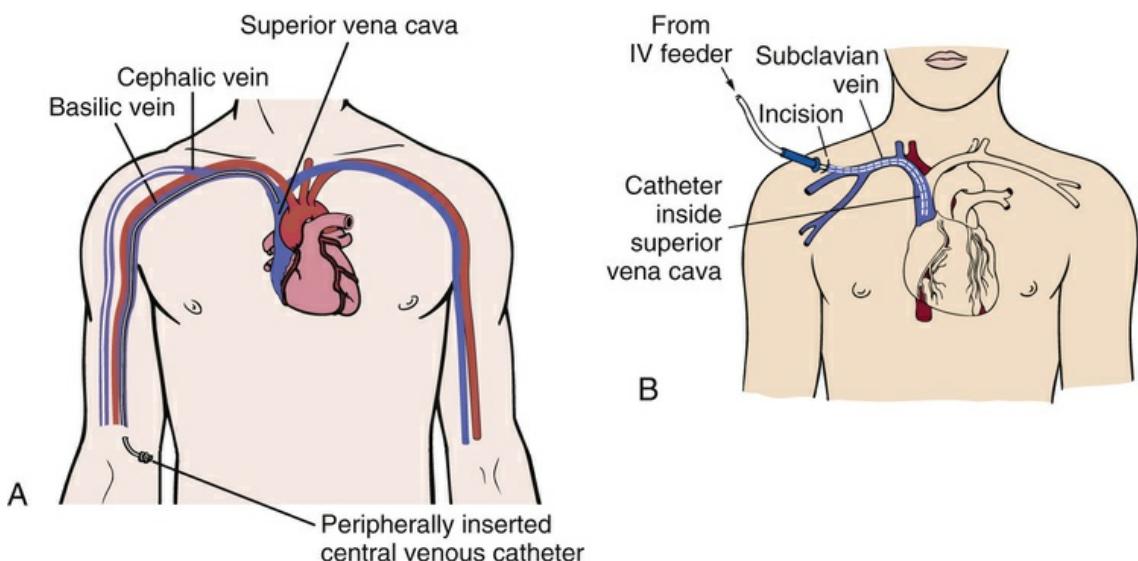


FIGURE 3-9 A, Placement of a peripherally inserted central catheter (PICC) through the antecubital fossa. B, Placement of a central venous catheter inserted into the subclavian vein. IV, Intravenous. (A, from Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 7, St. Louis, 2007, Mosby. B, from Elkin MK, Perry AG, Potter AG: *Nursing interventions and clinical skills*, ed. 3, St. Louis, 2004, Mosby.)

TPN solution is made up of a nitrogen (protein) source, hypertonic dextrose, and supplementary vitamins and minerals. The solution is hypertonic and contains 1 calorie/mL or 1000 calories/L. Some solutions also contain lipids. Because of its degree of concentration, TPN solution must be infused through a central vein, usually the subclavian, where the high rate of blood flow quickly dilutes it. The Hickman, Broviac, and Groshong catheters are the most commonly used central line catheters, and they can be used for long-term therapy. TPN solution is administered with a pump or an infusion controller device so that the flow rate is constant.

Safety Alert

Total Parenteral Nutrition Safety Precaution

The flow rate for TPN solution is never changed to “catch up” on the amount of fluid that should have been infused if the flow has slowed for some reason. The hypertonic solution can draw fluid into the vascular system, causing fluid overload.

TPN solutions and catheters must be handled with strict asepsis, because the solution is an ideal medium for bacterial growth. The TPN solution is mixed in the pharmacy under sterile conditions. However, infection is a major complication of TPN. There are many complications of TPN in addition to infection, including glucose intolerance, electrolyte imbalance, phlebitis, allergic reaction, and fluid overload. The port through which TPN is administered should not be used for any other solution. When beginning TPN, start the flow rate slowly at about 60 to 80 mL/hr, then gradually increase in increments of 25 mL/hr, until reaching the maintenance rate. This allows the body to adjust to the glucose load. During TPN carefully monitor the patient. Perform blood glucose determinations frequently during the stabilization period, which is usually the first week. If the patient's body has difficulty with glucose tolerance, insulin may be ordered and added to the TPN solution. At the end of therapy, taper down the flow rate for 1 to 2 hours before stopping the fluid, to allow the body to adjust.

PPN is used for patients in whom central venous access is not possible or who need IV nutritional support for only 7 to 10 days. A solution of less concentration is given to these patients because the solution does not flow into a vessel with a large blood flow, which would dilute it. **Box 3-6** summarizes the principles for administering TPN.

Box 3-6

Principles for Administration of Total Parenteral Nutrition

- Placement of a central venous catheter must be verified by x-ray before beginning the infusion of the total parenteral nutrition (TPN) solution.
- Use an infusion pump to administer TPN solution; start the infusion slowly at first and increase to the desired rate over a 24-hour period.
- If the solution is administered cyclically (e.g., at night only), taper to the desired flow over 1 to 2 hours and taper flow down for 1 to 2 hours before completion.
- Check the amount actually infusing every 30 to 60 minutes; do not rely solely on the pump functioning accurately.
- Before administering other solutions or drugs through another lumen of the central line, check compatibility with the TPN solution.
- Monitor continuously for signs of complications such as glucose intolerance, infection, fluid volume excess, phlebitis, and sepsis.
- Record the intake and output accurately.
- Never speed up the solution flow rate beyond that ordered, even if it falls behind for some reason.

Free-flow protection must be used on all general-use and patient-controlled analgesia infusion pumps. Alarms should be tested regularly, be activated with appropriate settings, and be sufficiently audible at all times when an infusion pump is in use. Although important for any IV infusion, an alarm system is vitally important when TPN is being administered.

Focused Assessment

Data Collection for Problems of Fluid, Electrolyte, and Acid-Base Imbalance

Assess the following:

Current Illness

Head

- Alertness, orientation, dizziness, signs of confusion, irritability, restlessness
- Appearance of eyes and eyelids
- Condition of oral mucous membranes, tongue, thickness of saliva

Skin and Extremities

- Color, moisture, temperature, areas of discoloration
- Turgor
- Tightness of rings
- Evidence and degree of edema
- Strength of handgrip
- Cramping of muscles
- Reflexes

- Chvostek sign

- Trousseau sign

Laboratory and Diagnostic Tests

- Hematocrit changes
- Urine amount, color, odor, and specific gravity
- Electrolyte values
- Blood gas values
- Electrocardiogram T-wave changes

Vital Signs

- Blood pressure changes
- Pulse rate, rhythm, and character
- Temperature
- Respirations
- Change in weight

Lungs

- Breath sounds (any crackles?)

Intake and Output

Known Disease Conditions

Medications

❖Nursing Management

■ Assessment (Data Collection)

First, assess the patient for **risk** of fluid, electrolyte, or acid-base imbalance, then assess for actual signs and symptoms of fluid, electrolyte, and acid-base imbalance. Question the patient about subjective signs and symptoms.

▣ Older Adult Care Points

Remember that checking for tenting is not an accurate way to assess dehydration in older adults, because their skin loses elasticity with aging and will tent with normal hydration. It is better to check for dry mucous membranes, concentrated urine, and other signs and symptoms in these patients.

■ Nursing Diagnosis

Analyze the assessment data, identify problem areas, and choose problem statements/nursing diagnoses. Common problem statements for patients with fluid, electrolyte, or acid-base imbalances include:

- Fluid volume deficit
- Fluid volume excess
- Potential for electrolyte imbalance
- Altered tissue perfusion

- Altered cardiac output
- Altered gas exchange
- Altered breathing pattern

Other problem statements may be appropriate as a result of the fluid, electrolyte, or acid-base imbalance or may be related to the cause of the imbalance, for example, diarrhea. Specific NANDA-I diagnoses may be chosen from the NANDA-I list (see inside back cover).

■ Planning

The goal is to restore the patient's fluid, electrolyte, or acid-base balance. Write the individual, expected outcomes. Expected outcomes might be one or more of the following:

- Patient will exhibit normal skin turgor.
- Patient's weight will stabilize at normal baseline.
- Intake and output will be balanced.
- Blood gases will return to normal.
- Breath sounds will be clear to auscultation.
- There will be no evidence of edema.
- Electrolyte values will be within normal limits.
- Patient will not experience complications of IV therapy.

See [Nursing Care Plan 3-1](#) for examples of expected outcomes with nursing interventions.

■ Implementation

When patients are unable to take in sufficient fluids on their own, work with the provider to provide adequate fluid and electrolytes. If patients can swallow and retain fluid, assist patients to frequently take small amounts of fluid. Establish a plan for assisting with both hot and cold liquid consumption. With conscientious care, the need for IV feeding can be avoided. It is helpful to assess what the patient prefers. In addition to water, offer the patient fruit juices, bouillon, ice pops, soft drinks, or gelatin.

? Think Critically

What type of fluid and electrolyte imbalance is a patient likely to have who has gastroenteritis and is suffering from both vomiting and diarrhea?

A patient with fluid volume excess may have an order for fluid restriction. This means that the patient may take in only a certain amount of fluid over a 24-hour period. Work out a schedule of fluid intake so that liquids are spaced evenly and the patient does not receive all the allotted liquids in a short time. A typical schedule would be day, 600 mL; evening, 400 mL; night, 200 mL. If not prohibited, sugarless hard candies and chewing gum can help relieve thirst. Frequent oral care is essential.

Diuretics may be prescribed, particularly if there is a potential for congestive heart failure or pulmonary edema. For patients at such risk, daily weight and electrolyte status must be monitored, along with I&O.

Assignment Considerations

Obtaining a Daily Weight

When assigning the daily weighing of patients to a certified nursing assistant (CNA) or UAP, remind the person that weight should be measured before breakfast, with the patient in essentially the same amount of clothing as at the last measurement, and after voiding. The same scale should be used each day to ensure reliable data for comparison. Any gain of 2 lb or more over 2 days should be reported to you immediately.

Skin care is particularly important in preventing a breakdown over an edematous area. The

stretched skin is extremely fragile, has a decreased blood supply, and is no longer flexible. Keep bed linens dry and smooth and turn the patient frequently to relieve pressure over bony prominences. **Be very gentle in repositioning and turning the patient; to avoid friction on the skin, use a turning sheet. A break in edematous skin can quickly form a pressure ulcer.**

When acid-base imbalance occurs, institute control of the underlying disorder. Monitor blood gases, and administer oxygen and electrolytes as needed. Apply nursing measures to improve pulmonary function, as appropriate.

Think Critically

Your patient has a PaO_2 of 94, pH of 7.32, Paco_2 of 48, and HCO_3^- of 26. What type of acid-base imbalance does he have?

Evaluation

Every 24 hours, perform evaluations to determine whether nursing interventions are assisting the patient to meet expected outcomes. If the patient is not progressing toward achievement of the outcomes, problem-solve and think critically to determine why, then alter the plan of care appropriately. When a specific outcome is met, discontinue that portion of the plan.

Community Care

Nurses in long-term care facilities deal every day with the problems of delicate fluid balance in their older adult patients. These patients often are taking multiple drugs that can affect their fluid and electrolyte status. Diuretics in particular can upset fluid and electrolyte status. It is especially important that the long-term care and home care nurse be vigilant for the signs of hypokalemia (see [Table 3-4](#)). Potassium imbalances are particularly dangerous for heart patients. Hypokalemia alters the way digitalis is metabolized in the body and predisposes the patient to digitalis toxicity. Signs of digitalis toxicity are fatigue, anorexia, headache, blurred vision, yellow-green halos around lights, nausea, diarrhea, and cardiac dysrhythmias.

Clinical Cues

Any patient in a long-term care facility or at home who is taking digitalis and is experiencing nausea, vomiting, diarrhea, or fluid and electrolyte alterations should be questioned daily about symptoms of hypokalemia and digitalis toxicity.

Dehydration and hyponatremia from infection account for many of the hospital admissions of patients from long-term care facilities and home situations. It takes a caring, skillful nurse to see that long-term and home care patients take in enough fluids without interfering with their nutritional intake.

The home care nurse must collaborate with the infusion company nurse when the patient is receiving IV fluids at home or is on TPN. Clear instructions must be given to the patient and family regarding the IV therapy. An older adult patient who has a fluid volume excess from congestive heart failure may already have a diminished appetite. In this instance restricting sodium in the diet may do more harm than good. You, along with the provider, must make individual judgments about the patient's priority needs.

Patient Teaching

Home Care Intravenous Therapy

Call me when:

- Swelling, redness, or pain occurs at the IV site or along the vessel.
- The solution will not flow even after you have checked that the clamps are open.
- The solution leaks at the catheter site and you have checked to see that the tubing is firmly attached to the catheter.
- The patient's temperature rises above 100° F (38° C).

Telephone number _____

Get Ready for the NCLEX® Examination!

Key Points

- Fluid balance is essential, because the life processes of every cell take place within fluid.
- Infants and older adults are at greatest risk for fluid imbalance.
- Water has four main functions in the body.
- Body fluids are distributed in intracellular compartments and extracellular compartments.
- Control of fluid balance is managed by hormones and by the thirst mechanism.
- Fluids and solutes move within the body by diffusion, filtration, osmosis, and active transport.
- Tonicity refers to the amount of solutes in relation to the amount of fluid.
- Filtration occurs through a semipermeable membrane.
- Hydrostatic pressure causes filtration of fluid out of the intravascular system into the interstitial spaces.
- Water diffuses by osmosis.
- Diffusion moves water from the interstitial spaces into the cells.
- The kidney is a major factor in the regulation of fluid and electrolyte balance in the body.
- Fluid volume deficit may result from fluid losses or because of lack of fluid intake (see [Table 3-1](#)).
- A fluid deficit causes dehydration. Checking skin turgor is one way to assess for dehydration.
- Check the tongue and mucous membranes of older adults to assess for dehydration.
- Weight change is the most accurate measure of fluid gain or loss.
- Fluid deficit is a common problem in older adults.
- Electrolytes need to be replaced along with fluid when there has been a fluid deficit.
- Prolonged vomiting leads to sodium and potassium deficits and metabolic alkalosis.
- Position the vomiting patient so that aspiration of vomitus does not occur.
- Rehydrate the dehydrated older adult patient cautiously so that overhydration does not occur.
- Medications can be administered to help stop vomiting and diarrhea (see [Table 3-2](#)).
- Fluid volume excess leads to hypervolemia, edema, and possibly to pulmonary edema.
- Assessment will reveal elevated blood pressure and a full, bounding pulse.
- Edema may be localized or general; pitting edema may occur.
- Loss of plasma proteins may cause edema.
- When fluid shifts from the intravascular space to the interstitial spaces, hypovolemia may occur.
- With fluid excess, sensorium may be clouded.
- Edema may be treated with diuretic medications, a low-sodium diet, and elastic stockings or sequential compression devices.
- Electrolytes are responsible for the transmission of nerve impulses, contraction of muscles, and excretion of hormones (see [Table 3-4](#)).
- Urine output must be at least 30 mL/hr before IV potassium is given.
- Intravenous potassium is always diluted and never given as a bolus injection.
- Acid-base imbalances upset the normal function of the body's systems.
- The kidneys are the principal organ in controlling a normal pH; the lungs also assist.
- Too much carbonic acid in the body causes acidosis; too much bicarbonate in the body causes alkalosis.
- Changes in carbon dioxide are usually respiratory; changes in bicarbonate are usually metabolic.
- Diabetic ketoacidosis causes metabolic acidosis and can be life-threatening.
- Arterial blood gases are analyzed to determine whether there is an acid-base imbalance and what type of imbalance is present.
- Each acid-base imbalance has its own signs and symptoms and probable treatments.

- Every ill patient should be assessed for a fluid, electrolyte, and acid-base imbalance.
- Intravenous therapy can provide the patient with fluid, electrolytes, and nutrients.
- Intravenous fluids are isotonic, hypotonic, or hypertonic (see [Table 3-6](#)).
- Intravenous therapy must be administered in a strict aseptic manner.
- The “Six Rights” should be used when administering any IV fluid or drug (see [Box 3-4](#)).
- Monitoring for complications of IV therapy is a top priority (see [Table 3-7](#)).
- Rate of IV flow must be monitored closely; never rely solely on an IV pump.
- Older adults can become fluid overloaded very quickly.
- Subcutaneous infusion is mostly used for pain control.
- TPN is used when a patient cannot obtain adequate nutrition by other means.

Additional Learning Resources

- SG** Go to your Study Guide for additional learning activities to help you master this chapter content.
- Online Resources
 - Acid-base tutorials,
http://fitsweb.uchc.edu/student/selectives/TimurGraham/Stepwise_approach.html; www.acid-base.com/
 - Acid-base physiology, <http://www.rapidlearningcenter.com/biology/anatomy-physiology/22-Fluid-Electrolyte-and-Acid-Base-Balance.html>
 - Home Health Nursing Online, <http://www.Homehealthcarenursingonline.com>
 - Nursing Made Incredibly Easy, <http://nursingmadeincrediblyeasy.com>

Review Questions for the NCLEX® Examination

1. What should nurses monitor when a patient is receiving a diuretic regularly? (*Select all that apply.*)
 1. Skin turgor and integrity
 2. Daily weight
 3. Electrolyte status
 4. Mentation

NCLEX Client Need: Physiological Integrity

2. Which patient(s) can be considered at high risk for fluid and electrolyte imbalance? (*Select all that apply.*)
 1. A 45-year-old woman with thyroid crisis
 2. A 35-year-old trauma victim on a ventilator
 3. A 60-year-old woman with temperature of 99.6° F (37° C)
 4. A 70-year-old man on anticoagulant therapy

5. A 30-year-old woman complaining of persistent diarrhea

NCLEX Client Need: Health Promotion and Maintenance

3. An older adult man is admitted for severe disorientation, confusion, and general weakness. His spouse reports that he is not able to tolerate any food or fluids and has had several episodes of vomiting and diarrhea. Which imbalance is the patient most likely experiencing?

1. Hypokalemia
2. Metabolic acidosis
3. Hyponatremia
4. Respiratory alkalosis

NCLEX Client Need: Physiological Integrity

4. In planning care for a patient with congestive heart failure, you choose the problem statement: fluid volume excess due to altered cardiac output. The Problem statement would most likely be supported by which sign or symptom?

1. Temperature of 101.5° F (38.6° C)
2. Hematocrit 35%
3. Fine crackles in the lung sounds
4. Clear, yellow urine

NCLEX Client Need: Physiological Integrity

5. A patient who has congestive heart failure has a fluid excess with a weight gain of 1.5 pounds since yesterday and edematous ankles. Which provider's order has the highest priority?

1. Maintain accurate intake and output.
2. Monitor skin for signs of breakdown.
3. Administer furosemide 20 mg PO once daily.
4. Obtain daily weight.

NCLEX Client Need: Physiological Integrity

6. The new patient on the floor has been diagnosed with gastroenteritis. What would be the most

critical level to assess?

1. Blood glucose
2. Potassium
3. Calcium
4. Sodium

NCLEX Client Need: Physiological Integrity

7. You appropriately elicit a sign of hypocalcemia by:

1. tapping the face about 1 inch from the ear.
2. palpating a partially stretched tendon.
3. inspecting facial symmetry.
4. applying pressure on the radial pulse.

NCLEX Client Need: Physiological Integrity

8. At the beginning of the shift, there is 410 mL of fluid in the IV bag. A piggyback medication containing 150 mL is hung at 12:00 noon to run over 30 minutes. You hang a new bag of 1000 mL at 1:00 P.M. to run at 125 mL/hr. At the end of shift there is 250 mL left in the bag. The count for the total amount of fluid infused during your shift ending at 7:00 P.M. is:

1. 1260 mL
2. 1285 mL
3. 1560 mL
4. 1310 mL

NCLEX Client Need: Safe and Effective Care Environment

9. Which would be the most accurate way to assess for dehydration in an elderly patient?

1. Skin turgor
2. Urine output

3. Respirations

4. Thirst levels

NCLEX Client Need: Physiological Integrity

10. You respond to a patient complaining of pain, burning, and wetness over the peripheral IV site. On assessment, you find that the IV insertion site is tender and cool to touch. These are signs and symptoms of:

1. phlebitis.
2. infiltration.
3. infection.
4. venous spasm.

NCLEX Client Need: Safe and Effective Care Environment

Critical Thinking Questions

Scenario A

Mrs. Thompson, age 64, is admitted to the hospital for congestive heart failure. She is very edematous. She is slightly confused on admission, and although she is not on absolute bed rest, she tells you she is too weak to get out of bed.

1. What type of diet would you expect the provider to order for Mrs. Thompson? Why?
2. Why are daily weights ordered for Mrs. Thompson? Why are those data important?
3. Mrs. Thompson is on fluid restrictions. How would you schedule her fluid intake?

Scenario B

Mr. Mendez, age 76, is admitted with dehydration and diarrhea. He is confused and listless.

1. What parameters would you assess to see if his fluid balance is improving?
2. What electrolyte imbalances would you expect to find?
3. Why would you need to keep a close eye on the IV infusion that is ordered?
4. What acid-base imbalance is he likely to be experiencing?
5. What assessment data would tell you that Mr. Mendez's plan of care is working to rebalance his fluid and electrolytes?

CHAPTER 4

Care of Preoperative and Intraoperative Surgical Patients

Objectives

Theory

1. Discuss the advantages of current technological advances in surgery.
2. Explain the preparation of patients physically, emotionally, and psychosocially for surgical procedures.
3. Identify the types of patients most at risk for surgical complications, and state why each patient is at risk.
4. Plan and implement patient and family teaching to prevent postoperative complications.
5. Compare the roles of the scrub nurse and the circulating nurse.
6. Analyze the differences in the various types of anesthesia and list the advantages and disadvantages of each to the health care team and the patient.

Clinical Practice

7. Perform a thorough nursing assessment for a preoperative patient.
8. Teach a patient postoperative exercises during the preoperative period.
9. Prepare a patient for surgery using a preoperative checklist.
10. Document preoperative care and assessment data.
11. Observe during a patient's surgery.

KEY TERMS

- anesthesia** (ă-nĕs-THĒ-zē-ă, p. 75)
atelectasis (ă-tĕ-LĒK-tā-sĭs, p. 65)
autologous (ăw-TŌL-ō-gūs, p. 62)
capnography (kăp-NŌG-ră-fē, p. 76)
dehiscence (dē-HĬS-ĕntz, p. 65)
palliative (PĂL-ĕ-ū-tīv, p. 61)
perioperative (pĕr-ĕ-ÖP-ĕr-ă-tīv, p. 62)
pneumonia (nū-MŌ-nē-ă, p. 65)
prosthesis (prōs-THĒ-sĭs, p. 64)
robotics (rō-bō-tĭks, p. 60)
stasis (STĀ-sĭs, p. 69)
thrombophlebitis (thrōm-bō-flē-BĪ-tĭs, p. 69)

Surgery

Surgery is performed for a variety of reasons (Table 4-1). For the patient, any type of surgery is a serious event. Knowing terminology specific to surgical procedures helps you envision the procedure so that you may better prepare patients for surgery and care for them afterward (Box 4-1). Surgery may be elective, urgent, or performed as an emergency.

Table 4-1
Selected Categories of Surgical Procedures

CATEGORY	DESCRIPTION	CONDITION OR SURGICAL PROCEDURE
Reasons for Surgery		
Diagnostic	Performed to determine the origin and cause of a disorder or the cell type for cancer	Breast biopsy Exploratory laparotomy Arthroscopy
Curative	Performed to resolve a health problem by repairing or removing the cause	Laparoscopic cholecystectomy Mastectomy Hysterectomy
Restorative	Performed to improve a patient's functional ability	Total knee replacement Finger reimplantation
Palliative	Performed to relieve symptoms of a disease process, but does not cure	Colostomy Nerve root resection Tumor debulking Ileostomy
Cosmetic	Performed primarily to alter or enhance personal appearance	Liposuction Revision of scars Rhinoplasty Blepharoplasty
Urgency of Surgery		
Elective	Planned for correction of a nonacute problem	Cataract removal Hernia repair Hemorrhoidectomy Total joint replacement
Urgent	Requires prompt intervention; may be life-threatening if treatment is delayed more than 24-48 hr	Intestinal obstruction Bladder obstruction Kidney or ureteral stones Bone fracture Eye injury Acute cholecystitis
Emergent	Requires immediate intervention to prevent life-threatening consequences	Gunshot or stab wound Severe bleeding Abdominal aortic aneurysm Compound fracture Appendectomy
Degree of Risk of Surgery		
Minor	Procedure without significant risk; often done with local anesthesia	Incision and drainage (I&D) Implantation of a venous access device (VAD) Muscle biopsy
Major	Procedure of greater risk, usually longer and more extensive than a minor procedure	Mitral valve replacement Pancreas transplant Lymph node dissection
Extent of Surgery		
Simple	Only the most overtly affected areas are involved in the surgery	Simple/partial mastectomy
Radical	Extensive surgery beyond the area obviously involved; is directed at finding a root cause	Radical prostatectomy Radical hysterectomy

From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2013, Saunders.

Box 4-1

Terminology Used for Surgical Procedures

Suffixes are often attached to a stem word to describe a surgical procedure. For example, *appendectomy* means cutting out the appendix.

-ectomy: Cutting out or off (colectomy: cutting out a part of the colon)

-lysis: Removal or destruction of (neurolysis: freeing a nerve from adhesions)

-oma: Tumor (excision of a fibroma: removal of a connective tissue tumor)

-ostomy: To furnish with an outlet (colostomy: creating an outlet for the colon from the body)

-otomy: Cutting into (thoracotomy: cutting into the chest cavity)

-plasty: Revision, molding, or repair of tissue (mammoplasty: revision of the breast)

-pexy: Fixation, anchoring in place (orchiopepxy: fixation of an undescended testicle in the scrotum)

In a hospital surgery may be performed as a same-day or outpatient procedure, or as an inpatient procedure. Many surgeries are done in a free-standing surgery center. Minor surgery is often performed in a provider's office; LPN/LVNs assist more with surgery in this setting. For any surgery, preparation is usually begun before admission. The patient undergoes diagnostic tests and is taught preoperative and postoperative care during the days just before the scheduled surgery. The ability to deliver and reinforce teaching for postoperative and home care is crucial to the well-being and quick recovery of patients.

Technological Advances in Surgery

Laparoscopic and endoscopic procedures have replaced many “open” surgeries (in which a large incision is necessary). Minimally invasive laparoscopic surgery (done through small openings in the abdomen) can be performed more quickly. This results in less trauma to tissue, less inflammatory response and therefore less pain, and a faster recovery. For example, laparoscopic cholecystectomy for gallbladder removal has reduced a patient's recovery time from 6 weeks to approximately 1 week. Endoscopic surgery (in which instruments are used to visualize interior structures of the body), operating microscopes, and lasers are commonplace in the surgical suite.

Medical **robotics** (design of computerized, mechanical instruments) provides a key to less invasive, less traumatic surgeries. A medical robot is operated from a nearby computer while the surgeon views magnified three-dimensional images of the surgical field on the computer's screen. The robot's tiny camera has multiple lenses that allow magnification up to 12 times that of normal vision. There are assistants and a second surgeon next to the patient, but the primary surgeon at the computer uses the robot to perform the surgery. Remote-controlled instruments are inserted through small incisions. An advantage of using the robot is that it has “rock-steady” hands, providing precision that is beyond human dexterity. Because only small incisions are needed, the patient has less pain postoperatively and requires less time to heal. With robotic surgical techniques, the patient experiences less scarring (because incisions are smaller), and the small surgical wounds heal faster. Surgeries can be transmitted via videoconferencing to locations around the world to enhance skill levels of surgeons everywhere.

Autologous Blood for Transfusion

Since the mid-1980s, patients undergoing elective surgery have had the option of banking their own blood before surgery, in case a transfusion is needed. The patient's blood is withdrawn at the blood bank several weeks before the surgery, prepared, and stored. The blood is prepared for **autologous** (related to self) transfusion. Cell savers can be used to collect and salvage blood during and after surgery, so the patient's own blood can be reinfused if the patient needs it. Access to autologous procedures has greatly decreased the anxiety of patients who fear infection with a blood-borne virus, such as human immunodeficiency virus (HIV) or hepatitis B or C.

Bloodless Surgery

Some patients opt for bloodless surgery to avoid completely the risk inherent in a blood transfusion. Bloodless surgery uses a combination of techniques to minimize blood loss and maximize blood volume and function. Epoetin alfa (Epogen, Procrit) may be given before surgery to stimulate red blood cell production, and hemostatic agents may be given before or during surgery to promote clotting (National Institutes of Health, 2012). During surgery, the surgeon may request induced hypotension or hypothermia to decrease oxygen demand.

Another bloodless surgical technique is hemodilution, in which several units of the patient's blood are removed and replaced with crystalloids or colloids to expand vascular volume. Hemodilution decreases blood viscosity, improves oxygen transport, and—if bleeding occurs during surgery—minimizes the loss of red blood cells.

Cultural Considerations

Jehovah's Witness Patients and Blood Transfusions

Followers of Jehovah's Witness will not accept a blood transfusion from another person because of their religious beliefs. They believe that there are eternal consequences from receiving blood not their own. In the past, this precluded them from having certain major surgeries. Now bloodless surgery is one option for them, because fluid expanders are available for them.

❖ Perioperative Nursing Management

Perioperative nursing refers to care of the patient before, during, and after surgery. The nurse plays a key role during the perioperative period.

■ Assessment (Data Collection)

Before surgery, the patient should be in the best possible physical condition. In emergencies, of course, physical condition cannot be controlled, but planned surgery may be postponed until the patient is physically able to withstand the stress of anesthesia and major surgery. To determine the patient's readiness for surgery, a thorough health assessment is conducted and risk factors are considered. In addition to the admission assessment data that are gathered when the patient is first admitted (see [Chapter 2](#)), the perioperative nurse gathers data specific to the surgical procedure and postoperative course. Thorough assessment facilitates planning of care during and after surgery.

Older Adult Care Points

Patients older than 75 years have surgical complication rates three times higher than those of younger adults. An older adult patient is less able to adjust and compensate for the stress of surgery, because physiologic reserves (cardiac, respiratory, renal) have already declined with age. Older adult patients are more likely to have impaired renal, hepatic, respiratory, and cardiac functions that alter their metabolism and excretion of drugs and anesthesia. The presence of chronic diseases causes vulnerability to fluid and electrolyte imbalances during and after surgery.

When assessing the presurgical patient, any significant deviations from normal range should be brought to the attention of the surgeon. For example, an elevated temperature might indicate an infection that would need to be brought under control before surgery.

Think Critically

If your 76-year-old patient seems confused the morning after her hip replacement, what would you check in her chart to see if there is an alteration?

Knowing the patient's usual blood pressure reading is necessary for comparison after surgery,

when postoperative shock is a concern. Height and weight are measured and charted before surgery so the anesthesiologist can accurately calculate anesthetic dosages. Allergies must be identified and noted on the front of the patient's chart and on an allergy bracelet worn on the patient's arm. This includes allergy to iodine prep solutions such as Betadine, although this solution is no longer commonly used.

Focused Assessment

Preoperative Data Collection

Health History and Psychosocial Assessment

- Have you previously had surgery? What was your experience?
- What is the reason for this surgery?
- How do you feel about having this surgery?
- What do you know about this surgery and the before and after care?
- What are your expectations of this surgery?
- Have you or any family members ever experienced any problems with surgery or anesthesia?
- Will this surgery create any problems in your usual roles or relationships?
- Do you have any chronic illnesses?
- Have you gained or lost considerable weight recently?
- Do you have any allergies to medications, iodine, shellfish, adhesive tape, or latex?
- What medications, over-the-counter preparations, vitamins, herbs, and supplements do you take?
- Do you smoke? How much and for how many years?
- What is your usual use of alcohol?
- When was your last bowel movement?
- Do you have any problems with urination?
- Do you currently have an upper respiratory tract infection?
- Do you have any musculoskeletal problems that need to be addressed during positioning for surgery?
- Do you have health insurance?
- What people will be able to help you during your recovery?
- Will you be able to cope with inconveniences during your recovery without additional help?
- How do you usually cope with pain?
- Are there any particular concerns or fears that you have regarding the surgery now?

Cultural Assessment

- What is your primary language?

- Do you have any cultural or spiritual practices that you would like to observe during this period of surgery and recovery?
- What are your cultural customs regarding privacy, blood transfusions, and disposal of body parts?

Spiritual Assessment

- Do you have spiritual or religious beliefs?
- Do you wish to talk with or see your spiritual or religious advisor?
- Is there any conflict between your value or belief system and this planned surgery?

Physical Assessment

- Measure height and weight.
- Measure vital signs.
- Auscultate the lungs and heart.
- Listen for bowel sounds.
- Check pulses and compare bilaterally.
- Gather basic neurologic data: level of consciousness, orientation to time, place, and person; ability to think, answer questions, and follow instructions.
- Assess skin status, integrity, moisture, and temperature.
- Assess for recent tattoos, piercings, and body jewelry.
- Assess for limitations in joint range of motion.
- Assess for muscle weakness.
- Assess for loose teeth, dentures, bridges, contact lenses, hearing aids, and other prostheses.

Laboratory and Diagnostic Test Data

- Verify that test results are in the chart.
- Note any abnormal findings.

Assessment for particular risk factors for surgical site infection includes preexisting infection or medical condition, nasal bacterial colonization, malnutrition, advancing age, diabetes mellitus, nicotine use, immunosuppression, and obesity.

Safety Alert

Latex Allergy

A patient who is allergic to latex is at high risk of exposure during surgery when unconscious and unable to monitor the environment. Contact and airborne precautions are necessary. The perioperative nurse must be constantly vigilant to keep anything with latex on it out of the patient's environment. Even rubber stoppers on medication bottles or intravenous (IV) supply containers can be a problem. The operating room must be prepared to be "latex free." A "latex-free" crash cart is kept at hand in case of emergency. ☺

Think Critically

Why would a localized infection be a contraindication for surgery in some instances?

It is particularly important to know if a patient is taking a corticosteroid, which can delay wound healing, alter fluid and electrolyte balance, and affect several metabolic functions in the body—factors that increase surgical risk. Patients should be questioned about medicines and eyedrops that may contain a corticosteroid. Corticosteroids should be tapered slowly before surgery, but never stopped abruptly. Vitamin E, aspirin and other nonsteroidal anti-inflammatory drugs (NSAIDs), and anticoagulants have a continuing effect on blood clotting for several days; these supplements and medicines are usually discontinued 7 to 14 days before surgery.

Complementary and Alternative Therapies

Herbals and Supplements

Most anesthesiologists will ask patients to discontinue taking herbal supplements 2 to 3 weeks before surgery, because many herbal supplements interact with anesthetic agents or interfere with blood clotting. If doing without a supplement is not possible, the herbal supplement container should be brought to the anesthesiologist. Black cohosh, St. John's wort, feverfew, valerian, goldenseal, licorice, and kava can have interactions with other medications and anesthetics and should be stopped 2 to 3 weeks before surgery. Ginger, feverfew, garlic, ginseng, and ginkgo biloba all can have adverse effects on clotting mechanisms. It is best to stop all herbals several days before surgery. After surgery, the patient should ask the health care provider when each herb can be restarted.

Nutritional status and body weight are significant factors in healing and repair of the surgical site. Obesity presents problems for such routine procedures as venipuncture and intubation for general anesthesia, and **obesity causes prolonged uptake of anesthetic drugs**.

The operating room personnel are notified if the patient has a hearing impairment, is essentially blind when glasses are not in place, or has a **prosthesis** (artificial body part).

The news that surgery is needed usually comes as an emotional shock to patients and their families. Surgery causes changes in the routine of their lives that could result in personal and financial burdens on patients and their families. Surgery will alter the lives of some patients permanently, and possibly may leave them physically impaired. Others might expect to be greatly helped by the surgical procedure. In any event, there will be fears and misgivings about the prospect of undergoing anesthesia and surgery.

Cultural Considerations

Beliefs Regarding Surgery

Cultural beliefs and values regarding surgery must be taken into consideration. If the patient does not speak the same language as the surgical team, an interpreter should be enlisted to assist with communication. If a female patient's culture has strict rules for female attire, she needs assurance of sufficient privacy and protection of modesty to allay any fears she might have. Such issues and interventions must be conveyed to the surgical team. If there are certain cultural taboos regarding an aspect of the surgery, the surgical team needs to know them and plan a way to achieve a good outcome without violating such taboos. It is especially important to know whether the patient will accept a blood transfusion.

Older Adult Care Points

Older patients who are experiencing serious depression are at high risk for complications of surgery, because their motivation for recovery often is very low.

Determine whether the patient will have adequate help at home when discharged from the hospital. Many older people live alone, and although self-sufficient before surgery, may have difficulty preparing meals, bathing, or performing wound care while recovering from surgery.

Some people are concerned about whether they will “wake up” or survive the anesthesia and surgical procedure. Some patients have a strong spiritual belief that helps them cope independently with sickness, suffering, and death. Others may need help in finding the spiritual support they need. Still others do not want to discuss this particular facet of their lives. Allow time with clergy or a spiritual advisor before the surgical procedure according to the patient's desire.

Cultural Considerations

Financial Burden

With the Affordable Care Act, individuals who formerly would forego insurance may now have it. Deductibles and copays may still present a problem for those with modest income. If the primary income earner in the household will be unable to work for an extended period, financial hardship may occur.

Laboratory and Diagnostic Test Data

Box 4-2 lists the tests most frequently required before surgery. A chest radiograph is usually obtained, and an electrocardiogram is ordered for many patients older than 40 years. If the patient has lung disease, pulmonary function tests may be ordered. If the laboratory reports indicate any abnormal values, surgery may be postponed. Most surgeons prefer to delay surgery if a patient's hemoglobin level is below 10 g/dL.

Think Critically

Why would anemia make a patient a poor surgical candidate?

Box 4-2

Commonly Ordered Preoperative Laboratory Tests

- Complete blood count (CBC)
- Urinalysis (UA)
- Blood glucose*
- Electrolytes
- Prothrombin time (PT)
- Partial thromboplastin time (PTT)
- Blood type and crossmatch
- Liver function tests (AST, ALT, bilirubin)*
- Renal function tests (BUN, creatinine)*
- Beta-human chorionic gonadotropin†

ALT, Alanine aminotransferase; *AST*, aspartate aminotransferase; *BUN*, blood urea nitrogen.

*May be ordered as part of a metabolic panel or sequential multiple assay (SMA)-6 or SMA-12.

†To check for pregnancy in women of childbearing age.

Surgery puts a strain on the cardiovascular, renal, and respiratory systems. Liver function is important because the liver is involved in synthesizing clotting factors, producing albumin, and metabolizing and detoxifying drugs. Although requesting preoperative diagnostic tests is the responsibility of the provider, you will need to explain to the patient why these tests have been ordered.

Surgical Risk Factors

Carefully assess the patient before surgery for risk of complications (Table 4-2). Infants and older adults are at higher risk for complications of surgery due to either immature body systems or a decline in function of various body systems. Maintaining core body temperature is one concern when caring for these patients. Although smoking is a risk factor, research has shown that quitting smoking and alcohol intake 3 to 8 weeks before surgery will reduce the incidence of serious postoperative complications (Doheny, 2012).  Smoking is not allowed within the hospital.

Think Critically

What points would you make when explaining how smoking is harmful to the surgery patient?

Table 4-2
Surgical Risk Factors

FACTOR	KEY POINTS
Diabetes mellitus and other chronic diseases	Stress of surgery may cause swings in blood glucose levels that are difficult to control. Patients may receive intravenous insulin during and after surgery. Wound healing tends to be delayed in patients with diabetes, making the risk of dehiscence (wound separation) greater. The incidence of infection in surgical wounds is also higher. Liver and kidney disease makes it more difficult to metabolize and eliminate anesthesia and waste products.
Advanced age with inactivity	Healing is slower in older adults. The risk of disuse syndrome, hypostatic pneumonia , (inflammation and consolidation in the lungs), and thrombus formation is higher in inactive older adults.
Very young person	Infants have difficulty with temperature control and in maintaining normal circulatory blood volume; they are at risk of dehydration.
Malnutrition	Inadequate nutritional stores lead to poor wound healing and skin breakdown.
Dehydration	Reduced circulating volume reduces kidney perfusion and predisposes the patient to a reduced urine output and thrombus formation. Dehydration also alters electrolyte values. A dehydrated patient is more at risk for problems with pressure areas during surgery.
Obesity	An extremely heavy patient does not breathe as deeply and is at risk of hypostatic pneumonia. Excessive fatty tissue also is a factor in poor wound healing.
Cardiovascular problems	Patients with hypertension, left ventricular hypertrophy, cardiac dysrhythmias, or a history of congestive heart failure are at a higher risk for myocardial infarction from the stresses of surgery and anesthesia.
Peripheral vascular disease	Poor circulation in the extremities predisposes the patient to possible thrombus formation and pressure sores on the lower legs and feet. Anti-embolism stockings or devices are generally prescribed for use during and after surgery.
Liver disease	Interferes with normal blood clotting; liver cannot properly detoxify anesthetics and other drugs.
Respiratory disease	Inhaled anesthetics may irritate the respiratory mucosa, creating more secretions. With immobility there is greater probability of accumulated secretions and inflammation of the lungs and bronchial tree. Impaired oxygen–carbon dioxide exchange may cause acid-base imbalance.
Substance abuse or alcohol dependence	May alter reaction to anesthetic agents. Alcohol dependence may cause withdrawal symptoms if the use of alcohol is discontinued abruptly.
Smoking	Causes increased lung secretions from anesthesia and predisposes the patient to atelectasis (collapsed alveoli) and pneumonia postoperatively. Smokers are more prone to thrombus formation.
Regular use of certain drugs	Aspirin, nonsteroidal anti-inflammatory drugs, and anticoagulants make the patient more prone to excessive bleeding. Corticosteroids reduce the body's response to infection and delay the healing process.
Excessive fear	Stimulates the sympathetic nervous system and causes the release of hormones, causing swings in the body's chemistry and vital signs. Increased muscle tension makes surgery more difficult. Physical manifestations of fear can interfere with achieving the desired state of anesthesia.

Adapted from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.

Learning Needs

General information should be provided to the surgical patient about what will happen immediately before, during, and after surgery, as well as specific preventive measures (see Implementation). If members of the family or supportive friends are expected to assist the patient during the postoperative period, they need to be instructed during teaching sessions.

Patient and Family Teaching

General Preoperative Teaching

Whenever possible one or more family members should be included in teaching sessions. All surgical patients should receive information related to:

- **Preoperative procedures:** Enemas, skin preparation, care of belongings, restriction of food and liquid intake, and administration of bedtime sedatives and preoperative medication; time to come to the hospital
- **Technical information:** Anticipated surgical procedure; location of incisions; dressings, tubes,

drains, catheters, or other equipment that is expected

- **Day of surgery:** Time surgery is scheduled, time to arrive at the hospital or time patient is to leave her room, probable length of procedure, effects of preoperative medications, where family will wait, when and where family can see the patient after surgery, pain control, and postoperative routine
- **Postanesthesia care unit (PACU):** General environment (noise, lights, equipment), frequent taking of vital signs, pulse oximetry, and administration of oxygen
- **Surgical intensive care unit (SICU)** (if patient is to go there from PACU): Location of the unit, expected length of stay, and visiting privileges

■ Nursing Diagnosis

The LPN/LVN assists in gathering data so that based on the total assessment data, the RN can formulate problem statements in the preoperative stage that include both actual and potential problems. Common preoperative problem statements include:

- Anxiety due to the surgical experience and outcome
- Fear due to the potential for death, effects of impending surgery, or loss of control due to anesthesia
- Potential for grief due to impending loss of a body function or body part
- Insufficient knowledge of preoperative and postoperative routines
- Insomnia due to stress or unfamiliar environment
- Limited coping ability due to lack of problem-solving skills or adequate support
- Altered role performance due to inability to perform job duties or to care for children during hospitalization

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover). Each problem is supported by data obtained during the nursing assessment.

■ Planning

Specific expected outcomes will be written for each problem ([Nursing Care Plan 4-1](#)). However, there are general **nursing goals** for all preoperative patients. The expectation is that the patient will be:

- Prepared for surgery physically and emotionally
- Able to demonstrate deep breathing, coughing, and leg exercises
- Able to verbalize understanding of the procedure and the expectations for the postoperative period
- Able to maintain fluid and electrolyte balance throughout the perioperative period

[Nursing Care Plan 4-1](#)

Care of a Patient Scheduled for a Simple Mastectomy

Scenario

Mrs. Talbot, a married 38-year-old woman and the mother of two children ages 16 and 14 years, is scheduled for a simple mastectomy as treatment for a localized malignant tumor that was detected by self-examination of her breasts.

Problem Statement/Nursing Diagnosis

Fear of diagnosis/*Fear related to cancer, disfigurement, and possible death*

Supporting Assessment Data

Subjective: Grandmother died of breast cancer.

Objective: Malignant tumor by biopsy, crying at intervals; states is worried about husband's reaction to the loss of the breast

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will discuss fears openly by day 2.	Establish rapport and trust.	Establishing trust helps patient express fears and concerns.	Spent time with patient answering questions.
Patient will look at incisional area before discharge.	Encourage her to discuss fears with nurse and family.	Expressing fears decreases anxiety.	
Patient will identify spiritual support before discharge.	Encourage her to think of cancer as a challenge.	A positive perspective empowers the patient.	
Patient will talk about having cancer by postoperative day 2.	Help her to identify specific fears and deal with each one separately.	Identifying fears decreases the fear of the unknown. Dispelling fear and anxiety makes learning easier.	Stated is afraid of chemotherapy. Is now using the word "cancer" when discussing her surgery.
			Discussed ways to meet the challenges of chemotherapy.
	Teach relaxation exercises to decrease anxiety.	Relaxation exercises help decrease anxiety.	Expressed willingness to learn a relaxation exercise.
			Tried relaxation exercises twice.
Patient will join support group for cancer patients after discharge.	Advise of community resources available to her.		Expressed appreciation for information about a support group.
Patient will use community resources after discharge.			

Problem Statement/Nursing Diagnosis

Insufficient knowledge/Readiness for Enhanced Knowledge about preoperative routine and postoperative care

Supporting Assessment Data

Subjective: States, "I've never had surgery before. What will I need to do?"

Objective: Puzzled expression on face

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize understanding of preoperative procedures and requirements before surgery.	Do preoperative teaching for patient and family: routine procedures, NPO status, expected tubes and drains, equipment to expect in room, probable length of surgery, where family will wait, pain relief measures, handling of arm on operative side, coughing, deep breathing and leg exercises, ambulation, diet, daily postoperative routine.	Knowledge reduces fear of the unknown and anxiety.	Performed return demonstrations and verbalized understanding of routine and procedures.
Family will express understanding of what will happen preoperatively, where they will stay during surgery, and what to expect after surgery by end of teaching session		Family verbalized understanding of what to expect.	
	Call pastor or chaplain if patient desires a visit.	Clergy can be a positive support in time of stress.	A pastoral visit is scheduled for this afternoon.
	Provide private time for patient and husband and patient and family.	Private time is necessary for serious discussions.	Will have private talk with husband and one with daughters later today. Continue plan.

Critical Thinking Questions

- How would you specifically assess this patient's learning needs?
- How could you assess for any cultural factors that would affect her learning or your teaching?

When preoperative patients are assigned, you must plan your work for the shift carefully to have the patients ready for surgery without neglecting the needs of other assigned patients.

Clinical Cues

At the beginning of the shift, check to see that any ordered preoperative medications are on hand. Often IV medications are to be sent with the patient to the surgical holding area where further preparation of the patient is performed. Check the surgery schedule and estimate the time needed to prepare the patient for surgery.

Implementation

Preoperatively, your time is divided between preparing the patient for surgery and teaching the patient about what will happen and how to hasten recovery. The same-day surgery patient receives teaching from the provider's office nurse or from a surgical intake nurse. Teaching sessions may be scheduled when the patient comes for diagnostic testing. Sending written instructions home with the patient reinforces what has been taught. Before entering the hospital for surgery, the patient

should be given a phone number to call for answers to questions that may arise. Protocols may differ from one facility to another.

Older Adult Care Points

It is particularly important to reinforce instruction and information given to older adult patients. It is best to have a family member present during teaching. The anxiety of surgery, unfamiliar surroundings, diminished hearing and vision, and forgetfulness make learning more difficult and may decrease retention of information. Seek specific feedback periodically of points that are important for the patient to remember. Treat all patients with respect and dignity.

Consent for Surgery

Before the surgeon can perform an operation, written permission signed by either the patient, guardian, or whoever holds power of attorney must be obtained. This written consent protects the surgeon against claims of unauthorized surgery and provides the patient an opportunity to exercise the right of **informed consent**. In most hospitals, the “consent” is a printed form that the patient signs before surgery. The correct surgical procedure is written into the consent form. The surgeon explains the procedure, risks, and benefits; the nurse only witnesses the patient's signature. The patient must be mentally competent and give consent freely and without coercion. The consent form is attached to the patient's chart and is sent to the operating room (OR) with the patient. **The nurse must always check that a consent form has been signed before giving the preoperative medication.** Many hospitals require a signed “Power of Attorney for Health Care” declaring a health care proxy person to be in the chart before surgery.

Legal and Ethical Considerations

Giving Surgical Consent

Mrs. Jones, age 66, was slightly confused as a result of dehydration when she was brought to the hospital. She has signed a surgical consent for a hip replacement, but her daughter feels she was confused when she signed the form and questions its validity. What would you do? How would the surgeon verify that Mrs. Jones was not confused when she signed the form?

Clinical Cues

Patients have the right to change their minds and revoke consent up until the time of surgery. If a patient tells you the surgery is not wanted, delay preoperative preparations and explore the issue with the patient. If it appears the consent for surgery really is being revoked, notify the charge nurse and the surgeon.

Think Critically

Why should the consent be signed before giving any preoperative medication? What happens if a patient has been given the preoperative medication and then it is discovered that the surgical consent form has not been signed?

Food and Fluids

Food and fluids will often be restricted for 8 hours before surgery, and the patient is placed on NPO (*nil per os*, which means “nothing by mouth”) status. A light meal such as toast and clear fluids may be allowed up to 6 hours before surgery. Clear liquids such as black coffee, tea, apple juice, or carbonated beverages may be consumed up to 3 hours before surgery in elective cases. (American Society of Anesthesiologists, 2011). Often the surgeon or anesthesiologist will allow an oral blood pressure medication, heart medication, or anticonvulsant to be taken with a sip of water the morning of surgery. Always check the provider's order before giving anything by mouth in the immediate preoperative period. The purpose of oral restriction is to prevent nausea, vomiting, and aspiration. **Confirm with the patient that the NPO order has been heeded.** Insulin may or may not

be given; check the orders.

Clinical Cues

If a patient has not remained NPO for the prescribed period, surgery may be canceled.

Elimination

If the patient is having abdominal or colon surgery, enemas may be ordered to clear the bowel. Sometimes oral GoLYTELY solution is used. The patient may be placed on a special soft or liquid diet for the 3 days before surgery to decrease the content of the bowel.

When completing the preoperative checklist, ask the patient to empty the bladder (unless a catheter is in place). If the bladder is not empty, relaxation induced by medications and anesthesia causes the urge to urinate. The bladder should be emptied before any sedating medication is given.

Tubes and Equipment. If a nasogastric tube (NG) will be inserted during surgery for postoperative use, explain its purpose, its care, and what it will feel like to the patient. Give an estimate of how long the tube will remain in the stomach. The tube is usually removed when bowel sounds return and nausea has passed. If surgery has occurred in the stomach or intestinal tract, the tube may remain longer. Explain the function of other tubes such as drains, an IV line, oxygen delivery and monitoring devices, a chest tube, and a urinary catheter, as well as their care and probable duration of use.

Think Critically

If a patient has an NG tube in place, what are the necessary assessments to be made by the nurse?

Rest and Sedation

It is desirable for the patient to be as well rested as possible before surgery so the body is not compromised in meeting the stresses of anesthesia and the surgical procedure. A sedative may be ordered for the patient the night before surgery, but the inpatient often must ask for it. Check on the inpatient frequently during the night. If the patient awakens and is restless, sit and listen and try to dispel fears, offer a soothing back rub, or give backup sedation as ordered. A patient scheduled for same-day surgery should take the sedative at home and retire early the night before because it is necessary to arise early to enter the hospital.

Pain Control

Many surgeons order a patient-controlled analgesia (PCA) pump for their patients postoperatively. If a PCA pump is ordered, patients should receive instruction before surgery about the pump and how to operate it. If patients will be receiving injections for pain control, explain that this type of medication is ordered on an as-needed basis every 3 to 4 hours, and that patients must ask for it. Oral pain medication is usually ordered for every 4 to 6 hours as needed. Explain that asking for the pain medication before the pain becomes severe makes it easier to control the pain level. **It is the nurse's responsibility to gather data regarding the patient's pain throughout the shift and to offer interventions for relief.** Teach the patient about the pain scale that is used at the facility (see Chapter 7).

Skin Preparation

The night or morning before surgery, the patient may be asked to shower with a special antibacterial cleanser to remove as many microorganisms from the skin as possible. On the morning of the surgery, hair may be removed from the operative site—this is done either in the surgical holding area or in the OR. As a Core Measure for reducing surgical site infection, use hair clippers only for hair removal before surgery ([The Joint Commission \[TJC\], 2009](#)). Explain  to the patient the hair removal area to be prepared, the hair removal process, and the timing for hair removal. Nail polish is removed so that the pulse oximeter can function correctly when attached to the finger. Makeup is removed; note the presence of permanent makeup on the preoperative checklist. Ask about contact lenses and have them removed as well.

Clinical Cue

Preoperative skin cleansing is best performed with chlorhexidine gluconate solution, because it is more effective than povidone iodine solutions in preventing surgical site infections (Edmiston et al, 2013). A shower or bath using a 2% chlorhexidine gluconate solution may be ordered once or twice before surgery as well.

Preoperative Teaching

Teaching the patient correct breathing, coughing, turning, and leg exercises is a high priority during the preoperative period. It is helpful to have a relative or close friend present for these teaching sessions so this person can later give coaching and encouragement to the patient. Instruct the patient about what to expect before, during, and after surgery. Help same-day surgery patients devise a schedule for doing the necessary exercises.

Older Adult Care Points

Older adult patients should be taught necessary information in short segments to prevent confusion and increase the patient's comprehension. Written reminders of key instructions should be given to the patient.

Venous return is often hampered during the surgical procedure due to the position assumed on the operating table and pooling of blood in the lower extremities. **Stasis** (slowing of flow) of blood places the patient at risk for **thrombophlebitis** (blood clot and inflammation of a vessel). Specific leg exercises help to prevent this complication (Figure 4-1). Explain the importance of doing the exercises, show the patient how to do each one, and ask for a return demonstration. One way to remind patients to do the exercises is to have them exercise whenever a commercial comes on, if they watch TV. The exercises should be done after surgery at least 5 to 10 times every hour while awake, until the patient is up and moving around normally.

Patient and Family Teaching

Postoperative Foot and Leg Exercises

Whenever possible, one or more family members should be included in teaching sessions.

- Flex and extend the right foot, moving the toes upward and downward, four or five times.
- Repeat with the left foot.
- Trace circles to the right with the right foot five times; repeat with circles to the left.
- Trace circles to the right with the left foot five times; repeat with circles to the left.
- Bend the right leg at the knee, sliding the foot back toward the buttocks as far as possible; raise the bent leg off the bed, extend the leg, and dorsiflex the foot; extend the foot and lower the leg to the bed.
- Bend the left leg at the knee, sliding the foot back toward the buttocks as far as possible; raise the bent leg off the bed, extend the leg, and dorsiflex the foot; extend the foot and lower the leg to the bed.
- Tighten the buttocks muscles for a count of 10 and release to exercise the quadriceps muscles.
- Repeat each exercise four more times.



FIGURE 4-1 Teaching foot and leg exercises. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.)

If sequential compression devices or compression stockings are likely to be ordered after surgery, explain to the patient what they are, why they are used, and when they would probably be applied.

Deep Breathing and Coughing. For deep breathing and coughing, it is preferable for the patient to sit up, with the back away from the mattress or chair. This allows for full lung expansion and clearing of excretions. The surgical chest or abdominal incision should be splinted with a pillow (Figure 4-2).

Clinical Cues

A small, firm “coughing pillow” can be made by folding a bath towel or a light blanket and securing it inside a pillow case with the ends tucked inside over the towel or blanket.



FIGURE 4-2 Teaching deep breathing and coughing while splinting the incision. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.)

The surgeon may order use of an incentive spirometer. Instruct the patient in its use and supervise until the patient has mastered the technique.

Patient and Family Teaching

Lung Exercises

Whenever possible, one or more family members should be included in patient teaching.

Deep Breathing

- Sit up away from the mattress.
- Take a deep breath in through the nose, hold for a few seconds, and slowly exhale.
- Repeat four more times.
- Perform every 2 hours during the day and when awakened at night for vital signs.

Forced Exhalation Coughing

- Sit up away from the mattress.
- Splint the abdominal or chest incision:
- Take a deep breath through the nose and cough as you exhale with the mouth open, but covered with a tissue.
- If you cannot move secretions with your cough, use a forced exhalation cough.
- Take a deep breath through the nose and forcibly quickly exhale, producing a “huff” cough.
- Repeat the process using three short “huffs” as you exhale to bring the secretions to the mouth, where they can be expectorated. Repeat until no secretions are audible in the lungs, resting between attempts.
- Perform every 2 hours during the day and when awakened at night for vital signs.

Using an Incentive Spirometer

- Sit up away from the mattress.
- Insert the mouthpiece, covering it completely with the lips.
- Take a slow deep breath and hold it for at least 3 seconds.
- Exhale slowly, keeping the lips puckered.
- Breathe normally for a few breaths.
- Try to increase the inspired volume by at least 100 mL with each breath on the spirometer.
- Once maximal volume is achieved, attempt to inspire this volume 10 times, resting a few breaths between each attempt.
- Clean the mouthpiece of the spirometer when finished.

- During the first 3 postoperative days, try to do this every hour.

Turning. Show the patient how to turn in bed by flexing the legs to relax the abdominal muscles, placing a pillow between the legs, grabbing on to the side of the bed, and slowly turning to the side. This maneuver is also used for getting up out of bed. A trapeze bar for orthopedic patients is very helpful for turning and repositioning.

Family Instructions. Advise the family to come to the hospital 1 to 1.5 hours before surgery. The family should be told about the usual routines, where to wait, the approximate time before the patient may be expected to return, and what to anticipate in the way of tubes, equipment, and patient appearance after surgery. This knowledge keeps the family from thinking the patient has "taken a turn for the worse" when they see the extra equipment for suction, oxygen, or IV therapy in use after surgery. A warning about the occasional delays in starting surgery can keep the family from becoming excessively anxious if the patient is not back at the expected time.

Immediate Preoperative Care

The patient is usually dressed in a clean hospital gown, without underwear, for the operating room. Hair is covered with a surgical paper cap. Long hair should be fixed to minimize tangling, and all hairpins and barrettes must be removed. Ask about body piercings and the presence of piercing jewelry, including the tongue and genital areas. Explain why *all* jewelry must be removed for safety because of the electrocautery used during surgery and the danger of an electrical burn from conduction of electricity through metal.

Jewelry, along with money and credit cards, is given to a family member or relative to keep or is secured in a valuables envelope and placed in a safe, according to facility policy. If a wedding band is to be worn to surgery, tape the ring to the finger without restricting circulation and tape a cotton ball over the stone to prevent loss when the tape is removed. Dentures are removed, placed in a labeled cup, and kept in a designated place, according to hospital policy. Sometimes the anesthesiologist will order the dentures left in place to facilitate the administration of anesthesia by mask. If a hearing aid is left in place, a very visible note should be placed on the front of the chart, and placement of the hearing aid should be noted on the preoperative checklist sheet.

Verify that the identification bracelet matches the chart to avoid any error or mix-up of patients in the operating room. Verify that the procedure site indicated on the surgical consent form is the same as what the patient states. The procedure site will be verified and marked on the patient before transport to surgery or in the preoperative holding area if not done previously.

Clinical Cues

Attend to all items on the preoperative checklist that can be handled ahead of time ([Figure 4-3](#)). This prevents hurrying, which can increase mistakes, and prevents delaying administration of any preoperative medication while the list is completed. Many facilities use an on-line form.

PREOP/PREPROCEDURE CHECKLIST/REPORT FORM		PATIENT LABEL	
Date	Time		
Surgery/procedure	YES		
Correct patient ID band on	<input type="checkbox"/>		
On chart	<input type="checkbox"/>		
Dictated	<input type="checkbox"/>		
History and Physical <i>H&P 24 hours to 30 days: update with "No Pertinent Change in History & Physical" stamp</i> <i>H&P 31-180 days: H&P update form #2396</i> <i>OB H&P Update for Surgery/Procedures form #2543</i>			
		 19URG	
Initiate Anesthesia Preop order 101.S09. As appropriate initiate OB Anesthesia Order 144.P11 Include at least one page of patient ID stickers Procedural consent: Signed/On Chart Procedural site verified with patient/guardian Procedural site marked when laterality (including internal laterality), multiple structures (fingers, toes, lesions) or multiple levels (spine). Specify site: _____ Preop antibiotic given Interpreter if needed HBOC transfer report on chart (when applicable) Acuscan MAR-LOS custom report on chart (when applicable)		<input type="checkbox"/> YES <input type="checkbox"/> N/A	
OB <input type="checkbox"/> The Department of Social and Health Services consent for sterilization completed and on chart dated ≥ than 30 days prior to procedure (*unless meets exception criteria, listed in Standards of Care Notebook) <input type="checkbox"/> Notify anesthesia provider			
Diagnostic <input type="checkbox"/> Labs on chart <input type="checkbox"/> X-rays with patient (when appropriate) <input type="checkbox"/> When applicable Glucose: _____/time _____ <input type="checkbox"/> Type and screen <input type="checkbox"/> ECG (when applicable) Blood units available: #			
Medications/IV <input type="checkbox"/> MAR on chart <input type="checkbox"/> IV/Saline lock in place		<input type="checkbox"/> If TPN running, start second peripheral IV site	
Belongings Contacts Glasses Hearing aids R L Both Dentures <input type="checkbox"/> Upper <input type="checkbox"/> Lower <input type="checkbox"/> Partial		Labeled	With Patient/Family
Prep <input type="checkbox"/> Personal clothing removed <input type="checkbox"/> Prep completed <input type="checkbox"/> Snap gown <input type="checkbox"/> Voided, time: _____ <input type="checkbox"/> Foley <input type="checkbox"/> Jewelry/body piercings: <input type="checkbox"/> None <input type="checkbox"/> Taped <input type="checkbox"/> Family <input type="checkbox"/> Patient registration safe <input type="checkbox"/> Preop teaching done Last oral/fluid intake: _____ Time: _____			
Unit based or bedside procedures: FINAL VERIFICATION <input type="checkbox"/> Correct patient <input type="checkbox"/> Correct side/site <input type="checkbox"/> Correct position <input type="checkbox"/> Correct procedure <input type="checkbox"/> Correct equipment/trays			
<small>REPORT USING SBAR: Provide an opportunity to ask and answer questions. Include significant history/special needs.</small>			
<small>INITIALS/OR SIGNATURE IF SIGNATURE PAGE NOT USED</small>			

FIGURE 4-3 Preoperative checklist. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders. Courtesy of Peace Health Southwest Medical Center, Vancouver, Wash.)

Often no medication is given before the patient is in the surgical holding area. Most preoperative medications are given by the anesthesiologist. A medication to inhibit gastric acid secretion may be administered intravenously. You may need to send any IV piggyback antibiotic or other medication ordered to the OR with the patient.

Preoperative medications may be given to :

- Reduce anxiety and promote a restful state
- Decrease secretion of mucus and other body fluids
- Counteract nausea and reduce emesis
- Enhance the effects of the anesthetic

Assist in transferring the patient to the stretcher when the transport person comes to take the patient to surgery. Compare the patient's identification bracelet name and numbers with the transport request sheet for accuracy. Check the chart to make certain that everything ordered has been done, and complete final documentation.

Safety Alert

Preventing Falls

If the patient has received a sedative preoperatively, remember to put up the side rails of the bed per facility protocol and lower the bed. Place the call light button within reach and remind the patient not to get up without assistance. These are important patient safety measures after administering sedatives.

Cultural Considerations

Differences in Drug Metabolism

Asian people, and particularly Chinese patients, metabolize psychotropic drugs differently from people of other ethnic groups. Valium causes greater sedation with normal doses. Atropine is also metabolized differently and can greatly accelerate the heart rate. Asian patients should be monitored closely when receiving these drugs.

Older Adult Care Points

Because of decreasing liver and kidney function that occurs with age, older adult patients, especially those older than 75 years, will need reduced dosages of preoperative narcotics and sedatives. Observe for signs of toxicity.

Think Critically

How would you handle a situation in which a patient scheduled for an abdominal procedure has put back on underwear or jewelry after you finished doing the preoperative checklist?

Preparation of the Patient Unit

While patients are in surgery, prepare the room for their return. Make the bed with fresh linen; include a draw sheet between the shoulder and the knee area that can be used as a lift sheet to reposition the patient. For abdominal or perineal surgery, place an underpad at the hip area to catch excess drainage. Fan-fold the top covers to the far side of the bed or to the bottom of the bed. Raise the bed to the height of the stretcher that will return the patient, and arrange furniture so that the stretcher can be pulled up alongside the bed. Place the IV pole at the head of the bed.

Gather an emesis basin, tissues, frequent vital signs sheet or postoperative record, intake and output (I&O) sheet, small towel and washcloth, and pen and place them on the bedside table or console ([Figure 4-4](#)). Connect oxygen and suction equipment if their need is anticipated. A thermometer, sphygmomanometer, pulse oximeter, and stethoscope should be close at hand on the patient's return to the unit. If a PCA pump, sequential pneumatic compression devices, or a passive range-of-motion machine will be needed, see that they are obtained and ready.



FIGURE 4-4 Room prepared for surgical patient's return.

■ Evaluation

Evaluation is accomplished by determining whether the nursing goals have been met. If the patient is properly prepared for surgery, kept NPO, reasonably calm, and knowledgeable about the procedure and what is expected, the general goals have been met. If the preoperative medications were not given on time or the patient was not ready for transport at the appointed time, review your steps to see where improvement can occur. Data are gathered to determine if expected outcomes written for individual problem are being met (see [Nursing Care Plan 4-1](#)).

The Surgical Team

The surgical team consists of the surgeon, physician's assistant, surgical assistants, anesthesia care provider, circulating nurse, and scrub person or scrub technician. The surgeon is the head of the surgical team and may be a physician, an oral surgeon, or a podiatrist. The **first** surgical assistant is another physician, a physician's assistant, a surgical resident, or a specially trained and authorized RN or surgical technician. Other assistants may be RNs or LPN/LVNs. The surgeon, physician's assistant, surgical assistants, and scrub nurse or scrub technician are sterile members, perform a surgical scrub or rub, and wear sterile gowns and gloves. They work within the sterile field.

The Surgical Suite

ORs are removed from other areas of the hospital, and access is restricted to OR personnel and surgical patients. The OR is maintained as a positive pressure environment to reduce the entrance of microbes that might cause infection. The surgical suite is divided into three distinct areas to help keep the ORs as microbe free as possible. The unrestricted zone is essentially the control desk area. Street clothes may be permitted here. Semi-restricted zones include the hallways and outer regions of the ORs. The circulating nurse and anesthesia care providers work in these areas. Clean scrub clothes and caps are required. The restricted zone is the area surrounding the operating table and instrument trays and table. Personnel wear scrub clothes, sterile gowns, caps, shoe covers, masks, and sterile gloves within this area. Asepsis is the responsibility of all surgical personnel.

The temperature in the OR is kept at 66° to 70° F (18.9° to 21.1° C) to discourage microbial growth and to keep the surgical team comfortable under the bright lights and in the layers of surgical clothing. Cabinets, instrument tables, instrument trays, and disposal buckets are usually made of stainless steel that can be easily cleaned and disinfected. The restricted area is scrubbed down with disinfectant after each procedure. The entire room is kept scrupulously clean.

The Surgical Holding Area

The patient is transported to the holding area in the surgical suite. The holding area nurse, often the circulating nurse, greets the patient and verifies the patient's identification (Figure 4-5). He verifies that all preoperative orders have been accomplished, the signed surgical consent form is present, and the risk assessment is documented and he reviews the medical record and the preoperative checklist. The correct surgical site markings are checked. The Universal Protocol to prevent wrong-site surgery is followed in the holding area and in the OR (TJC, 2009). The nurse offers emotional support and answers any questions. The anesthesiologist may greet the patient, start an IV line if one has not been established, administer preoperative medications, and prepare the patient for anesthesia. When the OR is ready, the patient is transferred to the operating table. Patient identification is verified again by the circulating nurse.



FIGURE 4-5 Patient in surgical holding area.

Roles of the Circulating Nurse and the Scrub Person

A surgical technician or a specially trained nurse (LPN/LVN or RN) may be the scrub person. This person functions within the sterile area of the operating room (Box 4-3, Figure 4-6). **Sterile technique is maintained at all times. Any break in sterile technique should be immediately**

pointed out by the circulating nurse or any member of the OR team and remedied.

Box 4-3

Major Functions of the Scrub Nurse or Technician

- Gathers all equipment for the procedure
- Prepares all sterile supplies and instruments using sterile technique
- Gowns and gloves surgeons on entry into operating room
- Assists with sterile draping of the patient
- Maintains sterility within the sterile field during surgery
- Hands instruments and supplies to the operating team during surgery, anticipating what is needed
- Maintains a neat instrument table
- Labels and handles surgical specimens correctly
- Maintains an accurate count of sponges, sharps, and instruments on the sterile field; verifies counts with the circulating nurse before and after surgery
- Monitors for breaks in sterile technique and points them out
- Cleans up after the surgery is over



FIGURE 4-6 Scrub nurse setting up the instrument table in the operating room.

The circulating nurse is responsible, along with the anesthesia care provider, for maintaining the safety and dignity of the patient and bringing needed items to the operating team, as well as many other duties (Box 4-4). The circulating nurse is the communication link between the OR and those outside the surgical suite.

Safety Alert

Time-Out

Before surgery begins, while all members of the team are present, a “time-out” occurs during which a final verification of the correct patient, procedure, site, and implants (if applicable) is performed. Any questions or concerns must be resolved before the procedure begins. ☺

Box 4-4

Major Functions of the Circulating Nurse

- Coordinates care, oversees the environment, and cares for the patient in the operating room
- Greets patient and performs patient assessment
- Verifies that consent is signed and accurate and that surgical site is correctly marked
- Checks medical record and preoperative forms for completeness
- Sets up the operating room; adjusts lights, stools, and discard buckets; and ensures supplies and diagnostic support are available
- Gathers, counts, and checks all equipment and supplies that are anticipated to be used, ensuring its safe function
- Opens sterile supplies for the scrub nurse
- Provides needed padding and warming or cooling devices for the operating table
- Assists with tying the surgical team's gowns
- Assists with the transfer of the patient to the operating table and positions the patient
- Places the electrocautery ground pad under patient if electrocautery is to be used
- Assists the anesthesia induction provider
- May prep the patient's skin before sterile draping occurs
- May insert a Foley catheter
- Handles labeling and disposition of specimens
- Coordinates activities with radiology and pathology departments
- Monitors urine and blood loss during surgery and reports findings to the surgeon
- Supplies, monitors, and documents the infusion of ordered fluids
- Observes for breaks in sterile technique and announces them to the team
- Monitors traffic and noise within the operating room
- Communicates information on the surgery's progress to family during long procedures
- Documents care, events, interventions, drugs, fluids, and findings
- Assists with final count of sponges, sharps, and instruments with the scrub person
- Helps transfer the patient to the gurney and accompanies the patient to the recovery area, providing a report of the surgery and patient condition to the recovery nurse
- Verifies the count of equipment is the same after surgery as before

The patient is positioned with padding to prevent injury to nerves and to minimize pressure over bony prominences. Serious injury and pressure ulcers can develop from improper positioning or lack of padding for a surgical procedure (see [Chapter 42](#)). Safety straps are secured to safeguard the patient.

Anesthesia

Anesthesia (the loss of sensory perception) has been in use for surgical procedures since the 1840s. Newer anesthetics and techniques make anesthesia safer than ever, but **there is still a risk any time a patient is anesthetized**. The goals of anesthesia administration are to (1) prevent pain; (2) achieve adequate muscle relaxation; (3) calm fears and ease anxiety; and (4) induce forgetfulness of an unpleasant experience. Anesthetics are administered in a number of ways to achieve these goals (Table 4-3). Patients are classified according to their age, physical condition, and risk status and are assigned a risk potential. The choice of anesthesia depends on the type of surgical procedure to be performed and the risk potential. The anesthetic to be used is chosen by the anesthesia care provider, although it is discussed with the patient. The anesthesia care provider may be an anesthesiologist, another physician, or a certified registered nurse anesthetist (CRNA) who is supervised by an anesthesiologist.

Table 4-3
Types of Anesthesia

TYPE	USE	ADVANTAGE
General		
Inhalation	Extensive surgery for which it is desirable for patient to be unconscious with relaxed muscles	Well controlled with assisted ventilation; few side effects
Intravenous	Shorter surgery; rapid induction	Little postoperative nausea or vomiting
Regional		
Spinal	Surgery in lower half of body; for patients unable to undergo general anesthesia	Patient can be conscious; does not require fasting No nausea or vomiting from anesthesia
Epidural	For gynecologic procedures and childbirth	No diet restrictions postoperatively
Nerve block	Foot surgery and some orthopedic surgeries	Patient is conscious; can cooperate with instructions
Local	Minor surgical procedures	Can produce good pain control for many hours postoperatively; patient may remain conscious Numbs an area for a short period of time
Procedural/Conscious Sedation		
	Surgery of short duration for which unconsciousness is undesirable	Reversal is rapid Patient is unaware but can breathe without assistance Little if any nausea or vomiting Amnesia of surgery
Other		
Hypnosis	Surgery for patients who are unable to have general anesthesia and where regional anesthesia is inappropriate	No drug side effects
Cryoethermia	Surgery for patient who cannot tolerate other anesthesia, such as in life-threatening trauma	Provides decrease in pain

Go to Evolve for a table listing the types of anesthetic agents and their uses, advantages, and nursing implications.

General Anesthesia

General anesthesia is induced by the administration of an inhalant gas or by medication introduced intravenously. During general anesthesia, the patient is in a deep sleep state with muscle relaxation and is not aware of the surroundings. An oral or nasal endotracheal tube may be placed to maintain the airway. Placement of a laryngeal mask is another option. There are three stages of general anesthesia:

- 1. Induction:** Unconsciousness is induced.
- 2. Maintenance:** Period during which the surgical procedure is performed.
- 3. Emergence:** Surgery is completed and the patient is prepared to return to consciousness; neuromuscular blocking agents are reversed.

Older Adult Care Points

The physiologic changes that occur with aging affect the way drugs are taken up, utilized, and excreted. Obtaining an accurate height and weight of older adult patients is very important for calculation of anesthetic agents and medication dosages. Adverse drug responses are increased in the older adult population. In general smaller dosages of drugs are required, and fat soluble drugs in particular have a longer duration of action and a slower elimination period.

Regional Anesthesia

Regional anesthesia is accomplished by administering a nerve block. It is often more economical than general anesthesia. Regional anesthesia may be accomplished by injecting the spinal, epidural, caudal, or peripheral nerve area. The block anesthetizes the local area or the area distal to the block. Spinal or epidural blocks are typically used for high-risk patients undergoing pelvic or lower extremity surgery; epidural blocks are widely used in obstetric procedures.

Procedural or Conscious Sedation Anesthesia (Moderate Sedation)

A local anesthetic agent or regional anesthesia to numb the area plus IV sedation is used to provide systemic analgesia and sedation during a surgical procedure. The combination can be used for any procedure that can be done with local or regional anesthesia and is becoming increasingly common. The patient is monitored closely for blood pressure changes, oxygen saturation levels, and heart activity. Recently carbon dioxide levels have begun to be monitored by **capnography** (measurement of inhaled and exhaled carbon dioxide). Capnography provides a tracing that is a graphic representation of exhaled CO₂. The Microstream machine allows CO₂ monitoring without intubation with a nasal cannula-like device.

Complementary and Alternative Therapies

Music's Effects

Music that the patient likes is known to have a calming effect on preoperative patients. Research studying the use of music delivered by earphones to a patient during surgery has shown that music may reduce the amount of anesthesia and analgesia needed ([University of Kentucky, 2012](#)). The patient appears to become more relaxed and less anxious. Before and after surgery, listening to a CD with preferred music or with no recording on it through earphones appears to lower anxiety and pain, probably because the earphones decrease outside sensory stimulation.

Local Anesthesia

Local anesthesia is used for minor procedures such as superficial tissue biopsies, surface cyst excision, insertion of a pacemaker, and insertion of vascular access devices. A patient who has had local anesthesia is transferred directly to the nursing unit and does not need care in the PACU (also called the postanesthesia recovery room [PAR or PARR] or postanesthesia recovery unit [PARU]) (see [Chapter 5](#)).

Potential Intraoperative Complications

Potential intraoperative complications of surgery include:

- Hemorrhage
- Infection
- Fluid volume excess or deficit
- Hypothermia
- Malignant hyperthermia
- Injury related to positioning

No one with an active infection should be in the operating room. Surgical asepsis is practiced with great care to prevent contamination of the surgical site. Counts of sponges, needles, and instruments are performed to verify that no equipment has been left in a wound where it might cause a postoperative infection or complication.

Many associations and agencies have banded together to promote a program to decrease surgical infections and complications. Core Measures[®] and National Patient Safety Goals include proper hair removal, timely antibiotic administration, blood glucose control, prevention of thromboembolic events, and prevention of adverse cardiac events (Bratzler, 2009).

Intravenous fluids are carefully regulated by the anesthesia care provider and the surgeon. The cool atmosphere, cool IV fluids, inhalation of cool anesthetic gases, and exposure of body surfaces will lower a patient's normal temperature. Body temperature is monitored during surgery to ensure that it does not become dangerously low. Sometimes hypothermia is desirable for certain lengthy procedures to decrease metabolic needs of the body. However, if the patient's temperature drops too low, warmed IV fluids may be administered, or a body warming device may be used. Unless contraindicated, surgery patients are warmed with forced air during surgery. Hypothermia can adversely affect cardiac function and may make the body more susceptible to infection as well as increase bleeding and delay wound healing. Keeping the body at a normal temperature has been found to decrease postoperative wound infection and is especially important during colon surgery (Danelli et al, 2009). Prophylactic antibiotics work^{best} when given in the operating room (Rothrock, 2015).

Malignant hyperthermia is an inherited disorder. In patients with malignant hyperthermia, muscle metabolism and heat production increase rapidly and uncontrollably in response to the stress of surgery and some anesthetic agents. Fever, tachycardia, cyanosis, tachypnea, muscle rigidity, diaphoresis, hypotension, and irregular heart rate develop. If not treated quickly, cardiac arrest can occur. The circulating nurse monitors the patient's temperature along with the anesthesia care provider. If the temperature begins to rise rapidly, anesthesia is discontinued and the surgical team takes measures to correct the physiologic problems.

During a surgical procedure, the patient is placed in one position for an extended period of time. Such positioning places the patient at risk for injury, such as problems of immobility and pressure damage to the skin and underlying tissue. A variety of materials are used for padding pressure areas and stabilizing the patient's body. The circulating nurse must understand the risk factors for each surgical position and must pad joints and pressure areas accordingly. Joint problems and pressure ulcers can develop days after surgery from damage that occurred during the surgical procedure.

Get Ready for the NCLEX® Examination!

Key Points

- Surgical procedures vary in reason, urgency, degree of risk, and extent (see [Table 4-1](#)).
- The use of lasers, fiberoptic endoscopes with high-resolution video cameras, operating microscopes, and robotic technology has revolutionized surgery.
- Autologous transfusion or bloodless surgery techniques are reducing problems that can be caused by blood transfusions from outside donors.
- A thorough assessment is performed by the nurse, and any risk factors for surgery are identified (see [Focused Assessment](#)).
- Older adult patients are at much greater risk from surgery and anesthesia than younger adults.
- Cultural factors and preferences should always be assessed and considered.
- An appropriate individual nursing care plan is formulated for the preoperative period.
- The surgeon must obtain informed consent from the patient before surgery is performed.
- Preoperative procedures are performed in a timely manner.
- The method to be used for postoperative pain control is explained and discussed with the patient.
- Preoperative teaching of exercises to be performed postoperatively is very important; the patient is taught turning, leg, deep breathing, and coughing exercises.
- Immediate preoperative care includes checking to see that all jewelry and metal objects have been removed from the patient.
- A signed surgical consent form is checked before preoperative medication is administered.
- Once preoperative sedation (if ordered) is administered, the patient is cautioned to stay in bed to prevent falls.
- The patient's identity and the correct surgical site are carefully checked and marked before the patient is transported to surgery.
- After the patient leaves for surgery, the patient's room is prepared for postoperative care.
- A Universal Protocol is followed to prevent wrong-site surgery.
- Several measures are instituted to prevent surgical site infection and other complications.
- The OR is kept as microbe-free as possible.
- Surgical asepsis is the responsibility of the entire OR staff.
- A “time-out” occurs just before the start of the surgical procedure to recheck the patient's identity, the surgical procedure to be performed, and the site of the surgery.
- The scrub person and the circulating nurse, along with the surgeon and anesthesiologist or CRNA, provide care for the patient while in the operating room.
- The circulating nurse and the scrub person have distinctly different roles.
- Anesthesia is used to prevent pain, to achieve adequate muscle relaxation, and to calm fear, allay anxiety, and induce amnesia of an unpleasant experience.
- Inhalant gases and IV medications are used to induce general anesthesia, and the patient progresses through stages of induction to total anesthesia.
- Regional anesthesia, procedural (moderate) sedation, or local anesthesia is used for many surgical procedures.
- There is a risk of several complications during the intraoperative period.
- Patients are positioned carefully and pressure points and joints are padded to prevent injury.
- The circulating nurse, anesthesia care provider, and surgeon observe for symptoms of complications, and measures are taken immediately to avert a problem.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.
 Online Resources

- Surgery information, www.yoursurgery.com
- TJC performance measurement, www.jointcommission.org/PerformanceMeasurement.aspx
- Heath on the Net Foundation, www.hon.ch/HONselect/Selection/E04.html

Review Questions for the NCLEX® Examination

1. An advantage of robotic surgery is that the surgeon has:
 1. an assistant at the computer guiding instruments.
 2. an unobstructed view of the operative site.
 3. use of a laser to perform the operation.
 4. ability to make precise movements of the instruments.

NCLEX Client Need: Physiologic Integrity: Reduction of Risk Potential

2. Surgical risk factors include: (*Select all that apply.*)

1. obesity
2. malnutrition
3. age of 51 years
4. diabetes mellitus
5. dehydration
6. osteoarthritis
7. smoking or excessive alcohol use
8. cardiovascular or respiratory problems

NCLEX Client Need: Physiologic Integrity: Reduction of Risk Potential

3. Regarding informed consent for a surgical procedure, the nurse is responsible for which aspect(s)? (*Select all that apply.*)

1. Verifying that the consent has been signed and witnessed before sending the patient to surgery
2. Explaining the risks and benefits of the procedure

3. Determining the mental capacity of the patient
4. Administering any preoperative medications after verification that the consent has been signed
5. Answering general questions regarding postoperative care

NCLEX Client Need: Safe and Effective Care Environment

4. In discussing options for fluid resuscitation during major surgery, the provider indicated availability of bloodless surgery. Bloodless surgery may include which intervention(s)? (*Select all that apply.*)

1. Administration of Epogen
2. Administration of volume expanders
3. Induction of hypothermia
4. Banking blood before surgery
5. Autologous transfusion

NCLEX Client Need: Physiological Integrity

5. While reviewing the morning vital signs of a preoperative patient, which patient information warrants immediate notification of the surgeon?

1. Temperature 99.5° F (37.5° C)
2. Serum potassium 3.2 mEq/L
3. Bronchovesicular breath sounds
4. Blood pressure 135/80 mm Hg

NCLEX Client Need: Safe and Effective Care

6. The nurse reinforces the importance of turning, coughing, and deep breathing to a preoperative patient. Which patient statement indicates a need for further instruction?

1. "I could place a pillow to brace my abdominal incision to reduce pain with coughing."
2. "I would lie still in bed to reduce the risk of injuring my surgical

wound."

3. "Coughing would help reduce pneumonia."
4. "Immediately getting out of bed speeds up recuperation."

NCLEX Client Need: Health Promotion and Maintenance

7. The following nursing interventions occur in the preoperative preparation of a patient undergoing a hip replacement. Place the interventions in order of priority. (*Priority setting.*)

1. Have the patient shower with the prescribed antisepsis preparation.
2. Check that the surgical consent has been signed and is in the chart.
3. Confirm patient compliance with the nothing by mouth (NPO) status.
4. Complete the preoperative checklist.
5. Have the patient empty the bladder.
6. Check for proper marking of the surgical site.

NCLEX Client Need: Safe and Effective Care Environment

8. When teaching a patient using an incentive spirometer, the nurse determines that the patient's technique is correct if the patient is:

1. exhaling forcibly after holding the breath for 30 seconds.
2. using the spirometer for 5 breaths every hour.
3. taking slow, deep breaths and holding each for at least 3 seconds.
4. exhaling forcibly into the spirometer.

NCLEX Client Need: Health Promotion and Maintenance

9. While transferring from the preoperative area to the surgical suite, the patient asks, "Am I going to make it?" An appropriate response by a nurse would be:

1. "Everything will be alright."

2. "Didn't your physician discuss the possible adverse outcomes of the procedure?"
3. "You seem anxious. Tell me more about how you are feeling."
4. "Your physician has performed the procedure several times."

NCLEX Client Need: Psychosocial Integrity

10. During major surgery, the patient is considered at risk for:

1. Injury related to placement in one position for extended period of time.
2. Altered nutrition because of prolonged fasting.
3. Hypervolemia from irrigation and IV fluids used in surgery.
4. Hypertension because of continuous infusion of fluids.

NCLEX Client Need: Physiologic Integrity

11. The person in the operating room responsible for labeling and handling surgical specimens correctly is the _____.*(Fill in the blank.)*

NCLEX Client Need: Safe and Effective Care Environment

12. After same-day surgery, the patient is ready to go home when:

1. there is an adult there to drive the patient home.
2. the patient is alert, ambulatory, and able to empty the bladder.
3. pain is controlled with oral analgesia.
4. nausea has passed and the patient is taking fluids.

NCLEX Client Need: Safe and Effective Care Environment

13. Cefazolin (Ancef) 1 g IV is ordered to infuse over 1 hour during surgery. It has been mixed in a 50 mL piggyback bag. If the tubing delivers 15 gtt/mL, how many drops per minute should be infused? _____

NCLEX Client Need: Safe and Effective Care Environment

Critical Thinking Questions

Scenario A

Your patient is scheduled for abdominal surgery this morning. You are assigned two other patients

to care for as well. One of these patients is stable and will be going home. The other patient is going for a computed tomography (CT) scan at 9:30 A.M.

1. Describe in detail how you would plan your morning care for these three patients.
2. Your surgical patient shares with you that she is having second thoughts about having this surgery. How would you handle the situation?
3. You notice that the patient scheduled for surgery is wearing a St. Christopher medal under her gown as she returns from emptying her bladder. You had told her to remove it earlier. How would you handle this situation?

Scenario B

On your first day on the surgical unit, you are assigned a patient who is scheduled for surgery at 10:00 A.M. The following preoperative medications are ordered: Lotensin 10 mg PO with sip of water and Cefazolin 250 mg IV 1 hour before incision.

1. What would you check in the patient's chart as part of her preoperative preparation?
2. What steps would you take to complete the preoperative checklist and charting for this patient? When would you start the preoperative preparation?
3. When would you give the dose of Lotensin? How would you handle the dose of Cefazolin?

Scenario C

A patient is scheduled for right hip surgery. You have been asked to have her sign the surgical consent form, because her surgeon forgot to have her do it when he saw her last evening.

1. What should you do before asking the patient to sign the consent form?
2. She asks when and how she will be "prepped for surgery." What would you tell her?
3. She inquires as to when she will be able to see her family after surgery. What would you tell her?

CHAPTER 5

Care of Postoperative Surgical Patients

Objectives

Theory

1. Describe the care of a patient in the postanesthesia care unit (PACU).
2. Compare differences in the care of a patient undergoing general anesthesia and one having spinal anesthesia.
3. Formulate a complete plan of care for a postoperative patient returning from the PACU.
4. Discuss measures to prevent postoperative infection.
5. Prioritize measures to promote safety for postoperative patients.

Clinical Practice

6. Identify how to promote adequate ventilation of the lungs during recovery from anesthesia in the PACU.
7. Perform an immediate postoperative assessment when a patient returns to the nursing unit.
8. Apply interventions to prevent postoperative complications.
9. Assess for postoperative pain and provide comfort measures and pain relief.
10. Promote early ambulation and return to independence in activities of daily living.
11. Perform discharge teaching necessary for postoperative home self-care.

KEY TERMS

- anaphylaxis** (ă-nă-fă-LĂK-sĭs, p. 92)
atelectasis (ă-tĕ-LĒK-tă-sĭs, p. 83)
dehiscence (dĕ-HĬS-ĕntz, p. 90)
embolus (ĚM-bō-lüs, p. 87)
evisceration (ē-vĭs-ĕr-Ā-shŭn, p. 90)
hematoma (hē-mă-TŌ-mă, p. 89)
malignant hyperthermia (MH) (mă-LĬG-nănt hī-pĕr-THĚR-mĕ-ă, p. 92)
paralytic ileus (pär-ă-LĬT-ik īL-ĕ-üs, p. 86)
pneumonia (nū-MŌ-nē-ă, p. 85)
purulence (PŪ-rū-lĕns, p. 89)
seroma (sĕ-RŌ-mă, p. 89)
thrombophlebitis (thrōm-bō-flĕ-BĪ-tĭs, p. 84)
thrombosis (thrōm-BŌ-sĭs, p. 84)

Immediate Postoperative Care

Postanesthesia Care Unit

When surgery with general anesthesia is completed, the patient is usually transferred to the PACU adjacent to the surgical suites (Figure 5-1). Patients who have had spinal anesthesia for a major procedure go to the PACU also. Very critically ill patients, such as those recovering from open heart surgery, are often taken directly to the intensive care unit for anesthesia recovery. Surgical patients who had procedural sedation or a local or regional anesthetic usually recover in the ambulatory surgery area. The PACU nurse receives a verbal report from the anesthesia care provider about the procedure, blood loss, anesthesia administered, fluids infused, medications administered, and any problems encountered.



FIGURE 5-1 A nurse caring for a patient in the postanesthesia recovery unit.

The patient is immediately attached to the cardiac and pulse oximeter monitors, and oxygen is usually administered if the patient had general anesthesia. Oxygen helps eliminate the anesthetic gases and helps meet the increased metabolic demand for oxygen caused by surgery. Any respiratory problems are immediately addressed, because maintenance of airway and adequate ventilation take priority. An oral airway may be in place, because the anesthesia medications often cause the tongue to occlude the airway. Alternatively, the airway can be opened by moving the jaw forward (Figure 5-2). Suction is turned on and readily available to clear secretions. If needed, mechanical ventilation is provided. Warm blankets are placed over the patient, vital signs are assessed and compared with baseline readings, and a full neurologic assessment is performed. Neurologic assessment includes level of consciousness; orientation; sensory and motor status; and size, equality, and reactivity of the pupils. The patient may be asleep, drowsy but arousable, or awake.



FIGURE 5-2 Jaw-thrust maneuver to open the airway. The fingers are placed behind the angle of the jaw, lifting the jaw forward. As the jaw moves, the tongue comes forward, opening the airway. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

Determine intake and output (I&O) to assess the function of the urinary system. Closely monitor urinary output. Check all intravenous (IV) lines for patency, verify the solutions and the flow rate are correct, and inspect wound drains and evacuation devices for proper function. Assess dressings for unexpected drainage.

Surgical recovery can take from 2 to 6 hours. Because patients are coming out of anesthesia through various stages and are unstable, keep the environment as quiet as possible. Briefly communicate with the staff in hushed tones. The patient may wake up confused and may need reorientation and reassurance that the surgery is over, that he is in the recovery room, and that his family member or relative has been notified. Once the patient is awake, family members are sometimes allowed to visit for a few minutes so that they are assured that their loved one is alright and recovering. Assess for return of the gag reflex by determining whether the patient can swallow his secretions.

Assessments are performed at least every 15 minutes or according to the status of the patient. Assessment for complications of the particular surgery and anesthesia are ongoing. The patient remains in the PACU until the vital signs are stable and the patient is awake and able to respond to stimuli. A form of the Aldrete scoring system may be used to determine readiness for transfer. Activity, respiration, circulation, consciousness, skin color, and oxygen saturation are each given a score. A patient with a score of 9 or 10 is ready for transfer to the nursing unit. Report is given to the staff nurse (Box 5-1).

Think Critically

What is the number one priority of care for a patient in the PACU?

Box 5-1

Postanesthesia Care Unit Report to Nursing Unit Nurse

General Information

- Patient name, age
- Diagnosis
- Allergies
- Stability level

Surgical Data

- Surgeon's name
- Surgical procedure performed

- Length of surgery time
- Unexpected surgical events
- Vital sign trends during surgery
- Anesthetic administered
- Medications administered during surgery and recovery
- Amount of blood loss and replacement

Postanesthesia Care Course

- Vital signs and oxygen saturation
- Urine output
- Intravenous solutions and blood products administered, with amounts
- Tubes, drains, and equipment in use
- Results of any intraoperative laboratory or diagnostic tests (note whether patient or family has been told pathology results)
- Pain status and time of last dose of analgesia
- Any problems encountered

For many procedures the patient may be transferred from the operating room (OR) directly back to the same-day surgery unit. Monitor the patient's respirations, circulation, vital signs, neurologic status, fluid balance, wound drainage and dressings, and comfort level. When the vital signs are stable, the patient is allowed to sit up and then is ambulated. If discharge criteria are met, the patient may be discharged when able to ambulate unassisted and empty the bladder. Recovery time in the same-day surgery unit usually takes 1 to 3 hours. Discharge teaching is begun before the surgery and continues once the patient is again alert. Written instructions are always sent home with the patient. If the patient has undergone sedation, another adult driver must provide transportation home after same-day surgery. Advise surgery patients who have received anesthesia or procedural sedation not to resume normal activities or make important decisions for at least 24 hours after surgery. The phone number of the surgeon and signs and symptoms to report are written on the postoperative instruction sheet.

Think Critically

How would you assess a patient to determine whether or not the gag (swallowing) reflex has returned sufficiently after sedation to allow him to have a few ice chips?

Nursing Management

Assessment (Data Collection)

After the patient is transferred from recovery, check identity, settle the patient in bed, and perform an initial postoperative assessment. **Airway, breathing, and circulation are always the top priorities.** This provides a baseline against which frequent postoperative assessment data can be compared to prevent or quickly detect signs of complications. Vital signs are taken more frequently if they are unstable; this is a nursing judgment.

Focused Assessment

Postoperative Assessment

AREA	ASSESSMENT	SCHEDULE
Airway	Lung sounds, depth and quality of air movement	Auscultate lungs initially; respiratory rate q15min until easily arousable; then assess quality of respirations with vital signs assessment
	Respiratory rate	
Oxygen saturation	Oxygen delivery at rate ordered and patency of system	Note per vital signs schedule and whenever in room
		Check oxygen delivery system with initial assessment and each shift
Circulation	Auscultate heart; check peripheral pulses and sensation, especially distal to surgical site; assess skin color	Initially, q4h × 2, then with vital signs; if surgery was on an extremity, assess each time vital signs are measured
Mental status	Level of consciousness and orientation	Initially and then with full vital signs
Vital signs	Temperature	Check initially; then q8h once stable
	Blood pressure, pulse, and respirations	Check q15min × 1 h; q30min × 4; q1h × 4; q4h × 24–48 h; or per agency protocol
Fluid status and hydration	Intravenous infusion site and flow rate	Check initially and when in room
	Intake and output	Check each shift
	Skin turgor; oral membranes	Check initially and each shift
Surgical site	Check for bleeding; mark boundaries of drainage on dressing with the time; assess wound drainage in containers	Initially and q1h × 4; then with vital signs
Gastrointestinal	Auscultate bowel sounds; assess abdomen	Initially, then q8h
	Check nasogastric drainage color, character, amount	Check drainage whenever in room
Tubes	Check for patency and function of each	Initially; then with vital signs and after turning
Kidney function	Assess urine output from Foley catheter; must void within 8 hr if no Foley in place	Initially and q1h × 4; then if >30 mL/hr, q4h
Pain	Use a pain scale and observation of nonverbal behaviors	Initially and with vital signs; assess at least q3h
Skin	Pressure areas over bony prominences	Initially and q2h
Safety	All equipment is intact and safely functioning	Initially and each shift

Assignment Considerations

Postoperative Vital Signs

Because postoperative patients need close vigilance in the early postoperative period, it is best not to assign the taking of frequent vital signs to a UAP for the first couple of hours. Other parameters besides the measurement of vital signs need to be checked on a frequent schedule. After the first couple of hours, the task of vital sign measurement can be assigned to a UAP proficient in obtaining accurate measurements. Remind the UAP of exactly what to report: temperature elevation above 99.8° F (37.1° C), blood pressure (BP) alteration of a specific amount down or up from the baseline, tachycardia, and respiratory rate above or below normal range.

Monitoring for signs of the various surgical complications that may occur is a major nursing responsibility. The first 72 hours after surgery require frequent observations to detect signs of postoperative complications.

Nursing Diagnosis

Patient problems commonly used for postoperative patients who have undergone general anesthesia include the following:

- Altered gas exchange due to the effect of anesthesia on the lungs
 - Altered breathing pattern due to analgesia and pain
 - Altered skin integrity due to surgical incision
 - Potential for infection due to surgical wound
 - Potential for injury due to sedation, decreased level of consciousness, or excessive blood loss
 - Acute Pain due to disruption of tissue
 - Alteration in airway clearance due to inability to breathe deeply and cough without discomfort
 - Fluid volume deficit due to fluid loss and nothing by mouth (NPO) status
 - Potential for constipation due to opioid analgesics, decreased mobility, and decreased peristalsis
 - Altered self-care ability due to decreased mobility, use of tubes, and presence of dressings
 - Potential for altered myocardial tissue perfusion due to surgery, anesthesia, and positioning in the OR
 - Strained coping ability due to loss of body part or change in body image
 - Altered urinary elimination due to effects of anesthesia or presence of catheter
- For patients who have undergone spinal anesthesia, also include :
- Altered mobility due to effects of spinal anesthesia
 - Potential for injury due to decreased sensation and movement in lower extremities

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning

The expected outcomes depend on the individual specific patient problems. General *nursing* goals include:

- Maintain patent airway and adequate respiratory exchange.
- Maintain adequate tissue perfusion.
- Promote normal physiologic body function.
- Prevent injury.
- Promote comfort and rest.
- Promote wound healing.
- Promote psychological adjustment to lifestyle or body image changes.
- Prevent postoperative complications.

When planning your work for the shift, allow time for frequent postoperative assessments. Careful planning is essential so that proper care for the early postoperative patient does not override the needs of other patients.

■ Implementation

Maintain Ventilation

Postoperative patients are at risk for respiratory problems from the effects of anesthesia on the lungs, being in one position for the duration of surgery, and limited mobility in the immediate postoperative period. **Maintaining a patent airway is a priority measure to promote ventilation.** Unless contraindicated, the patient must be positioned on the side or with the head turned to the side to prevent aspiration until fully recovered, alert, and with the gag reflex intact. Monitor oxygen saturation closely, and administer oxygen as ordered.

▣ Older Adult Care Points

Providing adequate pain control for older patients has been shown to prevent respiratory complications, because patients whose incisional pain is controlled will breathe more deeply and are more able to follow instructions for respiratory care.

Some degree of **atelectasis** (collapse of alveoli in the lungs) exists after anesthesia. A mild hypoxia is usually present for about 48 hours after surgery. A large percentage of all patients who have had either abdominal or thoracic surgery suffer from increasing atelectasis and pneumonitis. **If any area of the lung remains atelectatic for more than 72 hours, hypostatic pneumonia from retained secretions is likely to occur.** A low grade fever in the first 24 to 48 hours often indicates atelectasis.

Hypostatic pneumonia results when lack of movement or of position change causes stasis of secretions, which become a breeding ground for bacteria. Auscultate the lungs carefully for abnormal sounds indicating retained secretions, assess the rate and depth of breathing, and encourage the patient to deep breathe and cough every 2 hours to promote airway clearance. Coughing to remove secretions may be contraindicated for patients who have had a hernia repair or eye, ear, brain, jaw, or plastic surgery. Check the surgeon's orders. If the patient cannot cough effectively, instruct him to "huff" cough (see [Chapter 4](#)). If the patient is too weak to remove secretions, tracheal suctioning is indicated.

Ensure that the patient turns every 2 hours, which changes the distribution of gas and blood flow in the lungs and helps move secretions. Early ambulation is ordered to promote ventilation.

The use of an incentive spirometer is especially helpful to prevent atelectasis and hypoventilation (see [Chapter 4](#)). It should be used every hour while the patient is awake for the first 24 hours after surgery, and every 2 hours thereafter. Older adult patients may need extra coaching to master the spirometer technique.

Older Adult Care Points

The risk of hypoventilation is greater in older adults because lung expansion may be hampered by calcification of costal cartilage and weakened respiratory muscles.

A pulse oximeter may be used to determine blood oxygenation. Monitor oxygen readings periodically and report oxygen saturation (SaO_2) readings below 95%.

Maintain Circulation and Tissue Perfusion

When considerable blood is lost during surgery, a blood transfusion may be ordered. Autologous blood may be transfused if the patient donated blood several weeks before surgery or if the patient's blood was collected as it was lost during surgery. This blood is filtered and returned to the patient. Be vigilant for signs of shock and check for visible hemorrhage by measuring the amount of blood on dressings. (See [Prevent Postoperative Complications](#) and [Chapter 44](#).)

If surgery involves an extremity (arm, leg, foot, or hand) or if a procedure has been performed on the pelvic area, the distal or peripheral pulse is checked during each full assessment. Swelling at the surgical site can compress vessels and decrease blood flow distal to the surgical site. The skin distal to the surgical site should be warm to the touch, and there should be brisk capillary refill in the fingers or toes. Color, movement, and sensation of the fingers and toes should be checked to detect nerve or blood vessel compression from swelling and edema.

Blood pressure (BP) and pulse should be compared with preoperative values to determine whether there are significant changes. An increase in pulse may indicate that internal bleeding is occurring, but it can also signify incomplete pain control. BP that falls below the patient's normal baseline level may indicate major bleeding.

Core Measures (The [Joint Commission \[TJC\], 2014](#)) require antithrombosis therapy after many surgeries. The use of sequential compression devices (SCDs) on the legs is recommended. SCDs alternately compress and release, squeezing the legs and propelling blood along the vessels, increasing venous return from the legs and helping prevent stasis of blood in the lower extremities ([Figure 5-3](#)). The SCDs should be checked frequently to ensure proper fit and function. They should be removed at least once per shift to allow air circulation to the skin or for bathing and full skin inspection ([Gould et al, 2012](#)). As danger of **thrombosis** decreases, compression stockings may take the place of the SCDs. The stockings must be fitted correctly and should be checked frequently to ensure that they fit smoothly. Orders for ambulation are written as soon as the patient is able to be up and walking.

Clinical Cues

When compression stockings are ordered to be worn to surgery, they should be applied at least 2 hours preoperatively. Problems occur if the stockings are not fitted correctly, particularly with thigh-high stockings.



FIGURE 5-3 Sequential compression devices in place to prevent thrombus formation.

Low-molecular-weight subcutaneous heparin injections may be ordered as a general precaution and for any patient who has a history of **thrombophlebitis** (clot and inflammation in a blood vessel) or is at high risk for thrombosis. Patients undergoing hip surgery usually receive heparin. Thrombophlebitis may not occur until after the fifth day of bed rest, when stasis has allowed a clot to form and irritate the vein. Question the patient about pain or tenderness in the legs. If the patient complains of leg pain, gently assess the skin for increased warmth and notify the surgeon.

⚠ Safety Alert

Preventing Embolus

Never massage the patient's legs, which might dislodge a blood clot and cause an embolus that could lodge in the lungs, heart, or brain, causing a pulmonary embolus, myocardial infarction, or stroke.

💡 Think Critically

The initial vital sign readings for your patient on return from surgery were BP 138/86, pulse 76, respirations 14, temperature 97.7° F (36.5° C). An hour later they were BP 126/74, pulse 80, respirations 14, temperature 98.0° F (36.7° C). What action, if any, should you take?

Prevent Injury

Safety is a primary concern until the patient is fully recovered from anesthesia. Always leave the bed in the low position after administering care. Remind the patient to call for assistance as needed and be certain the call bell is within reach. Core Measures (The Joint Commission, 2014) require the use of interventions to prevent falls. Remember that you are the patient's advocate while he is still recovering from surgery and anesthesia or is under the influence of narcotic analgesia. Be certain that all appropriate safety measures are listed on the patient's care plan.

Reassure patients who have had spinal anesthesia that it is normal for the legs to feel numb and heavy, and that feeling will soon return to normal. Maintain a flat position with only a pillow until feeling returns. Sense of position in space will return to the legs first, followed by sensation to deep pressure, voluntary movement, and finally feeling of superficial pain and temperature. A feeling of "pins and needles" in the legs is common. The patient is susceptible to hypotension until all effects of the spinal anesthesia are gone. Lying flat for 6 to 8 hours may decrease the chance of post-spinal anesthesia headache. If a headache develops, staying flat in bed reduces the pain. Keep IV fluid

running as ordered. Encourage the patient to increased fluid intake, including those containing caffeine. The patient can turn the head to the side and sip from a straw while someone else holds the container. Fluids and caffeine raise the vascular pressure at the spinal puncture site and help to seal the hole.

Think Critically

How would care for a patient who has had spinal anesthesia differ from care for a patient who has had general anesthesia?

Many surgical procedures last several hours, which means that the patient has been lying motionless, in a fixed position, on a hard table for a considerable time. Check pressure points related to the position that the patient was in during surgery and provide padding and appropriate positioning for areas that are painful (see [Chapter 41](#)).

Think Critically

Your postoperative patient was placed in a right side-lying position during surgery. Which specific places should you check for signs of pressure problems? How would you position a patient who is complaining of pain in the right hip, as well as pain in the left flank where the surgery occurred?

Older Adult Care Points

Because skin is fragile and older adults have less subcutaneous tissue, check bony prominences carefully for signs of breakdown. Joint strains can occur from the positioning necessary for certain types of surgery; perform position changes slowly and gently.

Prevent Infection

Use aseptic technique when caring for postoperative patients. Good hand hygiene is the primary means of preventing infection. Dressing changes are performed with strict sterile technique while the patient is in the hospital; the patient may use clean technique at home. Encouraging fluid intake to flush the bladder will help prevent a bladder infection in patients who were catheterized or have an indwelling catheter. Turning, coughing, deep breathing, and ambulation will assist in preventing **pneumonia** (inflammation and accumulation of exudate in the lung) from retained secretions and lack of movement. Aseptically handling drains and aseptically emptying wound drainage devices prevent the entry of microorganisms.

[TJC Core Measures \(2014\)](#) state that if the patient is receiving a prophylactic antibiotic, it must be discontinued within 24 hours after surgery. Assess the surgical wound area each shift and assess for signs of infection (e.g., local pain, increased tenderness, warmth, redness, or drainage of purulent material). Monitor the blood count for increasing leukocytes (white blood cells [WBCs]) and the body temperature for an unexpected increase. Keeping blood glucose within normal limits helps prevent wound infection ([Neal, 2010](#)).

Maintain Fluid Balance and Elimination

Urine output is closely monitored after surgery. If the patient has an indwelling catheter, observe the urine in the bag every hour in the early postoperative period. Report a urine flow of less than 30 mL/hr to the charge nurse. Check the catheter to ensure that it is not kinked and that the connecting tubing is not lying beneath the patient. A patient without a catheter in place must void within 4 to 8 hours depending on the type of surgery and the anesthesia used. If the patient is unable to empty the bladder spontaneously, obtain a bladder scan and, if needed, an order for catheterization. **If flow is less than 60 mL over a 2-hour period, the surgeon must be notified.**

Assignment Considerations

Urinary Output

When a UAP is assigned to turn the patient every 2 hours, remind the UAP to check that the tubing

of any indwelling catheter is not under the patient or crimped. If the UAP is assigned the task of emptying the Foley catheter bag at the end of the shift, ask that you be notified if there is less than 30 mL of urine per hour for the shift in the output. Verify that the UAP knows to maintain sterility of the urinary catheter system and to wipe the spout with an alcohol sponge after emptying the urine bag.

Patients usually return from surgery with an IV infusion running. Depending on the type of surgery, IV fluids may be continued for a few days or may be discontinued after the fluid has infused. Check orders to see that the correct solution is running. **No potassium additive should be given until the urine flow is at least 30 mL/hr.** Potassium may cause hyperkalemia if kidney function is not adequate. Assess the IV site for patency, flow rate, and complications each hour. Document all IV fluids administered as intake on the I&O record.

As soon as the patient is conscious and the gag reflex has returned, offer a few ice chips or sips of water, unless there is an order to maintain NPO status. Document all oral intake, as well as IV fluids administered. At the end of each shift, calculate and document the difference between the intake and output. Because fluids were lost during surgery, the body will initially retain fluid. Postoperatively, the output will slowly increase until it is more than the intake; after 2 to 3 days, fluids should again be balanced.

Clinical Cues

A cup of ice equals $\frac{1}{2}$ cup of water.

Anesthesia may cause nausea and vomiting. Keep the emesis basin close by, and position the patient on the side to prevent aspiration. Check the orders to determine on which side the patient can be positioned. The surgeon usually writes an order for medication in the event of excessive nausea or vomiting. **To prevent stress on the incision and sutures, it is best to medicate the patient before actual vomiting occurs.**

Apply a cool cloth to the forehead and back of the neck, rinse the mouth, rid the room of odors, and provide a quiet environment to help reduce nausea. After emesis, mouth care should be provided. If vomiting is uncontrolled with medication, a nasogastric (NG) tube, which suction stomach contents and prevents fluid and electrolyte loss, may need to be inserted.

Older Adult Care Points

Fluid and electrolyte shifts may cause confusion in an older adult patient after surgery. The skin and vessels in older adults are more fragile, so the IV site must be assessed frequently for signs of infiltration. Adjustment to fluid shifts is more difficult, and older adults are very prone to postural hypotension when changing to a standing position. Be sure to provide adequate support.

Promote Gastrointestinal Function and Nutrition

Surgeons often keep the patient NPO and place an NG tube after abdominal procedures, because handling of the gastrointestinal (GI) tract and general anesthesia cause peristalsis to halt, which means that secretions will not flow through the system properly. The NG tube removes gathering secretions. When an NG tube is in place, check that the tube is positioned and functioning properly and that the suction is set according to orders. Assess the amount of drainage produced every 1 to 2 hours. If the drainage turns dark brown and grainy, it should be checked for blood using a special reagent. Report the presence of blood to the surgeon.

A healthy surgical patient may be kept on nothing but IV fluids for several days without developing a serious nutritional problem. If extensive tissue repair is required for healing, supplemental nutrition by enteral or parenteral feeding may be started (see [Chapters 3 and 27](#) for details of enteral and total parenteral nutrition). A patient who is NPO and kept on IV fluids will lose some weight, because there are insufficient calories in the IV fluids to meet total daily requirements. A liter of 5% dextrose in water contains only 200 calories.

After surgery that required general anesthesia, the patient will not be allowed to eat until bowel sounds have returned because of the risk of developing **paralytic ileus** (failure of forward movement of bowel contents).

Clinical Cues

When permitted by the surgeon, chewing sugarless gum can speed bowel recovery after abdominal surgery. Gum chewing has also been shown to be effective for recovery from paralytic ileus ( [Wronski, 2014](#)).

At least once per shift, or according to hospital policy, listen for bowel sounds in all four quadrants. Once they are heard, the surgeon usually orders clear liquids, followed by full liquids, then a regular diet if the preceding diets have been tolerated. The patient may be allowed to eat right away after spinal anesthesia.

Clinical Cue

Having the postoperative patient chew gum frequently tends to encourage the return of bowel function.

Discomfort from abdominal distention and considerable flatus may occur after general anesthesia, because peristalsis ceases. Taking only small amounts of liquid or food at a time, drinking only tepid liquids, and refraining from drinking with a straw helps keep flatus to a minimum, and ambulating helps move and evacuate gas. If permitted, the patient can try resting in a slight Trendelenburg's position, with the legs and rectum higher than the stomach, which may assist in evacuation of flatus.

Once the patient is eating again, a bowel movement should occur within 2 to 3 days. If this does not occur, an order for a suppository or laxative may be needed to stimulate a bowel movement. Patients receiving narcotic analgesics may become constipated and require stool softeners or laxatives to produce normal bowel movements.

Think Critically

Name four specific interventions to prevent constipation in a postoperative patient who is receiving narcotic analgesics for pain.

Promote Comfort

Pain and discomfort interfere with rest and inhibit the processes of healing and repair. Although analgesic drugs are almost always prescribed for postoperative patients, comfort measures also should be used. Nonsteroidal anti-inflammatory drugs (NSAIDs) and nonnarcotic analgesics work on both the peripheral nervous system and the central nervous system (CNS) to control pain and may be used to augment opioids. Opioids tend to depress respirations and the cough reflex and therefore may contribute to the development of pulmonary problems. Opioids also can increase the possibility of nausea and vomiting. Using other drugs in combination with opioids helps to control pain with the fewest side effects.

Pain must be reduced so that the patient will rest, turn, cough, and deep breathe frequently, and medication should be given consistently for the first 24 to 48 hours postoperatively. **Assess pain level and effectiveness of analgesia using a pain scale at least every 3 hours.** Remind the patient to request medication before the pain becomes severe, such as at 3 to 4 on the pain scale.

If the patient complains of pain on transfer to the unit, refer to the notes from the recovery unit nurse. Note any medications administered both preoperatively and postoperatively. **When droperidol plus fentanyl (Innovar) is given preoperatively, narcotic pain medication should be reduced by half for 8 hours postoperatively to prevent serious respiratory depression.** If respirations are within normal limits and there is no contraindication to doing so, medicate the patient promptly with the ordered analgesic. If it is too soon to give more analgesia, reposition the patient, be sure the bladder is not distended and causing discomfort, check that the patient is warm enough, and use other comfort measures to relieve the pain, such as distraction and imagery. Note when analgesia is due and have it ready to administer at the appointed time.

Teach relaxation techniques that can help decrease the patient's discomfort (see [Chapter 7](#)). Pain medication may be administered by subcutaneous or intramuscular injection, intravenously, epidurally, or by intermittent administration of local anesthetic into the pleural space with an

intrapleural catheter. Three methods commonly used for pain control are the patient-controlled analgesia (PCA) pump, the epidural catheter, and the continuous peripheral nerve block for extremity pain. Pain, methods of pain control, and pain medications and their administration are discussed in greater detail in [Chapter 7](#).

Maintain Temperature

Operating rooms are kept very cool so that the staff members working under the bright lights do not become overheated and growth of organisms is inhibited. The patient's temperature in this environment often decreases, especially during prolonged abdominal surgery in which the peritoneal cavity has been open for a long period. Warming during surgery is recommended, and the Core Measures specifically state the importance of warming the patient undergoing colon surgery ([TJC, 2014; IHI, 2013a](#)). Postoperatively, the patient may feel cold and should be kept warm with extra blankets or warmed bath blankets applied under the top covers. Placing socks on the patient's feet may help. Some anesthetic agents may cause tremors as they are metabolized. If uncontrollable shivering occurs, contact the surgeon for medication orders.

Dressings on extremities should be checked to be certain that they are not so tight that circulation is impaired. Check the pulse, skin temperature, sensation, and movement distal to the surgical site to evaluate circulation (neurovascular assessment). You should be able to slip your little finger between a dressing and the extremity. Dressings that are too tight cause pain.

Occasionally, continuous hiccoughs occur after surgery, making the patient quite uncomfortable. Having the patient breathe into a paper bag will often relieve the hiccoughs, and sedatives and tranquilizers are sometimes prescribed to promote relaxation and reduce irritation of the phrenic nerve. Severe, persistent cases of hiccoughs may require surgical interruption of impulses along the nerve pathways to remove the cause of the spasms of the diaphragm.

Complementary and Alternative Therapies

Stopping Hiccoughs

An alternative treatment for hiccoughs is to massage the earlobes. Massage activates the acupressure points, interrupting the hiccup reflex. Other commonly used remedies include:

- Fill a glass with at least 4 oz of water. Lean over a sink and drink the water from the back side of the glass. Drink continuously until the glass is empty.
- Stick a finger in each ear, and hold your breath.
- Drink from a glass that someone else is holding for you.
- Breathe into a paper bag deeply 20 times.
- Place a teaspoon of sugar or peanut butter on the tongue and let it slowly dissolve; the hiccoughs will be gone when the sugar or peanut butter has dissolved.

Promote Rest and Activity

Patients need sleep after surgery. Keep the room quiet and group nursing activities to prevent waking the patient more often than necessary. At least every 2 hours, the patient must do leg exercises and change position. Orders for ambulation may begin within several hours after surgery. Raise the head of the bed first and let the body adjust to the position change. Then sit the patient on the side of the bed, allowing the legs to dangle over the side with the feet on the floor or a foot stool. After a few minutes, slowly assist the patient to stand. Assist the patient to walk around the room, or for at least a few steps. Use a gait belt and have someone assist you if the patient is very weak. Pain medication can be timed to decrease pain during ambulation if it does not make the patient too groggy.

Emphasize that exercise is vital to prevent circulatory problems and offer praise for all efforts. Keeping blood from pooling in the extremities helps prevent thrombus formation and **embolus** (a thrombus or clot that travels and lodges elsewhere in the body). Continue to ambulate, in the

hospital or at home, on a set schedule until the patient is able to do so independently. In many hospitals, physical therapy orders will be written and the physical therapist will be responsible for ambulating the patient and overseeing range-of-motion exercises.

If the patient is on strict bed rest, range-of-motion exercises must be performed at least four times a day. The patient may do active range of motion on most joints, but passive range of motion must be done on joints the patient is unable to exercise unless physical therapy visits have been ordered. Family members also may help with these exercises.

Promote Wound Healing

Surgical incisions most often heal by primary, or first, intention (Table 5-1). Adequate rest, sufficient blood supply, and proper nutrition all promote wound healing. See Evolve for a review of the wound healing process. Rest decreases the metabolic rate and allows nutrients to be used for healing rather than activity. **Proteins** provide the amino acids that are the building blocks of tissue and are vital to the healing process. Blood transports amino acids and other elements needed for rebuilding tissue and is essential to healing. Good circulation ensures that blood reaches the wound. **Vitamin C** is necessary for collagen production, the formation of capillaries that bring blood to the healing tissues, and for resistance to infection. The minerals **zinc**, **copper**, and **iron** also assist in the formation of collagen.

■ Nutrition Considerations

Foods High in Vitamin C and Protein

FOODS HIGH IN VITAMIN C	FOODS HIGH IN PROTEIN
• Citrus fruits and juices	• Meats: chicken, beef, pork, lamb*
• Strawberries	• Cottage cheese
• Cantaloupe	• Milk*
• Tomatoes	• Cheese
• Bell peppers	• Peanut butter
• Cabbage	• Beans
• Turnip or collard greens	• Eggs
• Broccoli	• Ice cream
• Mangos	• Grain products: breads, pasta
• Peaches	• Tofu; soy products
• Pineapple	
• Potatoes	

*Meats and milk products contain the highest amounts of protein.

■ Older Adult Care Points

- Older adults often have chronic diseases that interfere with oxygenation, transport of nutrients to the cells, and removal of waste from the cells.
- Vitamin and mineral deficiencies are common in older adults and contribute to poor wound healing.
- Regeneration of tissue takes more time in older adults, partially because of the slower metabolic rate that occurs with age.

Factors Interfering With Wound Healing. Mechanical injury from friction, pressure, or abrasion—such as can occur when tape is removed—disrupts the healing tissue and prolongs wound healing. Physical injury destroys granulation tissue, which is the framework on which new cells grow and mature to form a covering for the wound. Handle all wounds gently and shield them from injury. When dressings are removed from a wound, take care not to dislodge granulation tissue. **Smoking decreases the amount of hemoglobin available to carry oxygen to the healing tissues and prolongs healing time.** (See the Evolve website for a review of the wound healing process.)

Table 5-1

Phases of Primary Intention Wound Healing*

PHASE	ACTIVITY

Phase I	
Acute inflammatory reaction (3-4 days)	Process of hemostasis. Constriction of blood vessels, platelet aggregation and the formation of fibrin, and epithelial cell migration. Phagocytosis occurs. Scab forms.
Phase II	
Proliferation and granulation (third or fourth day to 2-3 wk)	Macrophages clear debris, fibroblasts synthesize collagen, capillary networks are built, granulation tissue is formed. Closure by contracture begins.

*A surgical incision most often heals by primary intention. Many accidental wounds and some infected wounds heal by secondary or tertiary intention.

The presence of pathogenic organisms in a wound prolongs the inflammatory process and delays healing. Anti-infective drugs are sometimes given postoperatively to prevent wound infection and should be administered as ordered to maintain appropriate blood levels of the drugs. Corticosteroids taken for a chronic condition will slow the healing process, because they suppress the immune and inflammatory response.

Excessive stress, apprehension, and emotional disturbances seem to make the body more vulnerable to invasion by foreign organisms by depressing the immune system. When under excessive stress, the body also is less able to mobilize the elements and cells that promote healing.

Interventions for Wound Care. The surgical wound should be inspected during dressing changes, or at least once a day. Assessment includes observing the incision line for signs of excessive swelling, formation of a **hematoma** (blood-filled swelling), formation of a **seroma** (serum-filled swelling), redness, or tearing of the skin or other signs of separation of the edges of skin that have been sutured together. Normally, a surgical wound is sealed within hours, and little drainage is expected. Report and document evidence of bleeding, **purulence** (pus), or any other sign that the wound is not healing properly. Document the appearance of any drainage. Drainage may be serous (clear or very light yellow), serosanguineous (reddish yellow), or sanguineous (blood red). Documentation should include whether sutures or staples are intact and the wound edges are well approximated.

The best way to prevent hospital-acquired infection of a surgical wound is always to wash your hands before doing wound care or touching the patient, to use aseptic technique and Standard Precautions for dressing changes, and to change the dressings as ordered. Additional factors that may slow wound healing in a postoperative patient include vomiting, abdominal distention, and strenuous respiratory efforts, such as coughing and forcefully exhaling breaths of air without proper splinting of the incision. The wound should be properly splinted for coughing to prevent dehiscence of the incision (see [Figure 4-2](#)).

Dressings. **Surgical dressings should be checked each time vital signs are taken for the first 24 hours after surgery, every 4 hours during the next 24 hours, and then at least every 8 hours as long as the surgical wound is covered with a dressing.** If a wound is not expected to drain, but drainage is evident, the surgeon should be notified. If drainage is outlined and the time and date noted, you can tell if the wound is draining more than it should over a period of hours. The surgeon usually does the first dressing change. If the dressing becomes saturated before this, it should be reinforced by placing more dressing material over the area. If it is within the orders, remove outer dressings—leaving those in direct contact with the wound—and secure new outer dressings in place. When there is excessive drainage, the dressing probably will require reinforcing every 4 hours. Changing the dressing more often than once a shift is not recommended because of the dangers of introducing infectious agents, of traumatizing the wound, and of interfering with tissue regeneration.

Each time the dressing is changed as ordered, the amount and characteristics of drainage on the dressing should be noted and documented. If the wound is infected, the odor of the drainage can give a clue as to the kind of organism causing the infection. A musty odor is characteristic of aerobic organisms. An acrid (sharp, stinging) or putrid (foul) odor is characteristic of anaerobes. Anaerobic infections are commonly seen after colorectal and vaginal surgery. An infected wound should be cultured to see what organism is causing the infection.

Drains. Drains are used to (1) prevent accumulation of fluids or air at the operative site; (2) protect suture lines; and (3) remove specific fluids, such as bile, cerebrospinal fluid, or drainage from an abscess. Drains not attached to a suction device are attached to a drainage bag or have dressings placed to catch the fluid. An example of a drain is the **Penrose**, which is inserted into the abdominal cavity or any other area where an abscess, fistula, or other condition requires drainage ([Figure 5-4](#)). A T-tube drain may be placed in the common bile duct after surgery on the gallbladder or liver.

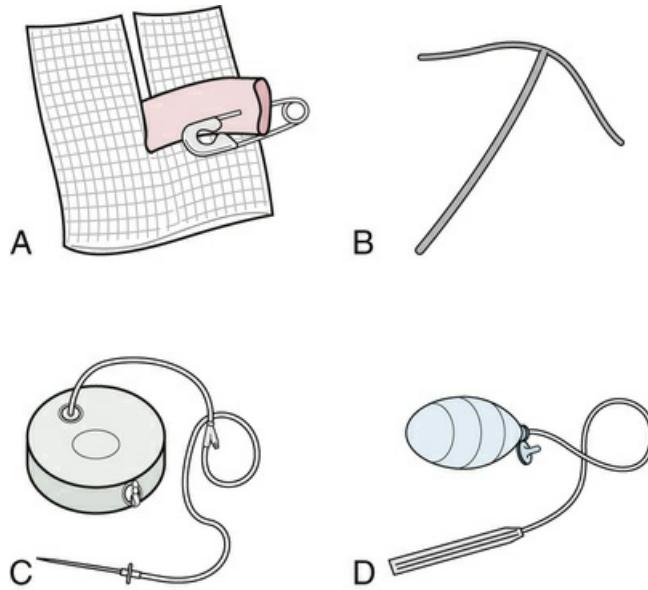


FIGURE 5-4 Wound drains. **A**, Penrose drain. **B**, T-tube drain. **C**, Hemovac. **D**, Jackson-Pratt.

Some drains are connected to an apparatus that creates continuous suction to facilitate removal of fluid and gas. If a drain is kinked, the accumulated fluid and gas can cause pain, create dead air space (which delays healing), damage the healing tissue at the suture lines, and delay healing by compressing surrounding capillaries and cutting off oxygen supply to the cells.

One kind of drain system is the closed-wound suction device (e.g., Hemovac). The drainage catheter is connected to a spring-loaded drum and is collapsed at least once each shift to create the desired suction, which pulls fluid into a collection area of the device (see [Figures 5-4, C](#), and [5-5, A](#)).

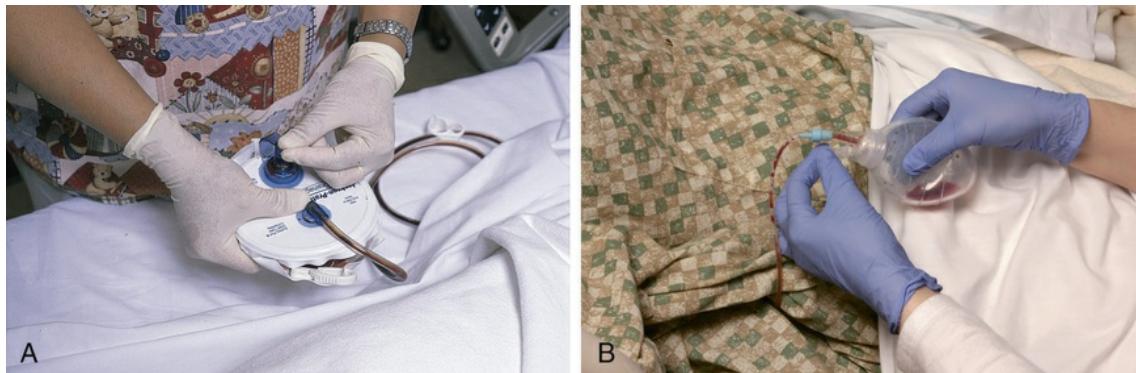


FIGURE 5-5 Reactivating surgical wound suction devices by compressing the suction device after emptying the reservoir. **A**, Hemovac. **B**, Jackson-Pratt. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.)

Jackson-Pratt suction devices are about the size of the bulb on a blood pressure cuff and have a valve on top. The valve is opened to allow removal of fluid and to collapse the bulb; the valve is then closed to create negative pressure, which provides the suction. As drainage accumulates in the bulb, it is emptied and recompressed (see [Figures 5-4, D](#), and [5-5, B](#)). This procedure should be done to Jackson-Pratt suction devices at least once per shift.

Removing Sutures and Staples. When an order is written to remove sutures or staples, check the order, gather the proper equipment, inform the patient about the procedure, correctly identify the patient, wash hands, don gloves, and inspect the incision carefully. For a long incision or an incision over a joint, remove every other suture or staple first ([Figure 5-6](#)). If the edges of the incision do not pull apart, remove the rest of the sutures or staples. Often **Steri-Strips** (small, reinforced strips of adhesive) are applied to hold the incision together until healing is complete.



FIGURE 5-6 Surgical staples are removed with a special implement.

Prevent Postoperative Complications

Table 5-2 summarizes the major postoperative complications and the nursing interventions to prevent them. Some complications are immediately life-threatening.

Table 5-2
Postoperative Complications

PROBLEM	SIGNS AND SYMPTOMS	PREVENTIVE INTERVENTIONS
Atelectasis	Decreased breath sounds over areas not aerating; dyspnea	Deep breathing and coughing; use of incentive spirometer; early ambulation; teach to cough properly.
Pneumonia: hypostatic, aspiration, or bacterial	Fever, malaise, increased sputum, purulent sputum, cough, flushed skin, dyspnea, pain on inspiration; abnormal breath sounds, crackles, rhonchi	Deep breathing, coughing, and frequent turning; early ambulation; incentive spirometer use; range-of-motion exercises if unable to ambulate; medication if bacterial.
Paralytic (adynamic) ileus	No bowel sounds 24–36 hr after surgery or fewer than 5 sounds/min	Monitor bowel sounds; encourage early ambulation; nothing by mouth as ordered. Do not feed until bowel sounds return.
Thrombophlebitis	Pain or warmth in calf of leg, swollen leg, area on leg warm to touch; possible temperature elevation	Encourage leg exercises; keep the patient well hydrated; encourage ambulation; use anti-embolism stockings or devices.
Urinary retention	Distended bladder; inability to void spontaneously	Palpate bladder; encourage voiding; if unable to void within 8 hr per order obtain a bladder scan and if needed an order for catheterization; medicate to increase urinary sphincter tone as ordered.
Urinary tract infection	Dysuria, frequency, foul-smelling urine	Force fluids when allowed; encourage frequent voiding; keep catheter clean and patent; use aseptic technique to empty drainage bag.
Wound infection	Redness, swelling, pain, warmth, drainage, fever, increased leukocytes, rapid pulse and respirations (fever 72 hr after surgery indicates infection in some system or in the wound)	Assess wound characteristics and drainage. Monitor white blood cell count and temperature. Use aseptic technique for wound care; encourage adequate nutrition and fluids; encourage activity.
Pulmonary embolus	Shortness of breath, anxiety, chest pain, rapid pulse and respirations, cyanosis, cough, bloody sputum	Anti-embolism stockings, adequate fluid intake, frequent turning or ambulation, preventive anticoagulant if ordered; leg exercises.
Hemorrhage and shock	Evidence of copious bleeding; decreased blood pressure, elevated pulse, cold clammy skin, decreased urinary output	Give blood or volume expander; stop bleeding. Place in shock position with feet and legs elevated and head flat; administer ordered medications to raise blood pressure; administer oxygen; measure vital signs frequently.
Wound dehiscence or eversion	Discharge of serosanguineous drainage from wound and sensation that "something gave"; separation of wound edges with intestines visible through abdominal incision	Teach to splint properly for coughing. Place patient supine with knees flexed; cover wound with sterile saline-soaked gauze or towels; return to operating room for repair; monitor for shock.
Fluid imbalance	Signs of overhydration: crackles in lungs, edema, weight gain Signs of dehydration: weight loss, diminished pulse, dry mucous membranes, decreased tissue turgor	Control intravenous flow rate. Monitor intake and output; correct imbalances. Output will be less than intake for first 72 hr after surgery with general anesthesia. Auscultate lungs each shift. Monitor weight; check for edema.
Malignant hyperthermia	High temperature, cardiac dysrhythmias, muscle rigidity, hypotension, tachypnea, and dark cola-colored urine	Genetic predisposition; can only monitor and treat symptoms; apply cooling blanket and ice packs. Give dantrolene as ordered.

Modified from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.

Wound Infection. Infection of a wound can occur after any surgical procedure, but it is more common in wounds caused by accidental injury and in wounds that were already infected at the time of surgery. A prophylactic antibiotic after surgery may be ordered to prevent a wound infection. **If an infection is going to develop, it usually becomes apparent 2 to 7 days postoperatively.** Most patients will already be at home when postoperative infection becomes evident.

Clinical Cues

Subjective complaints that may indicate infection include fatigue, loss of appetite, headache, nausea, or general malaise or pain. Objective signs may include pain, redness, swelling and induration in the area, purulent drainage, fever, increased pulse rate, elevated WBC count, and swollen lymph nodes in adjacent areas.

If an infection occurs, cultures are obtained and appropriate antibiotics are given for a specific length of time. Wound irrigations may be ordered for an open infected wound. Sterile normal saline is the most common solution for this purpose. The wound may be packed with dressings moistened with the sterile saline solution.

A noninfected wound should not be cleaned or irrigated with anything but sterile normal saline; other substances irritate the tissue and slow healing. Transmission-based isolation precautions or contact precautions are instituted when a wound is infected (see Chapter 6). Gowns and gloves are worn when performing dressing changes or when irrigating infected wounds. If splattering is likely, protective eyewear and masks are also worn. Soiled dressings and supplies are bagged in plastic barrier bags to be deposited in a biohazard trash receptacle. **Dressings from an infected wound should never be placed in the patient's room trash container.**

Dehiscence and Evisceration. When caring for a patient who has undergone abdominal surgery, you must be alert for possible disruption or separation of some or all the layers of the surgical wound. This is called **dehiscence** (Figure 5-7). If the wound completely separates and the contents of the abdominal cavity (viscera) protrude through the incision, the condition is called **evisceration** (see Figure 5-7).

Clinical Cues

Dehiscence can occur at any time during the postoperative period, but it most commonly occurs between the fifth and twelfth postoperative days—when the patient is feeling stronger and more active, but healing is not complete, or when infection has occurred. When checking an abdominal surgical wound, be particularly aware of any drainage on the dressing. There is often a noticeable increase in the amount of serosanguineous drainage on the dressing before the separation of the wound layers becomes apparent. Subjectively, the patient may not notice any symptoms until there is a feeling of “giving way” in the wound.

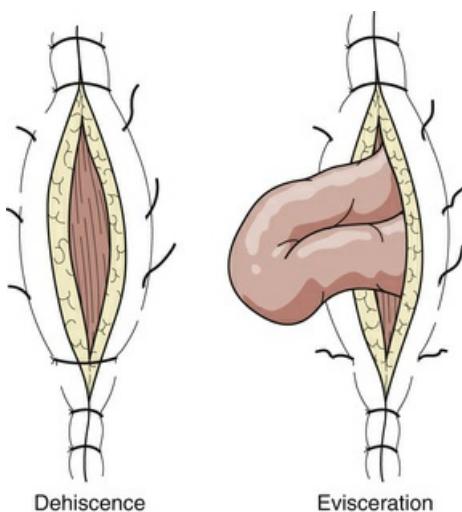


FIGURE 5-7 Complications of wound healing: dehiscence and evisceration. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2013, Saunders.)

Wound separation or disruption usually is brought on by a sudden strain or stress on the suture lines (e.g., when the patient sneezes, coughs, or has an episode of retching and vomiting). **Patients most at risk for dehiscence and evisceration are those who are diabetic, obese, malnourished, or dehydrated; have a malignancy; have experienced multiple traumas to the abdomen; or have an infected wound.** Abdominal distention and broken sutures are other factors in wound disruption. Wound dehiscence and evisceration create an emergency that requires immediate surgery and are very serious complications. After dehiscence and evisceration occur and before reparative surgery, the patient should lie supine with the knees flexed. The wound should be covered with a sterile towel or sterile dressings moistened with sterile normal saline. Positioning with the knees flexed prevents abdominal muscle strain.

Home Care Considerations

In Case of Dehiscence or Evisceration

If dehiscence or evisceration occurs at home, moisten sterile gauze with sterile water (or fresh water if sterile is unavailable) and place it over the exposed bowel to keep the bowel membrane moist. Immediately notify the home care agency or the surgeon, call someone to help, and have the patient lie supine with the knees flexed and the moistened dressings in place.

Think Critically

Identify seven assessment findings that together would indicate a wound infection.

Hemorrhage and Shock. The two most common complications of anesthesia and surgery are shock and infection. Shock, which can quickly develop into a life-threatening emergency, presents the most immediate danger to the patient. Shock disrupts normal physiologic function and can result from (1) failure of the heart to function as a pump (**cardiogenic shock**), such as in cardiac arrest (see [Chapter 20](#)); (2) a low volume of blood (**hypovolemic shock**), such as in hemorrhage; (3) collapse of the blood vessels as a result of faulty nervous system regulation (**neurogenic shock**) (see [Chapter 44](#)); (4) **anaphylaxis** (severe, allergic reaction), such as in hypersensitivity to a drug or other allergen (see [Chapter 11](#)); and (5) sepsis, occurring when toxins from bacteria relax and dilate blood vessels, resulting in a drop in blood pressure (see [Chapters 6 and 44](#)).

In the immediate postoperative period, the patient is most likely to suffer from cardiogenic, hypovolemic, or neurogenic shock. However, any of the five kinds of shock are possible after anesthesia and surgery. The symptoms of shock depend to some degree on the cause of circulatory failure.

Clinical Cues

Early signs of impending hypovolemic shock from hemorrhage are thirst, restlessness, tachycardia, and tachypnea. Changes in the vital signs may be the only warning sign of neurogenic and cardiogenic shock.

As shock progresses, BP begins to drop and pulse rate increases. Pulse may be bounding at first but becomes thready and indistinct as circulatory collapse occurs. Skin becomes cold and clammy, and pallor becomes evident. There may be air hunger with cyanosis of the lips and nail beds as a result of tissue hypoxia. As shock deepens, blood pressure continues to fall, and the patient loses consciousness, eventually becoming comatose. Untreated shock is fatal.

Both general and local anesthesia can bring about circulatory collapse. If there is evidence of shock, the patient should be placed in the supine position with the lower extremities elevated to add blood volume to the vital organs. **Patients in cardiogenic shock are placed in Fowler's position to lower the diaphragm and increase oxygenation as long as they do not become too hypotensive.** Pain contributes to the progression of shock; however, administering large doses of narcotics can decrease blood pressure further. Sometimes patients who develop shock also develop disseminated intravascular coagulation, a life-threatening disorder evidenced by bleeding from many sites (see [Chapter 17](#)).

Intravenous fluids and medications are important to prevent and treat shock. Supplemental oxygen is usually given to combat tissue hypoxia and cardiac response. See [Chapter 44](#) for specific treatments for shock.

Malignant Hyperthermia. **Malignant hyperthermia (MH)** is a rare but life-threatening complication of general anesthetic agents, including halothane, isoflurane, enflurane, and succinylcholine. MH occurs from a biochemical reaction in genetically predisposed persons. Signs of MH include high temperature, cardiac dysrhythmia, rigidity of the jaw or other muscles, hypotension, tachypnea, and dark cola-colored urine. A late sign of MH is an extremely high temperature of up to 111.2° F (44° C). Notify the anesthesiologist and surgeon immediately if any of these signs occur. If it is not treated swiftly and effectively, MH is fatal. Dantrolene is the drug of choice to treat this condition. The patient is immediately placed on a hypothermia blanket, ice bags

are applied to the armpits and groin to cool the core of the body, and iced saline IV solutions and cold-solution enemas may be administered (Chapin, 2013).

Promote Psychological Adjustment

When surgery alters physical appearance, the patient may not only be concerned about the ability to perform self-care postoperatively but also may have considerable changes in body image, particularly if there is extensive scarring. If part of an extremity, an organ, or part of a breast has been surgically removed, the necessary psychological adjustment is considerable and takes a long time.

■ Communication

Recovering from Abdominal Surgery

Mrs. Wilson is a 74-year-old woman recovering from abdominal surgery. Although her body language tells her nurse she is experiencing pain, she has denied any need for pain medication since she administered her patient-controlled analgesia dose 3 hours before.

Nurse: "Mrs. Wilson, I would like to see you able to cough more vigorously, move about in bed more, and walk around more frequently. I think that if you would use your pain pump more often, you would be more comfortable doing your exercises and coughing."

Mrs. Wilson: "I'm not that uncomfortable, and those medications always cause problems for me."

Nurse: "Problems?"

Mrs. Wilson: "Yes, I get really constipated."

Nurse: "The doctor has a stool softener ordered for you to help prevent constipation, and by increasing fluids, we should be able to control that. Do you have other problems with the pain medication?"

Mrs. Wilson: "Yes, it makes me light-headed and unsteady on my feet."

Nurse: "If the pain medication makes you light-headed, we can switch you to a different medication, and one of us will stay with you when you are out of bed to see that you do not fall."

Mrs. Wilson: "I'm very afraid of falling, breaking a hip, and adding to my troubles."

Nurse: "By taking the medication and being more comfortable, you'll feel more like doing your exercises. That's how you can help prevent postoperative complications such as pneumonia or blood clots."

Mrs. Wilson: "I certainly don't want pneumonia or a blood clot!"

Nurse: "Moving about more will also increase circulation and help your wound to heal faster."

Mrs. Wilson: "Okay, I'll take the pain medication if it will help me prevent complications."

Assess the patient for signs of ineffective coping, including withdrawn, depressed behavior; less attention to grooming than before; and poor communication efforts. If these signs occur, work with the patient to identify areas of concern and collaborate with other health team members to develop a plan of assistance. Help the patient by encouraging discussion of feelings regarding what has been removed and the effect it might have on the patient's life. Be an active listener; gradually focus the patient on the positives in life rather than on the loss incurred. It helps to refer the patient to a support group of people who have undergone a similar experience and are also learning to cope.

■ Evaluation

Evaluative statements regarding previously stated goals and expected outcomes might include:

- Lungs clear to auscultation; respirations 18
- Pulse 82, BP 136/86, peripheral pulses present
- Pain controlled for 4 hours with analgesia; states pain medication controls pain for about 4 hours
- Incision clean, dry, and without redness
- Patient expresses gladness that periods of pain and malaise will be gone
- No signs of thrombophlebitis or infection

Each nursing care plan is evaluated on whether the individual specific outcomes have been met. Further examples of evaluation are in [Nursing Care Plan 5-1](#).

Nursing Care Plan 5-1

Care of a Patient Who Has Had a Simple Mastectomy

Scenario

Mrs. Talbot, a married 38-year-old woman and the mother of two children ages 16 and 14 years, underwent a simple mastectomy with sentinel node biopsy as treatment for a 4.5-cm malignant tumor.

Problem Statement/Nursing Diagnosis

Altered skin integrity/*Impaired Skin Integrity related to surgical wound*

Supporting Assessment Data

Objective: Right mastectomy; dressing on right chest.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Wound will be free of signs of infection at discharge.	Keep Jackson-Pratt suction functioning properly.	Suction is needed to pull drainage from operative site.	No signs of infection. Incision clean, dry, and without reddening.
Wound will heal completely within 6 weeks.	Note character and amount of drainage; document.	Helps detect excessive bleeding.	Draining small amounts of serosanguineous fluid.
	Reinforce dressing as needed.		No need for dressing reinforcement.
	Assess for excessive bleeding q1hr for 4 hr, then q2hr for first 24 hr.		Small amount of serosanguineous drainage in Jackson-Pratt.
	Assess pulses in arm q2hr to detect excessive swelling in arm.	Swelling in arm can cause nerve damage.	Minimal swelling in arm; pulses are 2+.
	Monitor temperature and white blood cell (WBC) count.	Temperature and WBC count trends will show if infection is developing.	No increase in temperature or WBC count.
	Assess wound for signs of infection with each dressing change.	Sterile dressing helps prevent infection.	Wound clean and dry without signs of infection.
	Change dressing q8-24hr as needed.		Surgeon changed dressing this afternoon. Continue plan.

Problem Statement/Nursing Diagnosis

Incisional pain/*Pain related to surgical incision*

Supporting Assessment Data

Subjective: Complains of incisional pain and discomfort.

Objective: Right mastectomy; rates pain at 4 on pain scale.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Pain will be controlled by analgesia as noted by patient.	Instruct on use of patient-controlled analgesia (PCA).	Knowledge is needed to use PCA effectively.	Using PCA appropriately.
	Assess pain level q3-4hr.	Assessing pain level will show whether pain is adequately controlled.	Pain level consistently below 4.
	Provide comfort measures.	Comfort measures increase effect of analgesia.	Straightened bed; brought warmed blanket.
Pain is controlled by oral analgesia by discharge.	Administer analgesics as ordered.		Continue plan.

Problem Statement/Nursing Diagnosis

Potential for altered gas exchange/*Risk for Impaired Gas Exchange related to inhalation anesthesia*

Supporting Assessment Data

Objective: Had general anesthesia. Restricted mobility.

Subjective: "I don't like using the incentive spirometer. Do I have to cough? It hurts."

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not have atelectasis by end of postoperative day 2.	Have patient use incentive spirometer q1hr while awake.	Incentive spirometer use opens alveoli; decreasing atelectasis.	Using incentive spirometer; barely diminished breath sounds in lung bases.
	Have patient cough q2hr.	Coughing clears secretions from lung irritation caused by anesthesia.	Coughed secretions are clear.
Lung sounds will be clear at discharge.	Auscultate lungs q8hr.	Auscultation determines status of breath sounds.	Lungs clear.
	Encourage ambulation.		Ambulated ×2.
	Monitor temperature, respirations, and oxygen saturation.		Continue plan.

Problem Statement/Nursing Diagnosis

Potential grief/Risk for Grieving related to loss of body part and perception of femininity

Supporting Assessment Data

Objective: Right mastectomy.

Subjective: Expresses concern about husband's reaction to surgery.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize feelings of self-worth and confidence.	Have patient list her strengths and positive attributes.	Focusing on strengths can help counter feelings of loss.	Is patient verbalizing feelings of confidence and self-worth? Not yet.
Patient will discuss sadness over loss of breast.	Encourage sharing of sad feelings and fears with husband.	Talking openly with husband may provide reassurance.	Expressed sadness over breast loss to husband.
	Talk with husband privately about his feelings.	Involvement will show her he still cares for her.	Husband reluctant to speak about the surgery or his feelings so far.
	Involve husband in patient's care.		
	Encourage daughters to discuss their feelings and fears with patient.		Daughters have not been in yet today.
	Encourage independence in patient.	Independence increases self-confidence.	Brushed her teeth. Continue plan.

Critical Thinking Questions

1. You auscultate the patient's lungs the evening after surgery, and sounds are diminished in the bases. What do you think it means?
2. What would you do if the radial pulse in the arm on the same side as the breast surgery becomes weaker and harder to detect?

Discharge Planning

With same-day surgery and early release from the hospital after inpatient surgery, it is vital that discharge planning be started at admission or several days before the surgery. Assess needs for home care. Will the patient need assistance with bathing, meals, or dressing changes? It may be necessary to arrange home health care with an aide to assist with bathing, and with a nurse to assess the patient's condition and provide wound care. Equipment, such as oxygen, suction, or an IV pump, may need to be ordered before discharge so that the transition to home goes smoothly.

Cultural Considerations

Performing Wound Care

Although not overly modest, traditional Chinese people may hesitate in touching their own bodies, so it is important to assess who will perform wound care and change dressings at home. A home health nurse may need to be accessed, or teaching of another family member may be important.

Family or relatives must be included in discharge planning and teaching. Often it is a family member who will do the dressing changes, monitor for side effects of medication, alert the surgeon to signs of complications, and provide general support to the patient during recovery.

When the patient is discharged, review specific instructions regarding care at home, including care of the incision or wound, diet requirements, activity level allowed, medications, and signs and symptoms of complications to report to the health care provider. Make certain the patient understands when to see the provider for follow-up. Send home sufficient supplies of items needed for dressing changes, and tell the patient and family where more items can be obtained. Make every attempt to ensure that the patient does not go home with unanswered questions.

Patient Teaching

Discharge Instructions for a Same-Day Surgery Patient

Diet

- Type of diet and importance of proper nutrition for healing
- Dietary restrictions, if any
- Avoiding alcohol for first 24 hours after anesthesia
- Special dietary recommendations
- Recommended fluid intake

Activity

- Recommended exercise and frequency
- Instructions for special equipment: crutches, walker, cane, splint, etc.
- Schedule for deep breathing, coughing, and leg exercises; how long to continue these activities; splinting the incision when coughing and getting out of bed
- Recommended rest periods
- Activity restrictions (i.e., driving, intercourse, and lifting)
- Application, use, and care of anti-embolism stockings

Wound Care

- Hand hygiene
- Dressing changes and frequency
- Cleansing of wound; irrigations
- Drainage observations
- Signs to report
- Use of heat or cold packs for discomfort
- Supplies and where to obtain them

Temperature Monitoring

- Record time and temperature
- Report temperature greater than 100° F (38° C)

Bathing

- Type of bath
- Frequency

Medications

- Analgesics
- Antibiotics
- Sedatives
- Vitamin supplements
- Other medications

Precautions Related to Anesthesia or Side Effects of Medication

- Caution regarding using machinery
- Caution regarding making decisions for 24 hours
- Drug interactions
- Potential for constipation
- Potential for urinary retention

Signs and Symptoms to Report

- Elevated temperature
- Increasing malaise
- Severe pain or swelling
- Bleeding through bandage

- Decreased sensation below surgical site
- Severe nausea and vomiting
- Failure to urinate within 8 hours

Other

- Scheduled follow-up appointment with the surgeon
- Expectation for return to usual activities
- Expectation for return to feeling normal

Think Critically

An older adult patient who has had a hip replacement and who has chronic lung disease is being discharged home to the care of a 78-year-old spouse. Which health care professionals would you collaborate with to plan appropriate continuing care for the patient?

Community Care

The patient may be given follow-up care at an outpatient clinic, physician's office, subacute care unit, rehabilitation unit, extended-care unit, or at the patient's home. The nurse case manager will coordinate the care of the whole team, collaborating with the social worker, physical therapist, respiratory therapist, nurse's aide, dietitian, pharmacist, physician, and other health care professionals. The nurse assesses the patient's condition and progress, performs treatments and procedures such as wound care, and reinforces teaching about the signs and symptoms of complications. The quality of nursing care delivered postoperatively often is the factor that prevents complications and rehospitalization.

Some surgeons discharge patients who are ambulatory and normally self-sufficient, thinking that patients themselves can do complicated wound care. Most patients need assistance with anything more than a simple dressing change, which is particularly true if the patient lives alone. The nurse must verify that the patient can adequately perform self-care and collaborate with the patient, provider, social worker, and community agencies to secure the assistance the patient needs.

Home Care Considerations

General Points for Home Care for Postsurgical Patients

- Knows about each medication to be taken and when to take it
- Understands the diet, any restrictions, and guidelines for fluid intake
- Understands that alcohol must be avoided for 24 hours after surgery
- Verbalizes restrictions on activity and instructions for use of any special equipment such as crutches, splint, walker, and so forth
- Understands not to drive or make important decisions for 24 hours after anesthesia
- Verbalizes the type of bath permitted and how to protect the wound
- Can demonstrate cleansing and dressing of the wound; verbalizes where to obtain supplies
- Verbalizes signs and symptoms to report to the surgeon
- Understands how to schedule a follow-up appointment with the surgeon
- Understands written instructions for all essential points of care and consultation

Get Ready for the NCLEX® Examination!

Key Points

- Nurses in the recovery unit monitor patients very closely until they are fully aroused from anesthesia.
- Maintaining a patent airway is the highest priority.
- The nurse is vigilant for signs of complications and performs frequent assessments during the postoperative period.
- Nursing interventions are aimed at providing pain control, comfort, and fluid balance; protecting the patient from injury; maintaining vital functions; and preventing infection.
- The nurse tries to prevent or intervene in the many potential complications from surgery.
- Discharge planning begins at admission and covers all areas of basic needs, wound care, and activity restrictions.
- Written instructions regarding all aspects of postoperative care should be sent home with the patient.

Additional Learning Resources

- SG** Go to your Study Guide for additional learning activities to help you master this chapter content.
- Online Resources
 - Postoperative care, www.surgeryencyclopedia.com/Pa-St/Postoperative-Care.html

Review Questions for the NCLEX® Examination

1. When prioritizing safety measures for a postoperative patient in the PACU, the nurse would:
(Place in order of priority.)

1. Observe for urine flow of at least 30 mL per hour.
2. Position the unconscious patient on the side to prevent aspiration
3. Check for a patent airway and the rate and depth of respiration.
4. Check infusing IV fluids for the correct fluid and flow rate.
5. Observe the dressing for any blood saturation.
6. Monitor drains for excessive fluid drainage.

NCLEX Client Need: Physiological Integrity

2. A nurse performing an assessment of a newly postoperative patient notes the following: temperature 104.9° F (40.5° C), BP 90/60, pulse 58, respirations 30, rigidity of the jaw muscles, and dark urine. The priority nursing action would be to:

1. instruct the patient to relax and take deep breaths.
2. notify the surgeon immediately.

3. administer pain medications.
4. give a tepid sponge bath.

NCLEX Client Need: Safe and Effective Care Environment

3. On arrival from the PACU, the patient complains of severe thirst. The nurse finds that the patient is increasingly restless, tachypneic, and tachycardic. Considering the findings, what would the nurse likely suspect?

1. Hypovolemia
2. Cardiogenic shock
3. Normal response to anesthesia
4. Pain medication overdose

NCLEX Client Need: Physiological Integrity

4. The nurse knows that care for the patient having spinal anesthesia differs from that of the patient undergoing general anesthesia in that during recovery: (*Select all that apply.*)

1. the patient will be unresponsive immediately after surgery.
2. muscles in the lower part of the body will be flaccid immediately after surgery.
3. the patient is able to eat immediately upon return to the nursing unit.
4. monitoring for a patent airway is a top priority in the PACU.
5. the patient will be alert upon entry to the PACU.
6. nausea may be a problem during recovery from anesthesia.

NCLEX Client Need: Physiological Integrity

5. The nurse knows that an older adult patient who had open reduction and internal fixation of the right femur is at risk for infection because of the surgical incision and repair and lessened immunity that occurs in older age. A desired result of interventions for this risk would be that the:

1. nurse will monitor changes in temperature and laboratory values during the shift.

2. nurse will teach the signs and symptoms of wound infection before discharge.
3. nurse will teach aseptic techniques to the patient before discharge.
4. patient will not develop a wound infection before discharge.

NCLEX Client Need: Safe and Effective Care Environment

6. To promote wound healing, the nurse instructs the postoperative patient to eat foods high in protein. Which food choice by the patient warrants further patient teaching?

1. Caesar salad with French bread and milk
2. Tuna sandwich, carrot strips, and watermelon chunks
3. Broccoli cheese soup, crackers, and an orange
4. Broiled chicken breast, steamed broccoli, and mashed potatoes

NCLEX Client Need: Physiological Integrity

7. One measure by the nurse to promote early patient ambulation and a return to independence in activities of daily living is to:

1. open cartons and items on the food tray while the patient has an IV infusing.
2. provide a bedside commode for toileting in the initial postoperative period.
3. encourage visitors to play cards or board games with the patient.
4. assist the patient to walk to a chair in front of the sink to bathe areas easily reached.

NCLEX Client Need: Health Promotion and Maintenance

8. While caring for the postoperative patient, the nurse must reinforce which measure(s) to reduce the incidence of complications? (*Select all that apply.*)

1. Use the incentive spirometer every hour while awake.
2. Ambulate the designated distance six times a day.

3. After deep breathing, cough effectively every 4 hours.
4. Turn or change position at least every 2 hours.
5. Assess for pain and provide prompt relief.

NCLEX Client Need: Safe and Effective Care Environment

9. What action(s) by the nurse would be appropriate when caring for a postoperative patient with a Jackson-Pratt wound drain? (*Select all that apply.*)

1. Assess the wound drain for patency.
2. Measure amount of drainage.
3. Compress the bulb to reestablish pressure.
4. Rinse the bulb with sterile water after emptying.
5. Notify the surgeon when there is no drainage.

NCLEX Client Need: Physiological Integrity

10. The patient is prescribed anti-embolism stockings before discharge. The patient asks the nurse, "Why do I need these stockings?" The best response would be:

1. "Your surgeon ordered these stockings."
2. "These help prevent formation of clots in the legs."
3. "These massage your legs to make you feel better."
4. "You sound upset. Do these stockings bother you?"

NCLEX Client Need: Health Promotion and Maintenance

11. Which patient statement to the nurse indicates a need for further teaching regarding the use of a patient-controlled analgesia (PCA) pump?

1. "I control my pain medication by pressing the button."
2. "To a certain extent, I control the amount of pain medication I can have."
3. "I need to tell the nurse if the pain is not controlled well."

4. "I need to call the nurse when I need pain medication."

NCLEX Client Need: Physiological Integrity

12. A 38-year-old woman who has undergone bilateral radical mastectomy is withdrawn and quiet. She is afebrile with no apparent complaints of pain. Her dressings are dry and intact. Pulses are full on both upper extremities. Considering the data, the major problem at this time would be:

1. Pain in the surgical area.
2. Potential surgical site infection
3. Distress over loss of her breasts.
4. Concern about her children at home.

NCLEX Client Need: Psychosocial Integrity

13. After a surgical procedure, a priority point for the nurse to emphasize to the patient when performing discharge teaching for self-care is:

1. eating sufficient protein and vitamin C to promote healing.
2. always washing the hands before starting a dressing change.
3. ambulating on a set schedule each day, extending the distance a little.
4. obtaining at least 8 hours of sleep each night.

NCLEX Client Need: Health Promotion and Maintenance

Critical Thinking Questions

Scenario A

Ms. Simpson just had a colon resection for a tumor, and you are assisting with her care in the PACU. She is waking up but is still groggy and her breathing is somewhat shallow. She has a large dressing on the left side of the abdomen.

1. What would you do to improve her respiratory status?
2. Describe the method used to ensure an open airway.

Scenario B

You are assigned to care for a 37-year-old man who just had a same-day surgical repair of a ventral hernia with spinal anesthesia.

1. How does the care of this patient differ from that of a patient who had inhalation or general anesthesia?

2. If this patient has difficulty voiding after surgery, how could you assist him?
3. If he develops a spinal headache, what measures could be taken to decrease his discomfort?

Scenario C

Mrs. Saunders is a 58-year-old woman who underwent an abdominal hysterectomy and exploration for cancer of the uterus. She returned to the nursing unit from surgery 1 hour ago and has an IV infusion running into the right forearm. Her BP has gradually fallen from 138/88 to 102/62. She is restless, complains of thirst, and is anxious.

1. What assessments would you make?
2. What actions would you take? In what order would you perform these actions?

Scenario D

Mr. Jackson is a 68-year-old man with a history of asthma and frequent respiratory infections. He is recovering from chest surgery.

1. What are his increased risks from hypostatic pneumonia?
2. What nursing actions would you implement to help prevent this complication?
3. What signs and symptoms would indicate that he might have hypostatic pneumonia?

CHAPTER 6

Infection Prevention and Control

Trena Rich

Objectives

Theory

1. Examine the factors that increase the risk of infection.
2. Discuss how the body uses its natural defensive mechanisms to protect against infection.
3. Explain how fever plays a role in the prevention of infection.
4. Describe the classic signs of infection.
5. Distinguish situations that require the use of Transmission-Based Precautions.
6. List the types of personal protective equipment and analyze situations for whether they should be used.
7. Describe factors that make older adults more susceptible to infections.
8. Analyze factors that may impair the process of healing and repair of damaged tissue.

Clinical Practice

9. Care for a patient whose condition requires Transmission-Based Precautions.
10. From a day's patient assignment, determine the risk factors for infection for each patient.

KEY TERMS

acquired (äk-KWÍ-ĕrd, p. 103)

agent (Ä-gént, p. 99)

communicable (kō-MŪ-ní-kă-būl, p. 99)

disease (dī-ZĒZ, p. 99)

exudate (ĚKS-ū-dāt, p. 104)

hand hygiene (HĪ-gēn, p. 107)

health care-associated infection (HAI) (in-FĚK-shūn, p. 112)

host (hōst, p. 99)

iatrogenic (i-ăh-trō-JĚN-ĭc, p. 113)

immunity (i-MŪ-ní-tē, p. 103)

infection (in-FĚK-shūn, p. 99)

inflammation (in-flă-MĀ-shūn, p. 104)

innate (p. 103)

macrophages (MĂK-rō-făj-ěz, p. 104)

multidrug-resistant organism (MDRO) (MÜL-ti-drug rē-ZĬS-těnt ŌR-găñ-iz-ěm, p. 116)

normal flora (NŌR-măl FLŌR-ă, p. 99)
pathogen (PĀTH-ō-gĕn, p. 101)
personal protective equipment (PPE) (PĚR-sün-ūl prō-TĚK-shün ē-KWĬP-měnt, p. 108)
phagocytosis (făg-ō-sī-TŌ-sĭs, p. 101)
sepsis (SĒP-sĭs, p. 115)
shedding (shĕd-ĭng, p. 99)
Standard Precautions (STĀN-děrd prě-KĂW-shŭnz, p. 108)
susceptible (sŭs-SĒP-tĭ-bŭl, p. 99)
Transmission-Based Precautions (p. 108)
vectors (VĚK-tĕrz, p. 107)

The Infectious Process and Disease

Normal flora (microorganisms that normally exist in the body and provide natural immunity against certain infections) are most often found on or in body systems that have some form of contact with the outside environment ([Table 6-1](#)). Normal flora prevents the most harmful microorganisms from colonizing the body. Understanding how the body defends itself against infection, and how to prevent further exposure to **pathogenic** (disease-producing) microorganisms, is crucial to provide safe and effective nursing care.

Table 6-1

Normal Flora of the Body*

SITE	NORMAL FLORA
Eye	<i>Corynebacterium</i> species <i>Neisseria</i> species <i>Staphylococcus aureus</i> <i>Staphylococcus epidermidis</i> <i>Streptococcus</i> species
Upper respiratory tract (nose, mouth, throat)	<i>Corynebacterium</i> species <i>Enterobacter</i> species <i>Haemophilus</i> species <i>Klebsiella</i> species <i>Lactobacillus</i> species <i>Neisseria</i> species <i>Staphylococcus</i> species <i>Streptococcus viridans</i> Various types of anaerobes
Skin	<i>Corynebacterium</i> species <i>Staphylococcus aureus</i> <i>Staphylococcus epidermidis</i> <i>Streptococcus</i> species Yeasts such as <i>Candida</i> and <i>Pityrosporum</i>
Small bowel and colon	<i>Bacteroides</i> species <i>Clostridium perfringens</i> <i>Enterobacter</i> species (i.e., coliform) <i>Escherichia coli</i> <i>Streptococcus faecalis</i>
Vagina	<i>Corynebacterium</i> species <i>Klebsiella</i> species <i>Lactobacillus</i> species <i>Proteus</i> species <i>Pseudomonas</i> species <i>Staphylococcus</i> species <i>Streptococcus</i> species

*The central nervous system, lower respiratory tract, and upper and lower urinary tracts are normally sterile. This table lists only those organisms most commonly found in the various body systems. They can also cause illness or infection if they are able to invade another system within the body.

Modified from deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2014, Saunders.

An **infection** is the presence and growth of pathogenic microorganisms, in a **susceptible** (lacking resistance) host, to the extent that tissue damage occurs. Infection can be **communicable** (passed from one person to another directly, through touch, or indirectly, by using a contaminated object) or noncommunicable. **Disease** is one possible outcome of an infection. Once an infection has occurred, the person is considered communicable until the organism is no longer **shedding** (to lose by natural process) from the body. This period of communicability varies by the type of pathogen involved and the host's ability to fight off the infecting **agent** (any substance capable of producing an effect, whether physical, chemical, or biologic). Bacteria, for example, after entering the body, must find a way to attach to a **host** (an organism in which another, usually parasitic, organism is nourished and harbored) cell to multiply. Once the organisms have found a place to multiply, they can then spread through the body via the circulatory or lymphatic system. **The development of an infection is dependent on the interrelationship among the host, the agent, and the environment.**

Factors That Influence Infectious Disease

Many factors concerning the host determine the type of response the body will have to an invading pathogen. **Risk** of exposure is influenced by the lifestyle, occupation, and socioeconomic status of the host. The underlying disease state, as well as the immunologic and nutritional status of the host, influences the **degree** of resistance or susceptibility the body will have to the pathogen.

Environmental factors can also increase the likelihood of developing an infection ([Figure 6-1](#)). Other factors that influence infection or disease are listed in [Box 6-1](#).

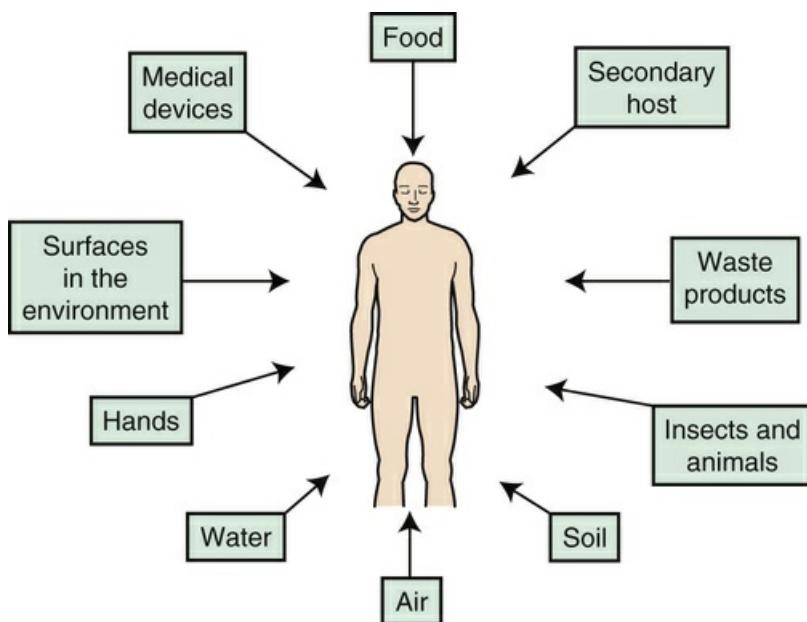


FIGURE 6-1 The environment and the spread of infection. (Redrawn from Sattar SA, Springthorpe VS. In Rutala WA (Ed.): *Disinfection, sterilization and antisepsis*. Washington, DC, 2010, Association for Professionals in Infection Control and Epidemiology.)

Box 6-1

Factors That Influence Infection and Disease

Host

Intrinsic (genetic predisposition [born with it])

- Age, sex, race
- Chronic diseases (e.g., diabetes mellitus)

Extrinsic (environmental)

- Personal behaviors (e.g., drugs, alcohol, hygiene, sexual practices)
- Occupation
- Socioeconomic status

Agent

Virulence: Dosage and duration of exposure to the infecting agent(s)

Biologic: Bacterial, fungal, viral, protozoal microbes can be involved

Chemical: Organic and inorganic, pesticides, pharmaceuticals

Physical: Ionizing radiation, cold, heat, electricity, noise

Environment*

Coexisting chronic disease (e.g., hypertension, diabetes mellitus)

Overcrowded living environment (e.g., dormitory or prison setting)

Travel to country with endemic diseases (e.g., tuberculosis)

Vectors (e.g., mosquitoes, flies, ticks, fleas)

*Environment includes not only the body, but also where an individual lives and works.

Data from Mandell GL, Bennett JE, Dolin R (Eds.): *Mandell, Douglas, and Bennett's principles and practice of infectious disease*, ed. 7, Philadelphia, 2009, Saunders; Arias KM: *Quick reference to outbreak investigation prevention and control in health care settings, critical issues in patient safety*, ed. 2, Boston, 2010, Jones & Bartlett; Brachman PS, Abrutyn E: *Bacterial infections of humans: Epidemiology and control*, ed. 4, New York, 2009, Springer.

Disease-Producing Pathogens

Any microorganism capable of producing disease is known as a **pathogen**. Once pathogens have entered the body, many are able to adapt to their new environment, enhancing survival and increasing their likelihood of causing illness or disease. Pathogens can be transmitted from one person to another through one of three routes: **airborne**, **contact**, or **droplet**. Hand hygiene is the primary way to prevent the spread or transmission of pathogenic microorganisms. Following respiratory etiquette by covering your cough or sneeze and performing hand hygiene afterward help prevent the spread of infection.

Categories of Microorganisms

Nine categories of microorganisms are known to cause infection in humans: bacteria, viruses, protozoa, Rickettsia, Chlamydia, fungi, mycoplasmas, helminths, and prions.

Bacteria.

Bacteria are classified into three major categories according to their shape, gram-staining properties, and requirements for oxygen. Round or spherical bacteria are referred to as *cocci*, rod-shaped bacteria are referred to as *bacilli*, and spiral or corkscrew-shaped bacteria are called *spirochetes*. Some bacteria grow in chains (streptococci), some grow in pairs (diplococci), and some grow in clusters (staphylococci).

Bacteria that require oxygen to live and reproduce are **aerobic**; those that cannot tolerate the presence of oxygen are **anaerobic**. When bacteria enter the body, they trigger the immune system to produce **antibodies** (proteins that fight and destroy antigens). Some bacteria produce poisonous substances called **endotoxins** (toxins that are found within the bacteria and are released when the cell breaks apart); others produce **exotoxins** (excreted by both gram-negative and gram-positive bacteria).

Different bacteria thrive under different environmental conditions. Some form **spores** (a protective covering over the original cell) to protect themselves against destruction from heat, cold, lack of water, toxic chemicals, and radiation. Examples of spore-forming infectious diseases are anthrax and botulism. Other bacteria thrive best in water, such as *Pseudomonas* species or *Legionella*. The bacterium that causes tuberculosis can survive for years in many environments. Some bacteria, such as *Staphylococcus aureus*, can survive in very high temperatures.

Different methods can prevent infection and its spread. A physiologic response can stimulate the immune system to produce a fever and trigger the body's immune response to destroy the invading pathogenic microorganism through **phagocytosis** (ingestion and digestion of bacteria). Cleaning, sterilizing, or boiling inanimate objects, such as a glass or surgical instruments, can prevent the spread of infection after the items are used by or on a patient. The correct antimicrobial agent must be given and the entire dose regimen completed as prescribed to prevent the risk for developing infection with a multidrug-resistant organism (MDRO).

Viruses.

Viruses are not cells. They do not have cell walls and do not reproduce like other microbes. They cannot be treated with antibiotics or antifungals. They are composed of either deoxyribonucleic acid (DNA) or ribonucleic acid (RNA); have an outside coating made of protein; and are dependent on the cell they have invaded to survive and reproduce. Some viruses use the cytoplasm from the cell they have attacked to develop an "envelope" that makes it harder for the body's immune system to

destroy them. Viruses have the ability to keep changing their protein markers, called *antigens*, making it difficult for the virus to be neutralized or killed by white blood cells (WBCs). Once viruses have established themselves in the body, they can trigger an immune response that is harmful to the cells. They can also damage cells by preventing protein synthesis from occurring. New viral elements can be released into the circulation either by the virus breaking down the wall of the cell it has invaded and releasing copies of its genetic material or from small offshoots that have burst, thereby infecting other cells.

Viruses are classified as one of three types: (1) latent, which can reside in the body for years without producing symptoms and then suddenly cause an acute flare-up of symptoms (e.g., herpes simplex); (2) **oncogenic** (cancer causing), which have the ability to alter the cell walls to the point where the cells become malignant; and (3) active, which enter the body, invade a number of cells, and infect the body (e.g., influenza and severe acute respiratory syndrome, which are discussed in [Chapter 14](#)).

Viruses and bacteria vary in their resistance to destruction by chemical disinfectants, but most are easily inactivated or destroyed by heat. However, some of the hepatitis viruses must be boiled as long as 30 minutes at a temperature at or above 185° F before they can be considered nonpathogenic. It is important to note that antibiotics do not help fight a viral infection, but antiviral agents, such as acyclovir, can help limit the virulence of a viral infection if taken at the first signs of illness.

Protozoa.

Protozoa are one-celled parasitic organisms that have the ability to move. There are four main types, named by their method of travel within their environment. They are called amoebas, ciliates, flagellates, or sporozoa. These microorganisms are typically found in water and soil. Many protozoa species have the ability to lie dormant. Although thousands of species exist, only a few are pathogenic to humans. To cause disease, some protozoans have to be ingested, whereas others are introduced into the body through the bite of a vector (a carrier), such as a mosquito.

Rickettsia and Chlamydia.

Rickettsia are small, round or rod-shaped bacteria that are often transmitted by the bites of body lice, ticks, and fleas. Chlamydia is also a bacterium and is typically transmitted via close contact, especially sexual. Both are dependent on a living host.

Fungi.

Fungi are very small, primitive organisms that grow on living plants, animals, and other decaying organic material. They thrive in warm, moist environments. Fungal infections in humans are called *mycoses* and are classified into three main types: (1) cutaneous mycoses, which grow in the outer layer of the skin; (2) subcutaneous mycoses, which involve the deeper layers of the skin, subcutaneous tissues, and sometimes bone; and (3) systemic or deep mycoses, involving internal organs.

Fungal infections are difficult to eradicate once they have invaded a host, because fungi tend to form spores that are resistant to ordinary antimicrobial agents. Antifungal agents can be given topically or systemically but can be toxic to the liver and the nervous system; therefore the course of treatment must be carried out cautiously and over a long period.

Fungal infections commonly found in immune-competent hosts include coccidioidomycosis (caused by *Coccidioides immitis*), histoplasmosis (caused by *Histoplasma capsulatum*), and blastomycosis (caused by *Blastomyces dermatitidis*). They are all systemic mycoses caused by inhalation of airborne spores. Once in the lung, the spores take root and then can spread to any part of the body. However, most fungal infections are self-limited and do not cause clinical disease.

Opportunistic fungal infections (infections that occur in a person with a depressed immune system) are more typically found in patients who have some form of immune compromise and typically include species from *Candida*, *Cryptococcus* (can infect any organ in the body, including the brain and the meninges), and *Aspergillus* (found in soil, dust, and decomposing organic material).

Mycoplasmas.

Mycoplasmas, once believed to be a virus, are very small organisms that do not have a cell wall. They are more like an extracellular parasite because they attach themselves to epithelial cells that line the body cavities and outer surfaces, such as the skin. They tend to be slow growing. For example, *Mycoplasma pneumoniae* can take up to 3 weeks to incubate before signs or symptoms begin to appear.

Other Infectious Agents

Helminths.

Helminths are worms (round, flat, or hooklike) and flukes. All are parasitic and are typically spread via the fecal–oral route. Pinworms are most commonly found in children and cause significant itching in the perianal area because the eggs are laid outside the rectum. Flatworms, such as a tapeworm, can grow up to 50 feet long and live in the intestines. Hookworm and fluke infestations can easily penetrate the skin, are found in the blood, and invade organs such as the liver and lungs. Flatworms and flukes can cause significant weight loss and debilitation.

Prions.

Although quite rare (one case per 1 million), prions are usually spread through eating meat, especially brain tissue, that has been infected or, in even rarer cases, through corneal transplantation from a donor who had a prion infection (Centers for Disease Control and Prevention, 2014). Prions are extremely resistant to the typical methods used for killing most viruses, bacteria, and fungi. These organisms require a type of special cleaning and sterilization that can be especially hard on surgical instruments.

The Body's Defense Against Infection

The four primary lines of defense the body has against infection are (1) the skin, (2) normal flora, (3) the inflammatory response, and (4) the immune response.

Think Critically

In the work environment, where do you think you are most likely to come in contact with pathogens that might cause infection? What precautions can you take to prevent or decrease your risk of exposure?

Skin

Mechanical and Chemical Barriers to Infection

Mechanical barriers.

Mechanical barriers are intact skin and mucous membranes. They are the primary defense the body has against invading microorganisms and infection. Skin, being the largest organ of the body, serves as a first line of defense against harmful agents in the environment. It functions as a protective covering for the more delicate and vulnerable underlying tissues and organs.

The portals of exit and entry provide the means by which pathogens move in and out of the body. For example, pathogens typically exit or enter the body where the skin and mucous membranes meet, such as through the mouth, nose, and gastrointestinal or genitourinary tracts, as well as through a cut in the skin.

Chemical barriers.

Chemical barriers assist the skin and mucous membranes in fighting off invasive organisms by the secretion of tears, saliva, and mucus. Lactic and fatty acids, which inhibit the growth of bacteria, are excreted via sweat and the sebaceous glands. Secretions from the mucous membranes lining the respiratory, gastrointestinal, and reproductive tracts contain an abundance of a bactericidal enzyme called *lysozyme*. This same enzyme is found in tears and saliva. Stomach acid and digestive enzymes kill off most swallowed microorganisms. Mucus produced by the respiratory tract helps capture a variety of inhaled particles. *Cilia* (tiny hairs), which line the respiratory tract, trap organisms and debris and then propel them up and out of the body with a wavelike action.

Think Critically

What effect might medications such as esomeprazole (Nexium) and omeprazole (Prilosec), which are proton pump inhibitors and reduce stomach acid, have on a person's general health? How will this affect a patient's ability to fight off pathogenic microorganisms that may be swallowed?

Protective and Defensive Mechanisms Against Infection

Our bodies have two forms of **immunity** (the body's ability to be unaffected by a particular disease or condition) against infections. They are **innate** (born with, or natural) and **acquired** (develops throughout life) (Box 6-2). See Chapter 10 for more detail. When the body's defense mechanisms are stressed or exhausted, it is more susceptible to infection. Heredity, the degree of natural resistance, and one's own immune status are the greatest determinants of infection, but personal habits and behaviors are also factors to consider. General health, state of nutrition, hormone balance, immune status, and the presence of a chronic disease, such as diabetes mellitus, may influence the degree of susceptibility a person may have to infection.

Box 6-2

Innate and Acquired Immunity

Innate Immunity

- The body senses the presence of pathogenic microorganisms
- Genetic predisposition to respond to invasion in a specific way
- Responds rapidly to invasion of pathogenic microorganisms
- Elements consist of antibodies, phagocytes, natural killer cells, and mast cells

Acquired Immunity

- Cellular and humoral immunity are activated through T-cell and B-cell receptors
- Genetic rearrangement occurs throughout life
- Develops slowly once the body has been initially invaded
- Provides the body with protection with each subsequent exposure to the same pathogens
- Is the basic component for immunity induced via vaccination
- Elements consist of antibodies and cytotoxic and helper T cells

Adapted from Munford RS: Sepsis. In Mandell GL, Bennett JE, Dolin R (Eds.): *Mandell, Douglas, and Bennett's principles and practice of infectious disease*, ed. 7, Philadelphia, 2009, Saunders.

Fever.

Fever is one of the primary mechanisms the body has to prevent infection from an invading microorganism. Once the immune system has determined that an invasion is being attempted, it signals the hypothalamus in the brain to raise the body temperature to fight off the infection. The increased metabolic and oxygen demand at the cellular level that results from the increased body temperature causes an increased heart and respiratory rate. Shivering occurs to increase the core body temperature, but the surrounding environment feels cooler than the new core body temperature, and the patient may complain of "freezing to death." It is at this point in the inflammatory response that fever is noticeably increased. In an attempt to decrease the body's temperature through evaporation, **diaphoresis** (sweating) occurs, and the patient may not want to be covered by a blanket or sheet. This increased heat in the body creates a hostile environment to the microorganisms, and an intact immune system is able to destroy them efficiently. Once the threat of infection is no longer present, the immune system again signals the hypothalamus, and the body is able to start cooling down on its own.

Think Critically

A patient asks you to explain what causes a person to have an increased temperature. Would the age of the patient be a factor you should consider in your teaching?

Nutrition.

Poor nutrition predisposes a person to develop an infection, because the body may not have sufficient protein stores to generate enough antibodies to help fight off an infection. The very young and older adults have less-efficient immune systems, which is why it is important to ensure that these age groups have received the appropriate vaccinations and immunizations. Excessive stress also influences a person's immune status. Stress can increase blood cortisol levels, which will decrease the anti-inflammatory response of the body.

Older Adult Care Points

Many older adults do not have sufficient protein in their diet because of monetary concerns or because of physical limitations that interfere with their ability to prepare a proper meal. Referral to

a home delivery meal program may help increase dietary intake of protein and other essential nutrients to help fight off infection.

Antigens.

An antigen is a form of protein found on the outside of cells that allows the body to identify it as “self” (native) or “nonself” (foreign). Antigens can stimulate the immune response to wipe out microorganisms.

Antibodies.

Antibodies, also known as immune globulins (Ig), are one part of acquired immunity. They have many functions, such as neutralizing toxins and killing invading pathogens. There are five types of antibodies: IgM, IgG, IgA, IgE, and IgD ([Table 6-2](#)). IgE has the ability to bind to mast cells and basophils and to release histamine and heparin. This in turn stimulates a hypersensitive reaction, as seen in bronchial asthma or systemic anaphylaxis.

Table 6-2
Types of Antibodies

ANTIBODY	DESCRIPTION
IgM	<ul style="list-style-type: none">Appears first if the body is exposed to an antigenBinds to the antigen and works to clear the pathogen from the body
IgG	<ul style="list-style-type: none">Most abundant immune globulin found in the bodyCrosses the placental barrier, reaching the developing fetusProvides passive immunity until the fetus's own immune system can defend itself
IgA	<ul style="list-style-type: none">Found in tears, mucus, saliva, gastric fluid, colostrum, and sweatPrevents pathogens from attaching to or penetrating epithelial cells, such as the skin
IgE	<ul style="list-style-type: none">Binds to mast cells and basophils and releases histamine and heparinStimulates a hypersensitive reaction, as seen in bronchial asthma or systemic anaphylaxis
IgD	<ul style="list-style-type: none">Works together with IgMAmong other functions, stimulates certain cells in the immune system; overall role in the immune response is unclear

Bone marrow.

The bone marrow is a major component in the body's defense system. Bone marrow plays an important role in the manufacturing of blood products that help the body defend itself against infection. These products are called *leukocytes*, *neutrophils*, *macrophages*, and *lymphocytes*.

Leukocytosis.

Leukocytosis is an increased number of **leukocytes** (white blood cells), usually seen at the beginning of an infection when the person's immune system has not been overly stressed. Leukocytosis is seen more often with bacterial than viral infections. When infection does occur, the bone marrow is stimulated to produce and release more leukocytes to help the body fight infection.

Phagocytosis.

The process of **phagocytosis** is a form of innate immunity. This is the body's first line of defense at the cellular level. Within the first few hours of the onset of the inflammatory process, the monocytes swell up (becoming macrophages) and migrate to the site of inflammation. Neutrophils, which are a type of leukocyte, are also released and have the ability to kill both aerobic and anaerobic organisms. After the macrophages and neutrophils engulf and destroy bacteria and other foreign matter, they die, producing an **exudate** (discharge) that is composed of tissue, fluid, dead cells, and their by-products. This exudate, usually yellow or green in color, is commonly known as *pus* and is a sign of infection.

Macrophages.

Macrophages are *monocytes* (large leukocytes) that have left the bloodstream and have migrated into the tissues. They ingest and destroy pathogens and clear away the cellular debris and dead neutrophils in the latter stages of an infection. Macrophages cleanse the lymphatic fluid as it passes through the lymph nodes and perform a similar action on the blood as it passes through the liver and spleen.

Liver cells.

As part of the innate immune system, about 50% of all macrophage cells can be found in the liver's Kupffer cells. These macrophages act either to prevent invasion by pathogens mechanically or to neutralize the pathogen chemically (through the pH of body secretions). Macrophages also destroy bacteria that have found their way into the blood circulation through the liver's portal system. The body's defense mechanisms against pathogens are summarized in [Table 6-3](#).

Table 6-3
The Body's Mechanism of Defense Against Infection

MECHANISM	FACTORS INVOLVED IN PROTECTION
Innate (natural) immunity	Determined by age, ethnicity, and genetics. Increases resistance to disease.
Antibody-mediated (humoral) immune response (antigen-antibody; B lymphocytes)	Antibodies are produced against invading pathogens and inactivate or destroy them.
Cell-mediated immune response (T lymphocytes)	Sensitized T cells kill or inactivate antigens by chemical release or secretion of substances that destroy the antigen.
Inflammation	Cells damaged by pathogens release enzymes, and leukocytes are attracted to the area; the damaged area is "walled off," and phagocytosis disposes of the microorganisms and dead tissue.
Phagocytosis by white blood cells	Leukocytes, neutrophils, and macrophages (large monocytes) engulf, ingest, kill, and dispose of invading microorganisms.
Fever	Fever may not always occur with an infection, especially with immunocompromised or debilitated patients or patients who have been on long-term corticosteroid therapy. Surface blood vessels constrict, which leads to shivering to hold heat in the body (to kill the invading organisms). Increases metabolic rate, which can be problematic for patients with cardiorespiratory problems because of increased workload on the heart/circulatory system. Fever stops once the anti-inflammatory agents have helped to restore homeostasis.
Normal flora	Present on skin and in mucous membranes of oral cavity, gastrointestinal tract, and vagina. Helps prevent excessive growth of pathogens.
Intact skin	Skin is the first defense; slightly acid pH and normal flora present an unfavorable environment for colonization of pathogens.
Mucous membranes	Mucous membranes, with their mucociliary action, provide mechanical protection against invasion of pathogens. Mucus secretions contain enzymes that inhibit many microorganisms. The respiratory system clears about 90% of introduced pathogens.
Gastrointestinal tract	Peristaltic action empties the gastrointestinal tract of pathogenic organisms. Acidic pH of stomach secretions, bile, pancreatic enzymes, and mucus protects against invasion by harmful pathogens.
Genitourinary tract	Flushing of urine through the system washes out microorganisms. The acidic pH of urine helps maintain a sterile environment in the system.

Normal Flora

The flora that is normally present on the skin and in the mucous membranes, gastrointestinal tract, and vagina coexists with the body and controls the growth of harmful pathogens. When the amount of the normal flora is diminished, other pathogens may cause infection. When the body's immune system is suppressed for any reason, normal flora may grow out of control and cause infection. For example, *Candida albicans* commonly causes a yeast infection (thrush) after treatment with antibiotics, because the normal flora has been destroyed, allowing the *Candida* to flourish. [Table 6-4](#) shows changes in the natural defense mechanisms that occur with age and cause older adults to become more susceptible to infection.

Table 6-4
Changes in Natural Defense Mechanisms That Occur With Age

CHANGE	CONSEQUENCE
Decreased skin turgor and greater skin friability	Skin is more susceptible to friction damage and tearing.
Decreased elasticity and atherosclerosis of peripheral vessels	Decreased blood flow to extremities produces slower wound healing.
Calcification of heart valves	Provides a location for bacteria to attach and cause endocarditis.
Stiffness of thorax from arthritis or aging changes, weakened respiratory muscles, decreased ciliary action from smoking or exposure to air pollution	Decreased ability to maintain good oxygenation leads to less respiratory reserve; a greater tendency to retain secretions occurs because cilia cannot move foreign substances and secretions as easily; cough reflex and effort are diminished.
Decreased gastrointestinal tract motility as muscles weaken; decreased acid production	Acid is insufficient to inhibit growth of pathogens; decreased motility allows organisms to remain in the gastrointestinal tract and multiply.
Prostate changes, bladder prolapse, and urethral strictures	The bladder is not completely emptied at each voiding, which allows for stagnation and provides a medium for growth of pathogens.
Decreased immune response because bone marrow does not produce new blood cells as rapidly	Mobilization of body defenses to fight infection and heal wounds is slower.

The Inflammatory Response

Inflammation is an immediate, localized, protective response of the body to any kind of injury or damage to its cells or tissues. It is considered to be the second line of defense to infection at the cellular level ([Figure 6-2](#)). Three basic purposes of the inflammatory response are to (1) neutralize and destroy harmful agents, (2) limit their spread to other tissues in the body by walling off the organisms, and (3) prepare the damaged tissues for repair.

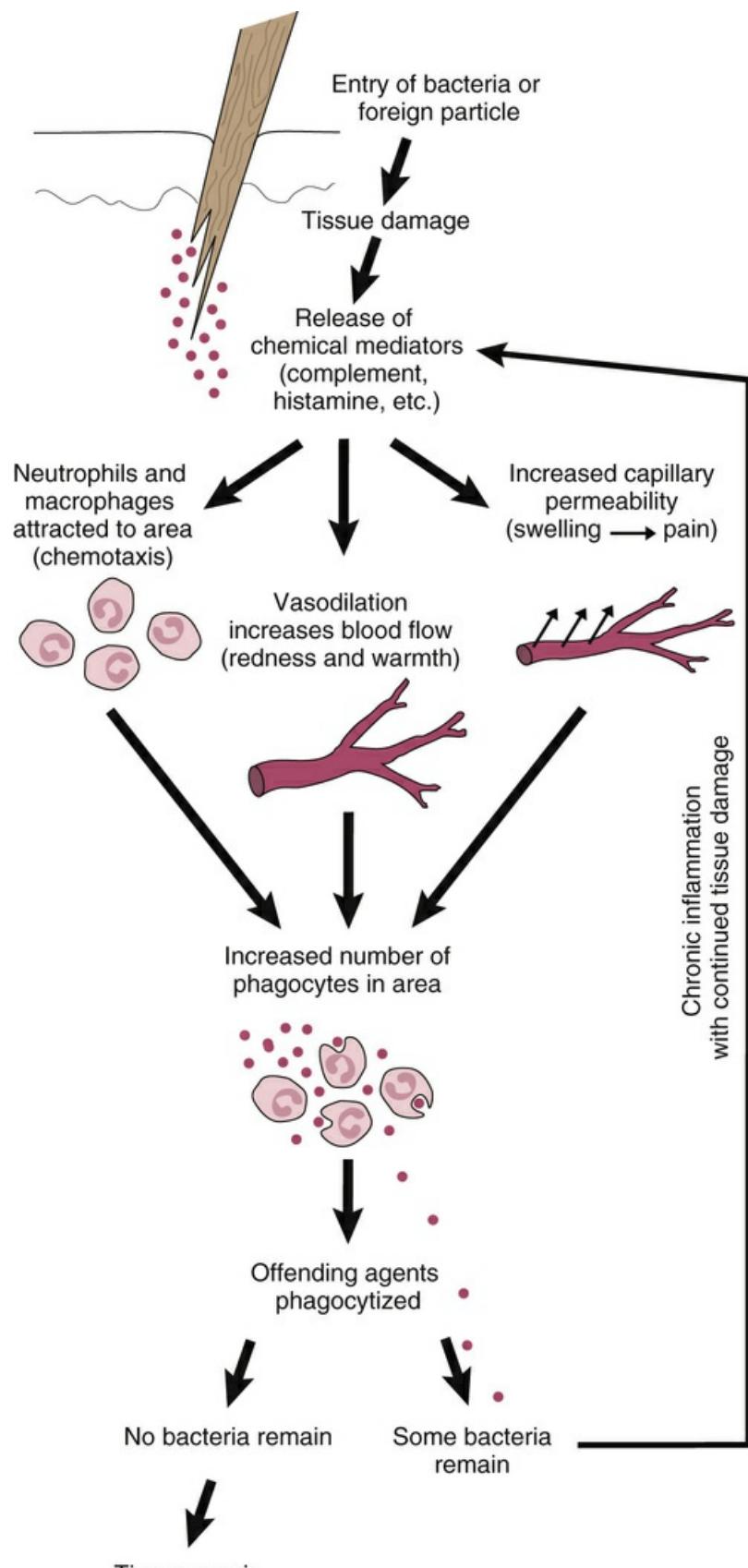


FIGURE 6-2 Steps in the inflammatory process. (From Applegate E: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2010, Saunders.)

Inflammatory Changes

Changes that are part of the inflammatory response can occur locally, at the site of injury, and systemically. These changes involve (1) the cells of the damaged tissues and adjacent connective tissues; (2) the blood vessels in and near the site of injury; (3) the blood cells, particularly the leukocytes; (4) the macrophages and phagocyte activity; (5) the immune system; and (6) the hormonal system. An inadequate inflammatory response may cause active, systemic infection.

Clinical Cues

The five local signs and symptoms of inflammation are heat, redness, swelling, pain, and limitation or loss of function.

Signs and Symptoms of Inflammation

Local reactions.

Redness and **heat** are caused by the increased blood flow to the affected area. **Swelling** is the result of the increased permeability of the capillaries and the leakage of fluid from the blood into the tissue spaces around the cells. Blockage of lymphatic drainage from the site also contributes to the local swelling. **Pain**, the result of irritated nerve endings, is caused by the chemicals released by the defensive cells and the accumulation of fluid in the area.

Systemic reactions.

Systemic reactions to inflammation are familiar to anyone who has had the flu or another generalized infection. Headache, **myalgia** (muscle aches), fever, diaphoresis, chills, **anorexia** (loss of appetite), and **malaise** (weakness) are some of the more common signs and symptoms experienced with a systemic infection. (Note: An inflammatory response can occur in the absence of an infection, such as rheumatoid arthritis or a histamine response triggered by an insect bite.)

Nursing care for patients who have a systemic infection includes providing for a balanced fluid intake and output, pain relief, and temperature control. Measures to ensure adequate nutrition and rest are used. If there is an inadequate inflammatory response to a systemic infection, bacterial infections may spread elsewhere in the body and delay tissue repair and wound healing.

Chemical Release and Vascular Changes

The complement system is a group of proteins that lie dormant in the body until they have been activated through an encounter with a foreign substance. The activation of these proteins enhances phagocytosis and the inflammatory process. If viral invasion has occurred, the chemical **interferon** is released to protect the cells against further viral invasion. As soon as damage occurs, the blood vessels in the injured area briefly constrict and, as histamine and serotonin are released, then dilate so that more blood is brought to the damaged cells. The walls of the capillaries become more **permeable** (i.e., their pores enlarge) so that water, proteins, and defensive cells such as neutrophils and macrophages can seep into the fluid surrounding the damaged cells to remove pathogens through the process of phagocytosis. One of the classic outward signs of inflammation is leakage of fluid into the spaces around the cells, producing a localized swelling, or **edema**. This results in a “walling off” of the area and delays the spread of pathogens, toxins, and other harmful agents to the rest of the body.

The Immune Response

The third line of defense is the immune response, which attempts to defend and protect the body through a series of complex chemical and mechanical activities. These activities involve (1) the detection of entry by foreign agents as soon as they gain access to the body's cells; (2) immediate recognition of the agents as foreign or alien; and (3) the ability to distinguish one kind of foreign agent from another and to “remember” that particular agent if it appears again years later. The specific antibodies and antitoxins produced by the immune response are transported by the circulatory system to the tissue spaces that surround the site of inflammation. They attack the foreign cells and neutralize the toxins those cells produce. The immune response is discussed more

fully in [Chapter 10](#).

Hormonal Response

Some hormones, such as cortisone, have an **anti-inflammatory** action that limits inflammation to the locally damaged tissues. Other hormones, such as aldosterone, are **proinflammatory**, which means that they stimulate the body's protective inflammatory response. Thus the hormones have a regulatory effect on the inflammatory process so that the response is well balanced and provides maximum benefit. Other hormones, such as those excreted by the adrenal glands, can interfere with healing, and in some cases of severe inflammation, the provider may prescribe an anti-inflammatory drug to relieve these symptoms.

The Chain of Infection

For an infectious disease to be spread from one person to another, certain conditions must be met. Infection occurs through a cyclical interrelated process, like links in a chain ([Figure 6-3](#)). Prevention or control of infection is aimed at interrupting the chain of infection. This can include the performance of hand hygiene or the wearing of gloves to protect the hands or a cover gown to protect one's clothing.

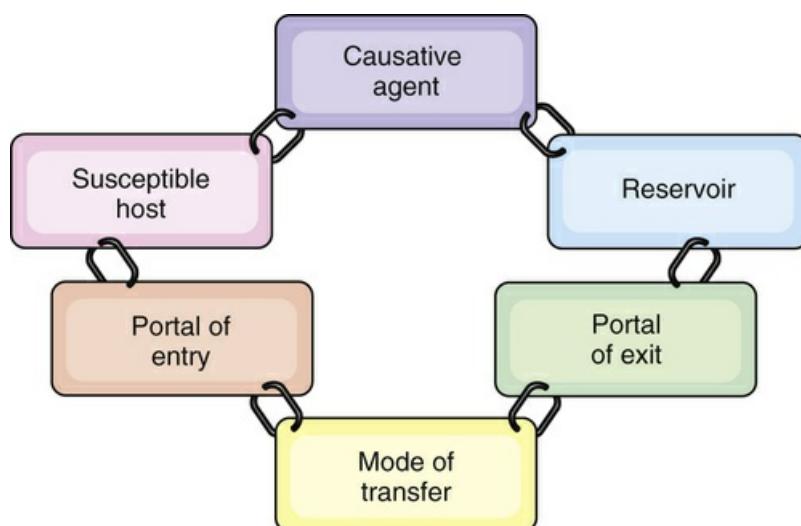


FIGURE 6-3 The cyclical process of infection. Each link of the infection cycle must be present and in the proper sequence to produce disease. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2014, Saunders.)

The mechanism of transmission of a pathogenic agent within the environment or to another person is by either direct or indirect contact. **Vectors** such as mosquitoes, fleas, ticks, and flies can transmit pathogens through their bites or stings. (Refer to [Chapter 14](#) for information on West Nile virus and avian flu, which are spread via a vector [mosquitoes or birds].)

The three most important aspects in the infection chain are the interaction of the agent, the host, and the mode of transmission.

A reservoir is any place a pathogen is normally found ([Box 6-3](#)). The reservoir can be **animate** (living) such as people, animals, and insects, or it can be **inanimate** (nonliving), as found in soil, in water, and on surfaces of objects such as a cup or bed rails. The body can be a reservoir because pathogenic organisms can grow and multiply (**colonize**) on the skin or inside the body without causing a specific immune response or an infection. Infectious agents can also be found in body excretions or secretions such as saliva, sputum, urine, feces, and wound drainage. Individuals who have become colonized with a specific pathogen, such as methicillin-resistant *Staphylococcus aureus* (MRSA) or vancomycin-resistant enterococci (VRE), can be asymptomatic carriers (**reservoirs**) and unknowingly spread the infection to others because they are not aware that they have been exposed and are now colonized with an organism that is known to be multidrug resistant. One of the *Healthy People 2020* objectives is to reduce the incidence of MRSA. In the home or community, contaminated or improperly cooked food, stagnant water, or sewage can also be a source of infection.

Box 6-3**Human Reservoirs****Carrier**

The person has the actual infection but does not show any obvious signs or symptoms; he or she typically does not take precautions to prevent the spread of infection and can transmit it to others.

Colonized

The person can transmit the pathogenic organisms by either direct or indirect contact with inanimate objects or within his or her own environment.

Infectious (Symptomatic)

The person has obvious signs and symptoms of infection; he or she is less likely to spread infection, because precautions are usually taken.

Infection Prevention and Control

Preventing and Controlling the Spread of Infection

Hand Hygiene

Hand hygiene is the primary intervention any health care provider can use to control the spread of infection. Hand hygiene can be performed with soap and water, if hands are visibly soiled, or with an alcohol-based hand sanitizing solution for routine decontamination. It is important to note that hand hygiene must be performed *regardless* of whether gloves were used or not. Artificial fingernails, extenders, or gels are not recommended for health care providers who have direct patient contact, because pathogens can be found beneath the nails.

Clinical Cues

Remove any rings or other forms of jewelry before washing hands with soap and water. Hand hygiene should be performed with an approved soap under warm running water, using friction, for at least 15 to 30 seconds. Ensure that the areas in between fingers and the dorsal and palmar aspects of both hands are thoroughly rubbed.

Precaution Categories for Infection Prevention and Control

Standard Precautions

Standard Precautions were mandated by the Centers for Disease Control and Prevention (CDC) in the 1980s (Box 6-4; also see Appendix B). These precautions are designed to prevent the transmission of microorganisms from one patient to another, as well as to protect the health care worker from unnecessary exposure to infection. Standard Precautions are to be used on all patients because their potential for being colonized, or actually infectious, is not always known. Barrier precautions, such as gloves or isolation techniques that include the proper handling and disposal of secretions, excretions, and exudates, can prevent the transmission of pathogens from one person or object to another. The most current CDC Guidelines and Recommendations related to infection prevention and control in a variety of health care settings can be found at http://www.cdc.gov/HAI/prevent/prevent_pubs.html.

Box 6-4

Standard Precautions

1. Use barrier precautions, such as gloves, gown, face mask, and protective eyewear, to prevent exposure of skin or mucous membranes to a patient's blood, body fluid, or other potentially infectious materials while providing care or assisting with a procedure for your patient.
 - a. Change gloves between contact with one body part and another (e.g., respiratory and urinary).
 - b. Discard used gloves in the appropriate waste container; do not wash or reuse them.
 - c. Perform hand hygiene immediately after removing gloves.
2. Prevent injury by needle stick or cuts from sharp instruments.
 - a. Be cautious and attentive any time you are handling a needle or

- sharp instrument.
- b. Do not recap a used needle by hand; scoop the cap onto the needle on a flat surface or deploy the safety device attached to the needle.
 - c. Immediately dispose of a used needle or other sharp instrument in the puncture-resistant container provided for that purpose in the room.
 - d. Replace puncture-resistant containers when they are three-quarters full and as needed; do not attempt to push needles into a container that is too full.
3. Prevent possible self-contamination or exposure through broken skin.
- a. If you have open lesions or weeping dermatitis, do not give direct patient care or handle patient care equipment until the condition has resolved.
4. Prevent possible self-contamination during cardiopulmonary resuscitation.
- a. Use a disposable mouthpiece or resuscitation bag for emergency mouth-to-mouth breathing.
 - b. Wear the appropriate personal protective equipment (PPE) whenever possible.

Transmission-Based Precautions

Transmission-Based Precautions incorporate Standard Precaution techniques with additional protective actions specific to the organism and location involved. These safety measures should be implemented for patients with a suspected or confirmed infection or who are known to be colonized with a highly transmissible organism such as tuberculosis or Ebola. These additional precautions are known as category-specific precautions and include the following: Airborne Infection Isolation, Contact Isolation, Droplet Isolation, and Mandatory Precautions. Health care facilities have information cards that are usually placed on the door to the patient's room to ensure that everyone who enters the room is aware of the safety precautions and the personal protective equipment (PPE) that must be used before entry. Depending on the microorganism involved, the nurse verifies which types of Transmission-Based Precautions should be used. If unsure as to what is required, contact the facility's infection preventionist for guidance. The effectiveness of Standard Precautions and Transmission-Based Precautions depends on rigorous compliance with the infection prevention and control precautions. See [Table 6-5](#) for more information regarding category-specific isolation methods.

Think Critically

What type of Transmission-Based Precautions would be necessary for a patient who is admitted with complications of Ebola? What PPE would you need to assist this patient with activities of daily living? How must it be donned and doffed? See the [Evolve](#) website for Ebola PPE Donning Instructions for more detailed information and pictorial description.

Table 6-5**Category-Specific Isolation Precautions (Transmission-Based Precautions and Expanded Precautions for Ebola)**

PRIVATE ROOM*	MASKS	GOWNS	GLOVES	COMMON DISEASES PLACED INTO ISOLATION CATEGORY
Airborne Infection Isolation				
Always; door to room must be kept closed at all times	Must wear a fit-tested NIOSH-approved N-95 respirator	No, unless draining wounds	No, unless draining wounds	Pulmonary or laryngeal tuberculosis, or draining tuberculosis skin lesions; smallpox, viral hemorrhagic fever, severe acute respiratory syndrome (SARS); measles; varicella, disseminated zoster
Contact Precautions				
Preferred; cohorting of patients with same type of infection is acceptable	Situation dependent	Always; if patients are cohorted, staff must perform hand hygiene and change PPE between patients	Always; if patients are cohorted, staff must perform hand hygiene and change PPE between patients	Open or draining wounds; history of MRSA, VRE, ESBL positive; diarrhea; MDRO infections
Droplet Precautions				
Preferred; cohorting of patients with same type of infection is acceptable	Wear a surgical mask when entering room; patient should wear mask during transport and observe cough etiquette	Not usually	When helping with cough-inducing procedures or discarding of used tissues	Pneumonia, influenza, rubella, pertussis, streptococcal pharyngitis, meningitis caused by <i>Neisseria meningitidis</i> or <i>Haemophilus influenzae</i> type B
Ebola Precautions*				
Requires "buddy" to assist donning/doffing PPE. See detailed instruction in Evolve  Note: information in this table is not in exact order of donning PPE.				
Mandatory	Must wear N-95 respiratory mask, full-face shield, cover hair	*Change into hospital-issued scrubs or disposable scrubs; then don impervious cover gown and hood that covers all of the neck and chest If activities performed in the patient's room are likely to dislodge cuff of gown, secure cuff with coban or tape	Don first pair before donning impervious shoe/leg covers, don cover gown Second pair is donned after face mask, hair cover, and hood are donned	Airborne, Contact Precautions with "buddy" observing all aspects of care being provided to ensure no exposure or contamination has occurred to the nurse in the room caring for a patient with Ebola

*In most cases, patients infected with the same organism may share a room. For any patient in Transmission-Based Precaution isolation (sometimes referred to as Expanded Precautions), limit the time the patient is out of the room; notify receiving unit or department that the patient is in isolation so that appropriate measures can be taken before the arrival of the patient. For a patient infected with Ebola, it is a two-nurse team: one to care for the patient, the other to observe the nurse to ensure that transmission-based precautions, hand hygiene, etc., have not been compromised.

ESBL, Extended-spectrum beta lactamase; MDRO, multidrug-resistant organism; MRSA, methicillin-resistant *Staphylococcus aureus*; NIOSH, National Institute of Occupational Safety and Health; PPE, personal protective equipment; VRE, vancomycin-resistant enterococci.

Personal Protective Equipment

Personal protective equipment (PPE) is the use of a barrier to protect a person from exposure to blood-borne pathogens, body fluids, or other potentially infectious materials. These barriers include, but are not limited to, gloves, cover gowns, facemasks, eye protection, face shields, and respirator masks. Ebola is a virus that is extremely lethal but is only transmitted through direct contact with blood or body fluids. When it comes to caring for a patient with Ebola, the CDC (2015) states: "To protect healthcare workers during care of a patient with EVD, healthcare facilities must provide onsite management and oversight on the safe use of PPE and implement administrative and environmental controls with continuous safety checks through direct observation of healthcare workers during the PPE donning and doffing processes." The precautionary asset on Evolve  shows a nurse in full PPE prior to caring for a patient infected with Ebola. By law, health care facilities are required to provide PPE at no expense to the staff (Occupational Safety and Health Administration Bloodborne Pathogens Standards, 1910.132[h][1]). If you suspect you have a latex allergy, contact your Occupational/Employee Health Services department so that a more detailed assessment can be made. If it is determined that a latex allergy does exist, your facility is required to provide you with the appropriate PPE. Figure 6-4 shows methods for donning and removing PPE.

Clinical Cues

Remember, when you are using PPE, you cannot retrieve common items from your uniform pocket (e.g., pen, alcohol pad, or stethoscope). You must plan ahead and obtain the necessary supplies and equipment before entering the patient's room.

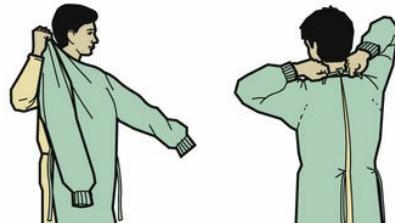
DONNING AND REMOVING PPE

Donning Personal Protective Equipment (PPE)

The type of PPE will vary based on the level of precautions required, such as Standard and Contact, Droplet, or Airborne Isolation Precautions.

Gown

- Fully cover torso from neck to knees, arms to end of wrist, and wrap around the back
- Fasten in back at neck and waist



Mask or respirator

- Secure ties or elastic band at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator



Goggles or face shield

- Put over face and eyes and adjust to fit



Gloves

- Extend to cover wrist of isolation gown



SAFE WORK PRACTICES

- Keep hands away from face
- Limit surfaces touched
- Change gown and gloves when torn or heavily contaminated
- Perform hand hygiene

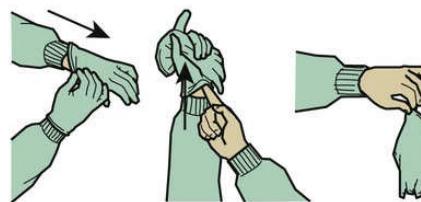
A

Removing Personal Protective Equipment (PPE)

Remove PPE at doorway before leaving patient room, or in anteroom; remove respirator outside of room.

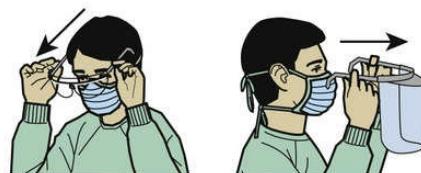
Gloves

- Outside of gloves are contaminated!
- Grasp outside of glove with opposite gloved hand; peel off
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist



Goggles or face shield

- Outside of goggles or face shield is contaminated!
- To remove, handle by "clean" head band or ear pieces
- Place in designated receptacle for reprocessing or in waste container



Gown

- Gown front and sleeves are contaminated!
- Unfasten neck, undo the waist ties
- Remove gown using a peeling motion; pull gown from each shoulder toward the same hand
- Gown will turn inside out
- Hold removed gown away from body, roll into a bundle, and discard into waste or linen receptacle



Mask or respirator

- Front of mask/respirator is contaminated—DO NOT TOUCH!
- Grasp bottom then top ties/elastics and remove
- Discard in waste container



Hand hygiene

- Perform immediately after removing all PPE!

B

FIGURE 6-4 A, Donning personal protective equipment (PPE). B, Removing PPE.

Protective Environment

Patients with hematopoietic stem cell transplantation require highly specialized forms of expanded isolation techniques. Nurses and all staff who provide care to the transplant recipient receive detailed education and training on the appropriate care. Interventions include special airflow and filtration rooms with positive air pressure, smooth surfaces to aid in disinfection, and minimizing the length of time the patient is outside of the protective environment. Staff must be free from signs and symptoms of illness. For additional information, refer to the facility's policy and procedure manuals or the CDC's website, www.cdc.gov.

Respiratory Hygiene and Cough Etiquette

Two methods of preventing droplets from spreading to others are teaching people to cover their mouth when sneezing or coughing and turning the head away to prevent coughing into someone else's face (Figure 6-5). In addition, educating patients and families to dispose of soiled tissues in waste containers and to perform hand hygiene after contact with actual or potentially contaminated items is important. To prevent the transmission of pathogenic microorganisms to a patient, instruct the patient to avoid contact with others who may have an infection.



FIGURE 6-5 Covering your cough to help prevent the spread of infection.

Transmission of an infectious organism can be interrupted at the portal of entry by using only clean or sterile items when caring for patients. Use of effective hand hygiene techniques by health care workers, visitors, and patients is key in the prevention of infection. Immunization and measures to boost immunity through proper nutrition and a healthy lifestyle also increase a person's resistance to infection. One of the *Healthy People 2020* objectives is to increase the proportion of adults who are immunized for influenza and pneumococcal disease. **Table 6-6** lists factors that can make a host more susceptible to pathogens.

Think Critically

What would you do if, while taking a blood pressure reading, your patient sneezes or coughs and does not cover her nose or mouth? How would you respond? What type of education would benefit the patient? What additional precautions would you need to institute once the patient has left the examination room?

Table 6-6

Risk Factors for Increased Susceptibility to Infection

RISK FACTOR	CONSEQUENCE
Altered defense mechanisms	Body damage from trauma; breaks in the skin or mucous membranes; fractures.
Lower than normal leukocyte (white blood cell) count	Bone marrow suppression from chemotherapy or toxic agents; genetic or acquired agranulocytosis, such as that seen with chemotherapy drugs.
Age	Older adult patients and the very young are more susceptible to infection, probably because of declining or immature immune function.
Excessive stress or fatigue	These states seem to interfere with the body's normal defense mechanisms.
Malnutrition	Poor nutrition interferes with cell growth and replacement, which contributes to decreased immune function.
Alcoholism	Inhibits the immune system.
Preeexisting chronic illnesses, such as diabetes mellitus, adrenal insufficiency, renal failure, or liver disease; serious illness such as pneumonia, peritonitis, etc.	These disease states upset the normal homeostatic balance within the body, impairing the normal defense mechanisms. Serious illness taxes the immune system, causing greater susceptibility to other pathogens.
Immunosuppressive treatment, chemotherapy, or corticosteroid treatment	These treatments depress the immune system or harm the bone marrow, decreasing the number of leukocytes. Corticosteroids depress the inflammatory response, inhibiting one of the body's defense mechanisms.
Invasive equipment or indwelling tubes	Fracture pins, endotracheal or tracheostomy tubes, intravenous cannulas, feeding tubes, and urinary catheters provide a potential route of entry for pathogens.
Smoking or inhalation of toxic chemicals	Inhibits ciliary action of the respiratory tract. Toxic chemicals may damage bone marrow, inhibiting the production of leukocytes.
Intravenous drug abuse	Allows introduction of microorganisms into the bloodstream from contaminated needles or from lack of aseptic technique.
Unsafe sexual practices (not knowing history or health status of sexual partner, not using condoms)	Allows entry of pathogenic organisms through the genital mucosal tissue.
Unsafe handling of needles and sharps	Potential for breaks in the skin through which pathogens may enter.

Adapted from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient centered collaborative care*, ed. 7, Philadelphia, 2012, Saunders.

Health Care–Associated Infections

A **health care–associated infection (HAI)** occurs when a patient is cared for in any kind of health care setting and acquires an infection. There are specific criteria for the infection to be classified as an HAI, such as length of time in the facility before the onset or appearance of the infection. Because health services are provided in a wide variety of locations, such as acute care facilities, outpatient surgery or dialysis centers, homes, and mobile clinics, it is sometimes difficult to determine where the patient became infected. Detailed documentation is essential in determining whether an infection the patient has was community or health care acquired.

Although inanimate objects such as needles, contaminated surgical instruments, and linens are major sources of infection in these settings, every patient is directly and indirectly in contact with large numbers of health care workers, each of whom could be the source of infection. Therefore, it is important to ensure that appropriate precautions, such as hand hygiene and Transmission-Based Precaution techniques, are followed at all times. **Table 6-7** presents HAI risk factors.

Table 6-7
Risk Factors for Health Care–Associated Infections

RISK	SOURCE OR CAUSE
Impaired host defenses	Invasive tubes (i.e., endotracheal, nasogastric, enteral feeding) Position of the patient (i.e., supine vs. head of bed >30 degrees) Impaired or altered mental status; sedation Malnutrition; malignancy; immunosuppression
Introduction of microorganisms	Bacterial colonization Gastric pH neutralized because of H ₂ -receptor-blocking agents Lack of oral hygiene Acute vs. chronic sinusitis Invasive procedures; open wounds Contaminated respiratory equipment
Overgrowth of virulent organisms	Prolonged or inappropriate antibiotic use Iatrogenic (resulting from health care provider action such as inadequate hand hygiene); multidrug-resistant organism infection Central venous lines (i.e., subclavian, femoral, peripherally inserted central catheter) Comorbid illness (e.g., diabetes mellitus, peripheral vascular disease) Frequent hospitalizations or exposure to invasive therapies Prolonged hospital stays

Adapted from Flanders AS, Collard HR, Saint S: Nosocomial pneumonia: State of the science. *American Journal of Infection Control*, 34:84-93, 2006.

The Cost of Health Care–Associated Infections

Human suffering, prolonged hospital stays, and time lost from work are some of the concerns with an HAI. In a recent study using a large sample of U.S. acute care hospitals, on any given day at least 1 in 25 patients had some form of HAI. This same study found an estimated 722,000 HAIs in 2011 and that 75,000 patients died during their hospitalization (Magill et al, 2014). Another cost is the increased expense of health care delivery. For example, the cost of treating a catheter-related bloodstream infection is estimated to be between \$3700 and \$29,000 (Institute for Healthcare Improvement, 2011). With the passage of the Affordable Care Act, Congress has approved funding for programs such as establishing an HAI Infrastructure, preventing HAIs across the spectrum of health care, and improving the public health department's capacity to provide infection prevention and control (CDC, 2014).

Nursing Interventions to Prevent Health Care–Associated Infections

The primary way to break the chain of infection is careful attention to hand hygiene before and after any direct patient contact, before and after any invasive or sterile procedure, after contact with infectious materials (e.g., wound drainage, feces, urine, or sputum), and before contact with immunocompromised patients. However, for hand hygiene to be effective, you need to know what cleansing product to use. For example, if the patient has an *S. aureus* infection, the health care worker can use either soap and water or an alcohol-based hand sanitizer to cleanse the hands. However, if the patient has a *Clostridium difficile* or *Candida albicans* infection, the health care worker must use only soap and water to cleanse the hands. The alcohol in alcohol-based sanitizers only makes the spores for these organisms “sticky”; it does not kill them. In addition, if a patient with *C.*

difficile is discharged, the housekeeping staff needs to know that the patient had this type of infection so that the appropriate cleaning agents will be used. Reducing catheter-related infections is one of The Joint Commission's 2014 National Patient Safety Goals and a *Healthy People 2020* objective. Interventions for this important goal include hand hygiene, use of a standardized kit for dressing changes, and chlorhexidine-based antiseptic for skin preparation.

Clinical Cue

In accordance with National Patient Safety Goals (The Joint Commission [TJC], 2014), compliance with guidelines for hand hygiene is one of the primary issues for reducing HAIs. Make a point of performing hand hygiene in view of the patient and the family; this increases their confidence in your ability as a caregiver and demonstrates your attention to preventing infection.

Used or contaminated items should not be placed on the floor or remain in an uncovered disposal container in the patient's room. Disposing of infectious materials, such as soiled dressings, full suction containers, and contaminated equipment, in covered, moisture-resistant biohazard containers helps contain microorganisms, as well as odors. Protecting patients from others with respiratory infections and from visitors with other communicable diseases is also appropriate. Table 6-8 reviews the major sites of HAIs, the infectious agents most often responsible, and some of the interventions nurses may take to prevent or control the spread of infection.

Clinical Cue

There are times when the nurse is not quite sure where to dispose of materials used in the treatment of a patient. If the item has blood or body fluids on or in it where you can squeeze, sling, fling, or flick it from or off the material, then it should be disposed of in the biohazard waste container.

Table 6-8
Preventing and Controlling Health Care–Associated Infections

MOST COMMON SITES	NURSING INTERVENTIONS
Urinary tract	Catheterize only when absolutely necessary. Observe sterile technique when catheterizing. Keep drainage system for indwelling catheter closed, off the floor, and below the bladder level at all times to prevent urine reflux. Empty urine drainage bag into a clean container, without contaminating the spout. Wipe the spout with an alcohol pad before securing it. Remove indwelling catheters as soon as possible to decrease risk of infection.
Surgical wounds	Administer prophylactic antimicrobials as ordered. Change soiled dressings and linens promptly and dispose of them in the correct container. Ensure the patient has adequate nutrition and sufficient fluid intake.
Respiratory tract	Encourage the patient to cough, deep breathe, and move. Perform suctioning, tracheostomy care, and other procedures under aseptic technique. Protect the patient from others with colds or other signs of infection.
Bloodstream (bacteremia)	Maintain meticulous aseptic technique in the administration of intravenous (IV) fluids. Follow the recommended procedure for daily care of the insertion site (including the dressing) and IV tubing and catheters. Assess the site for increased redness, pain, or infiltration. Remove and insert new IV sets per facility policy and when indicated.

Along with preventive interventions and appropriate treatments, you must continuously assess the patient to identify early signs of infection or its spread. It is also helpful to review and document each patient's immunization status against such infections as tetanus, pertussis, influenza, hepatitis B, pneumococcal pneumonia, and varicella.

Infection Surveillance and Reporting

Surveillance requires that nurses be alert for signs or symptoms of infection in patients under their care. For example, you should routinely assess patients for unexpected elevation of temperature; malaise; cough; loss of appetite; foul-smelling urine; new-onset diarrhea; and wounds that are red, swollen, painful, or have a foul-smelling discharge. It is important to note the color of the purulent drainage; this is helpful in identifying the kind of organism that may be causing an infection (e.g., *S. aureus* produces a golden discharge, and *Pseudomonas aeruginosa* has bluish green discharge).

Pay particular attention to patients who are more susceptible to infection. These patients include those who (1) are weakened by severe illness or injury; (2) have drainage tubes, intravenous catheters, or other invasive devices for monitoring or treatment; (3) are very young or very old; (4) have had recent surgery; or (5) are immunocompromised. When an infection is suspected, report this to the patient's health care provider. In certain situations, Transmission-Based Precautions may need to be instituted even before culture results are available. If there is a question as to what type

of precautions to initiate, contact the facility's infection prevention and control department.

Medical Asepsis and Surgical Asepsis

Medical Asepsis

Medical asepsis (the goal of which is to reduce microorganisms) includes hand hygiene, separation or isolation of the patient, use of appropriate precautions for the handling and disposing of contaminated articles, and other techniques devised to contain and destroy infectious agents, such as cleansing and disinfection.

Surgical Asepsis

Surgical asepsis (the goal of which is to completely eliminate microorganisms) involves the sterilizing of instruments, skin, and other articles that will be used to perform surgery or other types of sterile procedures. Surgical procedure typically requires that the first line of defense (i.e., the skin) be compromised in some way. Surgical asepsis must also be used when placing an intravenous catheter into a vein, when inserting a Foley catheter into the urinary bladder, during the placement of internal monitoring devices, or during other invasive procedures such as a cardiac angiogram. Hand hygiene for surgical asepsis is more vigorous and must be performed according to the facility's policy and procedure. In a surgically aseptic environment, surgical gowns, face masks, and sterile gloves are necessary and must be put on and removed in a specific way. Procedures being performed at the bedside that require surgical asepsis, such as a central line placement, require that all persons in the room wear a facemask and head cover. The person performing the procedure must also wear sterile gloves and a sterile cover gown. The patient must be covered with sterile drapes, and only sterile equipment and supplies are to be used. The door to the room must be closed throughout the procedure (CDC, 2002).

Sepsis and Septic Shock

If a patient's HAI or community-acquired infection is not adequately treated, the pathogen may enter the bloodstream, causing a bacteremia and sepsis with a systemic inflammatory response syndrome (SIRS). When microorganisms enter the bloodstream, they are carried throughout the body and may invade any tissue or body system. Symptoms of SIRS (commonly referred to as **sepsis**) include, but are not limited to, tachycardia, increased cardiac output, **tachypnea** (rapid breathing), fever, and an elevated WBC count. An altered level of consciousness may also occur. Sepsis is most commonly associated with bacterial invasion from gram-negative bacteria, such as *Pseudomonas aeruginosa*, *Escherichia coli*, and *Klebsiella pneumoniae*, or gram-positive bacteria such as *Staphylococcus aureus* and *Streptococcus pneumoniae*. The toxins secreted into the blood from these pathogens react with the blood vessels and cell membranes, stimulating a massive inflammatory and immune response. Increased capillary permeability with loss of fluid from the vascular space, cellular injury, and greatly increased cellular metabolic rates can result in septic shock. Refer to [Chapter 44](#) for further information on SIRS and septic shock.

Nursing Interventions for Patients with Sepsis

Patients who are at risk for sepsis must be identified and then closely monitored for changes from the baseline assessment, such as a change in mental status, tachycardia, tachypnea, changes in blood pressure, and decreased urine output. The temperature may be normal or elevated, depending on the organism or organisms that are causing the sepsis. Pneumonia and postsurgical wound infections are two conditions that can lead to sepsis if not quickly identified and treated, and some patients, often older adults, experience **hypothermia** (below normal temperature) when septic.

Sepsis is diagnosed from the clinical presentation of the patient and the results of laboratory tests, such as elevated leukocyte count, decreased platelets, and serial blood cultures that may be positive for invading microorganisms. Antimicrobial sensitivities are performed on these pathogens to determine which drugs would be most appropriate to treat the infection. Ensuring that the correct antimicrobial agents are prescribed in a timely manner decreases the risk of the patient developing a multidrug-resistant infection and eliminates the pathogens as quickly as possible.

Clinical Cues

If sepsis is discovered early, the chance of a full recovery is good. Septic shock can progress to the stage of tissue damage from microthrombus formation and disseminated intravascular coagulation (DIC); the prognosis is then poor, and death may soon occur. Closely monitoring a patient who has an infection for signs of sepsis and reporting any such signs to the provider are extremely important.

❖ Nursing Management

■ Assessment (Data Collection)

Detecting infection in a patient requires a thorough nursing assessment. Subjective data can be obtained by asking the patient to describe symptoms and time of onset. Questions should also include whether the patient is having or has had pain, headache, stiff neck, fever, or chills. The interview is based on the patient's complaints; for example, if the patient states that it hurts to go to the bathroom, ask if there is also urgency or burning when trying to empty the bladder. With some signs and symptoms, it may be appropriate to ask if patients have traveled outside the country recently (e.g., amebic dysentery); if they were bitten by any insects before the onset of symptoms (e.g., West Nile virus); or if they have a compromised immune system, either from disease or from drug exposure (i.e., chemotherapy agents). (Refer to [Chapter 14](#) for more information on West Nile virus.)

Clinical Cues

Subjective complaints that may indicate infection include fatigue, loss of appetite, headache, nausea, general malaise, and pain.

Objective data often point to the specific body system affected by the infection but may also include systemic signs such as fever, tachycardia, or tachypnea. Data collection includes assessing vital signs; auscultating the lungs to check for abnormal breath sounds; inspecting the skin for lesions or rashes; and checking the urine for cloudiness, discoloration, abnormal odor, and increased specific gravity. Bowel sounds are auscultated in all four quadrants, and then the abdomen is gently palpated for signs of tenderness. In addition, look for signs of local infection such as redness, swelling, pain or tenderness on palpation or movement, heat in the affected area, and possibly loss of function of the affected body part.

Older Adult Care Points

Many older adults, especially those older than 80 years, have a low baseline body temperature. Because of decreased inflammatory and immune response, their temperature may rise very little in the presence of infection. Small increases in temperature in these patients may be quite significant. Signs of inflammation may not be present or may be milder than what is typically seen in a younger person. A decrease in mental alertness, increased fatigue, or sudden onset of confusion, irritability, or apathy may be clues that an infection is present.

Diagnostic Tests

Laboratory data that may indicate infection include an elevated WBC count, changes in the distribution and number of the various types of leukocytes, elevated erythrocyte sedimentation rate (ESR), and microbiology cultures that test positive for microorganisms.

Bacteriologic tests are performed by culturing specimens of blood, body fluids, or waste products such as feces. When obtaining a culture, be careful to (1) use aseptic technique, where indicated and with sterile equipment; (2) only collect fresh material from the suspected site, avoiding contamination by microbes from nearby tissues and fluids; and (3) use the appropriate container for the sample, making sure the container is correctly labeled and tightly covered to avoid spilling and contamination during transport to the laboratory. Also note on the laboratory requisition form whether or not the patient has been given any antimicrobial agents before the specimen was collected. This is because some microorganisms may have responded to the administered drug and thus be in such low quantities at the time of collection, they may not grow in the culture media. This might cause a delay in the appropriate antimicrobial treatment for the patient.

Sensitivity tests are done in conjunction with microbiology cultures to determine which antimicrobials can most effectively destroy or inhibit the multiplication and growth of the specific infecting microbe. Once this has been determined, the drug that is most likely to kill the invading microorganism needs to be started as soon as possible. Inadequate dosages or delays in administration can lead to a genetic mutation of the pathogen involved or the development of a **multidrug-resistant organism (MDRO)**.

With some infectious diseases, intradermal skin tests are performed to determine the presence of certain active or inactive diseases, such as tuberculosis, coccidioidomycosis, and candidiasis. Radiography (x-rays), computed tomography (CT), or magnetic resonance imaging (MRI) may be used to detect changes in the tissues or organs and to locate abscesses anywhere within the body.

Nursing Diagnosis

The specific type of infection and the problem it presents determine the correct problem statement. For example, if the patient has a urinary tract infection, the more specific problem statement would be *Altered urinary elimination*. In some cases, collaboration with other health team members helps establish the correct problem statement. Appropriate problem statements for patients with infection always include *Potential for infection*. Any patient entering the hospital for surgery or an invasive procedure is at risk for an HAI. Therefore *Potential for infection* should be listed as a problem statement or nursing diagnosis on the patient's care plan. The problem statement Insufficient knowledge due to lack of knowledge about the disease and the problems of infection prevention, and limited ability for self-care should always be considered ([Nursing Care Plan 6-1](#)).

Nursing Care Plan 6-1

Care of a Patient With an Abdominal Wound

Scenario

Mr. Collins is a 28-year-old man who has been diagnosed with a lower abdominal wound infection that is culture positive for methicillin-resistant *Staphylococcus aureus* (MRSA). He is going to be discharged in 2 days.

Problem Statement/Nursing Diagnosis

Wound infection/*Impaired Skin Integrity related to infected abdominal wound*

Supporting Assessment Data

Objective: Drainage from abdominal wound is culture positive for MRSA, a multidrug-resistant organism (MDRO).

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Infection will be controlled and not spread.	Place under Contact Precautions and explain purpose and requirement to patient and visitors.	To prevent the spread of infection to other patients and staff	No evidence of spread of infection
	Assist patient with bath to ensure skin has been cleaned. Change wound dressing as ordered and as needed.	Enables the nurse to do a thorough skin assessment Ensures that the wound is assessed at least daily and nurse can track progression of wound treatment	Bathed Dressing changed, less drainage and redness
	Monitor vital signs, complete blood count, microbiology cultures.	Indicates progress in resolving the infection	Vital signs stable WBC normalizing Outcomes met

Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient Knowledge related to proper wound care at home*

Supporting Assessment Data

Subjective: States, "I don't know how to change the dressing."

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Before discharge, the patient and family member will be able to: Demonstrate proper hand hygiene techniques.	Demonstrate proper hand hygiene techniques and observe patient and family member perform this task.	Providing opportunities for education and training throughout the hospital stay increases the knowledge base the patient or the caregiver can build on.	Patient verbalizes reasons for Contact Precautions; patient and family member demonstrate proper hand hygiene, wound cleansing, and dressing change techniques using medical asepsis; patient and family member verbalize signs and symptoms to report to provider; and patient states that he knows how to take medication and why he must finish the prescription.
State reasons for using Contact Precautions for dressing change.	Discuss reasons for Contact Precautions with patient and caregiver and provide supplemental written or audiovisual materials.	Addresses different learning styles of the adult patient/learner.	Patient and caregiver state they understand the need for contact precautions.
Demonstrate dressing change, maintaining medical asepsis before discharge.	Demonstrate dressing change and wound cleansing procedure; obtain return demonstration from patient and family member before discharge.	Providing hands-on training increases the understanding of wound healing and need for appropriate wound care.	Demonstrated dressing change with correct technique. Will observe practice and return demonstration before discharge.
List signs and symptoms that should be reported to provider.	Instruct patient and family to watch for elevated temperature, increased redness, swelling, pain, or purulent discharge from wound, and to report any such findings to provider.	Knowing what to look for and report decreases the risk of adverse outcomes.	Explained signs and symptoms to watch for and left printed sheet. Will seek feedback before discharge.
State why it is important to complete the course of antimicrobial therapy exactly as directed.	Explain importance of taking medication exactly as prescribed and of finishing entire prescription.	Taking antimicrobials as prescribed decreases the risk of the patient developing an MDRO infection.	Obtained feedback from patient; he states rationale correctly.

Critical Thinking Questions

1. What other nursing methods could you implement that would promote healing?
2. How would you recommend the patient's linens be laundered at home?

■ Planning

The planning phase of the nursing process should take into account the physical strength of the patient and the need for rest. Every effort should be made to maintain the integrity of the skin and mucous membranes so that they continue to serve as effective barriers to infectious agents. Good skin care, oral hygiene, and personal cleanliness are essential. The psychological effect of

Transmission-Based Precautions must be addressed; some patients may feel “dirty” or that people are avoiding them because they have an infectious disease.

Cultural Considerations

Hot and Cold Foods

In some Asian cultures there is a belief that a balance of hot and cold foods should be eaten when a fever or infection is present. Cold foods, such as watermelon or white radish soup, are thought to help the body fight off the infection and regain its balance.

Many Hispanic cultures have a belief that “hot” and “cold” forces are thrown out of balance during an illness. Cold foods, such as dairy products, honey, or fresh vegetables, may be preferred by the Hispanic patient with an infection.

Implementation

Providing a quiet environment with uninterrupted rest periods is important in the recovery process. Relieving the discomforts of fever and muscle aches is accomplished by tepid sponge baths, ice bags placed in the axilla or groin, antipyretics, and massage. Warm compresses and the application of heat, as appropriate, can also promote healing. Mild physical exercise promotes circulation and helps some patients to relax. It can also increase blood circulation to an infected area. This ultimately will help to remove the metabolic wastes that were produced from the body.

Provide patient and family teaching regarding the infection, including:

- The purposes of diagnostic tests, treatments, and special precautions
- Why the family must help maintain medical asepsis to prevent the spread of infection to themselves and others

Administering Antimicrobial Agents

Administer antimicrobial drugs on time to maintain effective blood levels. In addition, monitor the patient for drug side effects and evaluate the progress of the patient to determine whether the drug is effective in eradicating the infection. General nursing actions for the administration of antimicrobial medications are shown in **Table 6-9**.

Table 6-9

General Nursing Implications for the Administration of Antimicrobial Drugs

NURSING IMPLICATIONS	RATIONALE
Before Giving the Antimicrobial Drug	
Check all drugs the patient is receiving for drug interactions with the antimicrobial prescribed.	To prevent toxicity or lack of absorption
Know the reason why the patient is to receive an antimicrobial drug (question the health care provider if the drug does not seem appropriate for the patient).	To help prevent drug administration errors
Check that the dosage of the antimicrobial drug is appropriate for the patient who may have decreased kidney or liver function.	To ensure drug levels do not build up to a toxic level
Verify allergies with the patient before administering an antimicrobial drug.	To prevent allergic reaction or adverse outcomes
Ensure cultures have been obtained before administering the antimicrobial agent. If culture and sensitivity results are available, verify that the drug that was ordered is one to which the organism is sensitive. If it is not, clarify the order with the health care provider.	To ensure medication being given is appropriate for the microorganism involved
Check precautions for administration of the antimicrobial drug, especially when the patient is pregnant or lactating.	To prevent harm to the developing fetus or infant
When Giving an Antimicrobial Drug	
Follow the “Six Rights” of medication administration.	To prevent errors and injury to the patient
Give each dose of an antimicrobial drug as close to the scheduled time as possible.	To maintain a consistent blood level of the drug
Check to see if serum drug levels have been ordered. Ensure that they are drawn as specified by the provider.	To ensure drug dosage is effective and to ensure toxicity will not occur
Possible Side/Adverse Effects	
Know and monitor for the possible side effects of the antimicrobial drug. The most common general side effects are gastrointestinal upset, anorexia, nausea, diarrhea, rash, and photosensitivity.	To aid the nurse in effectively teaching the patient about what to observe for and report to the provider
Monitor patient for signs of allergic reaction, such as rash, hives, itching, drug fever, swelling of the mucous membranes, difficulty breathing, or anaphylaxis.	To ensure appropriate interventions are instituted quickly and to prevent more severe outcomes, including death
Check for signs of superinfection in patients taking high doses of an antimicrobial drug for an extended period of time (e.g., oral thrush, vaginal itching or discharge, diarrhea).	To ensure appropriate countermeasures can be instituted in a timely manner
Patient Teaching	
“Take the medication with a full glass of water.”	To aid with absorption
“Take all of an antimicrobial drug prescription, regardless of whether you feel better and have no obvious signs or symptoms of infection.”	To prevent the development of multidrug-resistant microorganisms
“Take the medication in relationship to meals.” (Different drugs vary in this respect; some need to be taken with food and some should be taken on an empty stomach.)	For best absorption of the drug with minimal gastrointestinal side effects
“Discontinue the drug and notify the health care provider if an allergic reaction occurs.”	To ensure treatment is instituted quickly and to prevent more severe outcomes, including death; may require an alternate type of antibiotic to be prescribed
“Use a sunblock and protective clothing when sun exposure is unavoidable when taking an antimicrobial agent that is known to cause photosensitivity.”	To decrease the risk of sunburn
Unless contraindicated, “Increase fluid intake to 2500–3000 mL/day, especially when taking a sulfa-type drug.”	To prevent crystallization in the kidneys and promote drug excretion

Before administering the prescribed drug, be familiar with the different antimicrobial agent classifications: antibacterial, antiviral, antifungal, and anthelmintic (Box 6-5).

■ Complementary and Alternative Therapies

Prolonged antibiotic use can destroy the normal gastrointestinal flora and cause *Clostridium difficile* to flourish and cause antibiotic-associated diarrhea. Probiotics are available in yogurt or in tablet, capsule, or powder form and may help to restore natural flora. Side effects include mild abdominal discomfort and flatulence. The patient should be encouraged to consult the health care provider before using probiotics.

Koivula M: Intro to probiotic therapy. *Advance for Nurses*. Retrieved from <http://nursing.advanceweb.com/Regional-Articles/Features/Intro-to-Probiotic-Therapy-4.aspx>.

Box 6-5

Antimicrobial Drug Classifications*

Antibacterial Agents

Narrow Spectrum

Gram-Positive Cocci and Gram-Positive Bacilli

Penicillins G and V

Vancomycin

Erythromycin

Clindamycin

Gram-Negative Aerobes

Aminoglycosides: gentamicin, tobramycin, neomycin, and azithromycin

Cephalosporins

- First generation (e.g., cefazolin [Ancef], cephalexin [Keflex])
- Second generation (e.g., cefaclor [Ceclor], cefotetan [Cefotan], cefuroxime [Zinacef])

Mycobacterium Tuberculosis

Ethambutol

Isoniazid

Pyrazinamide

Rifampin

Broad Spectrum

Gram-Positive Cocci and Gram-Negative Bacilli

Broad-spectrum penicillins (e.g., ampicillin)

Cephalosporins

- Third generation (e.g., cefepime [Maxipime], cefixime [Suprax], cefotaxime [Claforan], ceftriaxone [Rocephin])

Tetracyclines (e.g., doxycycline, minocycline)

Carbapenems (e.g., imipenem, meropenem)

Sulfonamides (e.g., sulfasalazine, sulfisoxazole)

Antiviral Agents

Acyclovir

Amantadine

Azidothymidine

Saquinavir

Antifungal Agents

Amphotericin B

Ketoconazole

Itraconazole

Anthelmintic Agents

Pyrantel

*As with any other drug, it is important for the nurse to know what the drug is and what it is being given for, and to provide close nursing observation, especially if the patient has never received the drug in the past. Teaching the patient signs and symptoms to report is also an important part of providing safe and effective nursing care.

Data from Lehne RA: *Pharmacology for nursing care*, ed. 8, Philadelphia, 2013, Saunders; Skidmore-Roth L: *Mosby's nursing drug reference*, ed. 27, Philadelphia, 2014, Mosby.

There are two primary categories of antibacterial agents: narrow spectrum and broad spectrum. Both kinds inhibit replication and growth of bacterial organisms. The most common side effects are nausea, vomiting, and diarrhea. The narrow-spectrum agents primarily work on a select type of microorganism, such as a gram-positive organism that is susceptible to penicillin. A broad-spectrum antibiotic can attack a larger group of organisms. However, these agents can also cause superinfections because they kill off many of the “good bacteria” in the body. A narrow-spectrum antibiotic is the preferred choice for treatment over a broad-spectrum agent, because it primarily destroys the pathogenic organism and also reduces the risk of developing an MDRO infection.

Antiviral agents interfere with DNA or RNA synthesis required for the virus to duplicate itself. The most common side effects are headache, nausea, vomiting, anorexia, and diarrhea; more severe side effects include acute renal failure, encephalopathy, and bleeding disorders.

Antifungal agents increase permeability of the cell membrane by binding with certain components, leading to decreased nutrient availability to the cell. The most common side effects are headache, fever, chills, nausea, vomiting, and anorexia; more severe side effects include acute kidney and/or liver failure and hemorrhagic gastroenteritis.

Anthelmintic agents cause paralysis of the invading parasite, and common side effects include dizziness, headache, fever, nausea, vomiting, anorexia, diarrhea, and rash.

Supporting Coping Mechanisms

Stress makes the body more vulnerable to invasion by foreign organisms by depressing the immune system. When under excessive stress, the body also is less able to mobilize the elements and cells that promote healing. Nurses should realize that the attitude shown toward a patient and the ways in which you strive to meet the patient's needs could reduce stress and promote healing.

If an illness is lengthy, concerns about work and home responsibilities may cause anxiety or

increase the patient's stress levels. Therefore collaboration with a social worker or case manager for solutions to such problems may be needed.

Patient Teaching for Preventing and Controlling Infection

Appropriate teaching is essential so that the patient and the patient's family will understand why specific precautions are necessary. Before beginning teaching, find out how much the patient or family knows about the patient's condition and the problems that may arise. Nurses have an obligation to teach patients and/or their family how to care for themselves and how to prevent infection through good personal hygiene. In a recent study, patients stated they prefer information that is easy to understand and accessible either in written form or via the Internet ([Gudnadottir et al, 2013](#)).

Patient Teaching

How to Prevent and Control Infection

Teach the patient and family:

- The ways in which the infection is transmitted
- How to perform proper hand hygiene
- Correct techniques for wound care
- The approved method for disinfecting or sanitizing equipment, supplies, and linens
- The correct method for proper handling and disposal of contaminated articles
- Any specific precautions for the type of infection the patient has

A patient taking antimicrobial medications at home must be taught how to take them as prescribed and not to discontinue taking any antimicrobial medication, even if symptoms are gone, until all medication has been taken. Explain to the patient and the family that stopping before the full amount of medication has been taken can lead to a superinfection and possibly readmission to the hospital.

■ Evaluation

Evaluation of the success of interventions includes data indicating:

- Temperature, pulse, and respirations are within normal range.
- WBC count and ESR are within normal limits and cultures are negative (see [Chapter 10](#) for more information on diagnostic tests and normal laboratory values).
- Patient is able to rest comfortably.
- Pain and discomfort are absent or decreased in severity.
- Fluid and nutritional needs are being met.

Community Care

As more nurses work in community settings, opportunities to educate the public about preventing the spread of infection become even more important. Controlling the spread of infectious diseases within the community is accomplished in conjunction with public health officials. Their major goals, and those of nurses who work with them, are to (1) promote sanitary standards in communities, (2) identify persons who are highly susceptible to infection and reduce their chances of developing an infectious disease, and (3) provide immunization programs to protect people against certain communicable diseases.

Home Care

The home care nurse must educate the patient and family members to help prevent infection. All people living in the home should be instructed to wash their hands as soon as they return home from being out in a public place. Microorganisms are picked up on the hands from a variety of items, such as shopping cart handles, elevator buttons, door handles, and cell phones. The incidence of colds and flu might be decreased if, during influenza season, people who are at increased risk for infection stay away from crowded stores and theaters where pathogens are likely to be airborne.

The home care nurse must teach the techniques of medical asepsis to patients and family members to prevent cross-infection from one person to another or the spread of infection in the patient. Hand hygiene is stressed, and family members are taught not to share personal items, especially toothbrushes or razors that might be contaminated by blood. Dishes and eating utensils are washed with soap and hot water or in the dishwasher. The patient's soiled linens, clothing, and towels should be washed as soon as possible or stored in closed plastic bags until washed. Surfaces contaminated with traces of blood, urine, feces, or vomitus should be sanitized using a clean cloth, soap, and hot water, and then recleaned with a 1 : 10 solution of chlorine bleach and hot water. Within the home, the patient and family are taught to contain infectious wastes such as dressings and soiled tissues in a sealed, impermeable plastic bag, to minimize odors. The bags can then be disposed of in the garbage cans outside of the home.

Health Promotion

What You Can Do to Prevent Infections at Home

- Wash your hands often.
- **When:** Before eating; before, during, and after handling or preparing food; before dressing a wound, giving or taking medicine, or inserting contact lenses; after contact with body fluids or blood; after changing a diaper; after using the bathroom; after handling animals or their toys, leashes, or waste; after handling anything contaminated, such as trash, drainage, soil, etc.
- **How:** Wet hands and apply soap, briskly rub hands together for 20 seconds, rinse thoroughly with warm water, and dry with a clean towel.
- Routinely clean surfaces.
- **In kitchen:** Clean counters, cutting boards, and all other surfaces

before, during, and after preparing food, especially meat and poultry. Use hot, soapy water and scrub cutting boards well. Avoid wooden cutting boards, because they tend to hold more bacteria.

- **In bathroom:** Clean and disinfect all surfaces routinely.
- Handle and prepare food safely.
- **Clean:** Clean hands and work surfaces often.
- **Separate:** Do not cross-contaminate one food with another; use separate cutting boards for meat and fresh produce and keep food separate in the refrigerator.
- **Cook:** Cook foods to proper temperatures; use a food thermometer. Find recommended food cooking temperatures at www.isitdoneyet.gov.
- **Chill:** Refrigerate foods promptly. Do not thaw frozen foods on the countertop.
- Get immunized.
- Make sure you and your loved ones get the necessary shots suggested by your health care provider at the proper time, and maintain immunization records for the family. Ask your provider about special programs that provide free shots for your child or elderly parent.
- Use antimicrobials appropriately.
- Take antimicrobials exactly as prescribed by your health care provider. Antibiotics do not work against viruses such as colds or flu.
- Be careful with pets.
- Follow the immunization schedule for your pets as recommended by the vet.
- Clean litter boxes daily and perform hand hygiene immediately afterward.
- Make sure your child does not put any object or hands in his or her

mouth after touching animals.

- Wash hands thoroughly after contact with animals, especially after visiting farms, petting zoos, and fairs.
- Use flea and tick prevention treatment on cats and dogs.
- Avoid contact with wild animals.
- Do not leave food around and keep garbage cans sealed around your home.
- Clear brush, grass, and debris around your home.
- Seal any entrance holes to animal dens, if any are found inside or outside of your home.
- Use insect repellent to prevent ticks.

Maintaining a healthy lifestyle that promotes an intact immune system increases a person's resistance to infection. Obtaining adequate sleep, eating properly, and exercising regularly contribute to increased resistance to illness or infection. Adopting effective stress reduction techniques and using them regularly can also be beneficial.

Long-Term Care

Older adults in long-term care or assisted living facilities often have chronic illnesses that add to their susceptibility. Many older adults have low-grade infections of the urinary, respiratory, or gastrointestinal tract that can be easily passed on to others if hand hygiene is not consistently practiced. Provide assistance to residents to wash their hands before meals and after toileting, before and after being in community rooms such as the dining room or social activities lounge, and any time their hands become soiled. Cleaning incontinent patients promptly and maintaining skin integrity are essential nursing functions. Also, to help decrease the odors caused by incontinence, it is important to secure soiled linens in plastic linens bags before removal from the patient's room.

Get Ready for the NCLEX® Examination!

Key Points

- Normal flora is needed to help prevent harmful microorganisms from colonizing or infecting the body.
- An infection is the presence and growth of pathogenic microorganisms in a susceptible host to the extent that tissue damage occurs.
- The relationship between the host, the agent, and the environment is what determines whether or not an infection will occur.
- A pathogen is any organism that, if allowed to grow, can cause infection or disease.
- There are multiple types of antimicrobial drugs that can be used to fight infection: antibiotics for bacterial infections, antivirals for viral infections, and antifungals for fungal infections.
- The body has mechanical barriers, such as the skin and mucous membranes, and chemical barriers, such as tears or saliva, that help fight against infection.
- Fever is one of the primary immune responses to fighting off invading microorganisms.
- Hand hygiene is the number one way to prevent the spread of infection.
- There are three types of Transmission-Based Precautions: Airborne, Contact, and Droplet. Each requires different PPE and isolation protocols.
- A patient with suspected or confirmed Ebola virus infection requires PPEs to be donned and doffed so that no skin or mucus membranes are exposed to the patient's blood or body fluids at any time during the provision of nursing care.
- Using respiratory hygiene and cough etiquette helps to prevent the spread of infection.
- Blood or other body fluid specimens for culture must be collected before the start of any antimicrobial agent.
- Assess how much the patient already knows about preventing the spread of infection and teach about hand hygiene, the correct use of antimicrobial agents, cleaning of wounds, and keeping the home environment clean.
- The nurse must model scrupulous hand hygiene compliance for patients and family members.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• **Online Resources**

- Health care-associated infections, www.cdc.gov/hai/
- Infection control, <http://www.guideline.gov/content.aspx?id=36680>

Review Questions for the NCLEX® Examination

1. The nurse is admitting a patient with an infected abdominal wound. Wound cultures are positive for methicillin-resistant *Staphylococcus aureus*. Appropriate nursing care for this patient includes:

1. monitoring temperature and white blood cell count.
2. placing the patient on strict intake and output.
3. instituting respiratory precautions.
4. encouraging ambulation along the hallways.

NCLEX Client Need: Physical Integrity

2. During an assessment, the nurse notes fever, fatigue, general weakness, cold and clammy skin, nausea, vomiting, and diarrhea. What is the prominent nursing problem?

1. Pain
2. Dehydration
3. Hypotension
4. Immobility

NCLEX Client Need: Safety and Infection Control

3. Which patient instruction is most critical to a patient being discharged on antibiotic therapy?

1. "Wash your hands."
2. "Increase fluid intake."
3. "Reduce stress."
4. "Take all the antibiotics as prescribed."

NCLEX Client Need: Pharmacological and Parenteral Therapies

4. The nurse is observing a nursing student who must perform a dressing change for a patient. The nurse would intervene if the student:

1. washes hands with soap under running water, using friction, for 20 seconds.
2. removes rings and jewelry before washing hands with soap and water.
3. washes hands before donning clean gloves to remove the old dressing.
4. prepares supplies, dons sterile gloves, and removes the old dressing.

NCLEX Client Need: Safety and Infection Control

5. When administering an ordered antimicrobial for an infection, the nurse should check the lab

results for:

1. elevated white blood cells.
2. culture and sensitivity.
3. erythrocyte sedimentation rate.
4. fever.

NCLEX Client Need: Pharmacological and Parenteral Therapies

6. The nurse assumes the care of a patient with active pulmonary tuberculosis. Before entering the patient's room, the appropriate nursing action would be to do:

NCLEX Client Need: Safety and Infection Control

7. The need for protective isolation and the parameters are being explained to the patient. She wails, "How can I hug my children when I am locked up in this room?" An appropriate response by the nurse would be:

1. "They can see you through the glass door."
2. "You can communicate through the intercom system or via your cell phone."
3. "All people carry microorganisms and your immune system cannot fight off any infection right now."
4. "It won't be long before you can hug them again, we need to keep you safe from infection."

NCLEX Client Need: Safety and Infection Control

8. Which intervention would the nurse implement for a patient with active pulmonary tuberculosis who is socially isolated related to imposed airborne precautions?

1. Limit the number of visitors to immediate family.
2. Suggest alternative means of contact, such as e-mail and phone calls.
3. Arrange for a nursing assistant to sit with the patient.
4. Reinforce the rationale for airborne precautions.

NCLEX Client Need: Psychosocial Integrity

9. A nurse is caring for an older adult patient and notes a change in mental status. The skin is flushed, warm, and dry. There is a full, bounding pulse and a decreased urine output. In order of priority, which actions should the nurse take? (*Select all that apply.*)

1. Notify the charge nurse of findings.
2. Draw the patient's blood as ordered by the physician for blood cultures.
3. Take a full set of vital signs and compare them to the baseline.
4. Check the patient's history to determine risk for sepsis.

NCLEX Client Need: Reduction of Risk Potential

10. Cross-infection among members of the household who take care of a relative with a severe infection can be prevented by which behavior(s)? (*Select all that apply.*)

1. Sharing personal items.
2. Practicing good hand hygiene.
3. Using a diluted bleach to clean surfaces.
4. Sealing used dressings in impermeable bags.
5. Washing soiled linens weekly.

NCLEX Client Need: Safety and Infection Control

Critical Thinking Questions

Scenario A

Mrs. Compton, age 44, is admitted to the hospital for a hysterectomy. During the admission assessment procedure, you notice a large, draining abscess in her axillary region. She also has a temperature of 100° F (37.7° C), and she tells you that she has not felt well for the past few days.

1. What would be your course of action after this assessment?

Scenario B

Mr. Lopez, age 18, has been admitted to the orthopedic unit after an automobile accident. He has sustained an open fracture of the femur and has been placed in traction.

1. What would be some expected signs and symptoms of inflammation that he might experience?
2. What specific problems might his care present for the nurse?

Scenario C

Mrs. Kay is an older adult woman who comes to the clinic for treatment of an abrasion on her arm that she sustained “while picking up my cat.” She is alert, oriented, and very cheerful and talkative. You notice that she is slightly underweight and that her clothes are not very clean.

1. What additional assessment might you make about the wound and the injury because she mentioned the cat?
2. What changes related to aging are likely to affect Mrs. Kay's natural defense mechanisms to fight infection?
3. Based on the scenario, identify issues that will affect wound healing and self-care for Mrs. Kay.
4. Explain why older adults may have a normal or even subnormal temperature in the presence of infection.

CHAPTER 7

Care of Patients With Pain

Objectives

Theory

1. Review the gate control theory of pain and its relationship to nursing care.
2. Demonstrate an understanding of the current view of pain as a specific entity requiring appropriate intervention.
3. Compare nociceptive and neuropathic pain and nursing care for each.
4. Explain how pain perception is affected by personal situations and cultural backgrounds.
5. Analyze the major differences between acute and chronic pain and their management.
6. Demonstrate the use of the nursing process when caring for patients experiencing pain.
7. Give examples of the different pharmacologic approaches to pain that include the use of adjunctive measures.

Clinical Practice

8. Demonstrate the use of appropriate pain evaluation tools and measures for a variety of patients.
9. Recognize common side effects of analgesics and describe techniques for addressing them.
10. Employ nonpharmacologic approaches to pain management with a variety of patients.

KEY TERMS

- acute pain (ă-KŪT pān, p. 127)
- adjuvant (ÄJ-ü-vänt, p. 127)
- buccal mucosa (BÜK-ăl mū-CŌ-să, p. 136)
- chronic pain (KRÖN-ik pān, p. 127)
- endorphins (ěn-DÖR-fīnz, p. 125)
- epidural (ě-pě-DÜ-rūl, p. 136)
- intractable pain (ĭn-TRÄK-tī-būl pān, p. 136)
- modulation (mōd-ū-LĀ-shūn, p. 125)
- neuropathic pain (nū-rō-PÄTH-ik pān, p. 125)
- nociceptive pain (nō-sē-SĒP-tīv pān, p. 125)
- pain threshold (pān THRĒSH-öld, p. 127)
- pain tolerance (pān TÖL-ür-ěnz, p. 127)
- perception (pěr-CĒP-shūn, p. 125)
- phantom pain (FÄN-tüm pān, p. 126)
- placebos (plä-SĒ-bōz, p. 134)
- referred pain (rī-FÜRD pān, p. 131)

transduction (trānz-DŪK-shūn, p. 125)

transmission (trānz-MI-shūn, p. 125)

Theories of Pain

Pain is considered to be not just a symptom, but a specific problem that needs to be treated. *Pain* is defined as a neurologic response to unpleasant stimuli. Pain receptors are abundantly distributed throughout the skin and in many deeper structures of the body. Receptors for pain do not become dulled with repeated stimulation, and under some conditions, repeated stimulation results in an increase in the acuteness of the pain sensation.

Pain is initiated when various chemicals are released from damaged cells, but the actual mechanism of pain is poorly understood. It may be helpful to think of pain as being controlled by a “gate” in the central nervous system (Figure 7-1). When the gate is open, the pain sensation is allowed through. When the gate is closed, the pain sensation is blocked. The **gate control theory** recognizes that stimuli other than pain pass through the same gate. When a large volume of nonpainful stimuli are competing for the gate, pain impulses may be blocked. A high volume of pain, however, may override other stimuli and pass through the gate, causing the individual to perceive the pain.

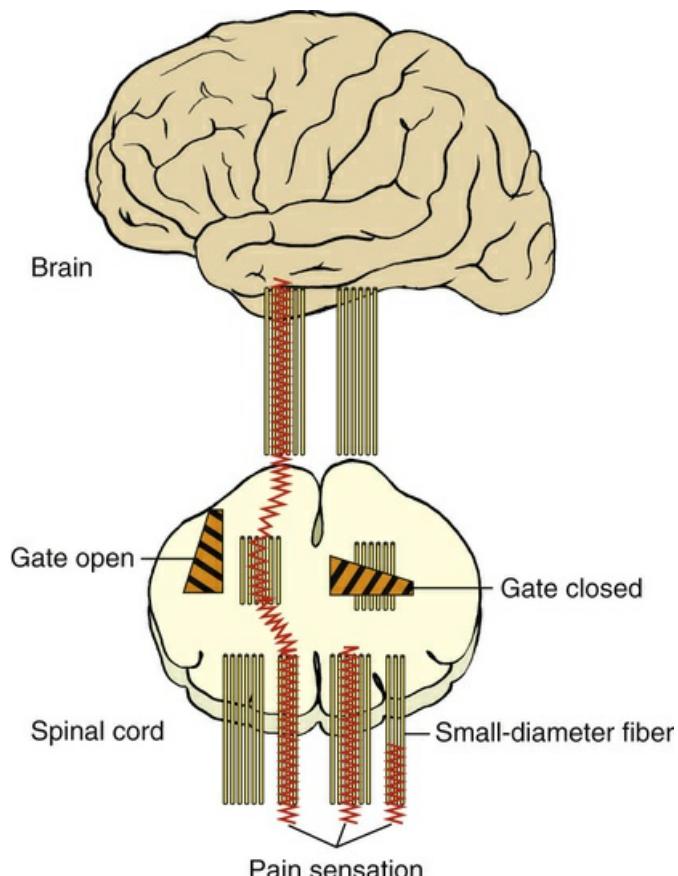


FIGURE 7-1 The gate control theory of pain. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2014, Saunders.)

Aspects of this theory relate to nursing practice in several ways:

- Two types of nerve fibers—small-diameter and large-diameter—carry pain stimuli.
- Activity in the small-diameter nerve fibers seems to open the gate, and activity in the large-diameter nerve fibers seems to close it.
- Massage and vibration produce activity in the large-diameter nerve fibers.
- High levels of sensory input create brainstem impulses that seem to close the gate. Distraction in the form of activity or social interaction produces these brainstem impulses.
- An increase in anxiety seems to open the gate, and a decrease in anxiety seems to close it. The fear

that pain will not be controlled may actually increase pain intensity, and knowing that pain can be or is being controlled may reduce pain.

Another way of looking at pain and its management is the idea of “pieces of pain.” The more intense the pain, the greater the number of pieces, and therefore a greater number of pieces of analgesia will be required to control the pain. This idea indicates that inadequate analgesia results in leftover “pieces” of pain, and total relief or control has not been achieved.

The human body produces substances called **endorphins** (endogenous opiates) that attach to pain receptors and block pain sensation. It is unknown how endorphins work, but their properties appear to modify and inhibit unpleasant stimuli, reduce anxiety, and relieve pain. Endorphins may produce feelings of euphoria and well-being. For example, the “runner’s high” may occur because endorphins are released after physical exercise.

Another theory of pain is that there is a “neuromatrix” where pain is a multidimensional experience in which stimuli are influenced by such things as past experience, cultural learning, personality variables, and influences from various body systems. The resulting perceptions of pain result in patterns of nerve impulses and body actions ([Waldman, 2011](#)).

Classification of Pain

Pain can be classified as one of three types: (1) acute pain, such as from trauma or surgery; (2) cancer pain; and (3) noncancer pain (e.g., postherpetic neuralgia, diabetic neuropathy, arthritis). There are two **pathophysiologic** classifications of pain: **nociceptive** and **neuropathic**.

Nociceptive Pain

Nociceptive pain is associated with pain stimuli from either **somatic** (body tissue) or **visceral** (organs) structures. Somatic nociceptive pain arises from injury to tissue where pain receptors called *nociceptors* are located. These nociceptors may be found in skin, connective tissue, bones, joints, or muscles. Trauma, burns, or surgery may cause injuries that trigger somatic nociceptive pain. Visceral nociceptive pain arises from pathophysiologic conditions in visceral organs, such as the organs of the gastrointestinal tract. Pathologic conditions that trigger visceral nociceptive pain include tumors and obstructions of the organs (Table 7-1).

Table 7-1
Physiologic Sources of Pain

PHYSIOLOGIC STRUCTURE	CHARACTERISTICS OF PAIN	SOURCES OF ACUTE POSTOPERATIVE PAIN	SOURCES OF CHRONIC PAIN SYNDROMES
Nociceptive Pain			
Somatic Pain			
Cutaneous or superficial: skin and subcutaneous tissues Deep somatic: bone, muscle, blood vessels, connective tissues	Sharp, burning, dull, aching, cramping	Incisional pain, pain at insertion sites of tubes and drains, wound complications, orthopedic procedures, skeletal muscle tissue	Bony metastases, osteoarthritis and rheumatoid arthritis, low back pain, peripheral vascular diseases
Visceral Pain			
Organs and the linings of the body cavities	Poorly localized Diffuse, deep cramping or splitting, sharp, stabbing	Chest tubes, abdominal tubes and drains, bladder distention or spasms, intestinal distention	Pancreatitis, liver metastases, colitis, appendicitis
Neuropathic Pain			
Nerve fibers, spinal cord, and central nervous system	Poorly localized Shooting, burning, fiery, shocklike, sharp, painful numbness	Phantom limb pain, postmastectomy pain, nerve compression	HIV-related pain, diabetic neuropathy, postherpetic neuralgia, chemotherapy-induced neuropathies, cancer-related nerve injury, radiculopathies

Adapted from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2013, Saunders.

Four pain processes are associated with nociceptive pain (Figure 7-2) (Pasero and McCaffery, 2011):

1. **Transduction** begins when tissue damage causes the release of substances that stimulate the nociceptors and initiate the sensation of pain.
2. **Transmission** involves movement of the pain sensation to the spinal cord.
3. **Perception** occurs when impulses reach the brain and the pain is recognized.
4. **Modulation** occurs when neurons in the brain send signals back down the spinal cord by release of neurotransmitters.

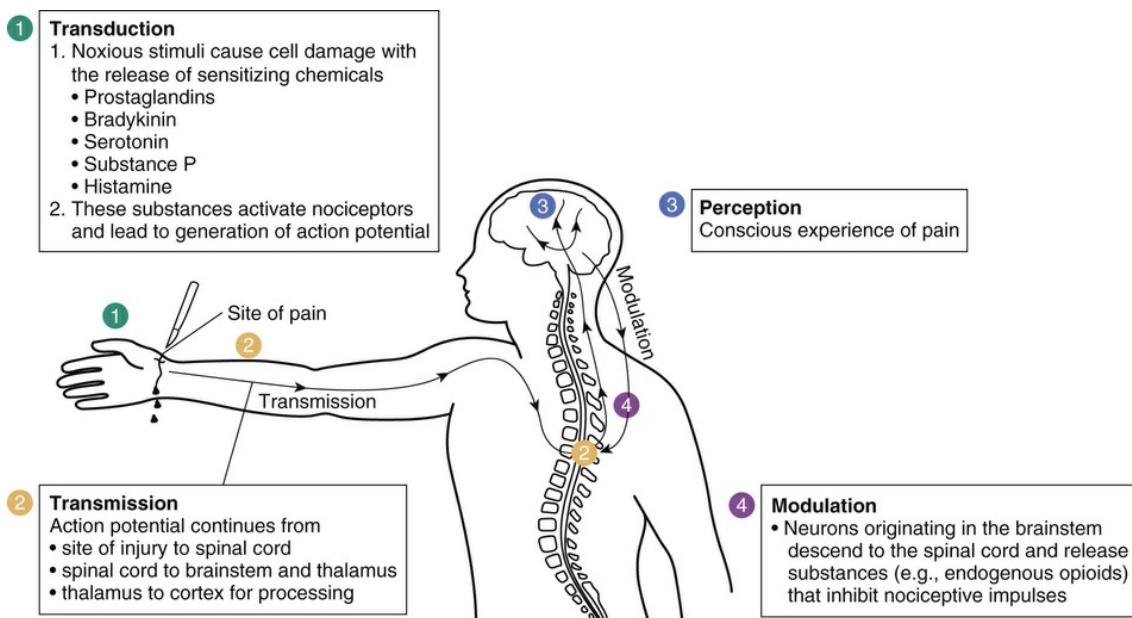


FIGURE 7-2 Nociceptive pain originates when tissue is injured. 1, Transduction. 2, Transmission. 3, Perception. 4, Modulation. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Aspects of nociceptive pain relate to nursing practice in several ways:

- Treatment of nociceptive pain may be directed toward one or all of the four phases.
- Nonsteroidal anti-inflammatory drugs (NSAIDs) work by blocking the production of the substances that trigger the nociceptors in the transduction phase.
- Opioids interfere with the transmission phase.
- Nonpharmacologic treatments, such as distraction and guided imagery, may be effective during the perception phase.
- Drugs that block neurotransmitter uptake work in the modulation stage.

Neuropathic Pain

Neuropathic pain is associated with a dysfunction of the nervous system that involves an abnormality in the processing of sensations. These dysfunctions in the nervous system are often associated with medical conditions rather than with tissue damage. The dysfunction may occur in the peripheral or central nervous system. In peripheral nervous system neuropathic pain, it is believed that pain receptors become sensitive to stimuli and send pain signals more easily. Nerve endings grow additional branches that send stronger pain signals to the brain. As the branches grow, they influence touch and warmth receptors. Other peripheral nervous system conditions may cause neuropathic pain. Neuropathic pain may be the result of damage to nerve roots, such as compression or entrapment. Another dysfunction of the central nervous system occurs when the pain signal that would normally move from the periphery toward the brain reverses, and the signal is sent in the opposite direction. **Phantom pain**, the pain felt in a limb after amputation, is an example.

Aspects of neuropathic pain relate to nursing practice in several ways:

- Analgesics and opioids usually do not relieve neuropathic pain.
- **Adjuvant** medications such as NSAIDs, tricyclic antidepressants, anticonvulsants, and corticosteroids relieve neuropathic pain.

Think Critically

What type of pain do you think a patient with an acute gallbladder attack might be experiencing?

Perception of Pain

Pain is a subjective experience. Only the patient knows the location of the pain, its degree of intensity, and which treatment regimen works and how long it is effective. **This is why the patient must be asked about pain.** Reactions to pain can vary widely from person to person and in the same individual under different circumstances.

Pain threshold is the point at which pain is perceived. Relaxation and distraction strategies can alter the perception of pain. **Pain tolerance** is the length of time or the intensity of pain a person will endure before outwardly responding to it. Tolerance varies among people and is influenced by culture, pain experience, expectations, and role behaviors. People with **acute pain** (of recent onset, lasting less than 6 months) may have physiologic symptoms such as increased pulse and respiratory rates, increased blood pressure, diaphoresis, and increased muscle tension. They may also experience nausea and vomiting. People with **chronic pain** (lasting months or years) may have learned adaptive methods that allow them to have some control over their pain. Symptoms associated with chronic pain include irritability, depression, withdrawal, and insomnia. Coping with any pain takes a lot of energy, and patients who are debilitated are less able to withstand pain than are strong, robust people. Fatigue caused by pain can lead to an increase in pain perception.

Clinical Cues

Patients who have a substance abuse problem are not to be denied pain medication when they experience acute pain. Patients who are being treated for long-term chronic pain often require higher doses of pain medication after surgery or trauma.

Pain causes a variety of physiologic responses, including increased respiratory rate, pulse, or blood pressure; muscle tension; sweating; flushing or pallor; and frowning or grimacing. Although the presence of any of these factors may indicate pain, their absence does not prove the absence of pain.

A person's cultural background influences feelings about pain. In much of Western culture it is considered desirable to have a high pain tolerance, particularly among men. Other cultures promote the idea that to endure pain is natural, or honorable. A nurse whose cultural background approves the "stiff upper lip" approach to handling pain may consider a patient who outwardly expresses pain to be weak or manipulative. By contrast, those patients whose cultural upbringing causes them to hide and deny pain may suffer needlessly unless the nurse can intervene and help them to understand that analgesia will aid the healing process by encouraging movement and decreasing fatigue. **Learning to accept without judgment the various ways of coping with and expressing pain is a very necessary process for nurses.**

Older Adult Care Points

The idea that pain perception diminishes with age is false. In fact, perception of pain may actually increase with age, as the individual becomes frail, has more than one chronic ailment, and has fewer resources for tolerating pain.

Acute versus Chronic Pain

Acute Pain

Patients with acute pain frequently experience fear and anxiety, which can take many forms. They may fear that something is seriously wrong, that they will never get relief from the pain, or that they will become addicted to the pain medication. The anxiety and fear of these patients can be alleviated by first providing adequate analgesia to relieve the pain and then educating them about their pain and the methods that can be used to control pain safely. Including patients in planning their care reassures patients that health care professionals believe them and want to help.

Rely on the patient's report of pain and intervene to promote comfort (Agency for Healthcare Research and Quality, 2013b). Table 7-2 compares acute and chronic pain. Some nurses hesitate to administer pain medication to patients with a history of drug abuse. Such patients may experience acute pain, for example, after surgery. The postoperative period is not the time to withhold pain medication from any patient. Concept Map 7-1 shows the various types and causes of pain.

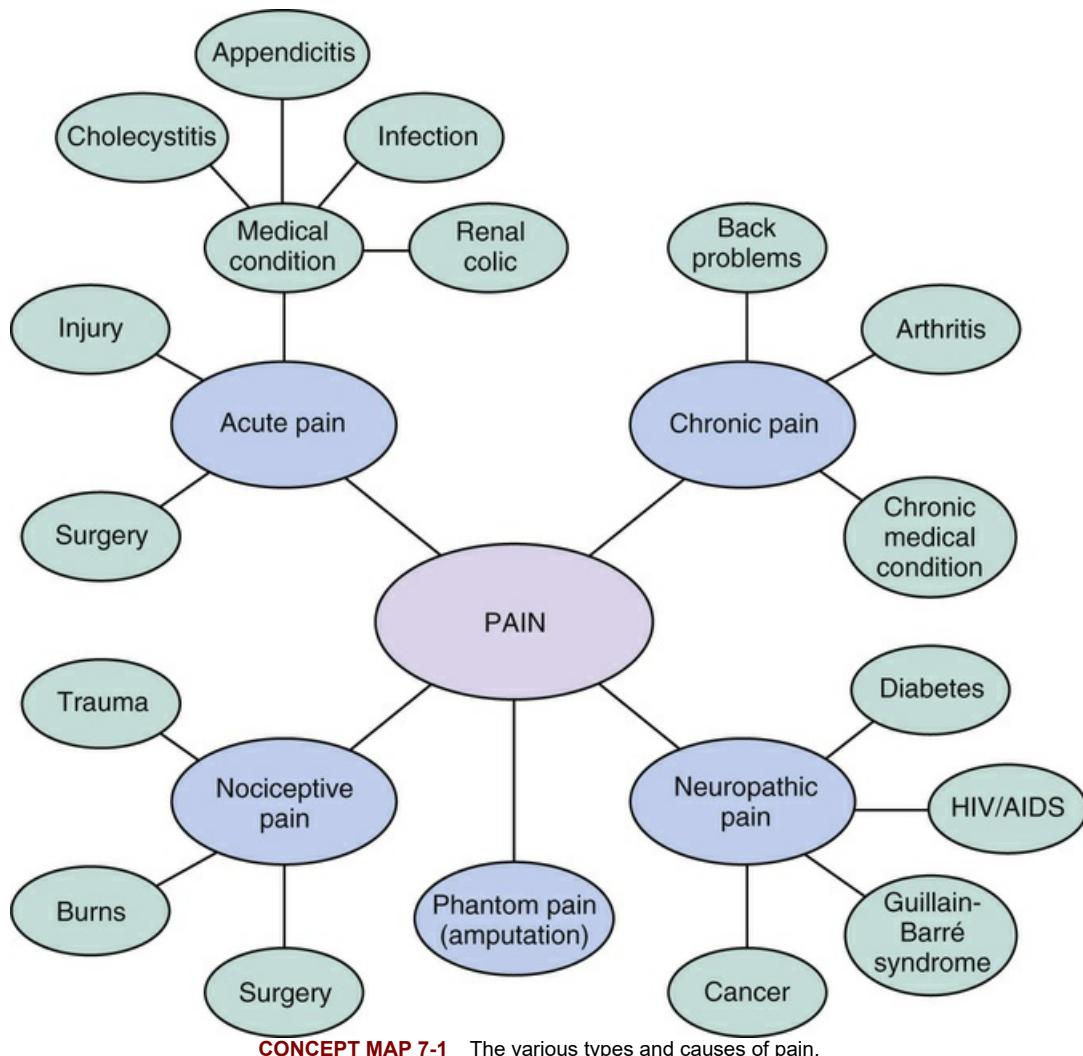


Table 7-2

Acute versus Chronic Pain

	ACUTE	CHRONIC
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Duration	Hours to days.	Months to years.
Prognosis for relief	Good; may resolve spontaneously or in response to analgesic therapy.	Poor unless complicating factors are removed; spontaneous relief is unusual.
Cause	Relatively easy to identify.	Sometimes the cause is known, but diagnosis may be complex or undetermined.
Psychosocial effects	Usually transient or none. May temporarily disrupt normal activities or routine.	Can affect ability to earn a living, enjoy social activities, or maintain self-esteem.
Effect of therapy	Medication is usually beneficial; surgery is often helpful.	Medications may be helpful, but patient may become dependent. Multiple-medication regimen may be used. Surgery may help but also may worsen the problem.

Chronic Pain

Neuromatrix theory, which hypothesizes that there is an interaction between physiologic mechanisms and psychosocial factors, supports using interventions to treat chronic pain. Behavioral and psychologic interventions may alter how the patient experiences the pain by affecting the patient's emotional state and cognitive process, thereby making the interventions more effective ([Smale and Rayner, 2013](#)). Chronic pain is often associated with depression. People who are in pain most or all of the time commonly resign themselves to the idea that they can never again live a normal life. Research and the work of several outstanding pain centers as well as nurse and provider specialists now offer new pain relief techniques for patients with chronic pain. Many people whose lives were previously dictated by their pain now experience good control and have returned to normal, productive lives.

Older Adult Care Points

Between 60% and 75% of older adults have chronic pain. The most common conditions that cause pain in this group are joint problems from osteoarthritis, degenerative disk disease, osteoporosis, low back pain, and pain from previous fracture sites. The pain may be combined with other chronic diseases and cause debilitation. If their chronic pain is adequately controlled, quality of life is improved ([Molton and Terrill, 2014](#)).

Nursing Management

Assessment (Data Collection)

Because no technology can accurately and objectively measure pain, you must use a combination of evaluation methods, including observation, rating scales, and the patient's self-report of pain. Pain is considered the "fifth vital sign." **Pain is to be assessed every time vital signs are taken by asking the patient to rate any pain and describe its characteristics.**

Observation

Appearance. The patient's face may look tense, drawn, or pale. There may be a grimace or even a look of fear. The body may be in a rigid, nonmoving position.

Behavior. A normally verbal patient may become quiet or withdrawn. One who is normally pleasant may become irritable, demanding, or argumentative. The individual may protect or "cradle" the painful area with the hands or arms or assume a fetal position with the legs drawn up. Tears, refusal of food or drink, or any behavior that is out of the ordinary for the individual may be an indication of pain.

Activity level. A person in pain often reduces activity to a minimum. Staying in bed, creeping slowly from place to place, stooping over during ambulation, and stopping frequently to rest or lean against a support can all indicate pain.

Verbalization. Many individuals in pain may verbalize their discomfort, but it is not always easy to interpret the degree of pain from what is said. Limited vocabulary, lack of experience in verbalizing abstract concepts, fear of disbelief or disapproval, cultural stoicism, and fear of medication side effects or of becoming addicted to the analgesic all can impair the person's ability to communicate the degree of pain.

Physiologic clues. Physiologic clues to pain include rapid, shallow, or guarded respirations; pallor; diaphoresis; increased pulse; elevated blood pressure; dilated pupils; and tenseness of the skeletal muscles. Other problems can also cause these physiologic clues to occur. All physiologic changes must be fully assessed to determine the cause.

Older Adult Care Points

Older patients may not report pain for a variety of reasons, and their pain is often undertreated. They may believe pain is an expected part of aging. They may deny pain because it means they are getting older. They may not report pain because they feel they cannot afford the cost of tests or treatments. Older adults often will say they have “soreness” or “discomfort” rather than pain. Assess further if such comments are made.

Focused Assessment

The Patient With Pain

Ask the following questions while assessing a patient with pain:

Location

- Where is your pain?
- Can you point to the pain?

Characteristics

- Can you describe your pain?
- What words would you use to describe the pain? (Aching, burning, gnawing, sharp, stabbing, shooting, etc.)
- Is the pain constant or does it come and go?

Quantity

- How strong or intense is your pain?
- How strong is your pain on this scale?

Pattern

- How long have you had this pain?
- Did the pain begin during activity, before eating, after eating?
- Did the pain start suddenly?
- Has the pain increased over time?

Associated Factors

- Have you had other symptoms such as nausea and vomiting, shortness of breath, rapid heart rate, sweating?
- What do your family members usually do when they are in pain?
- Do you have any chronic problems that cause pain?

Alleviating Factors

- What have you tried to relieve the pain? (Medication, certain position, application of heat or cold, distraction, etc.)
- Did it work?

Aggravating Factors

- What, if anything, makes the pain increase?

Pain Rating Scales

Several rating scales have been developed to evaluate pain. When using a pain rating scale, it is important that the nursing staff use it consistently and that the patient fully understands how to use it. The type of scale being used and any pertinent information about how the patient uses the scale must be included in the patient care plan.

Numbered scale. Numbered scales ask the patient to rate the degree of pain as a number from 0 to 5 or 0 to 10, with 0 indicating no pain and the highest number indicating the greatest amount of pain imaginable. The numbers in between show graduated levels of pain. The scale may be verbal or drawn on a piece of paper so the person can mark or point to the degree of pain. Number scales can be used very effectively with people who have a good understanding of the numerical concept and who like a strictly logical approach. They are not appropriate for young children, anyone who has difficulty with numbers, or anyone who is confused or disoriented.

Visual scale. Some visual scales use photographs or simple drawings of faces that progress through a series of expressions showing a pain-free state (happy and smiling) through increased discomfort. The final picture shows a face either crying or with an intense grimace ([Figure 7-3](#)).



FIGURE 7-3 Wong-Baker FACES pain rating scale. For coding purposes, numbers 0, 2, 4, 6, 8, and 10

can be substituted for the 0 to 5 system to accommodate a 0 to 10 system. (From Hockenberry MJ, Wilson D:

Wong's essentials of pediatric nursing, ed. 9, St. Louis, 2013, Mosby.)

Color scale. A color scale allows the patient to select colors that represent varying degrees of pain. Colored pieces of paper or plastic (e.g., poker chips), crayons, or markers can be used. The patient selects a color that represents no pain, a color that represents severe pain, and then one, two, or three other colors for pain levels in between. This scale is often used with children, but very young children cannot understand more than three or four possible choices.

Pieces of pain scale. A pieces of pain scale uses five poker chips or other identical, plain objects that represent “pieces” of pain. The patient indicates the degree of pain by selecting the number of chips that equals the intensity of pain being experienced.

Behavioral pain (face, legs, activity, crying, consolability [FLACC]) scale. A behavior pain scale is used with patients who are cognitively impaired or who cannot speak. The nurse assesses the patient’s behavior in categories such as facial expression, limb movement, and activity level ([Figure 7-4](#)). A score from 0 to 2 is obtained for each category, and the category scores are added together to arrive at a pain score total of 0 to 10. It is useful when assessing the pain of confused or nonverbal adults, infants, and young children. The Children’s Hospital Eastern Ontario Pain Scale (CHEOPS) is helpful for children 1 to 7 years of age (see Evolve[®]).

Think Critically

Can you explain the difference between acute and chronic pain to someone?

Face	0 No particular expression or smile	1 Occasional grimace or frown, withdrawn, disinterested	2 Frequent to constant frown, clenched jaw, quivering chin
Legs	0 Normal position or relaxed	1 Uneasy, restless, tense	2 Kicking, or legs drawn up
Activity	0 Lying quietly, normal position, moves easily	1 Squirming, shifting back and forth, tense	2 Arched, rigid, or jerking
Cry	0 No cry (awake or asleep)	1 Moans or whimpers, occasional complaint	2 Cries steadily, screams or sobs, frequent complaints
Consolability	0 Content, relaxed	1 Reassured by occasional touching, hugging, or talking to; distractible	2 Difficult to console or comfort

FIGURE 7-4 Face, legs, activity, crying, and consolability (FLACC) scale used to assess pain in cognitively impaired people. (Copyright 2002, reprinted with permission from The Regents of the University of Michigan.)

Data Collection Difficulties

Much of the data gathered when assessing a patient's pain comes from conversations with the patient, which presents a variety of problems. The first problem is language itself. Concepts of the true meaning of words in a common language may vary greatly from person to person. It is important to discuss the common words used to describe pain and to agree on their meaning ([Table 7-3](#)). It is important for documentation to include the patient's exact words.

Table 7-3
Common Terms to Help Patients Describe Pain

Degree of pain (from least to most severe)	Absent, minimal, mild, moderate, fairly severe, severe, very or extremely severe, excruciating
Quality of pain	Crushing, fingling, itching, throbbing, pulsating, twisting, pulling, burning, searing, stabbing, tearing, biting, blinding, nauseating, debilitating
Frequency of pain	Constant, intermittent, occasional, related to something specific (e.g., only when coughing)

The need to work through an interpreter or to deal with language difficulties when the patient speaks a foreign language compounds the problem of communicating pain. Whenever possible, use a medical professional (rather than a family member) with a good knowledge of both languages as an interpreter. Most hospitals have a list of approved interpreters to assist in these situations. Patients may hide personal, embarrassing, or painful information if the interpreter is a family member or personal friend.

Think Critically

What physical or behavior clues would you look for along with the use of a pain scale for a 22-year-old man admitted with a femur fracture?

Describing the location of pain can be made difficult by the phenomenon of **referred pain** (pain felt in a different part of the body from where it actually originates) ([Figure 7-5](#)). Heart pain may be felt in the jaw or radiating down the arm. Gastric pain may center in the area of the heart rather than the stomach. There also is a tendency not to believe an individual's statement of pain if there is no outward appearance of pain. For example, a patient watching an exciting football game with a

friend may enjoy the game even if his surgical incision is quite painful. The lack of a grimace or of physiologic changes indicative of pain may be viewed as an absence of pain, when in fact the patient is using distraction as a way of coping with the presence of pain. People may fall asleep even though pain is severe, particularly if uncontrolled pain has left them in a state of exhaustion.

Cultural Considerations

Cultural Beliefs That Affect Pain Perception and Treatment

Groups from different cultures may have beliefs about pain that differ from yours. However, just because a person is linked to a particular cultural group, it does not mean that he participates in the cultural practices of that group. Proper assessment of beliefs is important.

PAIN EXPRESSION AND MEANING	PREFERENCES AND ACTION
WHITE (EUROPEAN) Men display strong stoicism. Many fear addiction with opioid use. May dismiss the effects of pain and continue to work and carry out usual activities. May decrease use of pain medication quickly.	Prefer to use nonopioid medications. Many prefer to use relaxation and distraction techniques rather than medication, or just to "tough it out."
HISPANIC Mexican Americans often feel that pain is "God's will" and are stoical. Pain may be seen as a consequence of immoral behavior. For some males, expressing pain shows weakness and may cause lack of respect. Other Hispanic groups tend to be expressive of pain and discomfort and may moan, groan, or cry, and such expression is seen as acceptable.	Many feel that injectable medication is better treatment for pain than a pill. Prayer, heat, and herbs may be used to treat pain.
BLACK (AFRICAN AMERICAN, AFRICAN NATIVE) Pain is often seen as a sign of sickness. May express pain openly, but this varies. Pain may be seen as something to just be endured.	Laying-on of hands and prayer are believed to help relieve pain. May rely on spiritual or religious belief to help endure pain.
ASIAN Varies among subgroups, but generally tend to be stoical. Bearing pain may be seen as a matter of family honor. May describe pain obliquely in terms of body symptoms. Some Filipinos view pain as a part of life and to endure it as honorable. Older adults may fear addiction to pain medication.	May prefer oral or intravenous pain medication; injections may be seen as too invasive of privacy. May use applications of moist heat. Family may request pain medication for the patient.
AMERICAN INDIAN (NATIVE AMERICAN) Many believe that pain is something to be endured and will not ask for pain medication. Pain is often described in general body terms such as "I don't feel good." May not be aware that they can ask for medication for pain.	Many use traditional medicine men and rely on herbal preparations. May tell family or visitors about the pain rather than telling the health care provider.
ARAB View pain as something to be controlled and expect prompt treatment. May describe pain in terms of hot and cold. May express pain more openly to family than to health care providers.	Usually prefer injectable medication rather than pills.

Think Critically

Which pain scale would you use for a 24-year-old patient? Why? Which one would you use for a patient who is cognitively impaired? Why?

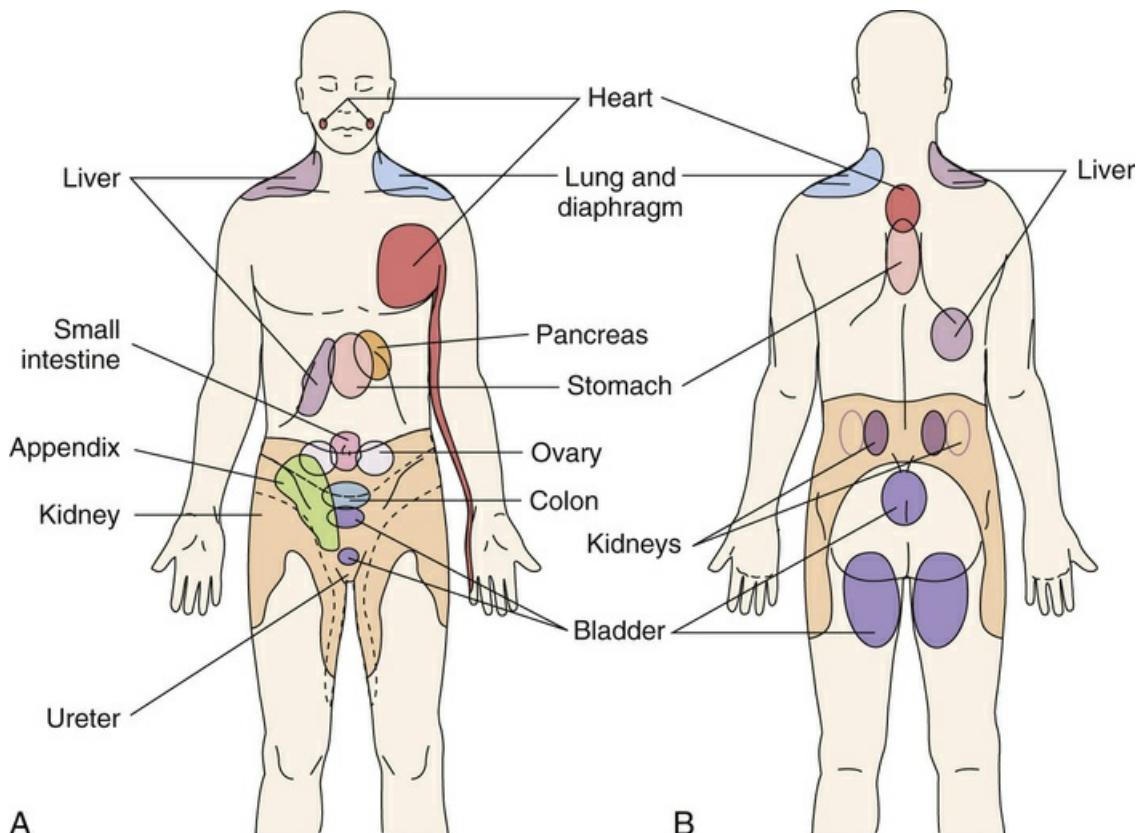


FIGURE 7-5 Usual sites of referred pain. **A**, Front. **B**, Back. (From Monahan FD, Neighbors M, Sands JK, et al: *Medical-surgical nursing: Health and illness perspective*, ed. 8, St. Louis, 2007, Mosby.)

■ Nursing Diagnosis

The nursing problem is pain, either acute or chronic. A specific NANDA-I diagnosis can be used showing a relationship to the cause and defining characteristics (symptoms).

■ Planning

The overall goal is **relief** of pain. If that is impossible to achieve, the goal is **control** of pain. Plan the goals of nursing care by indicating actions that will promote the comfort of the patient during treatment and recovery. Planning should be a team effort that includes the patient and relies on both pharmacologic and nonpharmacologic interventions. Provider input comes as written orders and progress notes and may be available through direct discussion. Include input on pain management from pharmacists, therapists, and other health care professionals. As recovery progresses, update the nursing care plan. The type of medication, method of delivery, and comfort measures will change as the patient's needs change. Planning must address all areas that affect the patient's pain management needs, including family situation, cultural influences, financial constraints, and whether pain is acute or chronic in nature ([Nursing Care Plan 7-1](#)).

Nursing Care Plan 7-1

Care of the Patient With Pain

Scenario

Mr. Jimenez, a 63-year-old patient with a history of a construction work accident, has been admitted through the emergency department after a fall and left hip fracture. A total hip replacement was performed this morning. Orders include morphine sulfate via patient-controlled analgesia (PCA), which has just been started. Mr. Jimenez has complained of pain at 7 on a 0-to-10 scale. His blood pressure and pulse are slightly elevated, but his temperature and respirations are normal. He has been restless and moaning.

Problem/Nursing Diagnosis

Pain/Pain related to surgical incision and replacement of hip.

Supporting Assessment Data

Subjective: Grimaces and moans when moves in bed; moves very cautiously; states muscles feel sore.

Objective: Incision at left hip; hip replacement on 5/17.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will report pain at 0-3 on a 0-to-10 scale within 2 hr.	Teach to use the PCA pump.	Knowledge of how to use the pump allows the patient to use it correctly.	Using pump correctly, but without good relief.
	Encourage relaxation techniques, provide diversionary activities such as television and electronic games.	Relaxation and diversion are known to lessen pain by focusing the mind elsewhere.	Taught relaxation exercise. Does not wish to watch TV at present. Will use electronic poker game.
	Assess for anxiety and concern about job and ability to keep working.	Anxiety and fear can increase the perception of pain.	Expresses concern about being out of work and what will happen to his family.
	Encourage use of the PCA before ambulation, exercise, or repositioning.	Medicating before activity reduces pain from the activity.	Medicated before physical therapy visit.
	Position in good body alignment.	When the body is in correct alignment, joints hurt less.	Repositioned in correct alignment with abduction pillow q2hr.
	Apply cold packs to reduce swelling over large bruise on lower thigh.	Cold reduces swelling by vasoconstriction and also dulls the perception of pain.	Cold pack over thigh for 20 min qhr × 8 hr.
	Observe frequently for pain relief and side effects of medication.	If pain is inadequately relieved, other measures to relieve it can be employed.	No side effects noted other than drowsiness. Pain at 3.
		Knowing if side effects are occurring allows measures to be taken to alleviate or prevent them.	
	Keep abduction wedge in place when supine.	Keeping leg abducted prevents dislocation of the hip and reduces pain.	Wedge in place when in bed.

Critical Thinking Questions

1. If the PCA pump medication is not controlling the pain adequately, what would you do?
2. Considering the age of the patient and the type of surgery, which possible side effects of the analgesia would be of greatest concern? What interventions would you use to try to counter the side effects and prevent problems?

■ Implementation

Reassess all patients for pain at the beginning of each shift, clinic appointment, or home visit and revise interventions based on the findings. Appropriate interventions include providing an analgesic as ordered, using nonpharmacologic measures such as repositioning or massage (adjunctive measures), and reporting to the provider when measures are not effective or have unwanted side effects. Implementation also includes teaching the patient and family how to monitor the effects of treatment. False perceptions of pain may need to be addressed (Table 7-4).

Table 7-4

False Perceptions of Pain

FALSE PERCEPTION	FACT
If pain is really present, there must be a demonstrable cause.	Pain can be present even though no cause can be found. Although damage to the cells does lead to the release of chemicals that stimulate the pain receptors, in many cases pain may be present even if no cellular abnormality can be found. A patient with a migraine headache may or may not suffer less than one with a brain tumor. We cannot say that just because the brain tumor can be shown on a brain scan and the headache cannot, the person with the brain tumor has greater pain than the person with the migraine headache.
A person who has a low tolerance for pain has no self-control and probably is emotionally immature or childish.	Pain tolerance is a physiologic response to pain that is made more complex by psychosocial factors—many of which can be beyond the control of the patient. Tolerance of pain is defined as that duration or intensity of pain the person is willing to endure without seeking relief. Pain tolerance varies greatly from one individual to another and varies in the same individual from time to time. Nurses often place a high value on a patient's ability to feel pain without complaining or asking for relief. Those who value a high pain tolerance usually impose their own values on their patients by ignoring or belittling patient reports of pain. The person who should decide how willing he ought to be to tolerate pain is the one who is suffering pain.
Neonates are too neurologically immature to perceive or remember pain, so analgesia is unnecessary in this age group.	Neonates do perceive and maintain memory of pain. They cry and pull away from procedures such as heelstick blood tests. Male infants cry and struggle when they are circumcised. Neonates with medical conditions that require repeated blood tests begin to cry and pull away as soon as someone grasps the foot if to perform a blood test, indicating a memory of pain from previous heelsticks. Analgesia for neonates is appropriate during procedures or situations that would be known to cause pain in more mature patients.
Older adult patients have a decreased ability to perceive pain, and pain medicines are dangerous for them because of their age.	Ability to express pain may be impaired by decreased cognitive function, but acute pain is still perceived. Advanced age combined with physical impairments, such as decreased kidney or liver function, may reduce tolerance for various medications, but with appropriate dosing and monitoring, older patients can have good pain management without severe side effects. Untreated pain will interfere with sleep, nutrition, healing, and general well-being.
Reactions to acute pain and chronic pain are the same.	In general, acute pain is more often associated with anxiety and chronic pain with depression. Emotional reactions such as anxiety and depression do not cause pain, but they can intensify pain. The management of acute and chronic pain is not the same, as discussed in the chapter text.
Addiction to pain-relieving drugs is always a hazard, and for the sake of the patient, nurses often must withhold a drug even though the patient asks for it.	A very small percentage of patients (probably less than 1% and no more than 3%) become addicted to drugs administered for the purpose of relieving acute pain. Despite an abundance of evidence to the contrary, this mistaken belief about the dangers of addiction persists, causing needless suffering among patients who are denied adequate pain relief.
Placebos (substances prescribed that contain no medication, such as sterile	There is no basis for believing that a patient who finds relief from pain after receiving a placebo has been pretending to have pain or that the reported pain has been "all in his mind." The question of how placebos affect people and why they have a positive response in some and not in others is still poorly understood. However, there has been sufficient study of the subject to show that actual pain is sometimes well relieved by placebos.

saline or sugar pills) are very useful in assessing whether a patient actually has pain.

Preventing complications from medications is an important aspect of implementation. Specific actions include:

- Prominent documentation of any known drug allergies
- Accurate recording of pertinent information obtained during the initial assessment phase, such as current medications and previous experience with pain, analgesics, and adjuncts to pain relief
- Patient and family teaching regarding dose, frequency, the need to first consult with the provider or nurse before taking any other medications to avoid dangerous interactions, possible side effects, and what to report
- Appropriate monitoring of effects of any medications given and prompt notification of the provider should medications fail to relieve pain or should problems occur
- Measures to prevent constipation when taking an opioid medication
- Accurate and complete documentation of any adverse reactions to treatment and communication of that information to other health care providers, to the patient, and to appropriate family members

■ Evaluation

Ask the patient about the effectiveness of the pain control measures. How quickly did relief occur? How long did it last? To what degree was the pain controlled? Were there any unpleasant side effects? Whenever possible, use patient verbalization as the primary evaluation tool. For evaluation, use a pain assessment tool with the patient before the pain is treated and again after treatment to compare the patient's response.

If the patient is unable to verbalize, evaluate the objective signs. For instance, an aphasic stroke patient might thrash, moan, and look fearful when in pain, and evaluation of effective analgesia might include, "Mr. Jones lying quietly, free of facial tension, watching the activity around him. He did not moan when repositioned 1 hour after analgesic given."

☒ Clinical Cues

Evaluation of the effectiveness of the pain control medication used should be based on the route of administration. Medications given by mouth may take 30 to 45 minutes to be effective. Injections are effective within 30 to 45 minutes. Intravenous (IV) medications are effective within 5 to 15 minutes.

■ Documentation

All measures to control pain must be accurately documented:

- Initial pain assessment (location, intensity, and duration of the pain and the method used to assess [e.g., pain scale, patient verbalization]; document aggravating and alleviating factors)
- Measures taken (e.g., analgesic medication, adjunctive measures)
- Evaluation of effectiveness of measures
- Provider notification of problems or concerns and provider response, if applicable
- Related patient or family education provided

☒ Patient Teaching

Managing Pain

Take medication before pain is severe, and take the medication regularly until the pain is well controlled before lengthening the time between doses. Use distraction, imagery, or relaxation exercises to augment the effect of the pain medication.

Example of Pain Documentation

01100. States pain level after physical therapy at 7 on a 0 to 10 scale. Morphine sulfate 10 mg IM in

the rt. deltoid. 45 minutes after injection, states pain level is now 2 to 3. Pulse 72, respirations 16, moving freely in bed. Discussed pain relief needs; suggested that he request pain medication before next therapy session (Signature).

Think Critically

What do you think is the most difficult aspect of evaluating someone's pain?

Management of Pain

Effective pain management is not just a matter of giving the right medicine at the right time. It is a combination of a stepped approach of pharmacologic measures coordinated with nonpharmacologic approaches that together give the individual the greatest possible degree of comfort for the longest possible time (see Evolve^E).

Home Care Considerations

Maintain a Medication Record

To prevent overdosage and toxicity, jot down the time pain medication is taken at home. It is easy to forget just when a medication has been taken.

Pharmacologic Approaches

Analgesics and Routes of Administration

Table 7-5 lists common analgesics by category and action.

 **Table 7-5**

Drugs Commonly Used to Treat Pain

TYPE OF DRUG AND PRIMARY ACTION	ACTION	EXAMPLES	NURSING IMPLICATIONS
Nonopioid analgesics, including nonsteroidal anti-inflammatory drugs (NSAIDs)	Block pain at the peripheral nervous system level	Over-the-counter aspirin, acetaminophen, ibuprofen, [*] ketoprofen, [*] naproxen [*] Prescription naproxen, indomethacin, ibuprofen, ketoprofen	May be present in combination drugs. Various possible side effects of which to be aware. [†] Educate patients not to use in combination with over-the-counter dosage of same medication.
Opioids	Block pain at the central nervous system level	Morphine, meperidine, hydromorphone, codeine, fentanyl	Constipation common, can be severe. Can cause respiratory depression; antidote is naloxone (Narcan).
Medications with nonanalgesic primary actions used as adjuncts to pain control	Various mechanisms of action	Antidepressants: amitriptyline, imipramine, trazodone hydrochloride Anticonvulsants: phenytoin, carbamazepine, gabapentin, pregabalin Stimulants: caffeine, dextroamphetamine Muscle relaxants: carisoprodol, baclofen Chemotherapeutic agents: methotrexate	Varied because of different mechanisms of action. Always be aware of side effects and possible adverse reactions. May cause grogginess.

^{*}Nonprescription dose.

[†]Note: Combination drugs are often used. These may combine two forms of analgesic (e.g., acetaminophen and codeine) or an analgesic with another type of medication, such as an antihistamine. It is important to be aware of what ingredients are contained in combination drugs to avoid administering excessive amounts of one of the components. The patient should receive no more than a total daily dose of 4000 mg of acetaminophen.

Oral analgesics.

An oral analgesic is any substance taken by mouth for the control of pain. Oral analgesics include over-the-counter (OTC) medications such as acetaminophen (Tylenol), aspirin (Bayer), and ibuprofen (Advil, Motrin) and prescription medications such as codeine and morphine. Oral analgesics are available in extended-release forms that can provide 12 to 24 hours of pain relief (naproxen [Aleve]). Mexiletine (Mexitil) may be used for the neuropathic pain of diabetes when adjunctive medications do not work.

Safety Alert

Preventing Acetaminophen Overdose

When administering acetaminophen, check all other medications and OTC drugs the patient is receiving. Many OTC drugs combine acetaminophen with other drugs. Toxicity may occur if more than the total recommended safe dosage of 4000 mg/day is ingested by an adult without liver impairment.

Intramuscular analgesics.

Intramuscular (IM) analgesics are substances injected into muscular tissue to control pain.

Subcutaneous analgesics.

Subcutaneous analgesics are medications injected or infused into **subcutaneous** (fatty tissue just beneath the skin) tissue to control pain.

Topical analgesics.

Topical analgesics are medications placed in a specific area on the skin to be absorbed by the vascular system. Topical anesthetics such as EMLA (a mixture of lidocaine and prilocaine) are used to treat pain from minor procedures such as venipunctures. Capsaicin (Zostrix) (made from a substance in peppers) is used topically for joint and other pain. Fentanyl sublingual spray has been approved by the FDA for use in more severe pain ([Jeffrey, 2012](#)).

Transdermal patches.

Transdermal patches placed on the skin rely on vascular uptake of pain medication. These patches can provide relief from systemic pain and are commonly used with patients who have chronic pain. Transdermal patches containing lidocaine may be used for local pain.

Safety Alert

Pain Patch

Fentanyl patches used for severe pain can cause death from overdose. Oxycontin patches may cause overdose as well. Signs of overdose are difficulty breathing; shallow breathing; extreme sleepiness; and inability to think, talk, or walk normally. Faintness, dizziness, and confusion are other signs.

Clinical Cues

Always remove the old transdermal patch before applying a new one; cleanse the skin where the old patch has been. The patch must be removed before the patient undergoes magnetic resonance imaging (MRI) to prevent a burn from the foil in the patch. Chart the location of the new patch.

Buccal swabs.

Buccal swabs contain medication that is absorbed through the **buccal mucosa** (mucous membrane lining the inside of the mouth) and provides rapid relief from pain. Buccal swabs are commonly used with hospice patients and may be used with other unconscious patients.

Intravenous analgesics.

Intravenous analgesics are substances injected or infused over a prescribed time directly into the vascular system. Ibuprofen, acetaminophen, and diclofenac (NSAIDs) have been released by the FDA for intravenous injection.

Patient-controlled analgesia.

Patient-controlled analgesia (PCA) is an infusion device controlled by the patient that injects the prescribed dose of analgesia. The PCA machine is programmed so that the patient can decide when a dose is given but cannot exceed the maximum dose or minimum time interval ordered by the provider. PCA analgesia is usually given IV, but it may also be administered subcutaneously. Ensure that free-flow protection is in use on the PCA pump so that overdosage is not possible. Morphine and hydromorphone (Dilaudid) are most commonly used for PCA. New guidelines allow “PCA by proxy,” by which a trained and authorized person may press the button on the PCA machine to activate an analgesic dose when the patient is alert but unable to press the button ([D'Arcy, 2013](#)).

Epidural analgesic.

An epidural analgesic such as morphine is medication infused directly into the **epidural** space near the base of the spine using a programmable pump. An anesthesiologist inserts the infusion catheter. Patients receiving epidural analgesia need to be monitored for possible delayed respiratory suppression or apnea, bradycardia, hypotension, urinary retention, nausea and vomiting, and allergic reactions such as itching or hives. Report adverse symptoms to the anesthesiologist immediately, and observe the insertion site for signs of infection, localized allergic reaction, and leaking. Usually an RN performs the thorough assessment and dressing change.

Peripheral nerve catheter.

A peripheral nerve catheter is used to deliver local anesthetic to the sheath of a nerve. These catheters are typically used postoperatively for patients who have had total joint replacement.

Nonanalgesic Medications Used for Pain Control

Antidepressants.

A number of antidepressant medications are effective in controlling some specific types of pain, such as nerve root pain. They may be given alone or in combination with other analgesic medications.

Chemotherapeutic agents and other immunosuppressants.

Occasionally drugs such as methotrexate (Rheumatrex) are used for **intractable pain** or to prevent further inflammation and joint damage in rheumatoid conditions.

Anticonvulsants.

Newer anticonvulsants, such as gabapentin (Neurontin), have been approved for treatment of neuropathic pain. Pregabalin (Lyrica) has been approved for the pain of fibromyalgia. Some patients experience side effects of grogginess and slowed reactions.

Muscle relaxants.

Muscle relaxants, such as baclofen, are often used adjunctively to ease spasm in patients with back pain, multiple sclerosis, and other neurologic and muscular disorders.

Marijuana.

When patients have limited relief from medication, adjuvants, and other nonpharmacologic methods, the provider may prescribe "medical marijuana" in states where its use is legal for the patient to try either for oral ingestion or to be inhaled in smoke. Three puffs a day have been shown to help people with chronic nerve pain resulting from injury or surgery ([Griffin and Nazario, 2014](#)). Marijuana in various forms has been found to be helpful for many cancer patients.

Special Considerations in Pain Management

Pharmacologic analgesics, including OTC drugs, may be administered to patients in a health care facility only under a provider's order to prevent unwanted interactions with other prescribed medications. For example, aspirin, commonly taken for occasional headache and arthritis pain, is a powerful anticoagulant. Aspirin can lead to dangerous complications for someone with a bleeding disorder or who is taking another anticoagulant medication. Acetaminophen in high doses is toxic to the liver and may be contraindicated in patients with a liver disorder. Alerting patients that OTC drugs can have serious interactions with their prescribed drugs is an important part of patient education.

Older Adult Care Points

Older adults commonly have reduced tolerance for medications. Smaller doses of analgesics may give effective relief without causing overwhelming sedation or disorientation. Older adult patients on analgesics must be monitored carefully, and the route of administration is a serious consideration. Intramuscular injections are not recommended for older adults, because diminished muscle and fatty tissue may affect the bioavailability of drugs.

Nurses' Responsibilities

In addition to following the “Six Rights” (right patient, right drug, right dose, right route, right time, right documentation), there are a variety of responsibilities when giving analgesic medications (Box 7-1).

Box 7-1

Nursing Responsibilities When Administering Analgesics

1. Document the drug, dose, route, and time of administration (including location of injection site for intramuscular or subcutaneous injections), and reason for drug administration.
2. Monitor the effectiveness of pain relief after 15 to 30 minutes and at 1- to 2-hour intervals. Document the degree and duration of pain relief in the patient record.
3. If the analgesic is ineffective, determine whether a stronger analgesic is available to the patient and administer per provider order. If no other analgesic is available, notify the provider that the medication is not effective. Also notify the provider if the medication is initially effective but the duration of effect is too short to maintain patient comfort until the next dose may be given.
4. If the analgesic results in unwanted side effects (e.g., depressed vital signs, vomiting, or altered level of consciousness), monitor the patient closely and notify the provider before administering another dose.

Pain is considered the fifth vital sign (temperature, pulse, respiration, blood pressure, and pain). Pain is assessed when vital signs are taken along with assessment for both efficacy of the analgesic given and side effects.

Side Effects and Complications of Pain Medications

Probably the most common—and one of the most distressing—side effect of pain medication is constipation. Analgesics such as morphine, meperidine, and codeine slow peristalsis. Fecal material becomes compacted and dry because of the extended time of passage through the intestines. Measures to prevent constipation should begin with the first dose of the medication.

Patients receiving these medications for any length of time should be monitored carefully for regular, normal bowel movements. **Oral fluids must be increased if possible.** Stool softeners and fiber-based laxatives, such as psyllium (Metamucil), can be helpful if approved by the provider. Miralax also has proven very effective for opioid-induced constipation.

Older Adult Care Points

Help prevent constipation in older adult patients receiving opioid analgesics by encouraging the increased intake of fluids and fiber, administering an ordered stool softener, suggesting prunes or prune juice; and monitoring for bloating, discomfort, and lack of daily bowel movement.

Some side effects of opioids, such as drowsiness and euphoria, generally only last for the first few days and then spontaneously disappear. Allergic reactions, such as itching and hives, must be reported immediately. Discontinue the medication and obtain an alternative order. The patient may need an antihistamine such as diphenhydramine (Benadryl) for relief of itching.

Clinical Cues

Itching from IV or IM morphine or other opioids may be relieved with an injection of nalbuphine (Nubain). An order for the medication is required (Susman, 2013).

Opioid analgesics can depress the respiratory system to the point of apnea (no respiration). Should this occur, resuscitation must begin immediately. In the hospital setting, provide respiratory support and call the code team. In the home, provider's office, or clinic, provide respiratory support

and call 911. The standard treatment for respiratory suppression from an opioid is naloxone (Narcan), an effective opioid antagonist that can be given IM or IV.

The most feared side effect to analgesia—that of addiction to opioids—in reality almost never occurs when pain medications are taken for real pain. **Patients in pain have a right to expect that effective analgesia will be available to them.** Dependence does occur with long-term use of many of the opioid analgesics and they should not be stopped abruptly. When pain can be controlled with nonopioid medications, the patient is tapered off of the opioid analgesic.

Clinical Cues

Because there seems to be an “epidemic” of women who are addicted to prescription opioid pain medications, nurses should seek close evaluation of patients who are on long-term opioids or those who seek more frequent doses of the medication or make more frequent refill requests ([Fiore, 2013](#)).

Legal and Ethical Considerations

Pain Control at the End of Life

Patients and their families often worry that treating the terminally ill with sufficient pain medication to control pain may hasten death. However, no scientific evidence has proven that this can happen when opioids are used to control pain. Health care providers have a moral obligation to adequately treat pain even at the very end of life, and opioids must be administered for the purpose of relieving pain and not to purposefully hasten death ([Reynolds et al, 2013](#)).

Older Adult Care Points

Some drugs are considered especially risky to administer to older adult patients. Tramadol (Ultram) and meperidine (Demerol) lower the seizure threshold and should be used cautiously ([AHRQ, 2013a; Hargas et al, 2012](#)). Consider all other drugs the patient is taking if tramadol or meperidine is ordered.

Nonpharmacologic Approaches

A variety of methods exist for relieving pain without or in addition to medications. Using adjuncts can increase the effectiveness of pain medication and may decrease the frequency at which it is needed .

Sleep

Adequate sleep and rest are major factors in healing. **Rest increases pain tolerance and improves response to analgesia.** Allow adequate time between treatments for naps, and plan care to keep sleep interruptions to a minimum. For instance, take vital signs when the patient is awake to use the bathroom or requests pain medication. It is important to remember that exhaustion will cause a patient to sleep, even while experiencing severe pain, but such sleep is not as therapeutic. Appropriate analgesia combined with adequate rest and other comfort measures promotes healing. Smoothing bedclothes, plumping pillows, adjusting lighting, and repositioning all increase comfort.

Heat

Gentle heat is very soothing for many types of pain. Heat promotes vasodilation of the area, which promotes increased blood supply and movement of nutrients to the affected area. Sources include warm compresses, warm blankets, water-filled heating devices, Hydrocollator pads, whirlpools, tub baths, heat lamps, and chemical self-heating packs. Compresses and packs are usually left in place for 15 to 20 minutes, although gentle heat sources such as water-filled heating devices may be used over longer periods. Always check the temperature before applying heat, and monitor the patient closely for tolerance. To prevent injury to the skin, never apply a warm compress directly to the surface of the skin. The very young and the very old are particularly sensitive to heat. Anyone with an altered level of consciousness or loss of normal sensation may not realize something is too hot,

and those with loss of movement may not be able to move away from the heat source when necessary.

Older Adult Care Points

The skin of older adults is thin and burns more easily. Stroke patients and those with diabetic neuropathy commonly have areas of lost or diminished sensation, and patients with senile dementia may not recognize that something is too hot. Even an alert and oriented older adult may fall asleep and be burned. Monitor any heat application very carefully. **Do not apply heat to any areas where nerve damage or decreased sensation has occurred.**

Menthol.

When applied to the skin, menthol causes warming, which may have an analgesic effect. Mentholated products are usually massaged into the skin, giving the individual the benefit of both massage and warmth. They are available OTC but require a provider's order in a hospital or clinic setting. Do not use menthol with external heating devices to avoid overheating the skin surface. Caution the patient to wash hands well after applying menthol to prevent contact of the menthol with the eyes or mucous membranes.

Cold

Cold is particularly helpful in reducing swelling through vasoconstriction. It also can be effective in relieving muscle spasms and some types of joint pain. Ice massage of sore muscles can be done by freezing water in a paper cup, then tearing away the edge of the cup to expose the ice, leaving the base of the cup as a handle. Some individuals are very sensitive to cold. If cold applications cause shivering, tensing of the muscles, or an increase in pain or spasm, discontinue their use.

Clinical Cues

The effectiveness of cold is maximized in 15 to 20 minutes. Remove the source after that time.

Distraction

Any activity that takes a person's attention away from pain is termed a *distraction*. This includes watching television, talking with friends, using a computer, or playing a game. People have an innate ability to distract themselves from their surroundings or situation. Health care workers may mistakenly interpret patients' ability to distract themselves as proof that there is no pain. Distracting activities can take the patient's mind off of pain momentarily, but distractions do not stop pain. Distraction can be helpful in bridging the time gap between giving an analgesic and the onset of pain relief.

Relaxation

Relaxation, also called "tension release," involves the conscious relaxation of muscle groups. Tension release is typically done as a progression, beginning at the feet and moving up the body, ending with the neck and facial muscles. Initially, you can guide the patient verbally, slowly directing the attention to the next muscle group to be relaxed. After one or two sessions, many patients can effectively provide their own relaxation sequence.

Guided Imagery

Guided imagery involves assisting patients to form mental images of a pleasant environment where they are comfortable and happy. For some, the experience is visual; in their minds they "see" a beautiful place. For others, it is a process of achieving a feeling of comfort and peace. Either is highly effective in giving the patient a brief mental break from pain. These methods often are used during painful procedures, such as bone marrow extraction.

Meditation

Meditation involves the use of a focus point, which may be a sound, a repeated phrase (sometimes called a *mantra*), the sound of the breath as it moves in and out of the body, or a visual image. The

visual image may be a picture or object that the patient gazes at, or it may be an imagined image (e.g., a candle's flame, a leaf moving with breeze, beach waves). Meditation works best when practiced daily.

Hypnosis

Hypnosis, or therapeutic suggestion, should be done by a trained practitioner. It involves the use of focusing and relaxation to induce a trance-like state during which a patient receives suggestions that may be helpful after returning to a normal level of consciousness. Hypnosis should be used only if the subject is comfortable with the idea and is open to its use.

Biofeedback

Biofeedback involves the use of a machine that uses electrodes attached to the skin to measure the degree of muscular tension. The machine has colored lights that change (usually red to yellow to green) and an audible tone that changes in pitch from higher to lower as the patient relaxes. The patient receives visual and auditory confirmation of self-induced relaxation. This technique is particularly effective with people who are highly competitive because it rewards success and allows them to "win" the game.

Music

Music used alone can be highly effective in bringing about relaxation and can be used as a focal point for meditation or to enhance other distracting activities. Nature sounds, including the ocean, running streams, breezes, rain, and birds singing, also can induce relaxation. Headphones allow the patient to be immersed in sound without disturbing others. Headphones with music can be used during loud or long diagnostic procedures such as MRI.

Binders

Binders are helpful for strains, sprains, and wounds or surgical incisions that are packed. They support the tissues during movement, such as ambulation or coughing, which reduces the pain.

Massage

The use of long, firm strokes; short, soft, circular strokes; and occasionally gentle pounding with the sides of the hands stimulates circulation, relaxes muscles, and increases the general sense of well-being. When the painful area has inflammation, or consists of a wound or an incision, massaging another area of the body with gentle but firm pressure helps the patient direct attention away from the pain. Always be guided by the patient's sense of comfort. Use only the degree of pressure that is pleasant and relaxing.

Simple massage can be done by a family member with just a little instruction, giving them an opportunity to assist in the care in a positive and loving way. Massage should not be used on any area that has been reddened by pressure. This tissue is already compromised, and massage can cause further damage through **shearing**, the traumatic pulling of tissue layers away from one another.

Acupuncture and Acupressure

Acupuncture originated centuries ago in China and involves the use of tiny needles inserted into the skin at specific points along lines called *meridians*, a concept similar to that of nerve pathways. In recent years it has gained favor as a pain control measure. Research has shown that acupuncture helps relieve back and headache pain ([Griffin and Nazario, 2014](#); [University of Maryland, 2013](#)). Acupressure involves the use of external finger pressure at the meridian points to achieve similar effects. Both acupuncture and acupressure require extensive training for proper use and should only be done by someone fully trained in these procedures.

Complementary and Alternative Therapies

Pain Relief

Complementary and alternative therapies are used more for pain relief than for anything else. Therapies include relaxation, meditation, biofeedback, yoga, hypnosis, imagery, chiropractic, acupuncture, acupressure, massage, aromatherapy, and herbal preparations and supplements. Research from the National Institutes of Health has proven that acupuncture is effective for many patients for various pain problems.

Transcutaneous Electrical Nerve Stimulation

Transcutaneous electrical nerve stimulation (TENS) uses a small electrical stimulator attached to the skin with electrodes placed around the area of pain. A low current running between the electrodes acts to block pain sensation. The degree of stimulation can be controlled by the patient using dials on the stimulator. The application of TENS requires specific training and must be ordered by a provider (Figure 7-6). Some patients find TENS unpleasant rather than helpful. In such cases, the provider should be notified and an alternative method of pain control selected.



FIGURE 7-6 Instructing the patient on how to use a transcutaneous electrical nerve stimulation (TENS) unit.

Spinal Cord Stimulator

A spinal cord stimulator is implanted in the epidural space adjacent to nerves that innervate the affected body area. This device is used for patients with chronic pain who have not responded to medications or other methods of pain management.

Invasive treatments.

Invasive treatments—such as sympathectomy, rhizotomy, and cordotomy, which sever the nerve conducting the pain—are now uncommon. Advances in pain management, including surgically implanted medication pumps and nerve stimulators, have made these invasive treatments unnecessary in most cases. A dorsal column stimulator may be implanted for pain after failed back surgery and for other pain syndromes. An epidural injection may be used to ease sciatic nerve pain.

The medication dosage given directly to the spinal cord (intrathecal) is about $\frac{1}{10}$ of the oral dose, so patients suffer no central nervous system side effects. They can work and drive while being relieved of severe pain. Epidural injection is recommended no more than two to three times a year, and there is some evidence that these injections make the patient more prone to fracture. The injection does not always work to relieve pain.

Think Critically

What types of nonpharmacologic methods would you use for a patient who is complaining of

shoulder muscle pain after an automobile accident?

Community Care

Community care for pain can take place in a variety of settings, with varying levels of training among direct caregivers. Nurses may need to work with the social worker before discharge to put in place all the necessary measures to control pain for the patient going home. Nurses in the community should help educate people about the complementary and alternative resources available to treat chronic pain.

Extended Care

Extended-care facilities may provide rehabilitative services, long-term care services, or both. Each type of care may include specific pain management needs. Patients undergoing rehabilitation often have acute pain related to therapy, particularly in the early phases. It is important that therapy be scheduled to allow for adequate rest and recovery time. It also is important that analgesic medication be given on a schedule that provides the patient with the greatest pain relief during therapy sessions. This assists the patient to cooperate with therapy, which in turn encourages a more rapid recovery. When planning, always include the patient, who knows best which medication and time schedule provides the most effective pain relief.

Long-term care facilities—also called nursing homes, skilled nursing facilities, transitional care units, and board and care homes—often have patients who live there for the last weeks, months, or even years of their lives. In such settings, the term *resident* is used, rather than *patient*. Residents may have pain resulting from a fall, after dental work, or during a period of illness, and they may have chronic pain from arthritis, degenerative disorders, or cancer. Residents may be mentally alert and oriented, be alert but confused, or have a decreased level of consciousness. Each of these individuals can perceive pain and should be given appropriate analgesics when pain exists.

Nurses can be of great assistance to providers in ordering analgesia by providing accurate information about the type of pain, the frequency, the intensity, and precipitating factors. For instance, a resident with degenerative arthritis and chronic joint pain may benefit from a routine oral analgesic such as acetaminophen or ibuprofen. Those with more severe chronic problems, such as cancer, may benefit from routine time-released medications such as MS Contin (oral morphine sulfate in a time-released tablet). As pain increases, an increased dosage of opioid may be needed to gain relief, but remember that older adults and debilitated individuals may be more drug sensitive. Monitor all medications carefully and work with the provider to ensure that the resident's pain is being appropriately addressed. Ideally, the resident is comfortable, alert, and able to participate in activities of choice. Nurses in the long-term care setting must make pain assessment and management a priority.

Home Care

The number of individuals receiving skilled and professional nursing care at home is increasing rapidly. Early discharge from the hospital is becoming more common, primarily to control escalating medical costs and because people generally are more comfortable and heal more rapidly in their home environment. Patients may go home from the hospital with peripheral or central IV lines providing analgesia. The nurse provides patient and family education on pain management in the home setting, which includes verbal and written instructions about the medication and any equipment used to dispense it. Telephone numbers that give the patient and family access to 24-hour assistance should be prominently displayed.

Just as in an inpatient setting, home care patients must be evaluated for the continued safety and effectiveness of the analgesic medication. Contact the provider any time the medication orders need to be adjusted. Adjuncts to pain management, such as simple massage, relaxation techniques, and the use of pillows, warmth, repositioning, or soft music, are taught to patients and families for use in the home care setting.

PCA medications sometimes are given subcutaneously rather than intravenously, particularly for those patients with poor peripheral venous access who are not candidates for a central line. A tiny needle is placed in the subcutaneous tissue on the abdomen and taped in place. Sites are changed at regular intervals to maintain good absorption of the medication and avoid damage to the tissues.

The increased use of central IV catheters and ports and the availability of oral and topical patch timed-release analgesics are making subcutaneous PCA devices much less common.

Current guidelines for home care by agencies such as Medicare require that case management be done by a licensed professional. This usually is an RN, although a registered physical therapist may fill this role for patients whose only acute need is continued restorative therapy. The role of the LPN/LVN is that of direct patient care under the guidance of the case manager. The LPN/LVN may monitor an ongoing infusion and discontinue the infusion as needed but must report any difficulties immediately to the case manager for intervention. Some states offer IV therapy certification for LPN/LVNs, which allows them to infuse medications.

Always be alert to an increase in pain resulting from changes in the disease process. The provider needs to be notified of the change so that appropriate measures, including adjusting or changing the medications, can take place.

Get Ready for the NCLEX® Examination!

Key Points

- Only the patient knows where the pain is and its degree of intensity.
- Pain is a neurologic response to unpleasant stimuli.
- Pain tolerance varies from one individual to another.
- Pain threshold is the point at which pain is perceived.
- Endorphins can block pain sensation.
- The gate control theory states that when the gate is open, pain sensation is allowed through; when the gate is closed, pain is blocked.
- The two pathophysiologic classifications of pain are nociceptive and neuropathic.
- Nociceptive pain derives from stimulation of somatic or visceral structures.
- There are four phases of nociceptive pain: transduction, transmission, perception, and modulation.
- Neuropathic pain is from dysfunction of the nervous system.
- The patient should be asked to use an appropriate pain scale.
- Cultural factors and beliefs affect each person's perception of pain.
- Pain assessment and data collection include the areas of appearance, behavior, activity level, verbalization, and physiologic clues.
- An interpreter may be required to gather correct data about a non-English-speaking patient's pain.
- Goals of care are (1) relief of pain and (2) control of pain.
- Pharmacologic and nonpharmacologic methods are used to treat pain.
- Neuropathic pain is relieved with NSAIDs, tricyclic antidepressants, anticonvulsants, and corticosteroids.
- False perceptions about pain may affect care (see [Table 7-4](#)).
- Evaluating the effectiveness of measures used to relieve pain is a primary nursing responsibility.
- Always follow the "Six Rights" when administering pain medication.
- Ask the patient about pain level and relief from medication at regular intervals.
- It is important to be knowledgeable about the commonly used analgesics (see [Table 7-5](#)).
- Constipation is a common side effect of opioid analgesia, and preventive measures should be used as soon as a opioid is begun.
- Adequate sleep assists in controlling pain.
- Hypnosis and biofeedback have been proven to be effective for many people for a variety of types of pain.
- Chronic pain is common among older adults in long-term care facilities.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• **Online Resources**

- American Chronic Pain Association, <http://www.theacpa.org>
- American Pain Society, www.ampainsoc.org
- American Society for Pain Management Nursing, www.aspmn.org
- Geriatric pain management, Online Resources, <http://consultgerirn.org>
- Pain assessment and management resources: <http://ltctoolkit.rnao.ca/resources/pain>

Review Questions for the NCLEX® Examination

1. The nurse administers ketorolac (Toradol) 30 mg IM to a 30-year-old male patient. The gate control theory indicates that the next nursing action to assist in pain control would be to:

1. recap the needle.
2. massage the area.
3. check for pain relief in 45 minutes.
4. encourage an activity that will provide distraction.

NCLEX Client Need: Physiologic Integrity: Basic Pathophysiology

2. In determining the patient's perception of pain, which question(s) by the nurse would be useful in assessing pain? (*Select all that apply.*)

1. "Where are you hurting?"
2. "What pain control measures have worked in the past?"
3. "How would you describe your pain?"
4. "What were you doing before the onset of the pain?"
5. "Are you sleeping adequately?"

NCLEX Client Need: Physiologic Integrity: Basic Care and Comfort

3. The nurse realizes that chronic pain may be handled **differently** from acute pain to:

1. prevent respiratory depression or other unwanted side effects.
2. keep pain below a 5 on a numerical pain scale most of the time.
3. provide the best pain relief with the least side effects and chance of addiction.
4. ensure that good long-term pain control is possible for the patient.

NCLEX Client Need: Physiologic Integrity: Basic Care and Comfort

4. A patient who has osteoarthritis is experiencing right knee pain daily. The nurse knows that this type of pain usually has the best result if treated by:

1. oxycodone.

2. ibuprofen.
3. Lyrica.
4. prednisone.

NCLEX Client Need: Pharmacologic Therapies: Expected Actions/Outcomes

5. A Mexican American woman who was in a minor automobile accident along with her 5-year-old son has a minor laceration on her arm that is not deep. Her son is being examined in the next room. The woman is moaning about the pain in her arm. Factors possibly influencing her perception of pain are probably: (*Select all that apply.*)

1. blood smearing her skirt and blouse from where her arm brushed them.
2. her Mexican American ethnicity and recent entry into the United States.
3. relief that another driver was not hurt in the accident and the car has minor damage.
4. worry about her son possibly sustaining a severe injury in the accident.

NCLEX Client Need: Integrated Processes: Caring

6. An appropriate short-term outcome written by the nurse for a patient with acute pain after surgery would be:

1. the patient will demonstrate use of PCA pump.
2. the nurse will assess for adequate pain relief.
3. the incision will heal without infection.
4. pain will be adequately controlled with a PCA pump.

NCLEX Client Need: Safe and Effective Care Environment: Coordinated Care

7. A patient with chronic pain requiring further measures to decrease pain asks the nurse, "What is a TENS unit?" What is the best nursing response?

1. "It is an implant in the epidural space adjacent to nerves that innervate the affected body area."

2. "It provides a small electrical stimulus to the skin around the area of pain."
3. "It involves the use of external finger pressure at the meridian points."
4. "It supports the tissues during movement."

NCLEX Client Need: Integrated Processes: Teaching and Learning

8. A patient is discharged with a prescription for oral oxycodone with acetaminophen tablets. The nurse should inquire about all other medications the patient will be taking at home, looking for the possible presence of more _____. (*Fill in the blank.*)

NCLEX Client Need: Physiologic Integrity: Pharmacologic Therapies

9. Before the nurse administers an opioid analgesic to a patient, the **most** important nursing action is to:

1. check the blood pressure.
2. provide other comfort measures first.
3. assess for possible constipation.
4. assess the rate and depth of respirations.

NCLEX Client Need: Physiologic Integrity: Pharmacologic Therapies

10. A 25-year-old patient complains of moderate pain at his incision site. The nurse administers morphine sulfate IM. The most appropriate nursing action after the injection would be to:

1. evaluate the effectiveness of the pain medication in 2 hours.
2. encourage him to close his eyes and rest.
3. suggest he play solitaire or watch something interesting on TV.
4. administer ordered ibuprofen orally.

NCLEX Client Need: Physiologic Integrity: Pharmacologic Therapies

11. The nurse is assigned to care for a patient with an epidural for analgesia. Which sign or symptom related to this treatment would require immediate provider notification?

1. Blood pressure 80/60 mm Hg

2. Temperature 99.5° F (37.5° C)
3. Respirations 12/min
4. Urinary output less than 30 mL/hr

NCLEX Client Need: Physiologic Integrity: Pharmacologic Therapies

12. A long-term care nurse is caring for an older adult male patient who appears to be withdrawn and quiet. He grimaces whenever he is touched. The **most** appropriate nursing action would be to:

1. administer pain medication.
2. assess for underlying causes of the patient's behavior.
3. reposition him and check again in 2 hours.
4. notify the provider.

NCLEX Client Need: Health Promotion and Maintenance: Aging Process

Critical Thinking Questions

Scenario A

Jo Ann Patterson, a 56-year-old woman, has suffered shoulder pain from an old healed fracture for several years. When the pain is too severe to be controlled with acetaminophen, her provider recommends that she use the oral opioid analgesic he prescribed. However, Jo Ann does not want to continue taking drugs that she "might become addicted to."

1. How would you respond to Jo Ann's statement regarding her fear of addiction to the pain medication?
2. What other measures could you suggest for management of Jo Ann's pain?

Scenario B

Tom Johnson, an African American construction worker, had a bowel resection 3 days ago. He is determined to get back to work quickly and is cooperative about ambulation. He refuses pain medication, stating, "I don't need it." You note that he stops frequently to lean against the wall, walks stooped over, and grimaces when no one is looking.

1. Why might Tom be refusing pain medication?
2. What information might you share regarding pain control and getting well after major surgery?
3. What suggestions might you make to Tom regarding his comfort?

Scenario C

Jim Tolliver, age 32, sprained his left ankle while playing football with his friends this morning. He consults his neighbor (who is a nurse) about what to do because it is hurting a lot.

1. What should his nurse neighbor do first?

2. What should be suggested to Jim regarding home treatment?
3. What precautions should the neighbor take regarding further treatment?

CHAPTER 8

Care of Patients With Cancer

Objectives

Theory

1. Analyze organization of neoplastic (abnormal tissue) growth.
2. Identify at least five factors that may contribute to the development of a malignancy.
3. List at least four practices that can contribute to prevention and early detection of cancers.
4. Include the recommendations of the American Cancer Society in a plan for routine checkups and detection of cancers into patient education.
5. Explain the advantages and disadvantages of the various treatments available for cancer.
6. List the major problems for a patient who is coping with side effects of radiation or chemotherapy for cancer, and state the appropriate nursing interventions.
7. Apply knowledge of the stages of the grieving process experienced by a patient dying of cancer to the patient's coping level.

Clinical Practice

8. Devise an individualized plan of care for a patient receiving chemotherapy.
9. Formulate a teaching plan for a patient who has bone marrow suppression from cancer treatment.
10. Institute nursing interventions to help a patient cope with the common problems of cancer and its treatment.
11. Use appropriate nursing interventions to help patients and families deal with the psychosocial effects of cancer and its treatment.
12. Employ nursing interventions to help cancer patients cope with death and dying.

KEY TERMS

benign (bē-NĪN, p. 145)

biopsy (BĪ-öp-sē, p. 155)

brachytherapy (bra-kē-thér-ě-pē, p. 161)

carcinogens (kär-SĪN-ō-jēnz, p. 147)

carcinoma (kär-sī-NŌ-mā, p. 146)

cytology (sī-TÖL-ō-jē, p. 152)

cytotoxic (sī-tō-TÖK-sīk, p. 163)

deoxyribonucleic acid (DNA) (dē-ōks-ē-rī-bō-nū-KLĀ-īk ĀS-īd, p. 145)

encapsulated (ěn-KĀP-sū-lāt-ēd, p. 145)

hematoma (hē-mă-TŌ-mă, p. 146)
incidence (ĭN-sĕ-dĕns, p. 144)
leukemia (lū-KĒ-mē-ă, p. 146)
lymphoma (lĭm-FŌ-mă, p. 146)
malignant (mă-LĬG-nănt, p. 145)
melanoma (mĕl-ă-NŌ-mă, p. 146)
metastasis (mĕ-TĀS-tă-sĭs, p. 146)
mutation (mū-TĀ-shŭn, p. 147)
neoplasm (NĒ-ō-plăzm, p. 145)
occult blood (ö-KÜLT blüd, p. 152)
oncogenes (ÖNGK-ō-jēnz, p. 147)
palliative care (PĀL-ē-ă-tĭv kār, p. 173)
prognosis (prōg-NŌ-sĭs, p. 146)
promoters (prō-MŌ-tĕrz, p. 148)
sarcoma (sär-kŌ-mă, p. 146)
TNM staging (tē ēn ēm STĀ-jĕng, p. 147)
transformation (trānz-fĕr-MĀ-shŭn, p. 149)
tumor markers (TŪ-mōr MĀR-kĕrz, p. 156)
vesicants (VĒ-si-kĕntz, p. 163)

The Impact of Cancer

Cancer is a group of diseases that characteristically grow in an uncontrolled manner with the spread of abnormal cells. In many instances, however, the growth can be controlled by specific treatment. In the early 1900s, there was little hope for survival once cancer was detected. Now, approximately 4 of 10 people who are diagnosed with any type of cancer will be alive in 5 years, which is a 50% improvement since 1975.

Excluding basal and squamous cell skin cancer, about 1,658,370 new cases of invasive cancer will be diagnosed in 2015 ([American Cancer Society \[ACS\], 2015](#)). It is estimated that more than an additional 1 million people in 2015 will be told that they have squamous or basal cell skin cancer. The current rate of cancer is about the same as it was in 1977, indicating little advance in the rate of cancer occurrence. The **incidence** of lung cancer in men declined during the past two decades, and the incidence in women has just begun to decrease. Thus, for the first time, the death rate from lung cancer is the same in both men and women. However, approximately 1000 adolescents begin smoking every day; if this continues, approximately 5.6 million children under 18 years of age today will eventually die of smoking-related illness, including lung cancer ([U.S. Department of Health and Human Services, 2014](#)). The incidence of colorectal cancer declined 4.1% among adults 50 years of age and older but increased by 1.1% for those younger than 50 years. However, the incidence of breast cancer has increased over the past three decades, a trend that is mostly attributed to improved detection.

Death rates for many other major cancers have stabilized or declined since the 1930s. However, cancer still accounts for one in four deaths in the United States today. About 589,430 people died of cancer in 2014 (1600 people per day) ([ACS, 2015](#)). On the other hand, there are 14.5 million living Americans who have a history of cancer, and 68% of them were diagnosed more than 5 years ago. **That means that 68% of cancer patients are surviving!** Because of earlier detection and improvements in treatment methods, patients who are diagnosed today may have much higher survival rates. Individuals are more likely to survive cancer if it is treated in its earliest stages. In fact, the American Cancer Society (ACS) estimates that if all the cancers that are detectable early **were diagnosed in localized stages**, the 5-year survival rate would be 95%. [Figure 8-1](#) shows the leading sites of new cancer cases and deaths.

Leading Sites of New Cancer Cases and Deaths – 2015 Estimates

Estimated New Cases*		Estimated Deaths	
Male	Female	Male	Female
Prostate 220,800 (26%)	Breast 231,840 (29%)	Lung & bronchus 86,380 (28%)	Lung & bronchus 71,660 (26%)
Lung & bronchus 115,610 (14%)	Lung & bronchus 105,590 (13%)	Prostate 27,540 (9%)	Breast 40,290 (15%)
Colon & rectum 69,090 (8%)	Colon & rectum 63,610 (8%)	Colon & rectum 26,100 (8%)	Colon & rectum 23,600 (9%)
Urinary bladder 56,320 (7%)	Uterine corpus 54,870 (7%)	Pancreas 20,710 (7%)	Pancreas 19,850 (7%)
Melanoma of the skin 42,670 (5%)	Thyroid 47,230 (6%)	Liver & intrahepatic bile duct 17,030 (5%)	Ovary 14,180 (5%)
Non-Hodgkin lymphoma 39,850 (5%)	Non-Hodgkin lymphoma 32,000 (4%)	Leukemia 14,210 (5%)	Leukemia 10,240 (4%)
Kidney & renal pelvis 38,270 (5%)	Melanoma of the skin 31,200 (4%)	Esophagus 12,600 (4%)	Uterine corpus 10,170 (4%)
Oral cavity & pharynx 32,670 (4%)	Pancreas 24,120 (3%)	Urinary bladder 11,510 (4%)	Non-Hodgkin lymphoma 8,310 (3%)
Leukemia 30,900 (4%)	Leukemia 23,370 (3%)	Non-Hodgkin lymphoma 11,480 (4%)	Liver & intrahepatic bile duct 7,520 (3%)
Liver & intrahepatic bile duct 25,510 (3%)	Kidney & renal pelvis 23,290 (3%)	Kidney & renal pelvis 9,070 (3%)	Brain & other nervous system 6,380 (2%)
All sites 848,200 (100%)	All sites 810,170 (100%)	All sites 312,150 (100%)	All sites 277,280 (100%)

*Excludes basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

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FIGURE 8-1 Leading sites of new cancer cases and deaths. (From American Cancer Society. *Cancer Facts and Figures 2015*. Atlanta: American Cancer Society, Inc.)

Physiology of Cancer

The human body is continuously producing new cells to replace those that are worn out and to repair damage done to cells by illness and injury. An abnormal replication of cells results in a **neoplasm** (new growth of tissue, or tumor), which is not beneficial. The word **benign** indicates a neoplasm that is usually harmless. Benign growths are almost always **encapsulated** (surrounded by a fibrous capsule). The capsule prevents the release of cells and restricts their spread to other parts of the body. Benign growths can, however, create problems if they press against and interfere with the normal structure and function of nearby organs.

The cells of **malignant** (uncontrolled growth that can lead to death) growths are quite different from normal cells. Cells that exhibit malignant growth are known as *cancer*. Cancerous growth changes a cell's **deoxyribonucleic acid (DNA)** makeup and function and the DNA structure and function of cells that are replicated; hence cancer cells do not look like or behave like normal cells (Figure 8-2).

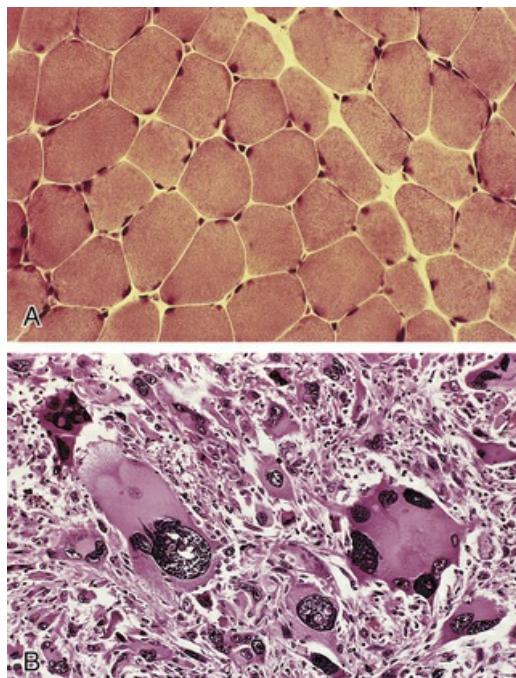


FIGURE 8-2 Normal and malignant skeletal muscle cells. **A**, Normal skeletal muscle cells. Note that cells are well differentiated and similar in appearance. **B**, Malignant tumor cells in skeletal muscle (rhabdomyosarcoma). (From McCance KL, Huether SE, Brashers VL, Rote ND: *Pathophysiology: The biologic basis for disease in adults and children*, ed. 6, Philadelphia, 2010, Elsevier.)

The nucleus of a malignant (cancer) cell is large and irregular. Dividing cells fail to follow the rules that regulate the reproduction of normal cells. Malignant cells do not seem to "know" when to stop multiplying. The offspring of cancerous cells **proliferate** (multiply) in great numbers, and they grow more disorganized, often forming tumorous masses. Some cancerous cells take on new characteristics, so that they do not resemble the cells of the original tissue. The malignant cells invade neighboring tissues and travel to other parts of the body. There they establish another colony of malignant cells. Their demand for nutrients depletes the supply of nourishment available for normal cells. This spread of tumor cells is called **metastasis** (movement of cancer cells from the original cancer site to other areas of the body). **Not all malignant cells metastasize, but most do.**

Think Critically

Can you compare and contrast the aspects of a benign versus a malignant tumor?

Classification of Tumors

Tumors are often classified according to the organs or tissues from which they first began to grow; alternatively, tumors can be classified according to the substances of which they are formed. The suffix *-oma* means “tumor”; this suffix is used in the names of various kinds of growths or swellings. Remember that *-oma* simply means “tumor”; the suffix *-oma* can designate any swelling, including a swelling in which there is a collection of fluids, as well as a swelling containing malignant cells. For example, **hematoma** (another word for bruise) is a combination of *hema-*, meaning “blood,” and *-oma*, meaning “a swelling or collection of fluid or cells.”

The prefixes used in classifying neoplasms indicate the kind of tissue in which they originate. For example, a tumor arising from fatty (lipoid) tissue is called a *lipoma*. A *fibroma* is a tumor composed of fibrous tissue. A *leiomyofibroma* contains both smooth-muscle tissue and fibrous connective tissue. Lipomas, fibromas, and leiomyomas are the most common types of benign growths.

Malignant growths are divided into four main types. A **sarcoma** arises from mesenchymal tissues (bone, muscles, and other connective tissues). A **carcinoma** originates in epithelial tissues (skin and mucous membranes). These kinds of cancers make up most cancers of the stomach, uterus, lungs, skin, and tongue. **Leukemia** and **lymphoma** are cancers of the blood-forming system. Malignancy of the pigment cells of the skin is called **melanoma**.

These are the main groups of cancers. More accurate naming can be achieved by adding modifying prefixes. For example, *osteosarcomas* arise from bone (*osteo-*), and *adenocarcinomas* arise from glandular (*adeno-*) structures.

Metastasis

Metastasis refers to the movement of malignant cells from the site of origin to another site. Malignant cells can metastasize by traveling in the blood and body fluids, in much the same way as do bacterial cells. It also is possible for free malignant cells to be directly transplanted from one organ to another during surgery when gloves and instruments that have these cells on them serve as vehicles for their transportation. Another way in which malignant cells can "contaminate" normal tissues and organs is by entering a body cavity and coming in contact with a healthy organ. For example, malignant cells may break off from a diseased organ, enter the abdominal cavity, and attach themselves to an ovary or the **mesentery** (tissues that connect the internal organs to the abdominal cavity wall) (Figure 8-3).

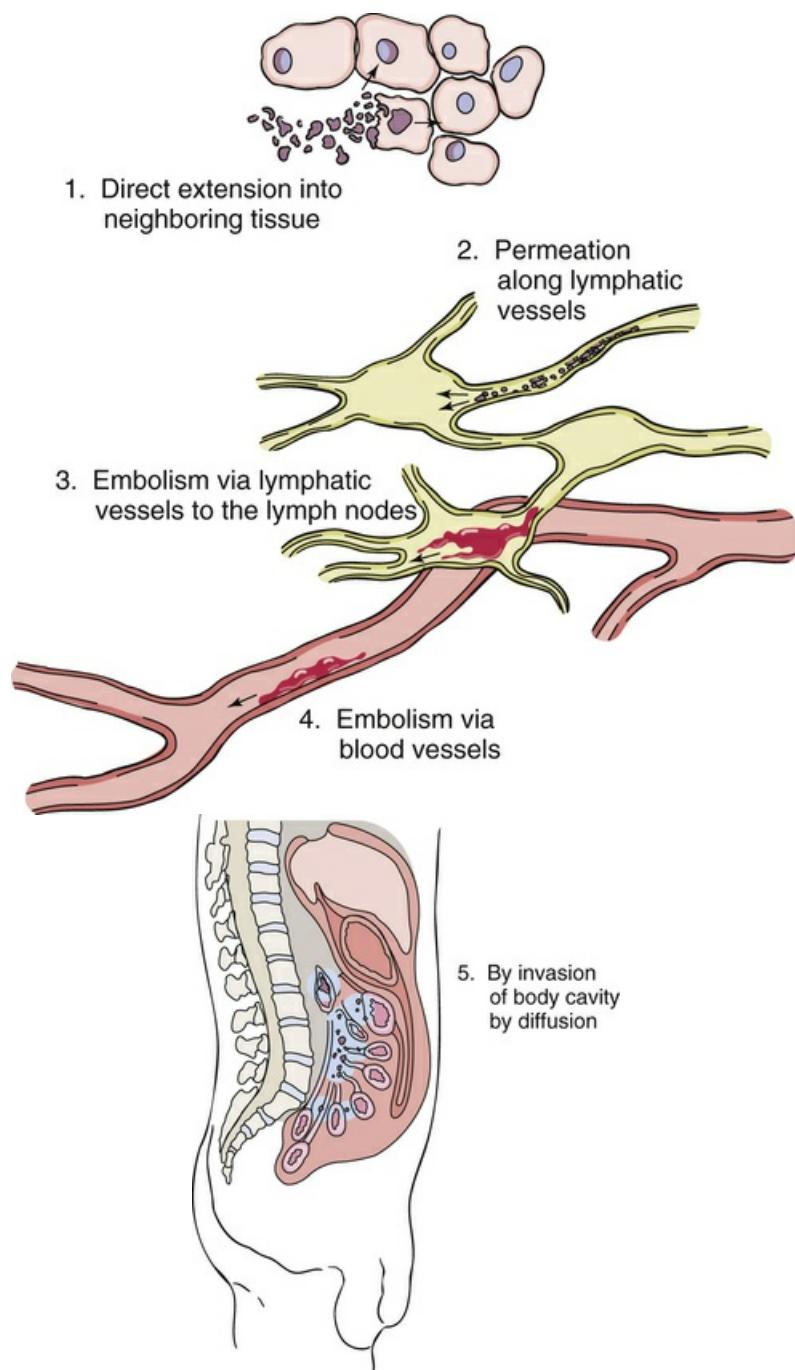


FIGURE 8-3 Modes of dissemination of cancer. (From Monahan FD, Neighbors M, Sands M, et al: *Medical-surgical nursing: Health and illness perspective*, ed. 8, St. Louis, 2007, Mosby.)

The **prognosis** (prediction of survival) for a patient with a malignancy depends on how much the malignant cells have attacked body tissues. A localized growth is one that remains at the original site (**in situ**) and has not yet released its cells, even though the growth may have invaded underlying tissues. At this stage the disease is much more easily destroyed.

A **regional** malignancy is one in which cells from the original malignancy have spread to the body area around the tumor, such as to nearby lymph nodes. The spread has been limited by the body's protective mechanisms. These cells may continue to grow and multiply, and if the regional cancer is not successfully treated, malignant cells will eventually break away and spread throughout the body. This creates an **advanced** cancer that is often fatal.

A new way to detect and measure malignant cancer cells is by CellSearch, a test developed to measure the circulating tumor cells in the blood. This test can detect just one tumor cell among 40 million circulating blood cells. At this point in time the test is being used to help determine the efficacy of treatment, but future uses may include cancer screening.

One system that identifies cancers by how much the malignancy has spread is the **TNM staging** system. The three basic parts of the system are *T* for primary tumor, *N* for regional nodes, and *M* for metastasis. The number written beside each letter indicates how much the malignancy has spread and attacked other tissues (see Evolve[®]). For example, T1, N0, M0 means that the tumor is small and localized (no involvement of regional lymph nodes and no metastasis). A label of T1, N2, M1 indicates a small (T1) tumor with moderate regional involvement (N2) that has metastasized to one distant site or organ (M1).

Causative Factors

All cancer results from defects in the DNA of genes. These defects either are inherited or are caused by **mutation** (a permanent change in the DNA sequence of a gene) during a person's lifetime from exposure to chemicals or radiation. Several cancer-causing genes (**oncogenes**) are discovered each year. Oncogenes are mistakes in the instructions inside a cell's genetic code, whereby newly created cells are no longer normal. The defective gene tells the new cells to multiply at a higher rate. Also, the defective coding prevents newly created defective cells from dying and being reabsorbed. This results in a tumor, or mass.

Tumor suppressor genes are healthy, normal genes that control the growth of cells in the body. Each person's body has a different ability to withstand the effects of cancer-causing substances (**carcinogens**), to mount a healthy immune response, and to repair damaged DNA. It is hoped that discoveries in molecular biology will allow individual risk profiles to be drawn that could be used to counsel people to avoid certain occupational and environmental exposures or to develop protective therapies.

In the external environment, many harmful agents exist that are known to be carcinogenic, and others are strongly suspected. **Among these harmful agents are certain chemicals, sources of radiation, and viruses** (Table 8-1). There are also some internal factors that affect an individual's ability to cope with malignant cells. Hormones play an undetermined role in the development and progress of cancer, and several inherited genes have been discovered that increase a person's chance of getting certain types of cancer.

Table 8-1
Common Carcinogenic Substances

SUBSTANCE	TYPE OF CANCER
Asbestos	Lung, peritoneal, pericardial
Benzene	Acute myelocytic leukemia
Tobacco	Lung, mouth, pharynx, larynx, esophagus, pancreas, bladder, kidney, colon, liver
Alcoholic beverages	Mouth, pharynx, larynx, esophagus, liver
Radon	Lung
Ionizing radiation	Leukemia, tumors of most organs
Sunlight (ultraviolet rays)	Skin
Diethylstilbestrol (prenatally)	Vaginal
Estrogens, synthetic	Endometrial
Androgens, synthetic	Liver
Vinyl chloride	Liver
Aromatic amines	Bladder
Arsenic (inorganic)	Lung, skin
Chromium	Lung
Nickel dust	Lung, nasal sinuses
Chronic hepatitis B or C infection	Liver
Human T-cell lymphotropic virus type 1 (HTLV-1)	Adult T-cell leukemia and lymphoma
Human papillomavirus (HPV)	Cervix, vagina, vulva, penis, anus, mouth, throat
Phenacetin	Renal pelvis, bladder
Alkylating agents (used for chemotherapy)	Acute myelocytic leukemia
Cyclosporine (used to prevent transplant rejection)	Non-Hodgkin lymphoma

Although cancer can strike at any age, older people are more susceptible. **Immunocompetence**, or the capability of one's immune system to deal with foreign cells—bacterial, viral, or malignant—decreases with aging and is an important factor in the development of cancers. As a result, the single biggest risk factor for cancer is age.

Chemical Carcinogens

More than 200 years ago (in 1775), Sir Percival Pott linked the occurrence of cancer to a substance in the environment when he observed that cancer of the scrotum was common among the chimney sweeps of London. He attributed this high incidence of cancer to repeated accumulations of soot on the skin of these young men, whose occupation required continuous contact with the coal soot in the chimneys they cleaned. Since that time, almost 500 different chemical carcinogens have been identified.

Think Critically

When you go shopping, can you identify additives used in your food that are carcinogenic? How can you reduce your exposure to them and decrease the risk of cancer?

Many of the cancer-producing substances in the environment are related to occupations that involve repeated exposure to these substances through handling or inhalation. **Petrofluorocarbons (polychlorinated biphenyls or PCBs) and some pesticides (e.g., DDT) are known carcinogens.** These and other such chemicals decrease immunocompetence. For example, cancer of the skin often is related to the handling of pitch, asphalt, crude paraffin, and petroleum products. Lung cancer is linked to irritating substances in the air, such as tobacco smoke, asbestos, radon, and chemical wastes from industry and automobiles. Benzene, an ingredient in older unleaded gasoline, is linked to leukemia. These are just a few of the chemical agents that can contribute to the development of cancer in humans.

Chewing tobacco has been directly related to cancer of the tongue and structures of the mouth and throat. **Cigarette smoking is a known direct cause of cancer of the lung and is believed to be linked to esophageal, pancreatic, bladder, kidney, liver, and colon cancers.** Cigarette smoking is even more deadly than previously understood. In early 2014 the surgeon general's office released a report implicating tobacco use in several other diseases, including diabetes, colon cancer, and liver cancer ([U.S. Department of Health and Human Services, 2014](#)).

Health Promotion

Effects of Smoking

Encourage individuals who use tobacco to quit. Ninety percent of lung cancers in men and 79% in women are related to smoking. Use of tobacco in conjunction with the intake of alcohol is related to several other types of cancer.

Immunosuppressive drugs used to suppress organ transplant rejection are a cause of non-Hodgkin lymphoma. Synthetic estrogens are linked to a higher incidence of endometrial cancer. Many cancer drugs affect the immune system and can predispose the patient to other types of cancer.

Promoters

Promoters are substances that are not carcinogenic alone but cause known carcinogens to lead to cancer at a faster rate. Alcohol is such a substance. When nicotine is present, cancers occur at a faster rate in those who are heavy consumers of alcohol than in those who use nicotine but do not drink alcohol. It is estimated that 90% of all head and neck cancers are related to a combination of tobacco and alcohol use.

Physical Carcinogens

Radiation

Radiation may originate from x-ray machines and radioactive elements or from the ultraviolet rays of the sun. These rays are capable of penetrating certain body tissues and causing the development of malignant cells in the affected area. The relationship of intense and prolonged exposure to these rays and the production of cancer cells was first discovered when there was a high incidence of cancer, particularly leukemia, among people who pioneered studies of x-rays or worked with radium or uranium. Survivors of the atomic blasts at Hiroshima and Nagasaki at the end of World War II had an unusually high incidence of leukemia.

There is continued concern about the danger that excessive radiation in the environment presents, especially the long-term effects that are not immediately apparent but may eventually prove to be related to malignancy. In addition to leukemia, cancers of the skin, bone marrow, breast, lung, and thyroid are believed to be closely linked to exposure to radiation.

The ultraviolet rays of the sun can produce skin cancer. The deterioration of the Earth's ozone layer is causing more ultraviolet rays to reach the earth than in the past, which compounds the problem. The susceptibility of the individual also is a factor: people with fair complexions have less protective pigment and therefore are more likely to develop skin cancer from ultraviolet radiation than are people with darker skin.

Radon Gas

Areas that have more radon emission from the soil have a higher incidence of malignancy in the population than do areas that are low in radon.

Viruses

The first cancer-causing virus was discovered in 1911, but it was not until recent years that extensive research has been directed toward establishing a link between **viruses** and **malignancy**. Experiments involving animals have demonstrated that a number of cancers can be produced in animals by injecting them with a filtrate from virus-infected malignant growths. **The hepatitis B virus is carcinogenic for liver cancer.** The Epstein-Barr virus causes Burkitt lymphoma. Cases of adult T-cell leukemia and lymphoma are caused by human T-cell lymphotropic virus. Several types of the human papillomavirus (HPV) cause cervical carcinoma or are related to throat and mouth cancer in nonsmokers. In fact, there are at least 10 cancers that have been identified as being driven by a virus. These viruses are known as **oncoviruses** because of their ability to cause cancer.

After the **transformation** (change into something else) of a normal cell into a precancerous state, the malignant cell requires many conditions favorable to its multiplication and growth into a cancerous tumor. **Viruses are capable of introducing new genetic material into a normal cell and transforming it into a malignant one.** Furthermore, cell reproduction can be altered when viruses interact with carcinogens. Viruses such as the human immunodeficiency virus (HIV) can damage the immune system and decrease immunocompetence, causing the body to become more susceptible to the growth of abnormal cells. Such damage also reduces the body's ability to fight off cancer-causing viruses, such as HPV. Some cancers—such as Kaposi sarcoma—are only seen in HIV-infected or severely immunocompromised patients (see [Chapter 11](#) for more information).

Genetic Predisposition

Research is revealing that there is a genetic predisposition to various types of cancer. It has been known for many years that breast cancer is more likely to occur in women who have a close female relative who developed breast cancer before age 50. Gene markers have been found for colon cancer, breast cancer, prostate cancer, pancreatic cancer, and leukemia. However, only 5% to 10% of cancers are related to a directly inherited gene. The remaining cancers are caused by genes that are damaged (mutated) throughout the lifetime and are not inherited. Some people are more susceptible to these mutations. These genes do not directly cause cancer, but the people who have the genes are at a much higher risk for cancer. For example, the breast cancer genes, *BRCA1* and *BRCA2*, increase a woman's risk for breast cancer, but other factors may also determine whether a woman will actually get breast cancer.

Because of this uncertainty, several assessment tools have been developed to estimate a woman's risk for breast cancer. These tools, which include the Gail model, the Claus model, and at least five other tools, ask the women to supply information about well-known predictors for breast cancer (family history, personal history) and provide an estimate of the women's risk. There are tools for other kinds of cancer as well.

Cultural Considerations

Race Factors

Some populations are at a higher risk for certain types of cancer. For example, of the four types of melanoma, African Americans are most susceptible to the acral lentiginous type, whereas whites are least susceptible to it. Lentigo maligna melanoma is found most often in Hawaii.

With the completion of the Human Genome Project, scientists are working to identify the genes that are related to specific cancers ([Perrett, 2012](#)). Currently, research is focused on finding genetic markers—or oncogenes—for other forms of cancer. Such markers, or the proteins they produce, could identify high-risk individuals who then might undergo more vigorous, regular diagnostic testing to detect any malignancy in the very earliest stages.

Contributing Factors

Intrinsic Factors

Age, sex, and race are considered “predisposing factors” for certain types of cancers. Predisposition simply means that, statistically, certain types of cancer strike particular age, sex, or racial groups more frequently than others. For example, prostate cancer is far more common in black males than in white males. Breast cancer is more prevalent in white women than in Asian women. As for age factors, approximately 76% of cancers occur in people aged 55 years and older.

Stress

Another factor that seems to play a role in the development of cancer is stress. Considerable stress over long periods has an adverse effect on the immune system; stress can make the immune system less effective in ridding the body of invading organisms and decreases the body's ability to destroy abnormal cells.

Diet

Most experts agree that approximately 30% of cancers could be reduced through proper nutrition and exercise. There is strong evidence that healthy diet and normal body weight are crucial in the control of cancer. Cancers of the breast, colon, rectum, endometrium, esophagus, uppermost abdomen, gallbladder, pancreas, liver, and kidney are all linked to excess weight and obesity. Although there is no universal agreement about the role of fiber in the prevention of malignancy, high-fiber foods such as fruits, vegetables, and cereals are recommended as a wholesome substitute for fatty foods.

Measures to Prevent Cancer

Nurses can be instrumental in educating the public about ways to prevent cancer. **Each nurse should teach patients the following measures at every opportunity.**

Diet and Nutrition

Encourage maintenance of normal weight. Obesity is considered a risk factor in many cancers. It also makes early detection of many cancers difficult. One study noted that men and women who were overweight by 40% or more have a 33% and 35% greater risk, respectively, for developing cancer than do persons with normal weight.

Nitrite and nitrate food additives are also known to be cancer **stimulators** (encouraging cancer). However, research has indicated that if foods containing nitrites are eaten in combination with foods containing vitamin C (ascorbic acid), the formation of nitrosamines is blocked. This means, for example, that if orange juice is consumed along with a meal containing bacon, there is less chance of carcinogenic nitrosamines damaging the body. In this instance the vitamin C is a cancer **inhibitor** (discouraging cancer).

Think Critically

If you saw that a package of meat contained nitrates, what other chemical would you expect to find in the package?

Nutrition Considerations

Minimizing the Risk for Cancer

- Eat a varied diet and balance caloric intake with exercise to maintain a healthy weight.
- Limit red meat and processed meat intake. Eat fatty fish twice a week to increase omega-3 intake. Limit other fat intake, particularly saturated and *trans* fats. Substitute olive oil for cooking and salad dressings where possible.
- Eat five or more servings of a variety of vegetables and fruits each day. Include cruciferous vegetables, those containing beta-carotene, tomatoes, onions and garlic, citrus fruits, and red and blue fruits and vegetables (cabbage, broccoli, Brussels sprouts, kohlrabi, cauliflower, carrots, yellow squash, sweet potatoes, red grapes, berries, and red cherries).
- Choose whole-grain foods over processed (refined) grains; include beans, whole-grain cereals, flaxseed, breads, and pastas to increase fiber intake daily.
- Keep alcohol consumption moderate: no more than two drinks or two glasses of wine or beer per day (one drink for women). No alcohol is best.
- Avoid smoked, salt-cured, nitrite-cured, and charred (blackened) foods.

From American Cancer Society: ACS guidelines on nutrition and physical activity for cancer prevention, 2015. Retrieved from www.cancer.org/healthy/eathealthygetactive/index.

These recommendations are from a report by a special committee on nutrition and cancer and are based on studies conducted for more than 20 years by the ACS's research program. Although no direct cause-and-effect relationship between diet and cancer has been demonstrated, there is ample evidence that avoidance of obesity and modification of the diet can help prevent some types of cancers.

Think Critically

Can you identify three specific changes you could make in your personal diet that might decrease your cancer risk? What would you add to the diet, or what would you stop eating?

Alcohol

Moderation in the drinking of alcohol is recommended, because alcohol consumption alone has been shown to increase risk for several cancers. Excessive alcohol consumption also can lead to liver damage, and possibly to liver cancer.

Environment

Because groundwater is often contaminated with chemicals from fertilizers, pesticides, and industrial wastes, it is wise to know the chemical makeup of the local water supply. If the geographic area is highly contaminated, filtered or bottled water might help prevent further damage to immunocompetence, and thereby decrease the incidence of cancer.

Patient Teaching

Avoiding and Limiting Exposure to Carcinogens

- Knowing which substances used in the household, yard, and areas of recreation and at the place of work are carcinogenic and using protective measures against them can decrease exposure.
- The use of protective clothing, gloves, and mask as appropriate when spraying pesticides or chemicals or using chemical cleaners or strippers greatly decreases exposure.
- Being certain the area is well ventilated when using chemical cleaners indoors is protective.
- Thoroughly washing the hands and any exposed skin after using compounds containing carcinogenic chemicals provides protection.
- Using an appropriate sunscreen and protective clothing when outdoors, avoiding sunburns, and avoiding tanning salons and sunlamps greatly decreases the incidence of skin cancer.
- Australians have the highest rate of skin cancer in the world and have developed a saying that is a good way to instruct your patients: **slip, slap, slop, strap**—**slip** on protective clothing, **slap** on a hat, **slop** on some sunscreen, and **strap** on sunglasses.
- Avoiding swimming and water sports in contaminated waters and avoiding eating fish from waters that have chemical contamination limit exposure.
- Washing or rinsing fruits and vegetables before preparing them for eating or cooking decreases exposure to agricultural pesticides.

Identifying High-Risk People

Studies of individuals who have developed cancer—their medical history, lifestyle, and family history—have shown that some people are more likely to develop certain kinds of cancer. Table 8-2 shows information on high-risk groups published by the ACS to develop an awareness of the need for frequent and thorough examinations to detect cancer early in those who are susceptible to developing a malignancy.

Table 8-2

Major Risk Factors for Cancer

TYPE OF CANCER	RISK FACTORS	SIGNS
Lung	<ul style="list-style-type: none">• Heavy smoker >50 yr• Smoked a pack a day for 20 yr• Started smoking at age 15 yr or	Persistent cough, blood in the sputum, chest pain, recurring pneumonia or bronchitis

	<ul style="list-style-type: none"> earlier • Exposure to environmental smoke • Exposure to asbestos, arsenic, certain chemicals in the workplace • Radiation or radon exposure • History of tuberculosis 	
Breast	<ul style="list-style-type: none"> • History of breast cancer • History of some forms of breast biopsy • Close relatives with history of breast cancer • Early menarche; late menopause • Never had children; first child after age 30 yr • Lengthy exposure to cyclic estrogen • Higher educational and socioeconomic status • Consumption of alcohol 	Lump in breast, nipple discharge, thickening, dimpling, nipple retraction, pain or tenderness of the nipple
Colon and rectum	<ul style="list-style-type: none"> • History of rectal polyps • Rectal polyps run in family • History of inflammatory bowel disease 	Blood in stool; alteration in bowel pattern (e.g., constipation alternating with diarrhea)
Uterine and cervical	<ul style="list-style-type: none"> • Frequent sex in early teens or with many partners • History of HPV • Low socioeconomic status • Poor care during or after pregnancy • Smoking or history of smoking • Exposure to in-utero DES 	Unusual bleeding or discharge
Uterine and endometrial	<ul style="list-style-type: none"> • Estrogen therapy • Tamoxifen therapy • Late menopause (after age 55 yr) • History of infertility or failure to ovulate • Diabetes, high blood pressure, gallbladder disease, obesity • Pelvic irradiation 	Unusual bleeding or discharge
Skin	<ul style="list-style-type: none"> • Excessive exposure to sun or tanning booth • Fair complexion • Work with coal tar, pitch, or creosote 	Change in the size, color, or appearance of a mole or spot on the skin; scaliness, oozing, bleeding or change in appearance of a bump or nodule; spread of pigmentation beyond the border; change in sensation of any skin lesion
Oral	<ul style="list-style-type: none"> • Heavy smoker and drinker • Use of smokeless tobacco • Poor oral hygiene • HPV 	White patch in the mouth or on the tongue; nodules
Ovary	<ul style="list-style-type: none"> • History of ovarian cancer among close relatives • History of breast cancer • History of never having children 	None until well advanced
Prostate	<ul style="list-style-type: none"> • Age >65 yr • Black ancestry • History of family incidence of prostate cancer 	Difficulty urinating; hesitancy, blood in the urine; need to urinate frequently; pain in lower back, pelvis, or upper thighs
Stomach	<ul style="list-style-type: none"> • History of stomach cancer among close relatives • Diet heavy in smoked, pickled, or salted foods • Some link with blood group A 	Nonspecific; indigestion, feeling of fullness or pressure; pain and weight loss are late signs
Pancreas	<ul style="list-style-type: none"> • Smoking or other recreational drugs 	No signs
Bladder	<ul style="list-style-type: none"> • Smoking 	Painless blood in the urine; need for frequent urination
Leukemia	<ul style="list-style-type: none"> • Down syndrome • Exposure to excessive radiation • Exposure to benzene (unleaded gas) • HTLV-1 infection • Philadelphia chromosome 	Frequent infections, easy bruising, fatigue, weight loss, nosebleeds, paleness

DES, Diethylstilbestrol; HPV, human papillomavirus; HTLV-1, human T-cell lymphotropic virus type 1.

Detection of Cancer

Cancer is a group of diseases. It can strike any organ of the body, affect different organs with different functions, and present an untold number of symptoms as it progresses. To be able to identify the symptoms of cancer in its earliest stages, it is important to be aware of its warning signals. The purpose of screening large segments of a population is to identify as many people with cancer as possible.

Health Promotion

Warning Signs of Cancer

- Unusual bleeding or discharge
- A sore that does not heal
- A change in bowel or bladder habits
- A lump in the breast or other part of the body
- A nagging, persistent cough
- An obvious change in a mole
- Difficulty in swallowing

Older Adult Care Points

Older adults have a higher risk for developing cancer; their immune system is not as efficient as that of a younger person. Many of the cancer screening programs are suggested to begin at age 40 or 50.

At physical examination, certain tests are conducted to determine whether a malignancy is present. Recommendations of the ACS for routine checkups and early detection of cancer are shown in **Table 8-3**.

Table 8-3
Screening Guidelines for the Early Detection of Cancer in People With No Symptoms and Average Risk

CANCER SITE	POPULATION	TEST OR PROCEDURE	FREQUENCY
Breast*	Women, age 20+	Breast self-awareness	All women should be familiar with their own breasts and how they normally look and feel. Women should be encouraged to contact their health care providers with any changes.
		Mammography	Begin mammography at age 40, if desired. <ul style="list-style-type: none">• Age 45-54: annual• Age 55 and older: biannual or annual, if desired• Continue mammography as long as life expectancy is 10+ yr.
Cervix†	Women, ages 21-65	Pap test Human papillomavirus (HPV) DNA test	<ul style="list-style-type: none">• Cervical cancer screening should begin at age 21.• Women ages 21-29 should be screened every 3 yr with conventional or liquid-based Pap tests.• Women ages 30-64, should be screened every 5 yr with both the HPV test and the Pap test (preferred), or every 3 yr with the Pap test alone (acceptable).• Women ages 65+ who have had normal results for the last 10 yr should discontinue testing and never restart.• Women who have had a total hysterectomy should stop cervical cancer screening.• Women vaccinated against HPV should follow the same cervical screening guidelines for all ages.
Colorectal‡	Men and women, age 50+	Fecal occult blood test (FOBT) with at least 50% test sensitivity for cancer	Annual, starting at age 50. Testing at home with adherence to manufacturer's recommendation for collection techniques and number of samples is recommended. FOBT with the single stool sample collected on the clinician's fingertip during a digital rectal examination is not recommended. Guaiac-based toilet bowl FOBTs also are not recommended. [§]
		Fecal immunochemical test (FIT) with at least 50% test sensitivity for cancer, or stool DNA test	Annual; starting at age 50 using the multiple stool take-home test. [§]
		Flexible sigmoidoscopy (FSIG)	Every 5 yr, starting at age 50. FSIG can be performed alone, or consideration can be given to combining FSIG performed every 5 yr with a highly sensitive gFOBT or FIT performed annually. [§]
		Double contrast barium enema (DCBE)	Every 5 yr, starting at age 50. [§]
		Colonoscopy	Every 10 yr, starting at age 50. [§]
		CT colonography	Every 5 years, starting at age 50. [§]
Endometrial†	Women, at menopause	At menopause, women at average risk should be informed about risks and symptoms of endometrial cancer and	For some women, history may dictate annual endometrial biopsy.

		strongly encouraged to report any unexpected bleeding or spotting to their physician	
Lung [¶]	Current or former smokers ages 55-74 in good health with at least a 30 pack-yr history, are still smoking or have quit within the past 15 yr	Low-dose helical CT (LDCT)	Clinicians with access to high-volume, high-quality lung cancer screening and treatment centers should initiate a discussion about lung cancer screening with apparently healthy patients ages 55-74 who have at least a 30 pack-yr smoking history, and who currently smoke or have quit within the past 15 yr. A process of informed and shared decision making with a clinician related to the potential benefits, limitations, and harms associated with screening for lung cancer with LDCT should occur before any decision is made to initiate lung cancer screening. Smoking cessation counseling remains a high priority for clinical attention in discussions with current smokers, who should be informed of their continuing risk of lung cancer. Screening should not be viewed as an alternative to smoking cessation.
Prostate [*]	Men, ages 50+ (African American, age 45) Should make an informed decision with a health care provider whether or not to be tested	Prostate-specific antigen test (PSA), with or without digital rectal examination (DRE)	Men who have at least a 10-yr life expectancy should have an opportunity to make an informed decision with their health care provider about whether to be screened for prostate cancer, after receiving information about the potential benefits, risks, and uncertainties associated with prostate cancer screening. Prostate cancer screening should not occur without an informed decision-making process. Research has not shown the benefits to outweigh the harm.
Cancer-related checkup	Men and women, ages 20+	During a periodic health examination, the cancer-related checkup may possibly include examination for cancers of the thyroid, testicles, ovaries, lymph nodes, oral cavity, and skin, as well as health counseling about tobacco, sun exposure, diet and nutrition, risk factors, sexual practices, and environmental and occupational exposures	

^{*}From the National Comprehensive Cancer Network (NCCN): NCCN Guidelines for Detection, Prevention, & Risk Reduction, http://www.nccn.org/professionals/physician_gls/f_guidelines.asp#detection

[¶]From the American Society for Colposcopy and Cervical Pathology (ASCCP): Screening Guidelines, <http://www.asccp.org/Guidelines/Screening-Guidelines>

[§]From American Cancer Society (ACS): American Cancer Society Guidelines for the Early Detection of Cancer 2015, <http://www.cancer.org/healthy/findcancerearly/cancerscreeningguidelines/american-cancer-society-guidelines-for-the-early-detection-of-cancer>

^{\$}Positive tests should be followed by colonoscopy.

[¶]From the National Cancer Institute (NCI): <http://www.cancer.net/cancer-types/lung-cancer-non-small-cell/screening>

One widely used technique to detect cancer is to examine cells under a microscope to determine whether they are malignant or premalignant. This technique is called **cytology**, and the most widely used cytology test is the Papanicolaou (Pap) smear to detect cervical cancer. A **cytologic examination** can be performed by obtaining a sample of secretions containing cells that have been released from adjacent tissue. The technique involves either scraping or brushing a sample of cells from the area or collecting body secretions that contain cells, such as cervical discharges, sputum, gastric washings, pleural fluid, or urinary washings. A specially trained technologist or pathologist examines the cells microscopically. If “suspicious” cells are found, the patient is referred to a health care professional for more extensive diagnostic tests. Another screening technique, used for colorectal cancer, is the simple test for **occult blood** (hidden blood) in the stool. This can be obtained through a fecal occult blood test (FOBT) or a newer test called the fecal immunochemical test (FIT). The person simply collects one or more stool specimens (depending on the particular test being used), applies a thin smear on the container provided, and returns the specimens to the health center, clinic, or clinical laboratory. **Occult blood in the stool is not always an indication of cancer of the bowel or rectum.** Other conditions also can produce this symptom.

Other procedures used to identify lesions that are possibly malignant include radiologic studies, endoscopy, sonography, magnetic resonance imaging, computed tomography, clinical laboratory testing of enzymes and other substances in the blood, and studies specific to the system in which the cancer is suspected. Research continues to identify proteins produced by mutated DNA that might be used to diagnose various types of cancer. Tests for viruses are now being done to identify increased risk for some cancers. For example, a test for the presence of high-risk types of HPV is available to identify women at risk for cervical cancer.

Diagnostic Tests

Biopsy

Biopsy of a tumor and examination of the cells obtained are the most certain techniques for establishing a diagnosis of malignancy in most neoplasms. Malignancies involving blood cells, such as in leukemia, are diagnosed by examining these cells. A **biopsy** is the removal of living cells for the purpose of examining them under a microscope. The cells may be removed by surgical **excision** (cutting out) of a small part of a tumor, by the **aspiration** (suction) of cells through a needle introduced into the growth, or by brush biopsy. If the tumor is small, the entire growth may be

removed. A pathologist examines the specimen obtained under the microscope.

If the sample is taken in the operating room and the surgeon is waiting for the results to determine the extent of surgery needed to remove all the malignant cells, the tissues may be frozen for quick examination. This technique is called *preparing a frozen section*.

New procedures, such as fine-needle aspiration (FNA) and **percutaneous** (through the skin) large-core breast biopsy, are used for diagnosing breast cancer without the disfigurement of traditional surgical breast biopsy. Breast biopsy is combined with imaging techniques such as ultrasound to verify correct placement of the biopsy needle. Then FNA is combined with computer analysis of the samples obtained.

Radiologic Studies

Mammography is a radiologic examination of the breast that is useful in diagnosing malignant growths, and x-ray films are particularly helpful in diagnosing bone and hollow organ tumors. Mortality rates can be cut by 20% to 33% when routine mammography screening is performed ([ACS, 2014](#)). Newly developed three-dimensional (3D) mammograms (also called *tomosynthesis mammography*) are available in 46 states. However, there is no evidence of lower mortality, and because they previously delivered twice the radiation compared with traditional mammogram, they were only recommended in selective cases (e.g., dense breasts) where the benefit would outweigh the risk. Recently newer techniques have made it possible to create the 3D images using the same radiation as the two-dimensional (2D) images. This makes tomosynthesis mammography superior to 2D mammography because it (1) better detects small invasive carcinomas and (2) reduces the rate of patient recalls ([Kopans, 2014](#)).

The respiratory, digestive, and urinary tracts can be visualized on a radiograph if a **radiopaque** (not penetrated by the x-rays) substance is used. The substance passes through the hollow organ and, because it is radiopaque, the inner structure of the organ is clearly demonstrated on the radiograph.

Another radiologic technique involves the use of a radioactive substance (**radionuclide** or **isotope**) that is given to the patient before the x-ray filming. The isotope is a “tumor-seeking” chemical that searches for a tumor and may concentrate around it. A special scanning apparatus records information about the concentration of the isotope in the area being examined. If the substance is concentrated in a tumor, the growth shows up as a “hot spot” on the screen of the scanning apparatus. If a tumor does not accept the isotope, the normal tissue around the tumor concentrates the isotope, and the tumor shows up as a “cold spot.” This technique is commonly used in the investigation of thyroid tumors.

A commonly used radiologic scanning technique is **computed tomography (CT)**. This method is noninvasive and involves relatively small amounts of radiation exposure for the patient.

In CT, the x-ray source moves past the patient in one direction while the film moves in another. In this way, 3D cross-sectional images, or “slices,” of tissue can be obtained. Tumors, as well as other abnormal structures within the body tissues, can be seen in this way.

Another imaging technique is called *magnetic resonance imaging (MRI)*. As in CT, MRI produces views of “slices” of tissue. MRI can sometimes “see” tumors and abnormalities that other techniques miss. It is currently used as a breast screening tool—in addition to mammography—only for patients at high risk for breast cancer (because of increased radiation exposure) based on family history. MRI can also be used in real time to monitor cancer treatments. Patients with pacemakers, certain metal fragments, clips, or shrapnel in the body cannot use MRI because the powerful magnets used in this technique can bend and twist metal and can damage the body.

Endoscopy

An endoscope is an instrument used for direct visualization of internal body parts. It is designed so that it can be inserted and passed along the interior of hollow organs and cavities.

Types of endoscopes include the colonoscope for the colon, the bronchoscope for the trachea and bronchi, the laparoscope for the contents of the abdominal or pelvic cavity, and the cystoscope for inside the bladder. During an endoscopy, a sample of cells may be taken from a suspicious area so they can be examined more precisely under a microscope (biopsy).

Laboratory Tests

No single blood test can establish a definite diagnosis of cancer, but certain tests are used to obtain specific information. A complete blood count is helpful in diagnosing leukemia. The presence of a high level of prostate-specific antigen (PSA) may indicate prostate cancer. Current recommendations include offering a baseline PSA test for men older than 50 years, to be repeated at various intervals depending on the patient's risk factors. Guidelines for performing a PSA test are provided in [Box 8-1](#).

Box 8-1

Prostate-Specific Antigen (PSA) Test

- The patient should have no sexual activity for 24 to 48 hours before the test.
- Do not perform the test until after a urinary tract infection is cleared.
- Do not perform the test after recent urinary tract surgery.
- Collect a blood sample before digital examination.
- Prostatic acid phosphatase is collected to confirm an elevated PSA.
- The phosphatase level gives information about the extent of disease.
- Alkaline phosphatase is often elevated with bone cancer and liver metastasis.

Specialized tests for **tumor markers** have been developed. These tests detect biochemical substances synthesized and released into the bloodstream by tumor cells. However, these are not 100% accurate for diagnosing tumors. Therefore **tumor markers are mainly used to confirm a diagnosis, determine the response to therapy, or to detect a relapse**. CA-125 is used to detect the presence of ovarian cancer or its recurrence after therapy. Carcinoembryonic antigen (CEA) and CA 19-9 are tests used to detect the recurrence of gastrointestinal, pancreatic, and liver cancer after initial treatment, and CA 27-29 is used most commonly to follow the progress in breast cancer treatment and later to check for recurrence.

❖Nursing Management

■ Assessment (Data Collection)

The first step is to find out whether the patient has been informed of the diagnosis and what is known about the illness and treatment. Some patients may suspect they have cancer but do not want to discuss it. Even those who have been informed may choose not to talk about it. The fact that a patient cannot discuss her illness or seek help in dealing with the problems it presents may indicate how frightened she is and how much she needs help and understanding. The nurse must assess how the disease is affecting the patient's body and life to plan comprehensive care.

A thorough assessment of the system where the cancer is located and a good general physical assessment provide a baseline for evaluation of changes in physical function caused by the cancer. A psychosocial assessment of the patient and family or significant others provides data that indicate psychosocial needs and resources for support and care.

Finally, the nurse should determine how to assist the patient to make the most of the personal resources and abilities that the patient currently possesses. This could mean helping with adjustment to the emotional effects of only recently receiving the diagnosis of cancer, or it could require helping the patient to deal with the pain and discomfort of advanced malignancy and to prepare for a peaceful death.

■ Nursing Diagnosis/Problem

Patients with cancer can develop complex problems, depending on the stage of the disease; a large number of nursing problems or nursing diagnoses may be appropriate. Specific problems are chosen for the body systems and functions in which the disease or tumor is causing disruption of

homeostasis. Common general patient problems associated with a diagnosis of cancer can be found in Box 8-2.

Box 8-2

Common Nursing Problems for Patients With Cancer

- Altered nutrition due to increased metabolic demand and nausea, vomiting, diarrhea, or mucositis
- Potential for infection due to bone marrow depression
- *Pain, acute or chronic*, due to effects of tumor on body structures or cancer therapy
- Altered skin integrity due to surgical or radiation therapy
- Altered body image due to weight loss or hair loss
- Potential for injury to patient, staff, and visitors due to exposure to a radioactive implant
- Altered physical mobility due to restricted activity secondary to a radioactive implant
- Diarrhea and dehydration due to effects of cancer treatment
- Constipation due to effects of chemotherapy
- Altered urinary elimination due to radiation therapy or secondary to effects of chemotherapy
- Fatigue
- Insufficient knowledge of drugs and their potential side effects
- Altered self-care ability due to weakness and fatigue
- Fear of dying
- Limited coping due to the significance of cancer
- Altered family coping due to anxiety over patient's prognosis

■ Planning

Specific expected outcomes are written for each nursing problem/diagnosis chosen, as appropriate for the patient ([Nursing Care Plan 8-1](#)). Planning is a collaborative process that includes the patient, the family, the physician, the oncologist, the nurse manager, the social worker, and other specialists on the health care team. The home care nurse, the infusion therapy company nurse, and the pharmacist often are involved in care and should be included in the planning process. The nurse manager typically consults with the other members of the team and coordinates the plan of care.

*** Nursing Care Plan 8-1**

Care of the Patient With Cancer

Scenario

Mr. Pole is receiving chemotherapy for leukemia. This is his third round of weekly intravenous treatments. His platelet count is down to 185,000; he has had difficulty eating as a result of mucositis and anorexia. He states that he is mildly nauseated most of the time. He is 15 lb underweight.

Problem/Nursing Diagnosis

Potential for/Risk for infection related to bone marrow suppression

Supporting Assessment Data

Objective: Receiving chemotherapy drugs that suppress bone marrow.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will remain free of infection.	Monitor WBCs.	Neutropenia is a sign of immunosuppression. More susceptible to infection when <3000 and granulocyte count is <2000.	WBCs 3200.
	Assess for signs of infection every shift.	Elevated temperature may indicate infection.	Temp. 98.8° F (37.1° C); no signs of infection.
	Teach good hygiene, mouth care, hand hygiene before meals and after using bathroom.	Hand hygiene prevents spread of infection.	Patient washing hands appropriately and using good hygiene.
	Use protective isolation techniques if needed.	If neutrophil count <500, protective isolation is necessary.	Isolation not yet initiated.
	Encourage good nutrition and hydration.	Good nutrition and hydration minimize irritation.	Taking sufficient food and fluid; continue plan.
	Give Neupogen as ordered.	Neupogen raises the WBC and neutrophil count.	Neupogen 300 mcg subcutaneously given 1 time/day.

Problem/Nursing Diagnosis

Potential for injury/Risk for injury related to impaired blood clotting ability

Supporting Assessment Data

Objective: Receiving chemotherapy (chemotherapy treatment lowers platelets and extends bleeding time).

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will remain free from hemorrhage.	Monitor blood count; assess for bleeding of gums or bruising and bleeding into joints every shift.	Blood count plays an important role in blood clotting and bleeding.	WBCs 3200; platelet count 180,000.
	Observe for signs of bleeding: hematuria, melena, etc.		No signs of bleeding.
	Refrain from needle sticks as much as possible.		
	Give stool softener as ordered to prevent straining at stool and bleeding. Prevent rectal bleeding. Do not take temperature rectally.	Hard stools can initiate bleeding in the rectum.	Stool soft; continue plan. Stool softener administered. Oral temp: 98.8° F (37.1° C).
	Brush teeth with very soft brush or tooth sponge. Do not floss.	Prevent bleeding gums.	Appropriate dental hygiene.

Problem/Nursing Diagnosis

Altered nutritional status/Imbalanced nutrition: less than body requirements related to nausea, vomiting, and mucositis.

Supporting Assessment Data

Subjective: "I feel nauseated."

Objective: Chemotherapy administration.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize relief from nausea.	Keep room odor free; give mouth care before meals.	Odors may aggravate nausea.	
Patient will be able to eat with minimal discomfort.	Give ordered antiemetic before and during chemotherapy.	Antiemetics help prevent chemotherapy-induced nausea and vomiting (N&V).	Antiemetic 45 min before meals.
Patient will maintain present weight.	Assess mouth and mucous membranes every shift. Give meticulous mouth care q2h.	Sore mouth may reduce food intake.	Mucous membranes reddened, but intact. Mouth care: 7, 9, 11, 1, and 3 o'clock.
	Use distraction, meditation, relaxation techniques.	N&V may be reduced with behavioral interventions.	Has not vomited this shift.
	Give small, frequent meals.	Experts recommend these dietary interventions.	Enriched shake taken between meals.
	Encourage added calories in meals and food supplements between meals.		

Problem/Nursing Diagnosis

Altered body image/Disturbed body image related to alopecia and weight loss

Supporting Assessment Data

Subjective: "I look awful; I don't want any visitors to see me."

Objective: Loss of considerable amount of hair from head.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will adjust to new body image within 3 wk as evidenced by verbalization.	Encourage him to maintain sense of humor.	Humor is a positive coping strategy.	
	Use caps, head bandanna, and eyebrow pencil as needed.	Hair covering may reduce negative body image.	Checking on purchase of wig; family is bringing head scarves.
	Assure him that hair will eventually grow back.		
	Encourage verbalization of feelings; focus on strengths.	Verbalization is a positive coping technique.	Talking more about feelings regarding weight loss and appearance.
	Establish and maintain trusting relationship.		
	Assess spiritual needs; help patient achieve spiritual consolation.		Continue plan.
	Encourage him to obtain clothing that fits.		

Problem/Nursing Diagnosis

Fear/Fear related to diagnosis of cancer

Supporting Assessment Data

Subjective: "Do you really think the treatment will cure my cancer? I'm afraid that I'll go through all this and it will just come back in a few months."

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize fears and develop coping mechanisms to decrease fear.	Encourage verbalization and identification of specific fears.	Verbalizing fears makes them easier to face.	Is verbalizing fears; encouraged to do same with family.
	Help him to explore ways to cope with fears.	Knowing what to expect helps people plan.	Used to meditate; encouraged to do so.
	Assess spiritual needs; contact minister or other as patient desires.	Patients have their own beliefs about death.	Began teaching imagery techniques.
	Offer support by active listening, offering hope in some form, and being there for patient.	Active listening provides comfort and strength.	Continue plan.
	Encourage expression of fears to significant others.	When significant others are aware of the patient's fears, they have a better understanding of behavior.	

Critical Thinking Questions

1. What is a nursing problem that may apply to a patient who is receiving chemotherapy?
2. Why should the nurse be concerned about infection in a patient who is receiving chemotherapy?

■ Implementation

See [Nursing Care Plan 8-1](#) and the following sections for specific interventions.

■ Evaluation

Evaluation is based on determining whether the expected outcomes specified for the patient are being met or have been met. Constant assessment for signs of complications, side effects of therapy, nutritional status, and pain status is necessary. The nursing care plan must be changed when the interventions initially chosen are not effective in meeting the desired outcomes. Collaboration with the patient and the other members of the health care team is important to the success of care plan changes.

Common Therapies, Problems, and Nursing Care

There are three traditional modes of therapy for malignancies: surgery, radiation, and chemotherapy. Hormone manipulation, immunotherapy with biologic response modifiers, and bone marrow or stem cell transplantation are treatments combined with traditional therapies.

Each of the modes of treatment may be used individually or in combination with one or more of the other methods available. For example, chemotherapy may be used as an adjuvant (assisting treatment) after surgical removal of a tumor. The methods of treatment are chosen after consideration of many factors and are prescribed with the best interests of the patient in mind.

Surgery

Surgery may be performed for a variety of reasons:

- To obtain a biopsy specimen
- As prophylaxis (preventive treatment), such as in the removal of the ovaries of a woman whose mother had ovarian cancer
- To determine the effectiveness of therapy by looking to see whether the initial tumor is reduced in size
- For palliation (offering relief), as in **debulking** (removing as much as possible) a tumor to prevent pressure on adjacent structures or obstruction of vessels or the gastrointestinal tract
- As an attempt at cure

Reconstructive surgery also is associated with cancer treatment. A woman who has lost a breast to mastectomy may have the breast reconstructed. Other extremely mutilating forms of cancer surgery require reconstructive procedures after the initial procedure. Flap grafts in a patient who underwent radical neck surgery for cancer of the throat are an example.

Surgical removal of a malignant growth is the oldest method of treatment. It works very well for tumors that are easily accessible. Adjacent tissues that may contain malignant cells also are excised. Regional lymph nodes often harbor malignant cells, which can then travel to distant parts of the body and establish a new cancer site if not removed. Newer surgical procedures and techniques have significantly reduced the need for extensive surgical removal of adjacent tissues and structures. Radical mastectomy, for example, involves removal of the entire breast along with underlying pectoral muscle tissues and lymph nodes under the arm on the affected side. This procedure has been replaced almost completely by a modified radical mastectomy, or lumpectomy and sentinel node biopsy, combined with radiation and/or chemotherapy, which is far less traumatic and mutilating. If there is no evidence of metastasis, some patients are good candidates for simple removal of the tumor (**lumpectomy**). The use of radiation and/or chemotherapy during, after, and sometimes before surgery has decreased the need for extensive removal of adjacent tissues and is associated with decreased recurrence.

Radiation Therapy

The source for radiation therapy is either a linear accelerator or a radioactive element or substance. The purpose of radiation is to destroy malignant cells (which are more sensitive to radiation than are normal cells) without permanent damage to adjacent body tissues.

Ionizing radiation can have both an immediate and a delayed effect on malignant cells. Ionizing radiation can damage the cell membrane immediately, causing **lysis** (bursting) or decomposition of the cell, or it can cause a break in both strands of the DNA in the cell's nucleus. **When a cell is damaged in this way, it will not die until it attempts to divide and replicate itself. The rate at which a particular kind of cell undergoes mitosis determines whether the effects of radiation will occur in a matter of days, months, or years.** This explains the delayed effects and side effects of radiation that might not be evident at the time of treatment but appear later. Normal cells have a greater ability to repair the DNA damage than do malignant cells. Some tissues are more sensitive to radiation than others, and this is taken into account when the physicist-provider calculates the dose of radiation needed to eradicate the tumor. The other factors considered are the sensitivity of the tumor to radiation, its location, and its size. Once calculated, the dose is **fractionalized**, meaning

it is divided over many days, to deliver the optimal dosage with the least amount of effects to normal tissues. The course of radiation is spread over a period of days to weeks. The **rad**, or **radiation absorbed dose**, is the unit used for measuring dosages of radiation.

Teletherapy and brachytherapy are the two types of radiation delivery used to treat cancer. Teletherapy is **external**—the source of radiation is outside the patient. Brachytherapy is **internal**—the source of radiation is a radioactive element or substance that has been implanted or injected into the body, to provide low doses in focused areas.

Because of improvements in tumor localization, beam direction, megavoltage machines, planning and prescribing the field to be irradiated, and determining the precise dosage needed, radiation therapy is far more beneficial and less harmful than it was when it was first pioneered. With the **linear accelerator** and its partner, the **cyclotron**, the damage to normal tissue can be minimized by keeping the dosage or degree of penetration accurate and by aiming the rays from several different angles. The latter technique increases the concentration of the rays in the area of the tumor with a minimum of damage to overlying tissues. Cobalt-60 machines deliver gamma rays, and these machines are now much more efficient and precise than they were in the early years of radiation therapy.

External Radiation Therapy

The linear accelerator used for external radiation therapy produces extremely high-energy x-ray and electron beam irradiation that bombards the malignant cells and destroys them. Because malignant cells divide at an abnormally high rate, they are more susceptible to destruction than normal cells.

Modern radiation therapy has considerably reduced side effects. Because DNA is the critical target for radiation damage, the increased knowledge about DNA gained from the Human Genome Project has also helped streamline radiation therapy. The use of **stereotactic** (exact positioning in space) surgery is effective for small brain tumors ([Figure 8-4](#)). Many cancer research institutions have lead-lined surgical suites where intraoperative radiation therapy may be delivered directly to the affected area after tumor removal and before the incision is closed. Depending on the dosage (rads) given, the patient may not need to receive further radiation. This method has proven beneficial for cancers of the head and neck, abdomen, pelvis, and extremities and for patients with operable pancreatic cancer.



FIGURE 8-4 Cyberknife used to deliver radiation to a small brain tumor. It is particularly useful for recurrence of tumor. (Courtesy Cyberknife Center, Southwestern Washington Medical Center, Vancouver, Wash.)

Nursing care of patients undergoing external beam radiation therapy.

Nursing care goals related to cancer radiation therapy include (1) helping the patient and family

cope with the diagnosis of cancer and treatment with radiation therapy and (2) teaching the patient and family how to recognize and manage the expected side effects of radiation.

Helping patients cope with radiation therapy.

A lack of knowledge about the side effects of radiation and how to cope with them can greatly add to the anxiety and stress that the patient feels. It is not unusual for a layperson to have some misconceptions about how radiation works, whether a patient can present a hazard to others while undergoing treatment, when the patient will begin to experience its effects, and how long it will be before the patient begins to recover from them.

Before the first treatment, the patient is told what therapeutic effects are anticipated, what it is like to have a treatment, and what is expected of her during the course of therapy. Because the patient will probably be treated on an outpatient basis, she should be encouraged to keep her scheduled appointments and notify the clinic if cancellation is necessary. Someone should accompany the patient for initial treatments—preferably a family member or a close and trusted friend—who can provide emotional support. It is essential that time be set aside for the nurse to establish a trusting relationship with the patient, to prompt and answer any questions about therapy, and to provide an avenue for communication throughout the course of treatment. Assurance that the source of radiation is in the machine only and that it is not possible to “contaminate” others with radioactivity should be provided.

Clinical trial enrollment may be available for patients who wish to help out future patients. A comprehensive list of current clinical trials is available on the National Cancer Institute (NCI) website at <http://www.cancer.gov/clinicaltrials>.

Patient Teaching

Skin Care During Radiation Treatment

- Shower or wash the area once a day using warm water and mild soap; use a hand to wash the affected area rather than a washcloth. Dry with a soft, clean towel; pat, do not rub the skin.
- Limit cold and sun exposure; when outdoors use a sunscreen with a sun protection factor (SPF) of at least 15.
- Do not use lotion, salve, or alcohol on the affected area unless prescribed by the radiologist.
- Do not remove any of the markings for radiation treatment.
- Wear loose, 100% cotton clothing over the irradiated area.
- Do not shave the area or use an electric razor without the radiologist's permission.

Skin care during radiation therapy.

With the advanced methods and computerized delivery of radiation, there is much less trauma to the skin from radiation therapy than in previous years. The patient must understand that should skin damage occur, it is usually only temporary. In preparation for radiation therapy, the provider will outline the area to be exposed to radiation by marking it with indelible ink. The exposed area will need special care. Most clinics and hospitals have written procedures and precautions to be used to prevent unnecessary trauma to the exposed areas of skin.

Although skin damage is rare now, the degree of reaction of the skin to radiation is individual and should be assessed daily, either by the patient or by a knowledgeable person.

Think Critically

Can you list the points to be covered for care of the skin when teaching a patient who is to undergo external radiation therapy?

Teaching the patient and family how to recognize and help manage expected side effects is

particularly important when the patient is not hospitalized. She will feel more in control if she is able to participate in assessing her condition and planning and implementing her care at home. It is unfair to expect either the patient or her family to remember everything they are told about her care. Therefore it is essential that they have some written information to refer to once they leave the clinic. They also should be encouraged to write down any questions they might have before the next visit, and to note any points on which they feel they need more information.

Internal Radiation Therapy

Radiation from **radioactive elements** has the same ionizing effect as that from linear accelerators; the only difference is the source of radiation. Internal radiation therapy, called **brachytherapy**, involves introducing a radioactive element into the body and may be administered in different ways: (1) it can be placed in a **sealed** container and inserted into a body cavity at the tumor site or placed directly into the tumor, or (2) it may be administered in an **unsealed** form and taken orally or injected by syringe.

To be effective, the radiation source must come into direct contact with the tumor tissue for a specified time. Most implants emit a lower level of radiation while in constant contact with the tumor cells. **Because the radiation source is within the patient, radiation is emitted for a period and can be a hazard to others. Nurses caring for patients receiving internal radiation must take extra precautions (Box 8-3).**

Box 8-3

Precautionary Measures When a Patient Is Receiving Internal Radiation Therapy From a Sealed Source

- Place the patient in a private room.
- Place a sign on the patient's door indicating that the patient is receiving internal radiation therapy.
- Observe principles of time and distance. Limit time spent in the room. Work as quickly and as efficiently as possible. Avoid standing near the part of the patient's body where the radioactive element is located; stand at the shoulders or the feet depending where the implant is located.
- Check all linens, bedpans, and emesis basins routinely to see if the sealed source has been accidentally lost from the tissue.
- If a sealed source is dislodged, but has not fallen out of the patient's body, notify the x-ray department at once. If the source has fallen out, **do not pick it up with your bare hands**. Use forceps and place it in a lead container.
- Most patients are placed on bed rest and instructed to remain in certain positions so that emanations from the element will reach the correct area.
- Visitors should spend limited time in the room.
- No children or pregnant women should visit.

As soon as an element becomes radioactive, it begins to lose its characteristic of radioactivity. The rate at which it becomes less radioactive is called its *half-life*, which is the amount of time it takes for half of its radioactivity to dissipate. The half-life of radium is about 1600 years, whereas the half-life of iodine is only about 8 days. Cesium-137 is a radioactive element with a half-life of 30.17 years, and is frequently used to treat malignancies of the mouth, tongue, vagina, and uterine cervix. **It is important that nurses caring for a patient receiving sealed or unsealed sources of radiation know the element used, its half-life, and the ways in which it might be eliminated from the body.**

Some isotopes are given orally and others are administered into a body cavity. The isotopes are unsealed sources of radiation. If radioactivity is a hazard, it is a problem only for the duration of the half-life of the isotope. The substance is eliminated through body secretions such as urine, feces,

sweat, sputum and vomit. Examples of unsealed sources include iodine-131, which is in a solution and is swallowed by the patient, and phosphorus-32 and gold-198, which are administered by injection. Because the thyroid gland readily takes up iodine, thyroid malignancies are often treated with iodine-131 delivered to the site of the tumor, where it can be more effective. The major hazard from radioactive iodine is in the patient's urine, but iodine is also excreted in the feces and sweat; therefore special precautions must be taken according to hospital policy (Box 8-4).

Box 8-4

Precautions When Caring for the Patient Receiving Internal Radiation From an Unsealed Source

- Observe the principles of time, distance, and shielding for radiation protection.
- Wear gloves when handling bedpans, bed linens, and the patient's clothes.
- Dispose of urine, feces, and vomitus according to policy.
- Handle dressings with forceps and dispose of them according to policy.
- Follow hospital procedure for disposal of patient's bed linens and clothing.

Principles of Radiation Protection

In general, the amount of radiation a nurse might receive while caring for a patient being treated with internal radioactive elements depends on three factors: (1) the distance between the nurse and the patient, (2) the amount of time spent in actual proximity to the patient, and (3) the degree of shielding provided.

Distance is an important factor in reducing exposure to radiation. Doubling one's distance from a radioactive element reduces the exposure to one fourth, and tripling the distance reduces it to one ninth (Figure 8-5). Time spent near the source of radiation can be controlled if the nurse who plans his nursing carefully so that he can spend less time with the patient without sacrificing the quality of care given. The total time spent with a radioactive patient should be less than 30 minutes per 8-hour shift.

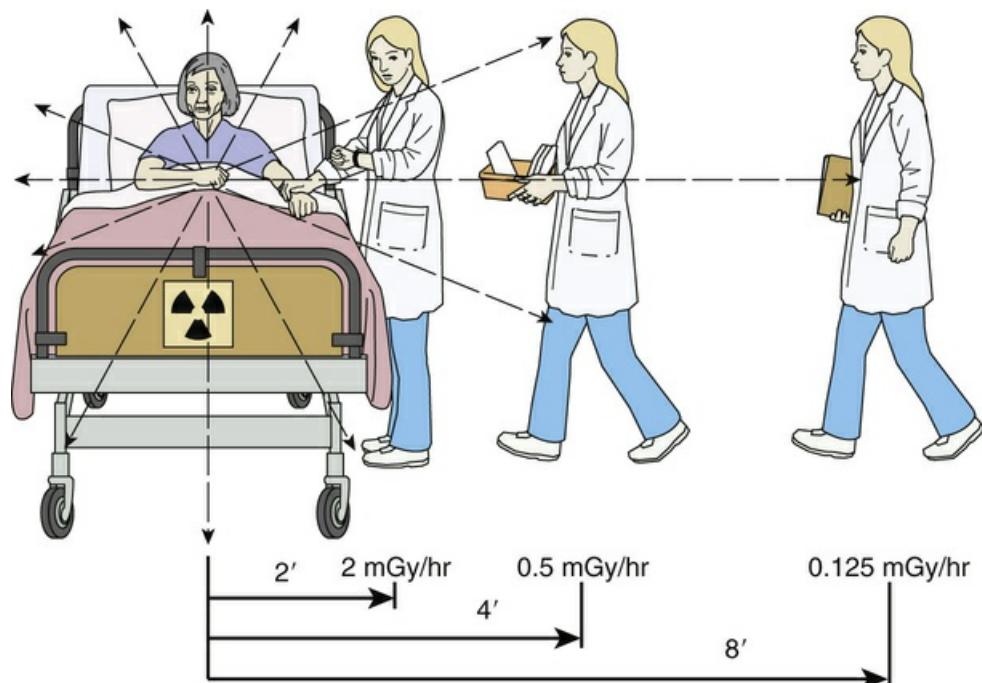


FIGURE 8-5 Time, distance, and shielding in radiation exposure. The nurse nearest the source of radioactivity (the patient) is more exposed; at 2 feet, exposure is more than 15 times that of exposure at 8 feet. *mGy*, Milligray.

Shielding from radiation exposure must take into account the type of rays being emitted. The denser the shielding material, the less the possibility of penetration by the rays, and the better the protection. A lead shield that is 1-cm thick offers the same amount of protection as 5 cm of concrete or 30 cm of wood. Lead aprons give protection from diagnostic x-rays but do not provide adequate shielding from the **gamma rays** emitted by radium, cesium-137, and cobalt-60. Anyone in proximity to—or in contact with—a source of radiation should wear a radiation dosimeter badge (Figure 8-6). This badge measures the radiation dose that the individual has received through exposure to the source.



FIGURE 8-6 Radiation dosimeter badge worn by personnel who might be exposed to radiation.

Hospitals where sealed sources of radiation are implanted into the body tissues to treat malignancies usually have written policies and procedures to guide personnel who are responsible for patient care. After the provider removes the source, the patient is no longer in need of special precautionary care. Special observations are necessary, however, in the event a systemic reaction develops. Table 8-4 lists the most common side effects of radiation therapy. For appropriate nursing care of problems related to radiation therapy, see the section on common problems related to cancer or cancer therapy.

Table 8-4
Common Side Effects of Radiation Therapy

TYPE AND AREA	EFFECT
External Radiation	
Head and neck	<ul style="list-style-type: none"> Irritation of oral mucous membranes with oral pain and risk of infection Loss of taste Irritation of the pharynx and esophagus with nausea and indigestion Increased intracranial pressure
Chest	Inflammation of lung tissue with increased susceptibility to infection
Abdomen	Nausea, vomiting, diarrhea, anorexia
Pelvis	<ul style="list-style-type: none"> Diarrhea Cystitis Sexual dysfunction Urethral and rectal stenosis
General side effects	<ul style="list-style-type: none"> Skin: Change in texture and/or color; moist desquamation (rare); alopecia Blood: Bone marrow depression with leukopenia, anemia, and thrombocytopenia Depressed immune function Fatigue
Internal Radiation	
General effects	<ul style="list-style-type: none"> Elevated temperature Cervical implant: Urinary frequency, diarrhea, nausea, vomiting, anorexia Head and neck implant: Mucositis, oral pain and risk of infection, anorexia

Chemotherapy

Oncologists have a wide variety of drugs from which to choose when planning a course of treatment for a patient with cancer. They may choose to give a particular drug alone, or in combination with other drugs. Chemotherapy may be used with other forms of therapy; for example, therapy may follow surgery and may occur before, during, or after radiation treatments, or with immunotherapy.

Among the drugs used to treat malignancies are the **antineoplastic agents** (Table 8-5). The overall effect of antineoplastic drugs is to decrease the number of malignant cells in a

generalized malignancy (such as leukemia) or to reduce the size of a localized tumor and thereby lessen the severity of symptoms. Antineoplastic drugs are **cytotoxic** (poisonous to cells), and their damaging effects are not limited to malignant cells. However, normal cells do not reproduce in exactly the same way as malignant cells and are able to repair themselves more rapidly and effectively. Steroids often are used in combination with antineoplastic drugs for cancer treatment.

Table 8-5

Common Antineoplastic Drug Classes, Actions, and Major Side Effects

CLASSIFICATION AND EXAMPLES	ACTION	MAJOR SIDE EFFECTS*
Alkylating Agents		
Cyclophosphamide, doxorubicin, mechlorethamine, ifosfamide, melphalan, chlorambucil, busulfan, streptozocin, carmustin, lomustine, dacarbazine, temozolamide, thiotapec, altretamine, platinum (cisplatin, carboplatin, oxaliplatin)	Attach "alkyl groups" or organic side chains to the proteins in the cell, poisoning it; inhibit cell division	Bone marrow depression, nephrotoxicity with some Nausea, vomiting, diarrhea, dermatitis; hyperpigmentation Platinum: Hearing loss
Antimetabolites		
Methotrexate, 6-mercaptopurine, 6-thioguanine, 5-fluorouracil, capecitabine, gemcitabine, cytarabine, fludarabine, pemetrexed	Interfere with a specific cell phase, thereby preventing replication Some inhibit enzymes that make essential cellular constituents; others attach to DNA, interfering with replication	Bone marrow depression, stomatitis, intestinal ulceration, nausea, vomiting, diarrhea
Antitumor Antibiotics		
Bleomycin, dactinomycin, doxorubicin, epirubicin, idarubicin, daunorubicin, plicamycin, mitomycin-C, mitoxantrone	Injure cells by direct interaction with DNA, causing distortion Interfere with DNA or RNA synthesis	Bone marrow depression, some cause cardiotoxicity; stomatitis, alopecia Bleomycin: Pneumonitis and pulmonary fibrosis
Mitotic Inhibitors		
Vincristine, vinblastine, vinorelbine, etoposide	Interfere with mitosis Act during M phase of cell cycle to prevent cell division	Vincristine: Peripheral neuropathy, constipation Vinblastine: Bone marrow depression
Miscellaneous Agents		
Altretamine, asparaginase, etoposide, hydroxyurea, procarbazine, mitotane, teniposide, paclitaxel, imatinib mesylate, epirubicin, docetaxel, cladribine, rituximab, interleukin-2, interferon-alfa	Work in a variety of ways; consult information for each drug	Bone marrow depression is the major side effect of all except asparaginase and mitotane Asparaginase: Pancreatic dysfunction Mitotane: Central nervous system depression Paclitaxel: Peripheral neuropathy
Hormone-Related Agents		
Anti-estrogens (fulvestrant, tamoxifen, toremifene), aromatase inhibitors (anastrozole, exemestane, letrozole), progestins (megestrol acetate), estrogens, anti-androgens	Lowers circulating hormone levels to prevent hormone-related tumors	Hot flushes; deep venous thrombosis; cancer

*Each drug has specific side effects. Consult information regarding each individual drug before administration.

Drug combinations are used to treat certain types of cancers because different drugs are effective at different times in the growth and replication cycle of the tumor cell. This method offers the best chance of killing the most malignant cells. Chemotherapy is the preferred treatment for various kinds of leukemias, some lymphomas, multiple myeloma, and many types of tumors that result from metastasis.

Techniques of administration of antineoplastic agents include intra-arterial, intraperitoneal, intraventricular, and **intrathecal** (within a space of the spine), as well as intravenous infusion. Cancers of the liver, ovary, and brain have sometimes shown better remission with intraventricular or intraperitoneal infusion treatment. An advance in chemotherapy has been the use of lower doses of multiple drugs to treat various types of malignancies. Because side effects are lessened when lower doses of a drug are used, several drugs can be used in combination to hit all phases of the cell cycle, destroying more malignant cells.

Often a central line or implanted injection port is used to administer chemotherapy drugs that are to be given over several weeks or months (Figure 8-7). The nurse cares for the central line and its insertion site according to hospital policy, using strict aseptic technique.

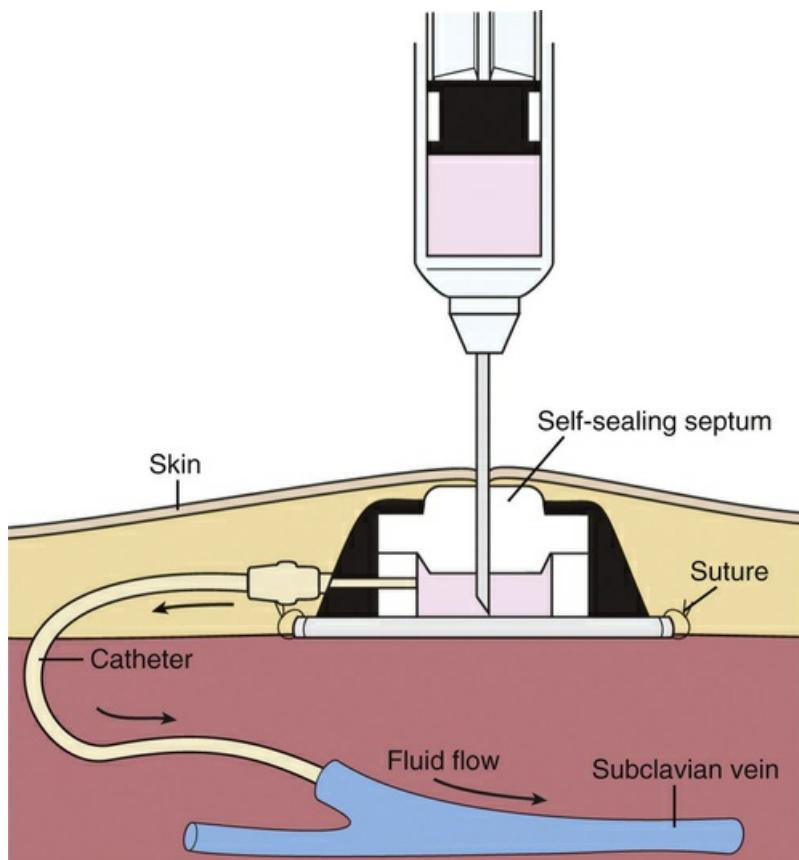


FIGURE 8-7 Implanted infusion port for administration of chemotherapy drugs or continuous morphine drip. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2014, Saunders.)

Many antineoplastic drugs are **vesicants** (chemicals that cause tissue damage on direct contact) that can cause severe local injury if they escape from the vein into which they are administered. Administration should be only into veins that have good blood flow. If **extravasation** (escape from the vein into the tissue) occurs, the infusion is stopped immediately. The type of treatment required depends on the drug and amount that is extravasated. **Should extravasation occur, consult the pharmacist, the policy and procedures manual, and the provider.**

Some antineoplastic drugs have toxic effects that must be monitored. Table 8-6 presents the assessments necessary to detect various types of organ toxicity. One drug, dexrazoxane (Zinecard), appears to be heart-protective for patients receiving the cardiotoxic drug doxorubicin (Adriamycin). If a drug is toxic to the reproductive system, the patient should make a decision about banking sperm or eggs before beginning chemotherapy.

Table 8-6
Assessment for Toxic Effects of Chemotherapy*

SIDE EFFECT	INTERVENTION
Bone marrow suppression	Monitor red and white blood cell count and differential count for numbers of neutrophils and granulocytes; check platelet count.
Cardiotoxicity	Monitor for signs of congestive heart failure, such as pulmonary crackles, shortness of breath, tachycardia, weight gain, and peripheral edema. Monitor ECG.
Neurotoxicity	Monitor for weakness, paresthesias, sensory loss (particularly in feet), and decreased reflexes. Constipation and urinary hesitancy are other signs.
Pulmonary toxicity	Evidenced by pulmonary infiltrates and pulmonary fibrosis on x-ray. Monitor respiratory status closely; auscultate for decreased breath sounds and for crackles.
Hepatotoxicity	Monitor liver function tests: AST, ALT, bilirubin.
Nephrotoxicity	Monitor kidney function tests: creatinine and blood urea nitrogen. Monitor urine output.
Ototoxicity	Monitor for tinnitus or hearing loss.

*Many antineoplastic drugs are toxic to various organs of the body. Whenever a specific drug has one of these toxicities, include the specific assessment parameters for that toxicity in your regular assessment.

ALT, Alanine aminotransferase; AST, aspartate aminotransferase; ECG, electrocardiogram.

Nursing Care of Patients Receiving Chemotherapy

Nursing management of a patient receiving chemotherapy requires special knowledge and skills

beyond those of basic nursing. An oncology nurse is a specialist who is able to give comprehensive nursing care because of years of study and experience. A full discussion of care of patients receiving chemotherapy is therefore beyond the scope of this text. There are, however, some general principles that can be helpful to a nurse who encounters a patient receiving a course of chemotherapy for cancer or a patient who is experiencing some of the toxic side effects of antineoplastic drugs.

Not all antineoplastic drugs produce every toxic side effect, and the oncologist plans therapy so that destruction of malignant cells is maximized and toxicity is minimized. **The toxicity associated with chemotherapy is most evident in the cells of the body that have a short life span and therefore must continuously reproduce to provide the body with the normal cells it needs. These types of cells include the blood cells, hair follicles, and epithelial cells of the mucous membranes lining the digestive tract. Most chemotherapeutics are excreted in the body fluids, so precautions should be taken. Remember, most of these drugs are teratogenic (can cause birth defects), so they should be avoided during pregnancy.**

Some of the side effects of chemotherapy are similar to the expected effects of radiation (see Table 8-5). Although the causes of the problems are different, assessment of the patient and symptomatic relief measures are the same. See [Nursing Care Plan 8-1](#) for nursing interventions for selected problems that may be experienced by a patient receiving chemotherapy for cancer.

Hormone Therapy

Hormone therapy is used as an adjunct to other types of cancer therapy. It can slow tumor growth or prevent cancer recurrence. When a hormone is added to the body, the balance of naturally produced hormones changes. **Giving large amounts of one hormone prevents the uptake of other hormones. Thus if the tumor growth is aided by one type of hormone, giving another type prevents the uptake of the growth-promoting hormone and slows the progress of the tumor.** Tamoxifen and aromatase inhibitors such as letrozole (Femara), used against certain types of breast cancer, are examples of synthetic hormone therapy. They have been shown to be chemopreventive for women with high risk factors and improve survival after breast cancer ([National Cancer Institute, 2012](#)).

Side effects of hormone therapy depend on the type of hormone used. Androgens and anti-estrogen receptor drugs produce masculinizing effects, such as facial and chest hair. Menses may stop and breast tissue will shrink. These drugs cause fluid retention in women. Acne is another side effect of the androgens. Hypercalcemia and liver dysfunction can occur with prolonged therapy. Men taking estrogens or progestins to combat prostate cancer may experience a feminizing effect with decreased facial hair, a redistribution of body fat, breast development (**gynecomastia**), smoothing of the facial skin, and the risk of thrombus formation. Over time, some testicular and penile atrophy may occur, and it may become more difficult to attain and maintain an erection.

Immunotherapy Using Biologic Response Modifiers

Biologic response modifiers (BRMs) are agents that manipulate the immune system in the hope of controlling or curing a malignancy with little or no toxic effect on normal cells. These agents either stimulate or suppress immune activity. The BRMs include interferons, interleukins, colony-stimulating factor (CSF), monoclonal antibodies, vaccines, gene therapy, and nonspecific immunomodulating agents. They essentially make the immune system function better. BRMs stimulate the immune system to recognize cancer cells and to institute action to destroy them. Some BRMs, such as CSF, work by enhancing a quicker recovery of the bone marrow after radiation or chemotherapy. CSF stimulates bone marrow to function more quickly. Neumega (interleukin-2) is a drug that stimulates thrombocyte (platelet) production. This drug is used to decrease the bleeding tendencies induced by chemotherapy and could help create new chemotherapy protocols that are more effective against cancer cells.

Two types of BRMs are used to fight cancer: interleukins and interferons. **Interleukins help the immune system cells recognize and destroy abnormal cells. Interferons slow cell division in cancer cells, stimulate natural killer cells, delay the appearance of oncogenes, and assist cancerous cells to revert to more normal cells.** Both interleukins and interferons are manufactured using recombinant (artificial DNA sequence) DNA technology. Interleukin-2 is used for patients with melanoma, renal cell carcinoma, and lymphoma. Interferons are used effectively against

leukemia, melanoma, multiple myeloma, carcinoid tumors, and renal carcinoma. Both interleukins and interferons are very expensive to manufacture.

A second group of BRMs includes monoclonal antibodies (**MoAbs**) and tumor necrosis factor, both of which have direct antitumor effects. Genetic engineering techniques can produce the monoclonal antibodies, and thus this form of therapy holds much promise for the future. Rituximab (Rituxan) and trastuzumab (Herceptin) are examples of MoAbs that have been approved by the U.S. Food and Drug Administration. Rituxan is used in the treatment of non-Hodgkin lymphoma, and Herceptin is used for the treatment of metastatic breast cancer in patients who produce an excess amount of a protein called HER-2.

The third group of BRMs contains agents that have varying functions. This group includes cancer vaccines, which may stimulate the immune system to attack the cancer cells (therapeutic) or stimulate the production of antibodies against a cancer-causing virus (prophylactic). Also included are nonspecific immunomodulating agents that may stimulate the immune system and either restore depressed immune function or increase immune inflammatory responses.

Bone Marrow and Stem Cell Transplantation

Bone marrow transplantation (BMT) is mainly used to correct the severe bone marrow damage caused by chemotherapy or radiation. Sometimes whole-body irradiation is used to treat a hematopoietic cancer such as leukemia or Hodgkin disease. Irradiation of this sort totally incapacitates the body's bone marrow, and the patient would die if blood cells could not again be manufactured. Stem cells may be transplanted to overcome the devastating effects of chemotherapy or total body irradiation before bone marrow transplant. BMT and stem cell treatment are discussed in [Chapter 16](#).

Gene Therapy

As research reveals the genes believed to be responsible for various types of cancers, the possibility of gene splicing or replacement becomes a reality. Genetic engineering to cure disease is still in its infancy, but scientists are working to make it a reality for cancer patients. The genes *BRCA1* and *BRCA2* are implicated in about half of the cases of inherited breast and ovarian cancer. Research has shown that when healthy *BRCA1* genes are injected into mice that have faulty *BRCA1* genes, tumor growth is slowed. This has proven true for other genes implicated in other types of cancer. Someday gene therapy may be the major treatment for cancer.

Evaluating the Effectiveness of Medical Treatment

The oncologist conducts an ongoing evaluation of each patient's status to determine how effective the prescribed treatment has been and to plan for a future course of therapy should it be needed. It is particularly important to know whether there has been a reduction in the size of the tumor and an abatement of the patient's symptoms. This is the purpose of **second-look surgery**.

One test for monitoring the effectiveness of treatment is a measurement of CEA levels. This antigen is a glycoprotein that is produced during fetal life but is not normally present after birth. Its production may resume again, however, and CEA levels can be increased by some kinds of liver disease, heavy cigarette smoking, and especially by gastrointestinal and colorectal cancers. Because of the many and diverse conditions that can elevate CEA levels, the test cannot be used to diagnose cancer. However, it can be used as a tumor marker to evaluate the effectiveness of treatment, because CEA levels usually fall to within the normal range about 1 month after successful treatment of cancer. Other tumor markers, such as PSA for prostate cancer and CA-125 for ovarian cancer, are used to track the success of treatment and recurrence in those cancers.

Complementary and Integrative Medicine

Normally, standard treatments and therapies should be employed as the primary cancer treatment, but many patients choose to supplement their care with complementary therapeutic approaches, also known as complementary and integrative medicine (CIM). There are many such approaches, but the most common are alternative medical systems, such as traditional Chinese medicine (including acupuncture), Ayurveda, homeopathy, and naturopathy; mind-body interventions, which include meditation, hypnosis, dance, music, and art therapy; biologically based treatments, such as herbal and plant therapies, nutrition, and biologic pharmacology; and manipulative and body-based methods, which include chiropractic and osteopathic manipulation and massage therapy. The latest CIM program to be introduced at MD Anderson is health psychology ([MD Anderson Cancer Center, 2014](#)).

In CIM, the therapies are used in addition to—but not as a replacement for—traditional Western (allopathic) medicine. When patients choose to use these approaches, the health care professional and the patient work together to find the therapies best suited to the patient's needs. It is important to form a partnership to promote the patient's health and well-being.

Common Problems Related to Cancer or Cancer Treatment

The problems that can be experienced by cancer patients are complex and depend on both the location and type of cancer and the therapy used to treat it. A discussion of the most common problems and the related nursing care is presented here.

Anorexia, Mucositis, and Weight Loss

Many cancer patients experience an alteration in taste. Commonly the first thing noticed is that red meat does not taste good. The taste of sweets also is altered. **Anorexia** (loss of appetite) often is associated with changes in taste and with inflammation of the mouth and tongue, which can cause the patient great difficulty in eating and drinking. The loss of appetite can quickly lead to deficiencies of protein and calories. **A patient with anorexia can experience a significant weight loss (2 or more pounds per week) and may suffer from severe malnutrition.** A synthetic substance derived from the female hormone progesterone, megestrol (Megace), has proven to work well to stimulate the appetite. A thorough routine for mouth care to minimize damage and anorexia should be started several days before the beginning of chemotherapy or radiation therapy to the head and neck. Radiation to the head or neck will produce some inflammatory changes in the mouth and often also in the pharynx and esophagus. Measures to combat this expected reaction include frequent oral intake of liquids that are not chemically irritating, the use of artificial saliva, and frequent and consistent mouth care.

Patients are encouraged to drink water as often as possible to help alleviate the discomfort of dryness of the mouth and tongue. However, drinking water will not completely resolve the problem. Artificial saliva combats mouth dryness in a different way and helps keep the mucous membranes soft and moist. It also helps to buffer the acidity in the mouth and thus to reduce irritation of the oral mucosa. Artificial saliva is available as a spray (Salivart) and a gel (Biotène Oral Balance) and can be used by the patient as often as desired. It can be found at a local pharmacy or obtained from most online drugstores.

Patients undergoing chemotherapy may experience **mucositis** (irritation and inflammation of the mucosa) in the mouth. A major goal of mouth care (other than protection of the mucosa) is preservation of the teeth and prevention of gum infections. To accomplish this, the patient should be encouraged to accept as much responsibility as possible for frequent and consistent oral hygiene. She probably will need to be taught how to brush her teeth using a soft brush or tooth sponges (toothettes) and to employ gentle strokes. She also should be taught how to irrigate her mouth to remove debris and counteract acidity. The solutions most often used for this irrigation are normal saline, mild solutions of peroxide (1 : 5 ratio), or a bicarbonate of soda and salt solution ($\frac{1}{4}$ to $\frac{1}{2}$ tsp of baking soda and $\frac{1}{8}$ to $\frac{1}{4}$ tsp salt in an 8-oz glass of water). Fluid intake must be increased to 3000 mL/day. Because of the risk of infection, toothbrushes should be rinsed with a bleach solution or hydrogen peroxide and then rinsed with water before reuse. Running toothbrushes through the dishwasher is another option for disinfection.

Relief of the mouth pain of mucositis or **stomatitis** (inflammation of the mouth) is provided by special topical compounds (such as Xylocaine Viscous) that are “swished and spit.” Such compounds contain a topical anesthetic and an anti-inflammatory agent. **The patient is instructed not to swallow this solution.** The patient should avoid spicy foods, alcohol, and tobacco while undergoing treatment. The metabolic demand of malignant growth, the anorexia, and the mucositis that makes eating difficult all contribute to weight loss. Weight loss also can occur in cancer patients because of disturbances in their metabolism, whereby the body metabolizes its own proteins for energy instead of using the carbohydrates available in the diet or in body fat. The body has to work hard to repair normal cells after cancer treatment. Initially, the patient's weight should be noted and recorded and compared with her ideal weight. Her protein intake should be increased. Small, frequent feedings, attention to preferences for foods, and a pleasant and restful environment during meals are often helpful. Supplemental feedings to provide additional protein and calories can help prevent excessive weight loss and protein deficiency. Supplements taste better if they are served in glass or plastic rather than out of a metal container. The ACS has patient pamphlets available on

ways to increase nutritional intake.

Nausea, Vomiting, and Diarrhea

Radiation therapy of the abdomen or lower back often produces nausea, vomiting, and diarrhea starting 7 to 10 days after the beginning of treatment. Various antineoplastic drugs also can produce these side effects. Antiemetic regimens should be chosen based on the potential of the chemotherapy regimen to cause nausea. Dose and timing vary for the antiemetic agents, but the regimen (consisting of several different drugs) is usually started 30 minutes to an hour before doses of chemotherapy and continued for 1 to 2 days afterward. Antiemetics are used for nausea and vomiting resulting from radiation therapy as well. A commonly used class of antiemetics, serotonin antagonists, acts on the chemoreceptor trigger zone for vomiting and has proven very beneficial for chemotherapy patients, even for previously resistant chemotherapy-induced nausea and vomiting.

Eating before treatment seems to decrease nausea. Eating toast or crackers before arising or engaging in activity during periods of nausea may decrease vomiting. Liquids, liquid supplements, or easily digested foods are given at 3- to 4-hour intervals in small amounts. Foods and liquids should be high in protein and calories, bland, lukewarm, and to the patient's taste. Meals should be eaten slowly and food chewed thoroughly. Carbonated drinks and tea are tolerated better than other liquids but should be consumed 1 hour before or after meals, not with meals. It is best for the patient not to lie down for at least 2 hours after a meal. Caffeine and rich or fatty foods should be avoided. The patient's environment should be free of bothersome smells, sights, or sounds. If food odor is nauseating, consider serving cold meals. Chewing gum or sucking on hard or sour candy, candied ginger, or ice helps reduce nausea in some patients. Nursing care involves providing comfort measures and mouth care. If nausea strikes, breathing slowly and deeply through the mouth may prevent vomiting. The patient is monitored for dehydration and electrolyte imbalances when excessive vomiting occurs.

Diarrhea may occur from radiation to the abdomen, lower back, or pelvis. Many chemotherapy drugs cause diarrhea, because they affect the cells of the intestinal mucosa, causing inflammation. Treatment involves avoiding high-fiber foods that encourage rapid evacuation from the bowel and adding low-fiber foods such as bananas and cheese to the diet. Cleansing the rectal area and applying petroleum jelly, A&D ointment, or Desitin cream helps decrease discomfort and protects the skin from breakdown. The provider may prescribe a medication to decrease the number and frequency of bowel movements. The nurse must monitor the patient for signs of dehydration and electrolyte imbalance.

Constipation

Certain antineoplastic drugs, such as vincristine, vinblastine, and paclitaxel, cause constipation. Increasing fluids (as allowed), adding fiber to the diet, administering stool softeners and fiber laxatives, exercise, and monitoring vigilantly for the beginning signs of constipation are the usual measures taken. Suppositories or enemas may be necessary.

Cystitis

Cytoxan and ifosfamide may cause cystitis. The nurse monitors for hesitancy, urgency, and pain during urination. The urine is checked for cloudiness and signs of **hematuria** (blood in the urine). Fluids are increased to 2 to 3 L/day. The patient is encouraged to empty the bladder frequently. The antineoplastic drug is administered in the morning and/or early afternoon so that most of it can be flushed from the bladder before bedtime, which helps the patient sleep through the night.

Immunosuppression, Bone Marrow Suppression, and Infection

Suppression of the bone marrow is the major reason doses of chemotherapy must be limited. When the marrow is suppressed (that is, its cell production is slowed), few new erythrocytes, leukocytes, or platelets are produced. This reduction decreases oxygen-carrying power, and the patient experiences hypoxia and fatigue. Decreased platelets cause an increased risk of bleeding. A low leukocyte count means lower immune function and lower ability to fight infection.

All antineoplastic drugs cause some degree of bone marrow suppression, but some can cause

severe suppression. The amount of suppression is dose related. Severe suppression is a life-threatening side effect for the patient. The suppression usually is temporary, and improvement in bone marrow function occurs within weeks to months of completed therapy. The white blood cell (WBC) count is monitored; a count of less than $3000/\text{mm}^3$ indicates neutropenia. Filgrastim or sargramostim is given to raise the neutrophil count and the WBC count. Often, administration of these agents begins before the WBC count drops too low.

The anemia resulting from antineoplastic therapy places an increased workload on the heart and lungs as these organs attempt to oxygenate the body adequately. When the platelet count reaches a low of $50,000/\text{mm}^3$, any small injury can lead to an episode of prolonged bleeding. At $20,000/\text{mm}^3$, spontaneous bleeding that is difficult to control may occur. Therefore, at a count of $100,000/\text{mm}^3$, the next dose of chemotherapy is withheld. If the count is less than $50,000/\text{mm}^3$, bleeding precautions are observed (no invasive procedures), and if the count is less than 10,000 to $15,000/\text{mm}^3$, the patient is transfused.

The increased danger of infection is an indication to the nurse to become very attentive to good, frequent, and thorough hand hygiene and to maintain strict asepsis in all aspects of patient care. If the neutrophil count is below 500 mm^3 , follow the policy and procedures for protective isolation to prevent infection.

Patients with thrombocytopenia can take measures to help lower the risk of bleeding. An infusion of platelets may be administered if the count falls to $20,000/\text{mm}^3$. The patient must be handled gently. Using a lift sheet helps in turning and repositioning the patient. Needle sticks for injections, laboratory specimens, and intravenous line starts are kept to a minimum. The smallest gauge needle possible for the task should be used. Pressure is applied to the site for 5 to 10 minutes or until bleeding stops. All urine and stool should be tested for the presence of blood. Abdominal girth is measured daily to check for internal bleeding. Ice is applied to any area that is bumped or injured.

Patient Teaching

Cancer Treatment and Infection Prevention

- Wash your hands well with an antimicrobial soap or alcohol-based hand rub:
- Before eating
- After using the toilet
- After blowing your nose
- After handling items many people have handled, such as railings, money, shopping carts, library books, newspapers, and pieces of mail
- After touching a pet
- After spending time out in public
- Do not share personal care items (razor, toothbrush, toothpaste, washcloth, towels, deodorant, hand lotion, lipstick, etc.).
- Clean toothbrushes by running them through the dishwasher or soaking them in a bleach or hydrogen peroxide solution.

- Stay away from people with respiratory or other infections.
- Bathe daily if possible; use an antimicrobial soap.
- Examine the mouth daily for sores or white patches; perform mouth care frequently.
- Examine the skin, especially the feet, for signs of broken areas daily.
- Wash dishes, utensils, and items used in cooking in hot sudsy water or run them through a dishwasher.
- Drink only fresh, bottled water.
- Do not reuse drinking cups or glasses without washing them.
- Keep lips moist with lip balm or petroleum jelly to avoid cracking.
- Stay out of crowded places.
- Eat only canned or cooked foods.
- If leukocyte count is extremely low, maintain a low-bacteria diet by avoiding salads, raw fruits and vegetables, undercooked meat, pepper, or paprika.
- Do not handle garden flowers, plants, or earth.
- Do not clean out cat litter boxes or bird cages.
- Have someone else change the water in flower arrangements if they are allowed.
- Monitor temperature daily.
- Be careful not to nick or scratch the skin.
- Report the following signs of infection to the provider immediately:
 - Temperature over 100° F (38° C)
 - Persistent cough
 - Colored or foul-smelling drainage from wound or nose
 - Presence of a boil or abscess
 - Cloudy, foul-smelling urine or burning on urination

The diet is modified to avoid irritating foods. Stool softeners are given to keep the stool soft and to prevent the Valsalva maneuver that occurs with constipation. No rectal suppositories or enemas are given, and rectal temperatures are contraindicated.

Patient Teaching

Prevent Bleeding and Bruising in the Patient With a Low Platelet Count

- Use a soft toothbrush and brush lightly; do not floss.

- Use only an electric razor or depilatory for shaving.
- Prevent constipation by increasing fluid and roughage in the diet; take a stool softener if needed.
- Caution health care workers not to use a tourniquet to obtain blood specimens.
- Inform health care workers of normal blood pressure so that cuff is not pumped up excessively.
- Avoid nonprescription drugs that inhibit platelet function: aspirin, ibuprofen (Motrin, Advil), Alka-Seltzer. Check for salicylates that inhibit platelet function in all analgesic and cold medicines.
- Move around carefully to avoid bumping into things; avoid contact sports or any sport where falling is a risk.
- If a bump or injury occurs, apply ice to the area for 1 hour.
- Avoid tight, constricting clothing or shoes.
- Do not wear jewelry with sharp edges.
- Use ample lubrication for intercourse; avoid anal intercourse.
- Avoid blowing the nose or picking at it; if you must blow, blow gently without occluding either nostril.

Immunosuppression may be treated with CSFs, such as granulocyte-macrophage colony-stimulating factor (GM-CSF), granulocyte colony-stimulating factor (G-CSF), or in limited cases epoetin (EPO), to increase leukocytes, granulocytes, and erythrocytes. Granulocyte-stimulating factors are questionable for patients with a cancer of the blood-forming organs, such as leukemia (unless whole-body irradiation has occurred), because there is a possibility that more abnormal cells will be produced. Granulocyte-stimulating factors are used after total body irradiation for Hodgkin disease, acute lymphocytic lymphoma, and non-Hodgkin lymphoma. They are given after the BMT has been completed.

Think Critically

You came to work with a slightly scratchy throat and a drippy nose this morning. The charge nurse has assigned you to a cancer patient who has bone marrow suppression. What would you do in this situation?

Hyperuricemia

Antimetabolite drugs cause an increase in uric acid in the blood as cancer cells are destroyed. A high fluid intake helps prevent problems of the **hyperuricemia** (high uric acid in the blood) that occurs. Allopurinol may be prescribed at the beginning of therapy to decrease the incidence of gout caused by the hyperuricemia.

Fatigue

The fatigue that occurs from immunosuppression treatment itself requires an adjustment of lifestyle. Physically, the patient may feel tired and lack energy. She may find that she is impatient and irritable, and she may withdraw from her social environment. This decrease in activity may lead to a decline in function that is irreversible.

The nurse must instruct the patient about how to manage fatigue. Fatigue management includes avoiding unnecessary bed rest, maintaining a good balance between energy and activity, minimizing emotional distress, maintaining activities of daily living, using energy-saving devices, and prioritizing activities. Maintaining a good nutritional status with high protein intake will help keep up energy levels. Supplemental feedings between meals often are necessary to ensure

adequate calorie intake. Fluids should be increased to 3 L/day on day 3 of chemotherapy, unless contraindicated, to help flush the waste materials of killed cancer cells from the body and to decrease the toxicities of the antineoplastic drugs. Explain that fatigue is a normal result of cancer treatment, and that fatigue may continue for 2 to 3 months after completion of therapy. Light exercise such as walking tends to increase the energy level (Herrington & Dinh, 2015).

Alopecia

Hair loss (**alopecia**) resulting from chemotherapy is temporary. Occasionally, radiation therapy to the head causes permanent hair loss. Although some techniques—such as using ice caps or a tourniquet around the scalp during the administration of chemotherapy—have been somewhat effective, oncologists do not recommend them. The reduction of circulation of the drug to the area may prevent the killing of cancer cells that are harbored in the blood or lymph vessels in the scalp and head.

Hair regrowth begins about a month after chemotherapy ends. The patient must be told that the new hair may be different in texture and color from the original hair. Before hair loss occurs, the patient may choose a wig or head cover to wear until the hair is regrown. Some offices of the ACS have wigs available for loan that have been donated by former patients. Today it is popular to “sport” the baldness that results from treatment. Whatever your patient decides, help her understand that society supports her as a unique individual.

Pain

For many cancer patients, pain is a daily reality. Pain reduces appetite, limits activity, and interferes with sleep. Most cancer pain (90%) can be relieved or at least controlled by a combination of measures. Often, however, the pain of cancer is undertreated. [Chapter 7](#) discusses all the modalities to control patients' pain. Acupuncture has been validated as being useful to help control cancer pain (Paley et al, 2011). [Table 8-7](#) lists current oral and intravenous medications proven effective against cancer pain. By putting aside worries about addiction to opiates, believing the patient's reports of pain and what relieves it, and concentrating on humane treatment of cancer patients, the nurse can be the instrument for helping the patient achieve a pain-free or pain-controlled existence. Adjunctive medications used along with analgesics to help control cancer pain may include steroids, antidepressants, and antiseizure drugs and can be very effective. Pain should be reassessed 15 to 30 minutes after parenteral drug administration and 1 hour after oral drugs are given. Medication doses should be scheduled regularly and around the clock to maintain a therapeutic drug level to prevent pain recurrence.

 **Table 8-7**

Drugs Commonly Used to Treat Cancer Pain

DRUG	BRAND NAME	DURATION (hr)	DOSAGE (mg)	SIDE EFFECTS
Common Oral Pain Relievers: Mild to Moderate Intensity				
Acetaminophen	Tylenol	3-4	650	Hepatic
Aspirin	Many brands	3-5	550	GI
Codeine	Many brands	3-5	32	CNS, GI
Hydrocodone combination	Vicodin	3-4	5	CNS, GI
Ibuprofen	Motrin, Advil	3-5	400	GI
Ketoprofen	Orudis	5-7	50	GI
Naproxen	Naprosyn	2-8	250	GI
Oxycodone	Roxicodone	3-6	5	CNS, GI
Piroxicam	Feldene	24	20	GI
Propoxyphene	Darvon	4-6	65	CNS
DRUG	BRAND NAME	DURATION (hr)	PARENTERAL DOSE (mg)	ORAL DOSE (mg)
Common Opioid Pain Relievers: Moderate to Severe Intensity				
Morphine	Generic	4-5	2.5-10	10-30
Controlled-release morphine	MS Contin	6-12	—	15
Hydromorphone	Dilaudid	3-4	1-4	2-8
Fentanyl	Duragesic	1-2	0.1	0.025
Oxycodone	Roxicodone	4-6	—	5-15
Controlled-release oxycodone	OxyContin	12	—	10
Codeine sulfate	Generic	4-6	—	15-60

CNS, Central nervous system; GI, gastrointestinal.

Nonpharmacologic Interventions

Nonpharmacologic interventions are combined with oral, topical, and parenteral analgesia to achieve relief or good control of pain. Pain must be (1) assessed and documented regularly; (2)

discussed openly with family, and the reports of pain believed and understood; (3) addressed with options that are appropriate for the setting and for family; and (4) treated with interventions in a timely fashion. **The main factor in pain treatment is to continue to seek a combination of interventions or different treatments until the pain is under control.** The pain regimen used should be known to be effective for cancer pain. Pain control or relief greatly increases the quality of life for cancer patients.

Think Critically

The pain control regimen for an assigned cancer patient is not working well. Can you write a role-play situation that would show your classmates how you would interact with the provider to obtain better pain control for your patient?

Patients With Metastatic Disease

Some cancer patients experience metastasis. **Table 8-8** shows the most common locations for metastasis for major cancers. Treatment options are usually the same as for primary cancer. Nursing care becomes more complex as more body systems are affected. To rule out metastasis, the patient is periodically assessed by the provider, and bone scans are performed to detect metastasis to locations in the skeleton.

Table 8-8
Common Sites of Metastasis for Different Cancer Types

CANCER TYPE	SITES OF METASTASIS
Breast cancer	Bone* Lung* Liver Brain
Lung cancer	Brain* Bone Liver Lymph nodes Pancreas
Colorectal cancer	Liver* Lymph nodes Adjacent structures
Prostate cancer	Bone (especially spine and legs)* Pelvic nodes
Melanoma	Gastrointestinal tract Lymph nodes Lung Brain
Primary brain cancer	Central nervous system

*Most common site of metastasis for the specific malignant neoplasm.

From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, St. Louis, 2013, Elsevier.)

Fear and Ineffective Coping

A patient who is newly diagnosed with cancer faces enormous stress. **Knowledge about the disease, treatment options, and what will be experienced during each type of treatment greatly decreases fear in patients and families.** Knowing what to expect allows people to plan and feel confident that they will have some control over their experience. An assessment of the patient's and family's usual coping techniques is important in formulating the overall plan of care.

When a patient has been diagnosed with cancer, pay attention to the patient's partner. Give the partner enough knowledge to decrease anxiety, and the patient will be calmer. Be honest about the adverse effects of chemotherapy, immunotherapy, radiation therapy, and other treatments, but take a positive approach. Indicating that many patients feel a little nauseated with chemotherapy, but that there is medication that controls nausea very well, is better than telling the patient that there will not be any problems with the chemotherapy.

The nurse must consider psychosocial and spiritual care when working with a cancer patient, because the disease will affect every aspect of life in some way. The nurse's job is to be supportive, to assist the patient to use strengths in planning and fighting the disease, and to coordinate family strengths to support the patient to continue with daily life.

Speak with the patient and partner about sexual concerns. Intimacy is to be encouraged. Unless the patient is recovering from surgery, has pathologic fractures, or is severely immunosuppressed,

sexual intercourse should not be a serious problem. If sexual function has been altered by surgery or treatment, help the patient find other means of sexual expression and gratification.

Referral to a social worker may be needed to coordinate resources for treatment and care assistance. Care of the cancer patient is a collaborative process that involves many members of the health care team. Family, friends, community groups, and people with an interest are among the sources of support and encouragement that the cancer patient might need for self-care and to attain some level of independence and peace of mind.

Local chapters of the ACS and American Lung Association have a wide variety of services available to professionals and laypersons who are caring for cancer patients. These include an annotated bibliography of public, patient, and professional information and education materials, pamphlets and booklets, and audiovisual programs. Materials can be obtained by writing to or calling the nearest ACS division. There are more than 3000 local ACS unit offices in the United States and Puerto Rico.

Learning as much as possible about the particular kind of cancer advises the patient of available options. Knowledge of the latest and most effective treatments should be gained before making a decision about treatment. Contacting the NCI for the latest information is wise.

Throughout treatment, the patient should be actively seeking information. The patient must trust the provider and the hospital or treatment facility. Trust is not developed on the basis of someone else's recommendation alone. Encourage the patient to maintain a sense of humor and to look for a little pleasure and enjoyment in life on a daily basis to counteract the hours consumed by treatment.

Oncologic Emergencies®

An oncologic emergency can occur when a tumor grows so large it is compromising function of adjacent structures or when metabolic processes or normal coagulation processes are disrupted. There are six major oncologic emergencies:

1. *Tumor lysis syndrome*: Rapid release of by-products from cell destruction by cancer therapy; first sign is an elevated potassium level, which may cause renal failure, cardiac dysrhythmias, or asystole.
2. *Hypercalcemia*: Calcium level rises above 11 mg/dL because of bone deterioration and release of secretion of parathyroid hormone by a tumor.
3. *Disseminated intravascular coagulation (DIC)*: Caused by abnormal activation of clot formation, resulting in widespread blood clotting (consumptive coagulopathy) and organ damage, followed by depletion of platelets and blood coagulation factors. This results in excessive bleeding.
4. *Pericardial effusion and cardiac tamponade*: Invasion of cancer cells into the pericardial sac, causing fluid secretion into the sac.
5. *Spinal cord compression*: Related to metastatic tumor and bone collapse, causing impingement of the spinal cord.
6. *Superior vena cava syndrome*: Occurs in lung cancer when affected lymph nodes block circulation in the vena cava.

When these emergencies occur, immediate action must be taken to prevent severe injury or death.

Care for a Dying Cancer Patient

Psychological Process of Death

Although an increasing number of cancer patients are being cured, cancer is still the second leading cause of death in the United States. Sometimes cancer cannot be eliminated. It is estimated that 589,430 Americans died of cancer in 2014 ([ACS, 2015](#)). That amounts to 1600 patients who die of cancer every day. Oncology nurses need to understand the grief process and the process of death and dying, and they need to apply knowledge about these processes compassionately when caring for cancer patients.

Grieving

Elisabeth Kübler-Ross introduced the world to the stages of grief and dying when her landmark book, *On Death and Dying*, was published in 1969. Kübler-Ross suggested that people go through several predictable junctures as they learn to adapt to the processes of loss or impending death. Not everyone goes through all the stages, nor do people go through stages in any set order. These five stages may apply to the grieving process when a body function or part is lost (such as a lost breast from cancer), a loved one dies, or one's own death is approaching ([Box 8-5](#)).

Box 8-5

Kübler-Ross' Stages of Dying

Denial (This can't happen to me!)

Anger (Why *me*?)

Bargaining (Yes *me*, but ...)

Depression (It *is* me, I give up ...)

Acceptance (I'm ready ...)

Fear

The patient feels and expresses many powerful emotions as she grieves the loss of her life. Almost all dying patients face varying levels of fear ([Box 8-6](#)). Caregivers are almost never successful in directly making patients less afraid of death through talk. The nurse is most helpful to the patient in just "being there" for the patient and expressing caring. A nurse who is compassionate and soothing provides comfort and strength for the patient. In the same way, when a patient displays behavior that is upsetting to the family, the nurse can explain to the family that patients go through these stages and the behavior is not because the family has done something wrong. These are times that both the patient and family are in great need, and nursing support can be profoundly comforting.

Box 8-6

Common Fears of Dying Patients

Almost all dying patients face varying levels of fear, which may include fear of:

- The unknown
- Abandonment and loneliness
- Loss of relationships
- Loss of experiences in the future

- Dependency and loss of independence
- Pain

When nurses care for dying patients regularly, they cannot help but reflect on their own mortality. It is important to review one's beliefs about death and dying and reaffirm those beliefs. In this way, it is possible to support patients who may have their own beliefs about the mysteries of death. [Table 8-9](#) provides some common spiritual beliefs and practices.

Table 8-9
Spiritual Beliefs and Practices Regarding Death

EXISTENCE OF DEITY	END-OF-LIFE (EOL) RITUALS	AFTERLIFE?	SPECIAL BELIEFS SURROUNDING EOL
Christianity			
Roman Catholic			
One triune deity: Father, Son, and Holy Spirit	Last Rites ("Anointing of the Sick")	Soul goes to purgatory, followed by eternity in heaven or hell	Catholics may be cremated, but the cremains must be interred, not scattered or kept.
Protestant			
One triune deity: Father, Son, and Holy Spirit	No special rituals Minister may perform extreme unction	Consequences of actions on Earth dictate whether soul goes to heaven or hell, and it happens immediately after death	Beliefs vary among sects; in general, cremation and autopsies are allowed.
Judaism			
One God	<i>Halakhah</i> (contains accepted Jewish laws and customs of death and mourning)	Immortality of the soul; belief in afterlife among the Orthodox	Euthanasia, suicide, and assisted suicide are strictly forbidden. The body is never left alone until burial. Autopsy is discouraged. The body must not be cremated.
Buddhism			
No	Rituals to ensure that the consciousness leaves the body	Progression of the soul	Sick patients must not know they are dying.
Hinduism			
Multitudes of gods and goddesses—being of ultimate oneness	<i>Antyesti samskara</i> (death rites) The Hindu dies at home, if possible Family member chants a mantra at moment of death	Progression of the soul—cycles of rebirth	<i>Mahaprashtana</i> (a vision of a tunnel of light). Death is a blissful time. Excessive drugs are avoided. Body is cremated; only men go to cremation site.
Islam			
One God (Allah), powerful but unknowable	Family members or an Imam (clergy) read Koran and offer prayers	Another world after death	Dying person should face Mecca before and after death.
American Indian/Alaska Native			
Common concept is dual divinity: creator and mythical individual	May have Christian or aboriginal traditions May smoke ceremonial pipe	In general, no precise belief May believe in reincarnation, or progression to another world	Traditional natives object to incorporation of their religious beliefs into other spiritual paths or into commercial affairs.
African American			
Most believe in one deity	Important to incorporate prayer in coping with illness	Depends on actual religion, but most believe in an afterlife	More likely to request life-sustaining therapies. Spiritual beliefs incorporated into treatment. Provider is God's instrument.

Take a periodic inventory of your ability to provide care without "burnout." If you come to the point where you can only provide care in a detached and distant manner, you can no longer be supportive, compassionate, and understanding. When this happens, it is time to take a break or to move on and let others provide care for the dying patient.

Palliative Care

Patients are living longer with cancer than they have in the past. Extended time means steps must be taken to maintain as high a quality of life as possible for the dying cancer patient.

Palliative care, also called *comfort care*, is directed at meeting the needs of the dying patient by providing comfort while maintaining a high quality of life. Nurses who care for a dying patient have a unique opportunity to become an intimate part of the patient's life. The dying patient can be supported physically and emotionally, while the nurse maintains a professional role.

Whether assisting the patient in the hospital or at home, certain comfort measures are required. Palliative care requires a specialized body of knowledge and skill that can be difficult to obtain and maintain if the nurse is not routinely applying the skills. Clinical issues in both settings involve the following.

Anticipatory Guidance

The nurse can prepare the family and patient by anticipating the death to come: giving them guidance about physical changes, symptoms, complications that may arise, and decisions about possible hospice care. There are two stages of dying. In the **preactive phase**, patients know they are dying and exhibit this knowledge by withdrawing from social activities and attempting to put their affairs in order. This may take weeks or months. Patients often report seeing loved ones who have already died. They become restless, have slow wound healing, and begin to have dependent edema (swelling in extremities, or even the entire body). When patients enter the **active phase** of dying

(the final 2 to 3 days) they exhibit specific signs in breathing patterns and other body functions that indicate that death is imminent. Following are some active dying symptoms and associated nursing activities.

Terminal Hydration

A dying patient gradually reduces fluid intake. Dehydration can also increase as a result of the disease process. Also, a dry mouth and a feeling of thirst may be induced by the drugs being administered. The nurse must help educate the patient and family as to both the benefits and burdens of hydration. Many times, the course is for the patient to choose what to take, and also to be allowed to refuse further nourishment. This is termed *patient-endorsed intake*.

End-Stage Symptom Management

Many expected symptoms are related to metabolic changes at the end of life. The last few days of patient life have been studied extensively. Recognize these latter symptoms and either alleviate them or help explain them to the patient and family. Because comfort is the goal of palliative care, administering only oral medications is the preferred choice. However, this may not be possible as death draws near, and it is also the goal to allow a pain-free death. In some cases it may be possible to administer transdermal and/or rectal pain medications.

Pain.

Transdermal fentanyl has helped eliminate the burden of pain at the end of life. Sometimes this regimen is supplemented with rescue doses of morphine. Studies have shown that pain relief, either total or at least enough to make the pain tolerable, is possible 75% to 97% of the time.

Dyspnea.

When patients are near death, they often subjectively feel as if they cannot get enough air. It is difficult to determine what causes this feeling, but several measures can be taken. The patient can be placed in Fowler's position, activities reduced, and air temperature adjusted, and medications such as bronchodilators can be given. Morphine may be given to ease breathing. It is important for the nurse to remember that this feeling can be very frightening for both the patient and family members, and aggressive treatment to lessen discomfort is important.

Death rattle.

Noisy ventilation is heard when patients can no longer clear their throats of normal secretions. Family members are often alarmed and are afraid the patient will choke to death. In these cases, scopolamine or atropine, drugs that are known to reduce secretions, may be used to quiet the patient and quiet the breathing.

Delirium.

Dying patients may experience hallucinations and/or altered mental status. Nurses must first search for causes such as pain, positional discomfort, or bladder distention and address those physical problems. Next, the nurse should discuss the delirium with the patient's family and encourage the family to talk to the patient in quiet tones while remaining calm.

Nursing Resources

The palliative care nurse is an important element for the patient's and family's comfort during this transition. In September 2004, a certification examination for LPN/LVNs was launched by the National Board for Certification of Hospice and Palliative Nurses (NBCHPN). Detailed information is available by calling 1-888-519-9901 or visiting the NBCHPN website (see Online Resources).

Get Ready for the NCLEX® Examination!

Key Points

- Cancer cells begin growing as a result of a change in normal body cells, probably a mutation in their DNA.
- Malignant cells can spread to other areas of the body.
- Tumors are classified according to the organs or tissues in which they first develop.
- All cancer results from defects in the DNA of genes.
- Harmful agents that are carcinogenic exist in the environment.
- Some people may have a genetic predisposition to some types of cancer.
- Age, sex, and race are considered predisposing factors for certain types of cancers.
- Changing certain lifestyle characteristics, such as quitting smoking, maintaining normal weight, reducing alcohol usage, avoiding and limiting exposure to carcinogens, and eating a varied diet, can lower the risk of cancer.
- Cytology, biopsy, radiologic studies, and laboratory tests are common methods used to diagnose cancer.
- Tumor markers detect biochemical substances synthesized and released into the bloodstream by tumor cells and are used mainly to confirm a diagnosis or determine response to a cancer therapy.
- Treatment modes of therapy for malignancies may include surgery, radiation, chemotherapy, hormone therapy, immunotherapy, and gene therapy.
- Nurses must protect themselves from overexposure to radiation. One of the most important areas of the patient's body to protect from radiation is the skin.
- Antineoplastic chemotherapy drugs are effective at different times in the growth and replication phases of the tumor cell cycle.
- Many antineoplastic drugs can cause tissue damage on direct contact, so the nurse must take care to protect patients from extravasation and administer the drugs into veins that have good blood flow.
- Biologic response modifiers manipulate the immune system to stimulate or suppress activity. These drugs assist the body in destroying cancer cells with minimal effect on normal tissue.
- Bone marrow and stem cell transplantation are used to correct damage caused by chemotherapy or radiation.
- Nausea, vomiting, diarrhea, and constipation are common complaints of cancer patients and require vigilant care.
- Cancer treatment may suppress the patient's bone marrow, and the patient may develop thrombocytopenia, requiring therapy to be ceased for a period of time.
- The main factor in pain treatment is to continue to seek a combination of interventions or different treatments until the pain is under control.
- Many cancer patients and their families go through the five stages of grief that are recognized in patients experiencing loss.
- Palliative care is providing comfort for the dying patient and maintaining a high quality of life throughout the death process.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- American Cancer Society, www.cancer.org
- American Pain Foundation, www.painfoundation.org
- Association of Cancer Online Resources, www.acor.org/index.html
- Complementary/integrative cancer therapy, <http://www.mdanderson.org/education-and-research/departments-programs-and-labs/programs-centers-institutes/integrative-medicine->

[program/index.html](#)

- National Board for Certification of Hospice and Palliative Nurses, [www.nbchpn.org](#)
- National Cancer Institute, [www.cancer.gov](#)
- National Coalition for Cancer Survivorship, [www.canceradvocacy.org](#)
- OncoLink, [www.oncologlink.upenn.edu](#)
- Online cancer resources, [www.cancerindex.org/clinks6.htm](#)

Review Questions for the NCLEX® Examination

1. There are two types of tumors: benign and malignant. A difference between the two types is:
 1. malignant cells have a nucleus that is small and regular in shape, whereas benign cells are large and irregular.
 2. malignant cells do not know when to stop multiplying, whereas benign cells have controlled patterns of reproduction and follow signals to stop.
 3. malignant cells do not invade adjacent tissue, whereas benign cells sometimes do.
 4. malignant cells reproduce exact copies, whereas benign cells become more disorganized with each succeeding generation.

NCLEX Client Need: Physiologic Integrity

2. A 40-year-old woman is scheduled for external radiation therapy for breast cancer. To help the patient cope with her illness and the effects of radiation therapy, what should the nurse help her to focus on? (*Select all that apply.*)
 1. Complying with scheduled radiation therapies
 2. Taking precautions on exposing other family members
 3. Protecting the skin by applying lotion
 4. Wearing snug-fitting clothing
 5. Understanding the therapeutic effects and side effects of the treatment

NCLEX Client Need: Psychosocial Integrity

3. The nurse reinforces patient instructions regarding neutropenic precautions. Important topics should include which of the following? (*Select all that apply.*)

1. Pregnancy
2. Diet restrictions
3. Hand hygiene
4. Social isolation

NCLEX Client Need: Safe and Effective Care Environment

4. Your patient will begin chemotherapy next week. Based on the understanding of the effects of chemotherapy, what patient education would be appropriate?

1. Advise the patient to use good birth control methods, because most chemotherapeutic agents are teratogenic.
2. Teach the patient that the toxicity associated with chemotherapy is most evident in cells that have a long life span, so the patient can expect to have continuous muscle aches while undergoing chemotherapy.
3. Most antineoplastic drugs produce most of the possible side effects, so expect to be very sick during the entire span of treatment. Show the patient how to take nausea medication as prevention.
4. Most therapeutics are excreted in the stool, so precautions should be taken.

NCLEX Client Need: Safe and Effective Care Environment

5. Pain is not unique to cancer but is a common occurrence in cancer patients. An important point to keep in mind when employing pain control efforts is to:

1. always try one type of intervention at a time and give it a chance to work before switching to a different intervention.
2. seek a combination of interventions to offer the best pain control.
3. try to avoid opioids to protect the patient from drug addiction.
4. refer the patient for psychological counseling if pain becomes an issue.

NCLEX Client Need: Physiologic Integrity

6. Before chemotherapy, a female patient expresses concerns regarding hair loss. She says that her partner will no longer love her because she will not be as attractive. An appropriate nursing problem statement would be:

1. Fear of rejection due to anticipated loss of hair.
2. Inability to cope with perceived loss of relationship.
3. Lack of power over effects of chemotherapy.
4. Deficient skin integrity related to hair loss.

NCLEX Client Need: Psychosocial Integrity

7. A terminally ill female patient reminiscing about the “good old days” becomes increasingly confused. She talks of seeing relatives who have died. Which nursing intervention(s) would be appropriate? (*Select all that apply.*)

1. Discuss the patient's behaviors with the family.
2. Force oral fluids.
3. Encourage the family to talk to the patient in quiet tones.
4. Promote a calm environment.
5. Apply physical restraints.

NCLEX Client Need: Physiologic Integrity

8. The family members attending to the needs of a dying patient express distress regarding the noisy breathing. An important nursing action would be to:

1. increase pain medications.
2. administer atropine.
3. reassure family members.
4. consult a priest or a minister.

NCLEX Client Need: Psychosocial Integrity

9. A patient is scheduled for bone marrow biopsy to confirm the diagnosis of leukemia. As the

nurse reinforces provider instructions regarding the procedure, an appropriate nursing statement regarding bone marrow biopsy would be:

1. "It is performed in the operating room."
2. "It is a painless procedure."
3. "It introduces a needle to aspirate tissue samples."
4. "It requires a surgical incision."

NCLEX Client Need: Physiologic Integrity

10. A patient who recently had chemotherapy for lung cancer complains of uncontrollable nausea and vomiting with accompanying loss of appetite. An appropriate problem statement would be:

1. Deficient coping ability
2. Deficient knowledge.
3. Anticipatory grieving.
4. Inadequate nutrition.

NCLEX Client Need: Physiologic Integrity

Critical Thinking Questions

Scenario A

An acquaintance tells you that she has had a mole on her back for several years and it appears to be getting larger and darker. She states she is worried about the fact that it is getting bigger, but says that she is scared to go to her provider. She does not have health insurance and is worried about paying for the visit.

1. What is your obligation as a nurse in encouraging this person to see a provider at once?
2. What suggestions could you make about obtaining a medical opinion without incurring a lot of expense?

Scenario B

Ms. Allen went to her provider for a regular physical checkup and was told that she had malignant cells in the cervical secretions obtained from her Pap test. She had a biopsy of the cervix, and this, too, proved to contain malignant cells. She was admitted to the hospital, Cesium-137 was implanted in the cervix, and Ms. Allen was kept in bed in a private room during the treatment.

1. If you were assigned to give morning care to this patient, what special precautions would you take to protect yourself from excessive radiation?
2. What would be some signs and symptoms that you would watch for to determine whether Ms. Allen is having either a local or a systemic reaction to radiation?

Scenario C

Mary is a 19-year-old college student receiving chemotherapy for Hodgkin disease.

1. Identify psychosocial problems you would expect Mary to have, and state the measures you would suggest to help her deal with them.

Scenario D

Alisha is a 40-year-old mother undergoing radiation therapy for ductal carcinoma of the breast. She has heard that acupuncture might help the xerostomia (dry mouth) that she is experiencing. She has tried mouthwashes and various toothpastes, but still has the problem, and her breath odor is interfering with her social life. She asks you for your opinion regarding acupuncture.

1. What should you tell Alisha about acupuncture and alternative approaches to this problem?
2. If you do not agree with complementary or integrative medicine, what is your obligation as a nurse in this situation?

CHAPTER 9

Chronic Illness and Rehabilitation

Objectives

Theory

1. Demonstrate understanding of relevant nursing issues for patients with chronic illness.
2. Examine and identify patients at risk for problems associated with immobility.
3. Describe the effect of immobility on each of the major systems of the body and identify how they are interrelated.
4. Explain the general goals for a resident in a long-term care facility and how to meet those goals.
5. Compare the role differences of LPN/LVNs in long-term care facilities with their role in acute care settings.
6. Describe the types of rehabilitation programs that might be found in a large city.
7. Apply the goals of rehabilitation to patients with varying levels of disability.
8. Identify the members of the rehabilitation team and the collaborative care-giving process and state the role of each.
9. Explain the differences in philosophy and attitude required in the home care setting and the hospital.

Clinical Practice

10. Choose specific interventions to assist a patient with a chronic illness who is home-bound and has issues of loneliness.
11. Discuss with the charge nurse the measures that are used for safety and fall prevention in a long-term care facility.
12. Observe a rehabilitation team conference to see how a collaborative care plan is created or updated.
13. From assessment data, identify areas of psychosocial need for a home care patient and his or her family.

KEY TERMS

- disability** (dīs-ă-BIL-ĕ-tē, p. 179)
handicap (HÄN-dĕ-kăp, p. 179)
hemiparesis (hĕm-ĕ-pă-RĒ-sĭs, p. 187)
impairment (ĭm-PÄR-mĕnt, p. 178)
orthostatic hypotension (ōr-thō-STĀT-ĕk hī-pō-TĒN-shŭn, p. 184)
rehabilitation (rē-hă-bil-ĕ-TĀ-shŭn, p. 188)

resilience (rī-zīl-yēns, p. 178)

sundowning (SŪN-doun-īng, p. 187)

Patients with chronic illnesses and disabilities are cared for in long-term care facilities, rehabilitation institutes, at home, at outpatient clinics, at rehabilitation agencies, and in providers' offices. When working with patients who have a chronic illness or who are disabled, nurses need to be skilled in providing care and comfort, promoting self-care for independent living, fostering quality of life, and promoting **resilience** (the ability to cope with events that affect the patient's well-being).

Chronic Illness

Chronic illness affects millions of people. Diabetes, hypertension, heart disease, cancer, neurologic disorders (such as multiple sclerosis and stroke), asthma, arthritis, back disorders, and musculoskeletal deformities (such as those from arthritis and osteoporosis) all require continuous care. Although many people with a chronic illness can lead an active and productive life, about 133 million people in the United States—45% of the population—have chronic illnesses or disabilities that interfere with normal function. A chronic illness, such as diabetes, can result in a physical impairment. For example, a lower limb is amputated as a result of diabetes every 30 seconds in the United States ([Partnership to Fight Chronic Disease, 2013](#)). People, and particularly older adults, may have more than one chronic illness, which makes treatment and care very complicated. The terms *impairment*, *disability*, and *handicap* are used in relation to patients who have a chronic illness. **Impairment** refers to dysfunction of a specific organ or body system. **Disability** indicates a difficulty in performing certain tasks because of impairment, and having a **handicap** means that there is a physical or mental defect or characteristic that prevents or restricts a person from participating in a normal life or limits the capacity to work; a handicap is usually related to a disability.

When chronic illness causes the loss of function, usual roles may be changed. The person may no longer be able to be the primary income provider or hold the positions in the workforce or community that formerly were held. Changes in the person's role affect the family as well. Daily patterns are altered to accommodate treatments and therapy and to cope with the problems of the disability. Sorrow is felt for all that has been lost. The patient may wonder, *Why did this happen to me?* Spiritual distress may be experienced as the person is faced with the limitations of the illness or disability that has occurred. Holistic care that addresses spiritual and psychosocial needs as well as physical needs is essential.

Patients with a chronic illness often feel powerless, especially during the phases of diagnosis and early treatment. Patients realize that the chronic illness will dictate much of their course in life, and that they have less control over what is happening to their body. Nurses can improve the patient's resilience. Support for the patient's usual coping techniques—and teaching new ways to cope—help the patient effectively deal with the illness and the changes in life patterns it brings. Be instrumental in instilling hope for a good quality of life and fostering resilience despite the illness ([Edward, 2013](#)).

Preventing the Hazards of Immobility

Patients are immobilized to varying degrees and for different amounts of time. A multiple-trauma patient may be on bed rest for several weeks. A patient with advanced multiple sclerosis may be able to move around only with a wheelchair. A patient who experiences great difficulty breathing from advanced lung disease or heart disease may have very little energy and thus may not move around much. Patients with a spinal cord injury or brain damage from a stroke may be immobile for the rest of their lives. Patients who have pain or who have arthritic joints that cause pain with movement also tend to be less mobile. Patients who have any disorder requiring bed rest are at risk. All of these patients are subject to the problems of immobility.

Evaluate each patient situation and determine whether the patient is at risk for problems related to immobility. **Even if the patient is going to be immobile for only a few days, measures should be taken to prevent secondary problems.** Patients with disorders causing immobility should be assessed for the degree of risk for the various problems of immobility, and interventions to prevent them should be initiated ([Box 9-1](#)). **Early effects of immobility include a decrease in muscle strength, generalized weakness, easy fatigue, joint stiffness, decreased coordination, abdominal distention, and various metabolic changes detectable by laboratory test.** [Table 9-1](#) presents the more severe problems with measures for prevention when lack of activity occurs for more than a few days.

Box 9-1

Disorders That May Cause Immobility

- Multiple sclerosis
- Stroke
- Spinal cord injury
- Lower extremity amputation
- Head injury
- Multiple trauma
- Fractures of the knee, leg, ankle, hip, pelvis, or spine
- Neuromuscular disorders: muscular dystrophy, amyotrophic lateral sclerosis, poliomyelitis, cerebral palsy, myasthenia gravis, etc.
- Congenital deformities
- Burns
- Advanced metastatic cancer
- Advanced stages of chronic disorders such as Parkinson disease, Alzheimer disease, or Huntington chorea
- Severe rheumatoid arthritis, osteoarthritis, and other forms of arthritis

Table 9-1
Prevention of the Common Hazards of Immobility

COMPLICATION	PREVENTION
Musculoskeletal	
Contractures	Range-of-motion exercises
Footdrop	Foot support while in bed, range-of-motion exercises, high-top tennis shoes
Osteoporosis	Range-of-motion exercises, ambulation if possible (walking)
Susceptibility to fractures	Weight-bearing exercises
Muscular atrophy	Passive or active range-of-motion exercises
Gastrointestinal	
Constipation	Increased activity level, Increased fluid and fiber intake
Cardiovascular	
Decreased cardiac output	Range-of-motion exercises
Increased venous stasis	Exercise, support hose or anti-embolism stockings
Thrombus formation	Exercise, support hose or anti-embolism stockings
Embolism	Avoidance of leg massage, low-molecular-weight heparin
Neurologic	
Disorientation	Sleep-wake schedule in accord with light-dark pattern, Reorientation (to person, place, and time), Control of sensory stimulation, Avoidance of sudden position changes, tilt table
Renal/Urinary	
Calculi	Decreased dietary calcium level, Increased fluid intake, Maintenance of acidic urine
Infection	Increased fluid intake, use intermittent catheterization instead of indwelling if possible
Respiratory	
Pneumonia	Frequent repositioning in wheelchair or bed, respiratory exercises

The prevention of problems related to immobility begins the moment a patient first becomes ill or injured. Preventive actions must continue as long as the patient needs health care. The systems of the body work together as a whole and lack of activity affects more than one system. The effects vary depending on the general health of the individual, his age, the degree of immobility, and the length of time of inactivity or bed rest. Lack of mobility may begin a cycle that leads to an ever-increasing loss of independence for the patient. As he becomes less able to move, the patient becomes more dependent, and as he becomes more dependent, he is less able to care for himself—which in turn leads to even more adverse effects from immobility. You can avoid the beginning of such a cycle by helping the patient maintain normal functioning of each body system to the highest degree possible ([Nursing Care Plan 9-1](#)).

Older Adult Care Points

Although a lot of older adults are active in their daily lives, many do not engage in daily exercise

activity. When immobilized, these patients quickly lose what strength and flexibility they had, because muscle fibers atrophy quickly. It is much more difficult for these patients to regain mobility.

Assess the patient daily, looking closely at each body system in which a problem related to immobility might occur. Know the signs and symptoms of each type of problem and understand how to intervene to decrease or prevent it. The assessment details and nursing care for each problem are discussed in the relevant chapters of this text.

Older Adult Care Points

Older adults are at greatly increased risk for problems of immobility because of the changes in the various body systems that normally occur with aging. Monitor closely for pressure sores, as well as hypostatic pneumonia, constipation, urinary problems, and inadequate nutritional intake resulting from anorexia. Attention to range-of-motion exercises is very important and often neglected.

Nursing Care Plan 9-1

Care of an Immobilized Resident

Scenario

Carl Sanders is an 83-year-old man with weakness and debilitation and who has several chronic diseases. He has been transferred to a long-term care facility after a hospitalization for pneumonia.

Problem Statement/Nursing Diagnosis

Altered mobility/*Impaired physical mobility related to weakness, debility, illness, and age.*

Supporting Assessment Data

Objective: Needs assistance to turn, reposition in the bed, or walk.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will maintain present joint mobility.	Perform range-of-motion (ROM) on joints qid.	Regular ROM prevents frozen joints.	Active ROM done twice this shift.
Resident will perform active ROM of arms by discharge.	Assist to turn and reposition q2h.	Repositioning helps prevent pressure ulcers and hypostatic pneumonia.	Repositioned q2h.
	Place in high Fowler position for meals; assist to chair for lunch.		Up in chair for meals. Breath sounds clear on right side; slightly diminished in left base.

Problem Statement/Nursing Diagnosis

Altered skin integrity/*Impaired skin integrity related to immobility and pressure over left trochanter.*

Supporting Assessment Data

Subjective: "I can't move very much."

Objective: Too weak to reposition self; stage I pressure ulcer over left trochanter.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will have no evidence of more pressure damage to skin.	Turn at least q2h and more frequently if possible.	Relieves pressure on dependent areas.	Position adjusted q1h.
	Use supports for positioning and cushioning for relief of pressure.	Prevents pressure ulcers and keeps body in good anatomic alignment.	On pressure relief mattress; pressure relief cushion in chair.
Stage I pressure ulcer will heal within 3 wk.	Keep reddened area clean and moist, with colloidal dressing in place; inspect every shift.	Cleanliness prevents infection. Clear film dressing seals in moisture while allowing inspection.	Clear dressing in place; reddening decreasing.
	Inspect all pressure points q4h.	Identifies skin problems.	Pressure points inspected q4h. No new reddened areas.
	Use turning sheet to turn patient.	Helps prevent shearing injuries from sliding resident on sheet.	Turning sheet used for turning.

Problem Statement/Nursing Diagnosis

Constipation/*Constipation related to immobility.*

Supporting Assessment Data

Subjective: "I feel constipated."

Objective: Only small amount of hard, dry stool passed once in last 4 days.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will have normal bowel pattern by discharge.	Administer oil retention enema as ordered followed by suppository; monitor results.	Oil will soften stool. Suppository stimulates bowel movement.	Oil retention given; held for 20 min. Had large bowel movement (BM); suppository not needed.
	Assist to bedside commode after breakfast every day. Provide privacy.	Sitting on commode and privacy promote ease of BM.	Assisted to commode after enema. Privacy provided.
	Give stool softener daily as ordered.	Keeps stool soft.	Received stool softener.
	Increase fluids to 8 oz/hr while awake.	Keeps stool soft.	Took in at least 6 oz of fluid each hour; continue plan.
	Increase fiber in diet.	Adds bulk, helping to prevent constipation.	Ate a bran muffin at breakfast.
	Offer warm prune juice each morning.	Stimulates bowel and softens stool.	Warm prune juice taken before enema.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to possible falls.*

Supporting Assessment Data

Objective: Unable to walk without falling; gets confused after dark and tries to get out of bed.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will not sustain fall in hospital.	Place call light and personal items within reach. Answer call light promptly.	Helps prevent him from trying to get out of bed without assistance.	Call bell and personal items on bed and bedside table within reach.
	Place an alarm device on the bed.	Alerts staff to attempt to get out of bed without assistance.	Bed alarm in place and functioning.
	Frequently reinforce instructions not to get up without assistance.		Reinforced not to get up without assistance q2h.
	Assist to bedside commode and back to bed.	Prevents falling.	Assisted to bedside commode after enema.
	Keep low light on in room at night to decrease confusion.	Light helps maintain orientation to room.	Placed instruction on Computer Care Plan.
	Check on resident frequently; anticipate needs.	Anticipating needs helps keep resident from arising without assistance.	Checked on resident every hour during this shift.

Problem Statement/Nursing Diagnosis

Altered mobility/*Impaired mobility related to weakness and debility.*

Supporting Assessment Data

Subjective: "I've really been sick; I'm so weak."

Objective: Unable to stand alone or transfer to chair; Lungs just cleared of secretions; breathes shallowly.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will perform breathing exercises q2h while awake.	Assist to sitting position for deep-breathing exercises, use of spriometer, and coughing q2h.	Lungs can expand better when thoracic cage is not against the mattress.	Assisted to sit up and perform deep breathing and coughing. Used spriometer q2h.
Lung fields will remain clear.	Encourage adequate fluid intake.	Keeps secretions more liquid and easier to expectorate.	Taking more fluid per hour (6 oz).
	Encourage to take deeper breaths during each commercial break when watching TV.	Aerates lower alveoli.	Encouraged to remember to take deep breaths during commercials on TV.
	Auscultate lungs each shift.	Detects changes in lungs.	Lungs clear on right side; slightly diminished sounds at left base.
	Turn q2h.	Helps prevent hypostatic pneumonia.	Turned q2h while in bed.
Patient will return to ambulation and other ADLs when possible	Assist to sit in chair.	Ambulation increases respiratory activity.	Short stays in chair, increasing as tolerated.
	Facilitate transfer training	Independence supports increased resilience.	Patient requires less assistance over time.
	Involve patient and family/caregiver in plan for progressive exercise	Involving patient and family increases resilience.	Patient increases activity as tolerated.

Problem Statement/Nursing Diagnosis

Potential for altered peripheral tissue perfusion; immobile for many days/*Risk for ineffective peripheral tissue perfusion related to venous stasis.*

Supporting Assessment Data

Subjective: "I've been mostly in bed for over a week."

Objective: Has been inactive and in bed most of the time for the past 10 days. History of previous thrombophlebitis in right leg.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will not have evidence of thrombophlebitis or deep venous thrombosis.	Encourage active ROM of legs, feet, and ankles q2h while awake.	Muscle movement compresses blood vessels, propelling blood to the heart.	Performing active ROM of legs, feet, and ankles after breathing exercises q2h.
	Keep TED hose smoothly in place	Elastic hose place pressure on vessels,	TEDs reapplied after bath.

	except for 30 min while bathing.	encouraging venous return to the heart.	
	Encourage extra fluid intake.	Fluid prevents dehydration and hemoconcentration.	Offered fluid each time care provided.
	Assess for Homans sign once per shift.	Homans sign may indicate a thrombus (clot).	No positive Homans sign.
	Visually inspect legs for reddening or swelling.	Reddening, swelling, or pain may indicate a thrombus or thrombophlebitis.	No reddening or swelling of legs and ankles.

Problem Statement/Nursing Diagnosis

Potential for infection/*Risk for infection of the urinary tract related to immobility.*

Supporting Assessment Data

Subjective: "I've had several bladder infections in the past."

Objective: Has been immobile for 10 days; Urine is concentrated and slightly cloudy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will not develop a urinary tract infection.	Increase fluid intake to at least 3000 mL/day.	Promotes more urine flow.	Is increasing fluid intake this shift.
	Encourage fluid intake hourly until 2 hr before bedtime.		Offering fluids each time care is given (q1-2h).
	Assess for bladder distention q4h.	Helps determine whether bladder is being emptied sufficiently.	No bladder distention; voiding sufficient quantities.
	Observe characteristics of urine for signs of infection.	Cloudy, foul-smelling urine may indicate infection.	Urine is yellow, clear, and without foul odor.
	Measure intake and output.	Helps evaluate fluid intake.	Intake 1800 mL this shift. Output 1465 mL this shift.

Problem Statement/Nursing Diagnosis

Potential for social isolation/*Risk for social isolation related to lack of social interaction.*

Supporting Assessment Data

Subjective: "I'm really sick of being in bed."

Objective: Confined to bed most of time without visitors; Roommate is aphasic and cannot communicate verbally.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Resident will maintain social contact.	Bring phone to resident and assist to call family members and friends.	Phone calls maintain contact with family and friends.	Phoned wife this morning. Says will call friend later this evening.
	Ask volunteers to play cards with him.	Playing cards with another provides social interaction.	Requested volunteer to play cards for late afternoon.
	Visit his room frequently.	Stopping in room provides social contact.	In room q1h.
	Set up a schedule with family members for visits.	Spread out visits to help dispel loneliness.	Wife is trying to set up visiting schedule.

Critical Thinking Questions

1. What other psychosocial problems might this resident have?
2. Once he is stronger and able to walk with assistance, what measures could you take to help prevent him from falling?
3. What types of activities will help him to restore his muscle strength?

Chronic Illness and Rehabilitation Care

A chronic illness may develop after an acute illness or an accident. Some patients are transferred to a transitional unit or long-term care facility for a period of weeks for recovery after the most acute phase of illness or injury has passed. Many older adults who have several chronic problems and deficits in self-care enter long-term care facilities for the remainder of their lives. Other patients may enter a rehabilitation facility for an extended time. Some patients are discharged home to continue with rehabilitation services as an outpatient.

Long-Term Care

In long-term care facilities, an RN usually is the director of nurses. The RN supervisor manages the care for the entire facility on a 24-hour basis and delegates tasks to LPN/LVNs. An LPN/LVN often is the charge nurse, and certified nursing assistants (CNAs), patient care assistants, or restorative

aides provide much of the basic direct care to the residents. An occupational therapist, physical therapist, speech pathologist, respiratory therapist, activity therapist, or other professional provides services as needed. A physician or advanced practice nurse supervises each resident's care program. Although the RN ultimately is responsible for the nursing care plan of each resident, the LPN/LVN charge nurse often is the person who admits the resident and initiates the care under the direction of the RN. Collaboration with the RN is necessary to ensure that the plan is appropriate and complete. The LPN/LVN performs treatments, performs wound care, regularly assists with gathering assessment data from the residents, organizes the shift's workload, administers medications, documents assessment findings and care given, assists with updating the nursing care plans, and assigns care tasks to patient care assistants. The LPN/LVN oversees care for a group of residents for a shift. The LPN/LVN assigns tasks to the patient care assistants. Those tasks may include assistance with toileting, bathing, feeding, ambulation, or range-of-motion (ROM) exercises; care of the resident unit; and transfer of residents from bed to chair. Patient care assistants are the core caregivers of the long-term care facility. A skillful LPN/LVN will establish rapport, harmony, and respect among the work team by valuing these workers, appreciating their contributions, and listening to their concerns.

Assignment Considerations

Appropriate Assignments

When assigning tasks to unlicensed assistants ([CNAs], patient care assistants, restorative aides), you must know that the UAP has shown competence at performing the task. Competencies of assistive personnel should be documented in their personnel files. Evaluation of task competence must be done at least annually. Give specific directions about what you want the person to do, how it is to be done, and what needs to be reported to you. You are responsible for the care of any resident or patient assigned to you. Do not assign unlicensed personnel to perform tasks for unstable patients.

In 1987, the Omnibus Budget Reconciliation Act (OBRA) was signed into effect by then President Ronald Reagan. This was the first revision of the standards for Medicare and Medicaid since they were originally created in 1965. OBRA was enacted so that long-term care facilities must provide the type of care to nursing home residents that promotes and results in the highest level of wellness possible for each individual recipient ([Hawes et al, 1997](#)). This act requires that all skilled nursing facilities and nursing facilities use only CNAs.

When planning care for residents in a long-term care facility, the LPN/LVN must keep in mind that the overall goals of care for the facility are to provide a safe environment, assist the resident to maintain or attain as much function as possible, promote individual independence, and **allow the resident to maintain or achieve as much autonomy as possible**.

Safety.

One of the six priorities of the Affordable Care Act (ACA) is to make care safer by reducing harm caused in the delivery of care ([Camicia et al, 2013](#)). Providing a safe environment for a group of residents, who may not be totally mentally competent, while allowing autonomy and independence is a great challenge. Two of the greatest safety concerns are to keep confused residents within the boundaries of the facility and to prevent falls. Those with physical disabilities need extra measures to ensure safety. Those with chronic physical conditions are more likely to experience mental illness. National Patient Safety Goals (The [Joint Commission \[TJC\], 2014](#)) have been developed specifically for long-term care and rehabilitation facilities (Box 9-2).

Box 9-2

The Joint Commission's National Patient Safety Goals

The 2014 National Patient Safety Goals that specifically pertain to long-term care and rehabilitation facilities include the following:

- **Identify residents correctly.** Use at least two ways to identify residents. For example, use the resident's name and date of birth. This is done to make sure that each resident gets the correct medicine and treatment.
- **Use medicines safely.** Take extra care with residents who take medicines to thin their blood. Record and pass along correct information about a resident's medicines. Find out what medicines the resident is taking. Compare those medicines to new medicines given to the resident. Make sure the resident knows which medicines to take when they are at home. Tell the resident it is important to bring their up-to-date list of medicines every time they visit a doctor.
- **Use alarms safely.** Make improvements to ensure that alarms are heard and responded to promptly.
- **Prevent infection.** Use the hand cleaning guidelines from the Centers for Disease Control and Prevention or the World Health Organization. Use proven guidelines to prevent infection of the blood from central lines.
- **Prevent residents from falling.** Find out which residents are most likely to fall. For example, is the resident taking any medicines that might make him weak, dizzy, or sleepy? Take action to prevent falls for these residents.
- **Prevent bed sores.** Find out which residents are most likely to have bedsores. Take action to prevent bedsores in these patients. From time to time, recheck residents for bedsores.

From The Joint Commission: *National Patient Safety Goals: Long term care*, 2015. Retrieved from www.jointcommission.org/standards_information/npsgs.aspx.

Fall prevention.

The first step in the prevention of falls is to recognize which residents are at greatest risk (Box 9-3). All residents are assessed for the risk of a fall on admission and whenever their condition changes (Box 9-4). The next step to prevent a fall is to recognize hazards in the environment that could precipitate a fall (Box 9-5).

Box 9-3

Problems and Disorders That Increase the Risk of Falls

- Musculoskeletal disorders that impair normal ambulation or balance
- Neurologic problems, such as peripheral neuropathy, affecting the feet
- Balance or gait problems resulting from stroke or inner ear problems
- Postural hypotension or dizziness caused by medications
- Impaired vision
- Impaired hearing
- Extreme weakness
- Oxygen deficit that may cause dizziness and loss of balance
- A history of previous falls

Box 9-4

Fall Risk Assessment

Place a check mark in front of the items that apply to the patient.

General Information

- ___ Age over 70 years
- ___ History of falls*
- ___ Confusion at times
- ___ Confused most of the time*
- ___ Impaired memory or judgment
- ___ Unable to follow directions*
- ___ Needs assistance with elimination
- ___ Visual impairment
- ___ Feels physically weak*

Medications

- ___ Central nervous system suppressants (opioid, sedative, tranquilizer, hypnotic, antidepressant, psychotropic, anticonvulsant)
- ___ Medication that causes orthostatic hypotension (antihypertensive, diuretic)*
- ___ Medication that may cause diarrhea (cathartic)
- ___ Medication that may alter blood glucose levels (insulin, hypoglycemics)

Gait and Balance

- ___ Poor balance when standing*
- ___ Balance problems when walking*
- ___ Swaying, lurching, or slapping gait*
- ___ Unstable when making turns*
- ___ Needs assistive device (walker, cane, holds on to furniture)*

*A check mark on any starred item indicates a risk for falls. A combination of four or more of the unstarred items indicates a risk for falls.

From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2014, Saunders.

Box 9-5

Interventions to Help Prevent Falls

- Keep pathways free of objects.
- Remove loose rugs or secure with a nonslip pad.
- Place shoes and slippers underneath the bed or chair rather than in the pathway.
- Provide lighting without glare or deep shadows.

- Provide adequate night lighting for the pathway from the bed to the bathroom.
- Wipe up spilled liquids immediately.
- Keep wheels locked on all equipment when stationary.
- Place belongings within easy reach to prevent leaning from the bed or chair.
- Check to see that the call bell is within reach before leaving the room.
- Promptly answer call light to prevent the resident from arising without assistance.
- Encourage the use of supportive, sturdy footwear with nonslip soles for ambulation.
- Floor covering should not be slippery or highly patterned, and should be easily navigated when ambulating in common footwear or with assistive devices.
- Encourage residents to crouch down rather than bending over to pick up something, and to sit to dry the feet and pull on underwear and pants.
- Place grab bars by the toilet, in the bath or shower, along each set of stairs, and in the hallways.
- Provide chairs that are the proper height and depth to prevent “falling” into the chair or leaning far forward to arise from the chair.

Restorative programs focus on muscle strengthening and balance. Residents who are at risk for **orthostatic hypotension** (blood pressure that falls with position change from supine to sitting or standing) are taught ways to decrease the risk of falling. Be alert to the fact that a resident who was previously ambulating safely may be weakened if he has been recently sick with fever, urinary tract infection, flu, a cold, vomiting, or diarrhea. A resident who is receiving diuretic therapy must be assessed frequently for fluid and electrolyte imbalance that could cause weakness, dizziness, or confusion. Residents on diuretic therapy must receive prompt assistance for toileting when assistance is requested. A resident who needs opioid therapy for pain or sedatives to sleep must be safeguarded. Instruct the resident to ring for assistance should the need to arise from the bed or chair occur. The bed should be kept in the low position.

Safety Alert

Medication Assessment

Assess all medications a resident is taking to determine the risk of medication-induced postural hypotension or dizziness. Medications that cause dizziness are a common contributor to falls. Over-the-counter medications should be considered as well as prescription medications.

Think Critically

Can you describe how you would determine a new resident's risk for falls? Can you identify points that should be included in the assessment of a high risk for a fall?

Use of security devices and alternative measures.

When a resident frequently forgets instructions to call for assistance, repeatedly attempts to get up and falls, or interferes with medical treatment by pulling out ordered tubes or scratching at wounds, the use of security devices may be necessary. However, these devices should only be used when all else has failed. Research has provided strong evidence that restraints increase rather than decrease the risk for injury ([Hollins and Stubbs, 2011](#)). Chemical restraints are tranquilizers or sedatives that calm a resident and alter behavior. Physical and chemical restraint use is restricted by law and is applied only as a last resort for safety when a resident is a proven threat to self or others.

Legal and Ethical Considerations

Considering Restraints

Patient deaths have occurred from improperly applied restraints. Laws require that they be used only after all other measures have been tried—such as sitters, family at the bedside, alarms, or distractions—and these other measures have failed. Documentation must be thorough, indicating specific alternative measures that have been tried and have failed. Document the time the restraint is applied, the condition of the patient at that time, interim assessments, the time the restraint is removed, and the condition of the patient at the time when the restraint is removed.

The purpose of such statutes is to ensure that restraints are used to protect residents, not to hinder their movements for the staff's convenience. Alternative measures are always tried first (Box 9-6). When a security device is used, the least restrictive device is chosen. A variety of techniques help provide a restraint-free, yet safe, environment. **All security devices must only be used as a last resort and must be ordered by a provider.** If a qualified, licensed nurse determines the need for a chemical or physical security device in an emergency, the need is specifically documented when the security device is applied. A provider's order for the security device must be written within 24 to 48 hours. Box 9-7 presents the principles related to the use of security and safety devices.

Box 9-6

Measures Helpful to Prevent the Need for Security Devices

- Explore what may be upsetting the resident and causing agitation.
- Place a restless or high-risk resident in a room or location close to the nurses' station where he can be checked frequently and attempts to get up will be most likely observed.
- Reorient an acutely confused resident as frequently as possible.
- Use validation to reaffirm the feelings and concerns of a resident with dementia.
- Provide distraction activities that keep the resident busy; give the person a "job" to do.
- If a resident is agitated, turn off the television and provide soft, soothing music.
- Provide familiar and cherished items that the resident can handle.
- Ask a family member to stay with the resident.
- Use a bed or chair alarm to alert nursing staff that the resident is attempting to get out of bed or chair unassisted.
- Remain with unsteady, agitated, or confused residents when they are up and about.
- Leave another person in charge of your residents when leaving the unit for a meal break or other reason; specifically mention which residents need to be visually checked frequently.
- If a resident needs to get up at night frequently to urinate and does not call for assistance, restrict fluid intake after 6 P.M. if appropriate.
- Provide social and diversional activities to a resident confined to a wheelchair or bed so that boredom does not cause the person to try to get up and seek activity.
- Move the mattress onto a low platform or the floor so that it is easier for the resident to get in and

out of bed without the risk of a fall.

Box 9-7

Principles Related to the Use of Security and Safety Devices

- The use of safety or security devices must help the resident or be needed for the continuation of medical therapy.
- All devices that limit movement or immobilize must be ordered by a provider.
- Use the least amount of immobilization needed for the situation. For example, use mitts rather than wrist restraints if the resident cannot otherwise be prevented from pulling out tubes or lines.
- Apply the device snugly but not so tightly as to interfere with blood circulation or nerve function.
- If a security device is applied, check on the resident at least every 30 minutes. Assess for breathing, circulation, and possible nerve or skin impairment.
- An immobilization device must be removed and the resident's position changed at least every 2 hours. Active or passive exercises are performed for immobilized joints and muscles.
- Reassess need for the security measure every 4 to 8 hours.
- Meet needs for food, fluids, and toileting and assess these needs every 2 hours.
- Assess pain and comfort level and provide interventions as necessary.
- Document alternative measures taken and their success or failure. Document all pertinent data related to assessments when security devices are in place, when they were applied, and when removed.
- The provider should be notified as soon as the security device is deemed no longer necessary.

A resident who is immobilized with a security device must be checked visually at least every 30 minutes to ensure that the resident's body is in good alignment and that there are no problems. These checks must be documented. Whenever you are in the patient's room, check skin color for circulation in the affected body parts. Residents must be turned or repositioned every 2 hours. Thorough assessment of skin and circulation is done at that time. The restraint should be removed immediately after the risk has been reduced.

Managing confusion and disorientation.

For residents with mild confusion and disorientation, various techniques and measures are used to help maintain orientation. Reality orientation involves both the environment and the people who interact with the resident and should be an ongoing process. The environment is structured so that the resident has concrete and continual reminders of the year, day, and time of day. Environmental aids include a readable, up-to-date calendar, a clock, and the daily newspaper or local television or radio news ([Figure 9-1](#)).



FIGURE 9-1 Promoting reality orientation in the long-term care environment.

Consistency in mealtimes, scheduled activities, treatments, and daily personal care routine also can be helpful. Limit the number of choices to be made during these activities. A time schedule for activities and events within the facility should be posted in large type where the resident can refer to it frequently. Decorations for the next upcoming holiday give clues as to the current season of the year. Try to assign caregivers who are familiar to the resident, avoid placing the resident in unfamiliar situations, and limit visitors to one or two people at a time.

A positive and helpful approach is to respond continuously to the resident's confusion with honest and real information. Remember to assess the possibility of a physical cause for the confusion, such as urinary tract infection, constipation, dehydration, reduced oxygenation, or suboptimal pain control.

Nocturnal confusion (**sundowning**) occurs often among some older adult residents. Sensory deficits, such as impaired sight and hearing, add to the resident's confusion and anxiety at night when the environment becomes different because of darkness. A night-light that gives illumination without shining in the resident's eyes or causing frightening shadows can be used. Keep the call bell within reach and visit the resident frequently to calm and reassure. Moving the resident closer to the nurses' station, touching, and other signs of caring are all ways to intervene to minimize nocturnal confusion. A bed alarm that alerts staff when the resident attempts to get out of bed is helpful. Door alarms that announce when the resident has left his room or designated area may be used in place of security devices and prevent patients from wandering in unsafe areas. Keeping the resident active during the day and encouraging physical exercise helps promote sleep at night. **Listening to the resident to try to determine any possible cause of unrest or fear can often help solve the problem.**

Promoting independence.

The move to a long-term care facility is a major upheaval, particularly when it is for the remainder of the person's lifetime. Specific goals should be set with the resident to encourage independence in activities of daily living (ADLs) and in recreational activity. Perhaps a resident can pursue a former hobby, such as knitting or playing the piano, if such activities are available. Adaptive devices and a consultation with the dietitian may provide all the assistance that is necessary for self-feeding once again. Other adaptive devices can make daily living considerably easier (Table 9-2). To promote a resident's independence, staff members should refrain from doing tasks that the resident is capable of doing himself. For the resident who has had a stroke or suffers from debilitating arthritis or other musculoskeletal problem, use of adaptive devices can assist in the promotion of independence, provide some autonomy, and help to maintain function (Figure 9-2).

Clinical Cues

When residents understand that they have control of what happens, they maintain good adaptive skills. They are resilient and have the power to adjust and reduce stress. This helps resist adverse effects of chronic disease. **Activity theory** states that people will be happiest in direct proportion to how much activity they are able to maintain as they grow older. **Continuity theory** proposes that participation in activities and relationships that have been maintained over a long period of time contributes to a sense of well-being and allows a sense of integrity and continuity with the past. Finding out what activities have significant meaning for the resident, and seeing how those might be continued by making adaptations so that enjoyment in the activities is possible, can greatly enhance the quality of the resident's life and reduce the negative effects of chronic conditions.

Think Critically

Can you think of three ways to foster independence in a new, right-handed resident who is still quite weak, has suffered a stroke, and has right-sided **hemiparesis** (weakness)?

Table 9-2
Uses of Common Assistive-Adaptive Devices

DEVICE	USE
Buttonhook	Threaded through the buttonhole to enable patients with weak finger mobility to button shirts. Alternative uses include serving as a pencil holder.
Sock puller	Assists in putting on socks and compression stockings. Is placed in sock; then pulling on the strings pulls up the sock.
Extended shoe horn	Assists in putting on shoes for patients with decreased mobility. Alternative uses include turning light switches off or on while the patient is in a wheelchair.
Plate guard	Applied to a plate to assist patients with weak hand and arm mobility to feed themselves.
Gel pad	Placed under a plate or a glass to prevent dishes from slipping and moving. Alternative uses include placement under bathing and grooming items to prevent their movement.
Foam buildups	Applied to eating utensils to assist patients with weak hands to grasp and help feed themselves. Alternative uses include the application to pens and pencils to assist with writing, or over a buttonhook to assist with grasping the device.
Hook and loop fastener (Velcro) straps	Applied to utensils, a buttonhook, or a pencil to slip over the hand and provide a method of stabilizing the device when the patient's hand grasp is weak.
Long-handled reacher	Assists in obtaining items located on high shelves or at ground level for patients who are not able to change positions easily.
Elastic shoelaces or Velcro shoe closure	Prevents the need for tying shoes.

Adapted from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, St. Louis, 2010, Saunders.



FIGURE 9-2 Adaptive devices to promote independence in eating.

Maintaining function.

Once a functional assessment has been completed, specific goals should be written to maintain the highest level of function possible for the resident. If the resident is ambulatory, exercise should be planned and encouraged on a daily basis. If the resident is not ambulatory, ROM exercises should be performed several times a day. Measures to promote continued bowel and bladder continence are essential. Assessing patterns of elimination and providing assistance for toileting as needed is a basic part of promoting continued function and protecting the resident's dignity. If the resident has been temporarily incontinent because of illness or surgery, a bowel or bladder retraining program is appropriate. Chapters 28 and 33 discuss such programs.

Mental stimulation is essential to maintaining a high level of cognitive functioning. Although resident preference and values should be considered in group television viewing areas, the staff should consider working with the residents to plan segments of time to turn on informational programs that are interesting. Scientific shows, travel shows, public television specials, and similar programs can stimulate thinking and encourage the sharing of thoughts on a variety of subjects. Assisting residents to work crossword puzzles is another way to help them keep an active mind. When a resident cannot write or read because of poor vision, group work on a puzzle is an option. Card games promote mental stimulation as well as social interaction. Group activities such as bingo, group singing, holiday celebrations, and entertainment acts provide socialization and stimulation. Continuing interest in lifelong activities is a factor in successful aging for many.

Documentation.

Documentation in a long-term care facility is somewhat different from documentation in the hospital or in home care. For long-term care documentation, an admission assessment and an extensive 38-page Minimum^E Data Set (MDS) form that is required by the federal government are filled out. Bowel and bladder training assessment forms and training program forms, weekly pressure ulcer reports, and 24-hour intake and output records are some of the other documentation forms used in the long-term care facility.

Rehabilitation

Rehabilitation is the process whereby a disabled person is helped to achieve optimal function. A primary goal of rehabilitation is to minimize the deficit from the condition and maximize the abilities that are intact. It involves measures to achieve the highest possible levels of physical, emotional, psychological, and social function and well-being. Vocational rehabilitation is job retraining for the disabled under the Americans with Disabilities Act (ADA) to provide a means of contributing to self-support. Rehabilitation is concerned with achieving a better quality of life. Most patients who require rehabilitation services are disabled as a result of a chronic illness. Others have become disabled from trauma incurred during an accident. Several of the objectives for *Healthy People 2020* are rehabilitation oriented. 

Each year about 8000 spinal cord injuries occur in the United States, and nearly 1 in 50 Americans live with paralysis ([Christopher & Dana Reeve Foundation, 2014](#)). One out of four of the more than 2 million people who suffer head injuries annually have residual deficits. Another objective of *Healthy People 2020* is to reduce the incidence of secondary disabilities associated with injuries of the head and spinal cord. The average age of those who report being paralyzed from spinal cord injury is 42 years. As the population ages, more people suffer heart attacks and strokes, which often leaves them with residual deficits. The need for rehabilitation services will continue to grow rapidly.

Rehabilitation Programs

Rehabilitation services are offered in freestanding rehabilitation hospitals, in general hospitals, and in skilled nursing homes where the patients stay for a few weeks.

Patients who have had a hip replacement often are placed in a skilled nursing facility for rehabilitation before returning home. Many communities have a hospital with an outpatient rehabilitation program for patients with cardiac and respiratory problems. Rehabilitation services are scarce in rural areas, and patients who have suffered neurologic injury or loss of musculoskeletal function as a result of amputation, trauma, or disease often have to go to a rehabilitation center far from home. Programs within large cities are often available for vision or hearing rehabilitation. Community centers often have rehabilitation programs with water exercise for patients with severe arthritis. Most burn centers have comprehensive rehabilitation programs available for burn patients. Rehabilitation programs have a philosophy that is based on three beliefs:

1. Each person is unique, whole within himself, and interdependent with his own environment.
2. Independence can be achieved within the limits of disability when the person is a full participant in managing his own life.
3. The goal is to enable patients to mobilize their own resources, choose goals, and attain them through their own efforts.

Rehabilitation involves a team effort directed at holistic care and involves a variety of disciplines.

Older Adult Care Points

An older adult patient who has suffered a major loss of body function may not be initially receptive to rehabilitation efforts. It takes a skillful nurse to help motivate the patient to want to improve his functional ability. Sometimes introducing the patient to someone close to his own age who has been through a similar illness and has managed to regain some functions is the best "medicine." Gentle encouragement with praise for small efforts and accomplishments is better than trying to force the patient to perform exercises or practice tasks.

A pulmonary (respiratory) rehabilitation program, or PR, teaches self-care techniques to the patient that will help him attain a better quality of life. There are generally three components to a PR program:

1. Breathing exercises
2. Paced walking exercise
3. Correct use of inhaled medications

These components are usually mixed with medical therapy and may also include nutritional counseling, energy conserving techniques, and psychological counseling or group support. Patients are enrolled in the program for a number of weeks and interact with other patients who have the same problems. A nurse or respiratory therapist teaches the various breathing techniques, paced walking, and use of inhalers. The nurse conducts motivational group activities to increase the desire to participate in an exercise program and to display the benefits of following the program. Teaching how to avoid respiratory infections is reinforced. The nurse or respiratory therapist is available to encourage the patient and, while he is exercising, to evaluate the patient's progress in using the techniques taught. Vital signs are monitored periodically to determine the effect of exercise on cardiac and respiratory function. Some rehabilitation centers provide respiratory services that wean the patient from the ventilator and then work with him to improve respiratory function and functional capacity for ADLs.

Cardiac rehabilitation programs are usually outpatient based and consist of several components:

- Monitored exercise to increase strength and endurance and build collateral circulation to the heart
- Diet counseling and education to lower cholesterol, triglycerides, and body fat
- Medication counseling regarding the purpose, administration, and side effects of the prescribed medications
- Vital sign monitoring to determine the effect of exercise on the cardiovascular system
- Group sessions on stress reduction techniques
- Support group sessions for those experiencing depression or anxiety after surgery or a myocardial infarction

Such cardiac rehabilitation programs usually have a physician, nurses, physical therapist, dietitian, and psychologist or social worker on staff.

Rehabilitation after knee surgery and other musculoskeletal injuries is often performed on an outpatient basis. Either the physical therapist goes to the home or the patient travels to the physical therapy facility. Supervised exercise is performed to increase ROM, decrease pain, strengthen muscles, promote ambulation, and improve balance.

Patients with neurologic damage from a spinal cord or head injury may need to spend several months in a rehabilitation facility. Because of insurance limitations, inpatient treatment is not always possible. Rehabilitation efforts then need to be continued at home.

The Rehabilitation Team

Nurses who work with rehabilitation patients must be flexible and creative and recognize that the patient is the "captain" of the rehabilitation team. The nurse's function is to assist the patient to achieve an optimal state of wellness as **defined by the patient**. It is very important that nurses be nonjudgmental and not impose their own values and attitudes on their patients.

The rehabilitation nurse must be able to work collaboratively with other health team members. Besides the provider, occupational, physical, speech, cognitive, and recreational therapists; vocational counselors; and social workers are part of the team. The nurse assists in ensuring that the patient correctly performs exercises and activities as instructed by each therapist and reinforces their teaching. A collaborative or interdisciplinary care plan is followed so that each member of the team is aware of what treatment and education the patient is receiving. Both short- and long-term goals are set. This provides for continuity of interdisciplinary care, recognizing the critical importance of each discipline in promoting positive outcomes for the patient. Team conferences are scheduled regularly for members to collaborate on the patient's care and evaluate rehabilitation progress ([Figure 9-3](#)).



FIGURE 9-3 The rehabilitation team conferring about the patient's care.

The patient and family both undergo considerable stress during the rehabilitation period. Caregivers should assist the patient and family in developing positive coping techniques. A good sense of humor; gentle, firm people skills; patience; and the ability to provide solid encouragement are good tools for working with rehabilitation patients.

The philosophy of rehabilitation nursing is based on the recognition of the patient's need for independence. Learn to judge when the patient should be allowed to struggle to do something on his own, and learn to recognize when the patient's frustration is reaching a level at which assistance is needed.

Roles of the LPN/LVN in Rehabilitation

There are often two levels of LPN/LVNs employed in rehabilitation facilities depending on the individual state practice act and facility protocols. One is the LPN/LVN I, and the other is the LPN/LVN II with intravenous (IV) therapy and Functional Independence Measure (FIM) certification. The LPN/LVN I does all nursing activities except for assessments and IV infusion therapy. The LPN/LVN II performs the same functions as the LPN/LVN I plus the tasks involved with IV infusions. At least a year of medical-surgical experience is required for employment as a nurse in a rehabilitation facility. The LPN/LVN initiates and participates in updating the team plan of care in collaboration with the RN to meet the patient's needs. The LPN/LVN assists with patient and family education by supporting the outlined teaching plan and reinforcing teaching. Any barriers to patient or caregiver readiness to learn are reported by the LPN/LVN to the supervisor. Recommendations are made by the nurses to team members on how to facilitate patient and caregiver learning. Learning outcomes are evaluated and documented. The LPN/LVN is an active participant and facilitator of both structured and nonstructured learning experiences. Leadership functions of the LPN/LVN are to supervise the patient care assistants, the CNAs, and the nursing rehabilitation technicians. The LPN/LVN acts as a preceptor for unlicensed personnel as needed and appropriate. As a member of the team, the LPN/LVN carries out all normal patient care nursing duties and provides input and feedback to the team. When assigned to do so, the LPN/LVN carries out quality improvement activities.

❖Nursing Management

■ Assessment (Data Collection)

After obtaining a thorough history, a physical and psychosocial assessment are performed for each patient to establish a baseline; to determine physical limitations, ability to perform ADLs, and amount of assistance needed; and to identify present psychosocial difficulties.

A skin risk assessment and fall risk assessment are performed (see [Chapter 42](#) for the pressure ulcer risk assessment tool). Patients covered by Medicare will have data filled in on the section of the MDS pertinent to rehabilitation[®]. The patient's home environment is examined before discharge to determine whether physical features of the home, such as stairs, narrow doorways, or access to bathroom facilities, will present a problem. Questions about the neighborhood, such as the location

of shopping centers and types of transportation available, are asked. Inquiries about who does the grocery shopping, cooking, errands, and housework for the patient are made.

The patient's usual daily schedule and habits of everyday living are examined, including sleeping, waking, eating, elimination patterns, hygiene, grooming, sexual activity, working, and leisure activities. A **functional assessment** of how the patient's disability has affected his former usual patterns (Box 9-8) focuses on the patient's present ability to perform ADLs, such as toileting, bathing, dressing, grooming, and ambulating, as well as his ability to use the telephone, shop, prepare food, and perform housekeeping chores. Various assessment tools are used to determine the patient's ability to function. A common one, the Katz Index of Independence in Activities of Daily Living, helps evaluate how much assistance the patient needs for various activities. [e](#)

Focused Assessment

For the Rehabilitation Patient

After reviewing the patient's history, the following data are collected by asking pertinent questions regarding the function of each body system.

Cardiovascular

- Fatigue
- Chest pain
- Arrhythmia
- Fear of cardiac event

Respiratory

- Activity tolerance
- Shortness of breath
- Fear of not being able to breathe

Gastrointestinal/Nutrition

- Dysphagia
- Anorexia, nausea, vomiting
- Eating pattern; amount of oral intake
- Weight loss or gain
- Bowel status; change in stool
- Serum albumin levels

Urinary

- Urinary pattern
- Fluid intake
- Retention
- Self-catheterization status

- Urinalysis and/or culture

Neurologic

- Motor function
- Sensation
- Cognitive abilities
- Assistive devices

Musculoskeletal

- Muscle strength
- Range of motion
- Endurance
- Fall risk assessment
- Assistive devices
- Safety measures

Integumentary

- Skin condition
- Skin risk of breakdown
- Presence of lesions
- Measures to decrease risk of breakdown

Degree of Independence

- Functional Independence Measure (FIM) scores per certified personnel assessment
- Ability for ADLs (Katz assessment of Independence in Daily Living)

Psychosocial

- Alteration in roles
- Financial concerns
- Support people
- Self-concept status
- Coping mechanisms
- Sexual concerns
- Employment/educational concerns
- Family strain
- Home environment alterations needed

Medications

- Scheduled medications
- PRN (as-needed) medications

Safety

- All equipment in use checked for safety
- Risk assessments for falls and skin
- Prostheses applied correctly
- Adaptive equipment obtained

Box 9-8

Functional Independence Measure Scoring Categories

- Self-care
- Sphincter control
- Transfers
- Locomotion
- Communication
- Social cognition

A score of 0 or 1 is given in each category. Totaled scores indicate independent (6-7), modified dependence (3-5), or complete dependence (1-2).

The Baird Body Image Assessment Tool is often used to perform a psychosocial assessment, which includes evaluating self-esteem and body image. Use of defense mechanisms, level of anxiety, and usual coping techniques are explored. To ascertain the patient's response to loss, ask the patient to describe feelings related to the loss of a body part or body function. The patient's support systems and the family's coping abilities also are determined. As rehabilitation progresses, perform a vocational assessment so that the vocational counselor can assist the patient in finding appropriate training, education, or employment after discharge from the rehabilitation program.

Patients with life-changing illness or injury, those who have suffered major loss of body function or former roles, and those who have lost most of their independence and social contacts may suffer from anger and depression. Assessing mental outlook is an ongoing nursing function. Should several signs of severe depression become evident, consult with the provider. The patient must be kept safe. Determining suicide potential in the depressed patient is important. [Chapter 45](#) discusses assessment and intervention for depression and suicidal thought.

Sexual concerns should be addressed during the rehabilitation period. Help the patient identify problems and concerns and work to assist him in finding means for sexual expression and gratification. If you are not comfortable or knowledgeable in this role, an appropriate referral to a psychologist or sex therapist should be made.

Think Critically

Can you explain the difference between a physical assessment and a functional assessment?

Nursing Diagnosis

Problem statements appropriate for the patient undergoing rehabilitation are listed in [Box 9-9](#).

Individual nursing diagnoses may be chosen from the NANDA-I list (see inside back cover) based on the data collected.

Box 9-9

Problem Statements Common for Patients in Rehabilitation

- Altered physical mobility due to neuromuscular impairment, sensory-perceptual impairment, and/or pain
- Altered self-care due Self-Care Deficit specify to perceptual or cognitive impairment and/or neuromuscular impairment
- Potential for altered skin integrity due to alteration in sensation, mobility, or nutritional status
- Potential for injury due to musculoskeletal weakness or perceptual or cognitive impairment
- Altered urinary elimination due to neurologic dysfunction or trauma or disease affecting spinal nerves
- Constipation due to neurologic impairment or immobility
- Altered coping ability due to added stressors or situational crisis
- Altered family coping due to situational crisis and/or added stressors
- Altered home maintenance ability due to neuromuscular impairment or perceptual or cognitive impairment
- Insufficient knowledge for self-care and techniques for rehabilitation
- Altered body image due to loss of normal function or traumatic injury and/or scarring
- Altered sexual function due to neuromuscular impairment, pain, or impaired mobility

■ Planning

An interdisciplinary[®] plan of care is devised for each rehabilitation patient (see Evolve). Often there will be five or more health professionals involved. Periodic care conferences are essential for the members of the health care team to evaluate the progress of the patient, to share perceptions and ideas, and to revise the plan of care if it is not helping the patient to meet established expected outcomes. Depending on the situation, care conferences may occur once every 1 or 2 weeks or once a month. Both long-term and short-term goals will be set. Expected outcomes are written for each problem.

■ Implementation and Evaluation

Interventions are carried out in a manner that encourages the patient to do as much for himself as possible. Praise is given for even small accomplishments or attempts at self-care. When working with the patient, observe for excessive fatigue. Pace activities according to the patient's fatigue level. Physical and occupational therapists work closely with rehabilitation patients to help them adapt so they can perform ADLs ([Figure 9-4](#)). Speech therapists, activity therapists, and others will be involved in the implementation of the care plan. The patient will be kept very busy during rehabilitation.



FIGURE 9-4 Physical therapist working with a patient on ambulation and muscle strengthening.

Discharge planning is implemented from the time the patient enters rehabilitation. The family and patient will need resources within the community. Evaluation^② is performed by gathering data that show whether the goals and expected outcomes have been met.

Home Care

Most care in the community setting is given by home health and hospice agencies. Home health care is the preferred and most cost-effective method of health care delivery. Recent innovations in medical equipment have allowed more complex, high-technology care to be given at home. For the patient there are many benefits, both physically and psychologically. **The goal of home care is to keep the patient as well and independent as possible and enable him to live at home.** The LPN/LVN must have 1 year of experience working in an acute care facility before working in home care in most states.

For home care, the RN acts as case manager and coordinates the care of all of the health care providers involved in the patient's care. The RN is responsible for the plan of care and for seeing that care is delivered in an uninterrupted manner. This nurse must act as a liaison with the other care providers to see to it that all efforts effectively complement one another. The LPN/LVN may perform treatments, perform appropriate delegated duties of the RN, or provide care in the home on a daily shift basis.

Home care nursing can prevent a patient's expensive readmission to a hospital or entry into a long-term care facility. Home health care is family centered, and the family members are also responsible for the ongoing care of the patient. Home visits are made to intervene and see that the patient is provided comfort, that complications are prevented and health is improved, and to assist with rehabilitation (Figure 9-5). Because home health care is family centered, **the philosophy of the nurse must have a different focus. In the home care setting, the patient and family are in charge. The nurse is a guest in the home and acts as a consultant, coordinator of care, provider of skilled care, teacher, and advocate.**



FIGURE 9-5 Home health nurse changing a dressing.

In home care, the patient and family are seeking the nurse's services and must be treated as valued customers. You must learn to be nonjudgmental of the patient, the family, and the living arrangements. Together, the nurse, patient, and family set goals for care, and then establish the boundaries of the nurse's role. Should the living situation not be ideal, furnishings and equipment lacking, or the home dirty, establish trust with the patient and family before trying to accomplish major changes. Be sensitive to the patient and family's cultural values, financial resources, and specific ways of doing things and try not to impose your own views. Work together with the patient and family to improve home safety, and share knowledge of available resources. **A home care nurse must be very flexible and creative in teaching patients and families ways to accomplish care of the patient while abiding by the principles of asepsis and safety.**

Think Critically

You visit a patient in his home for the first time. The sink is full of dirty dishes and there are throw

rugs throughout the home. You recognize that the sink may be a reservoir for infection and the throw rugs are a risk for patient falls. What measures can you take without making the patient feel criticized?

A large percentage of the home care nurse's time with the patient is spent evaluating physical and psychosocial status, signs of complications, side effects of medications, and effects of therapy. Both the safety of the home and the quality of nutritional and basic care are evaluated. The nurse is able to gather considerable useful data for the provider. Much time is spent consulting with providers by phone, providing updates on the patient's condition, seeking new orders, and collaborating about care needs. Each visit includes a physical assessment of the identified problems and of nutritional, home safety, elimination, skin, and psychosocial status. All findings are documented, as are data indicating that home health nursing care is still needed. Between visits, the nurse may contact the patient or family to check on various aspects of care or to see whether there are any concerns. The patient and family may contact the agency or the nurse at any time, and such phone calls are encouraged.

Other functions of the home health nurse include performing wound care and dressing changes, organizing medications for scheduled administration, monitoring blood sugar levels, drawing blood samples for laboratory testing, giving injections or teaching injection technique, monitoring pain control, and monitoring enteral feedings. Teaching self-care and rehabilitation techniques and monitoring progress and compliance with treatment are primary nursing functions that help control health care costs and keep the patient from needing hospitalization. The home care nurse needs to be a strong advocate for the patient's needs and treatment.

The home care nurse provides considerable psychosocial care for the patient and family. Sometimes, the nurse is the only visitor the patient has. In this instance the nurse becomes a sort of friend, providing social interaction as well as needed health care. The nurse must become knowledgeable about negotiating the complex medical care system and obtaining supplies, medications, or services when the patient does not have money for them. A full knowledge of the community resources available to the patient is essential. Most home health agencies have lists of resources available. A medical social worker who has a liaison with the agency also can be of help. The hospital nurse stays out of financial concerns (except for referrals to the social worker) but must try to help the patient find remedies to financial problems so that stress will be reduced and energies can be directed at healing and techniques of self-care.

Think Critically

Can you explain how you would go about trying to obtain a shower chair for a patient who cannot afford to buy or rent one?

The LPN/LVN in Home Care

Generally an LPN/LVN working in home care is under the supervision of an RN case manager. The LPN/LVN may be providing "private-duty" services for an unconscious patient who needs skilled care such as tracheal suctioning or tube feedings, performing home visits to change dressings or monitor blood sugar levels, or possibly acting as an in-agency supervisor by coordinating home health aide visits and supervising their work. The role of the LPN/LVN in home care is growing. The family provides assistance with personal care, and a home health aide may visit a few times a week to bathe the patient and shampoo hair. Homemaking is provided by family members or by a homemaker aide. "Sitters" may be hired to attend to the patient's needs at night if the family is not able to provide this service.

Nursing care plans are formulated, considering 24-hour needs, in collaboration with the patient, the family or relatives, and all other health care providers. Case conferences are conducted regularly, even if the case manager does them on the telephone with the others involved in the patient's care. Medicare requires a case conference every 60 days when more than one discipline is involved in the patient's care.

The Family Caregiver

When a patient has considerable disability and cannot function independently, a family member

often becomes the main caregiver. Depending on the degree of dependence of the patient, the caregiver may have an overwhelming task in caring for the patient, maintaining the house, obtaining food and supplies, cooking, and coordinating therapy or provider appointments. The caregiver's usual life is disrupted, and social contacts are limited because of time constraints and fatigue. You must assess the caregiver's stress levels regularly.

Focused Assessment

Assessing Caregiver Stress

- What help do you have in caring for your spouse or relative?
- Are there more family members who might help out?
- What are your cultural values related to caregiving?
- Is your sleep often disturbed because you have to meet your spouse's or relative's needs?
- Do you feel strained with all your family and caregiving responsibilities?
- Have you been feeling edgy or irritable lately?
- Are you feeling overwhelmed?
- Do you feel you cannot leave your relative alone?
- Have you been having crying spells?
- Are you having difficulty making decisions?
- Do you find you have trouble keeping your mind on what you are doing?
- Are you having frequent headaches, backaches, or muscle or stomach pain?
- Do you have any social contact?

Some home care agencies have an assessment tool for this purpose. When caregiver stress is high, calling the agency social worker for a consultation can provide either more help for the caregiver, or a respite program that might provide the caregiver a few days of needed rest and relaxation. A respite program provides room, meals, and care for a patient while the caregiver is relieved of all responsibility.

Get Ready for the NCLEX® Examination!

Key Points

- Chronic illness interferes with normal function for about 43 million people in the United States.
- Hazards of immobility are numerous and can occur within just a few days for immobile patients.
- It is a nursing responsibility to prevent hazards of immobility.
- Older adults are especially prone to develop problems of immobility.
- LPN/LVNs often work as charge nurses in long-term care facilities.
- The LPN/LVN supervises the nursing assistants in long-term care facilities.
- Safety of residents is a primary goal in long-term care facilities.
- Much attention is directed to preventing resident falls.
- Security devices are only used to protect the resident, or others, and only as a last resort.
- Frequent assessment is essential when a security device is applied to a resident.
- Techniques to minimize confusion and disorientation are used consistently.
- Keeping the resident active during the day helps decrease nocturnal confusion.
- A goal of long-term care is to promote as much independence as possible for the resident.
- Long-term care facilities must help residents to maintain or regain function.
- Rehabilitation helps a disabled person to achieve optimal function.
- There are rehabilitation programs for patients with respiratory, heart, and musculoskeletal problems.
- Rehabilitation is a team effort of the patient and many health professionals.
- The nurse assists with determining rehabilitation needs.
- Rehabilitation is carried out with a collaborative plan of care.
- Home care agencies provide continuing care in the community.
- LPN/LVNs are supervised by the provider or an RN in the home care environment.
- In the home care setting, the patient and family are in charge; the nurse is a guest in the home.
- Home care nurses must be flexible and creative to accomplish needed care of the patient in the home.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- Association of Rehabilitation Nurses, www.rehabnurse.org
- Christopher & Dana Reeve Foundation, www.christopherreeve.org
- Healthy People, <http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=9>
- National Council on Disability, www.ncd.gov
- National Rehabilitation Information Center, www.naric.com

Review Questions for the NCLEX® Examination

1. An 85-year-old diabetic man with a fractured hip has begun ambulating with a walker. He likes his independence, and the nurse is concerned that he may fall after having been immobile. The nurse instructs him to please call for assistance when he gets out of bed. What can the nurse do to help decrease his fall risk?

1. Make sure the patient knows how to use the call system and that

the call bell is within reach.

2. Place a bed alarm on the bed.
3. Instruct him that he can only walk during the day and must use a bed pan at night.
4. Place the patient in restraints when the nurse is not available.

NCLEX Client Need: Safe and Effective Care Environment

2. A 33-year-old man is admitted to the rehabilitation unit after a spinal cord injury from a motorcycle accident. What interventions can the nurse perform to optimize the man's resilience? (Select all that apply.)

1. Assist the patient in identifying strategies that he has used to problem-solve in the past.
2. Choose the patient's meals for him.
3. Refer the patient to a support group.
4. Help the patient bathe and dress.

NCLEX Client Need: Health Promotion and Maintenance

3. The nurse gives discharge instructions to an 80-year-old Asian woman who had open heart surgery. After detailing the importance of increasing activity, the patient smiles and nods her head. The nurse understands that the patient:

1. understood the instructions.
2. acknowledged the efforts of the nurse.
3. demonstrated enthusiasm with increasing activity.
4. may not understand the instructions.

NCLEX Client Need: Psychosocial Integrity

4. The nurse admits a 70-year-old woman who has diminished hearing and has bilateral cataracts. The patient is taking antihypertensive medications. A priority nursing problem would be:

1. *Potential for injury.*

2. Altered communication ability.

3. Insufficient Knowledge.

4. Altered Activity Tolerance.

NCLEX Client Need: Safety and Infection Control

5. The nurse provides discharge instructions regarding home safety to a 78-year-old woman. Which patient statement indicates a need for further teaching?

1. "Scatter rugs would be useful in decreasing glare from shiny floors."

2. "My favorite slippers can be stored underneath my bed."

3. "I need to have a handyman install grab bars in the bathroom."

4. "I need to be really careful when picking up something."

NCLEX Client Need: Safety and Infection Control

6. A 78-year-old woman is admitted with sudden onset of confusion and disorientation during the early evenings. Her family indicates that she is generally alert and oriented during the day. The nurse would likely recommend:

1. keeping soft lighting without shadows on during the evening.

2. promoting activity and physical exercise during the day.

3. encouraging napping during the day.

4. medicating with sleeping pills.

NCLEX Client Need: Health Promotion and Maintenance

7. After failure of less restrictive measures, the nurse decides to apply physical restraints to a confused older adult man. Which measure(s) must the nurse include to ensure safe use of physical restraints? (*Select all that apply.*)

1. Promptly attend to the toileting needs of the patient.

2. Reevaluate use of the restraints every shift.

3. Ensure adequate nutrition and hydration.

4. Administer scheduled doses of sedative-hypnotics.
5. Provide frequent range-of-motion exercises.

NCLEX Client Need: Safety and Infection Control

8. During a home visit, the nurse finds scatter rugs all over the house, the kitchen sink full of dirty dishes, a strong odor from the toilet, and several outdated food items in the pantry and refrigerator. The 76-year-old patient is coherent with occasional forgetfulness, disheveled with stained clothing, and generally ungroomed. A possible nursing problem would be:

1. *Moral ambiguity.*
2. *Powerlessness.*
3. *Altered self-care ability.*
4. *Altered nutrition.*

NCLEX Client Need: Safe and Effective Care Environment

9. The nurse suspects early complications of immobility in a 45-year-old patient admitted for multiple stab wounds to the chest. What sign would the nurse most likely find? (*Select all that apply.*)

1. Increased muscle strength
2. Generalized weakness
3. Moist breath sounds
4. Limited range of motion
5. Pain with repositioning

NCLEX Client Need: Physiologic Integrity

10. The nurse reinforces the use of an incentive spirometer to a patient with a blunt chest injury. Understanding of nursing instructions is clear when the patient:

1. exhales normally.
2. takes rapid, shallow breaths.
3. seals the mouthpiece during exhalation.
4. tilts the incentive spirometer.

NCLEX Client Need: Health Promotion and Maintenance

Critical Thinking Activities

Scenario A

Mr. Porter has been discharged home and transferred to a home health nursing agency for continued care after suffering a stroke that has left him with left-sided hemiplegia and dysphagia. His wife will be taking care of him, but she has severe arthritis and cannot perform many needed tasks. You are assigned to provide “private-duty” care to him, because he requires tube feedings.

1. What assessments would you make each day?
2. How would you collaborate with the case manager and the physical therapist?
3. How would you plan care for rehabilitation?
4. What would you teach Mr. Porter's wife about taking care of the equipment for his tube feeding?

Scenario B

Mrs. Robbins is a new resident in the long-term care facility where you work. She is mentally alert but needs assistance with bathing, dressing, and toileting because of arthritis and weakness and fatigue from heart failure. She can use a walker to ambulate short distances but does not like to do so.

1. How would you promote independence and autonomy for this resident?
2. How can you promote maintenance of function for her?
3. How would you promote socialization for Mrs. Robbins?

UNIT III

Immune System

OUTLINE

Chapter 10 The Immune and Lymphatic Systems

Chapter 11 Care of Patients With Immune and Lymphatic Disorders

CHAPTER 10

The Immune and Lymphatic Systems

Trena Rich

Objectives

Theory

1. Describe the body's innate (natural) immune response.
2. Compare and contrast the characteristics of innate and acquired immunity.
3. Describe the role of the lymphatic system in the immune response.
4. Identify the various ways in which immunity to disease occurs.
5. Analyze the factors that interfere with normal immune response.
6. Explain the role of immunizations in relation to immunity.
7. Compare and contrast the responsibilities of different members of the health care team in preventing infection in immunocompromised patients.

Clinical Practice

8. Identify assessments that indicate immune system function.
9. Describe precautions to be taken for patients with an impaired immune system.
10. Evaluate your patient's risk for infection during a clinical experience.

KEY TERMS

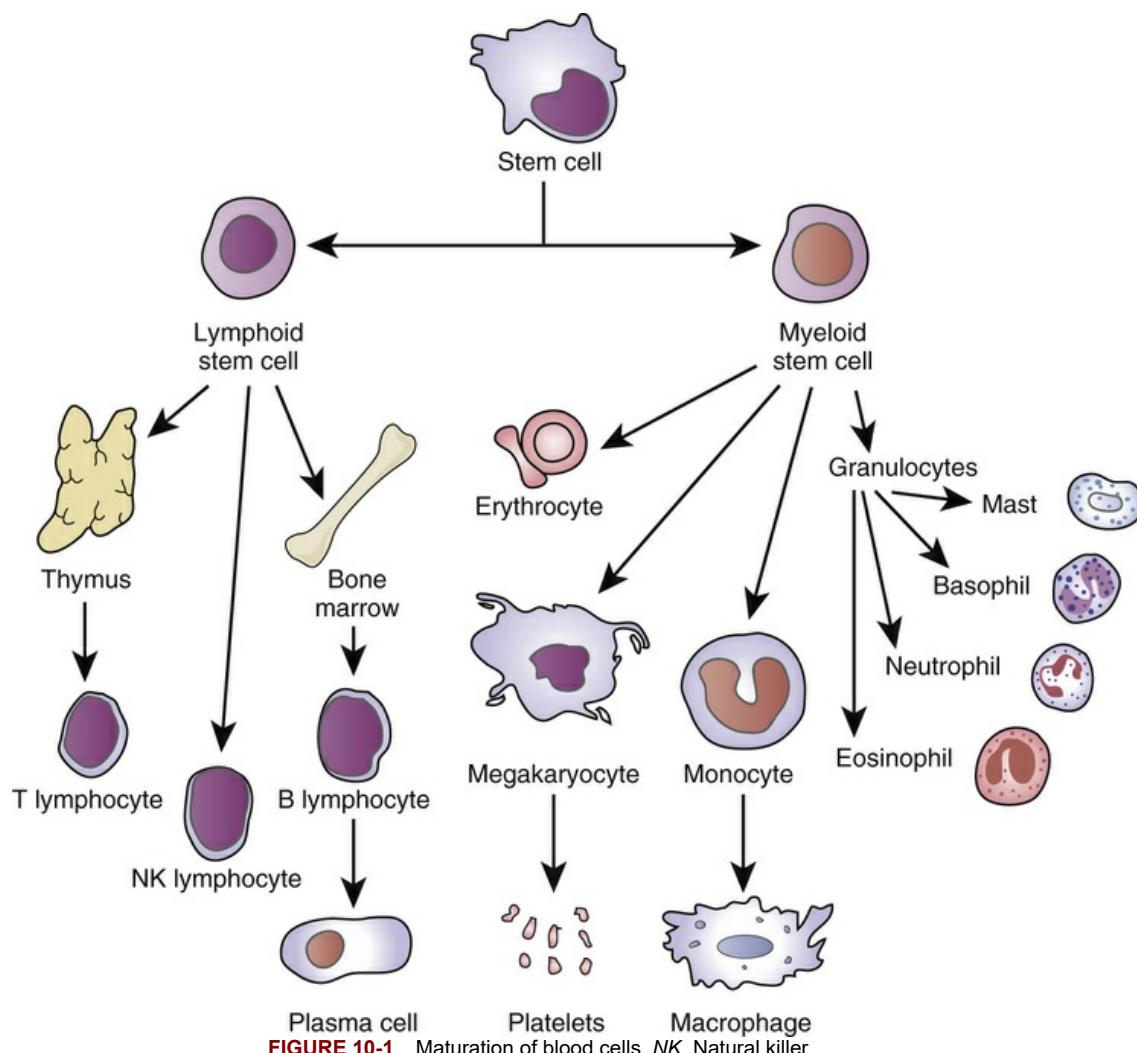
- acquired immunity (ă-KWĪRD ī-MŪ-nī-tē, p. 204)
antibodies (ĂN-tī-bō-dēz, p. 199)
antigens (ĂN-tī-jēnz, p. 200)
antigen-antibody response (ĂN-tī-jēn ĂN-tī-bō-dē rē-SPŌNS, p. 203)
antitoxin (ĂN-tī-tōk-sīn, p. 202)
autoimmune disease (ăw-tō-ă-MŪN dī-ZĒZ, p. 200)
autoimmunity (ăw-tō-ă-MŪN-ă-tē, p. 204)
cell-mediated immunity (SĒL MĒ-dē-ă-tēd ī-MŪ-nī-tē, p. 203)
complement system of proteins (PRŌ-tēnz, p. 203)
cytokines (Sī-tō-kīnz, p. 201)
homeostasis (hō-mē-ō-STĀ-sīs, p. 200)
humoral immunity (HŪ-mōr-ăl ī-MŪ-nī-tē, p. 202)
hyperpyrexia (hī-pēr-pī-RĒX-ē-ă, p. 213)
iatrogenic (ī-ăt-rō-JĒN-īk, p. 205)
immune deficiency (ī-MŪN dī-FISH-īn-sē, p. 200)

immunization (im-ū-ně-ZĀ-shūn, p. 206)
immunoglobulins (im-ū-nō-GLÖB-ū-līnz, p. 202)
immunosintigraphy (im-ū-nō-sěn-TIĞ-ră-fē, p. 211)
innate immunity (ř-NĀT ī-MŪ-ně-tē, p. 204)
lysis (Lī-sís, p. 202)
neutropenia (nū-trō-PĒ-ně-ă, p. 214)
passive immunity (PĀ-sív ī-MŪ-ně-tē, p. 204)
stromal cells (STRŌ-măl SĚLZ, p. 201)
toxin (TÖK-sěn, p. 202)

Anatomy and Physiology of the Immune and Lymphatic Systems

Organs and Structures

- Bone marrow produces a type of stem cell that is able to produce all types of blood cells (white blood cells [WBCs], red blood cells [RBCs], and platelets), which then **differentiate** (acquire individual characteristics) into the cells of the hematologic and immune systems (Figure 10-1). B lymphocytes are produced and mature in the bone marrow and play a significant role in the humoral immune response.



- The thymus gland, located behind the sternum (breastbone), is where T lymphocytes mature and are released into the bloodstream.
- Lymph nodes and vessels circulate fluid called *lymph*. It contains nutrients such as proteins, glucose, monocytes, and lymphocytes. Lymph nodes (Figure 10-2) are also where most lymphocytes are initially exposed to foreign antigens such as bacteria, fungi, and viruses.

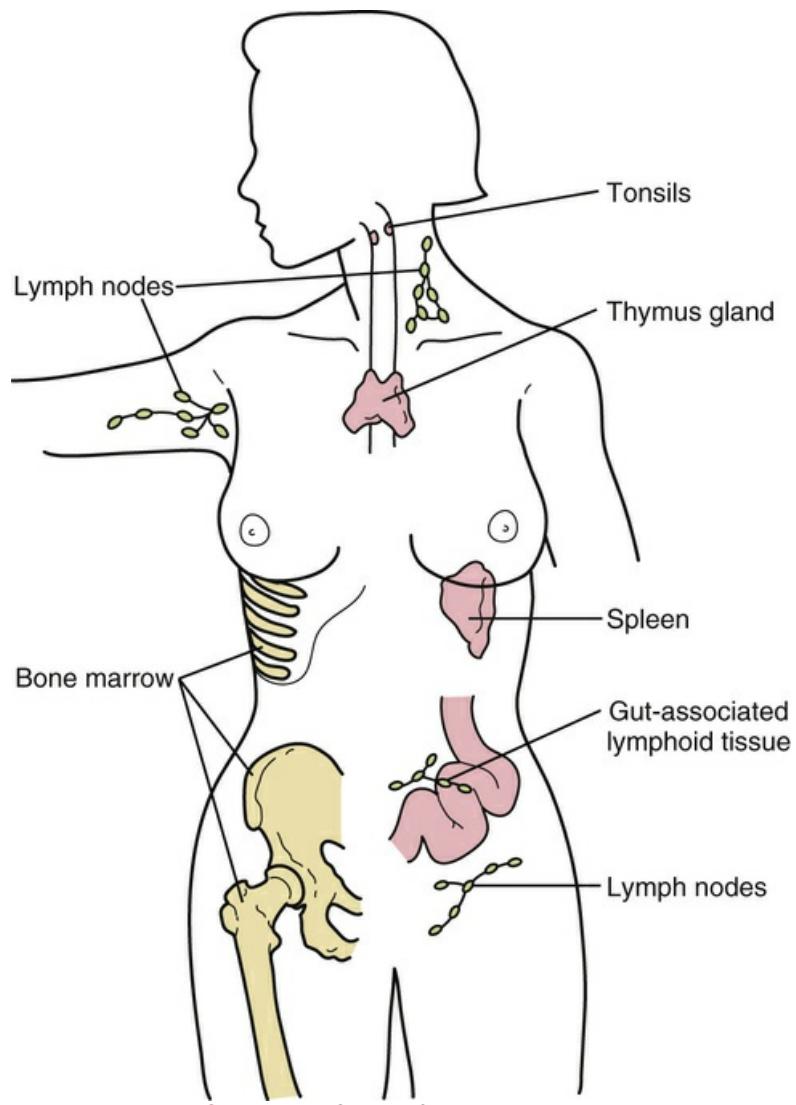


FIGURE 10-2 Organs of the immune system.

- The lymph vessels are located near the blood vessels and capillaries. The lymph system removes what is left over after the plasma has delivered nutrients to the cells.
- The lymph fluid drains into large veins, blending with the plasma circulating in the bloodstream.
- Tonsils and adenoids are lymph tissues that guard the airway from inhaled microbes.
- The spleen filters blood, which allows lymphocytes to come into contact with any circulating organism, thus activating the appropriate lymphocyte response. It also filters out damaged or old RBCs, recycling the hemoglobin in the production of bilirubin.
- Peyer patches are lymphoid tissue typically found in the ileum portion of the small bowel. These patches help defend against ingested pathogens.

Functions of the Immune and Lymphatic Systems

- The immune and lymphatic systems work together to guard the body against pathogens and to eliminate them if they manage to pass through external barriers.
- The neutrophils and macrophages of the hematologic system assist the immune system by phagocytosis when an antigen is encountered.
- Chemical mediators, plasma cells, and B and T lymphocytes play active roles in the immune response (Table 10-1).

Table 10-1

Major Components of the Immune System and Their Functions

COMPONENT	FUNCTION
Antigen	Foreign substance or component of cell that stimulates an immune response
Antibody	Specific protein produced in a humoral response to bind with an antigen
Autoantibody	Antibodies against a self antigen; attacks body's own tissues
Bone marrow	Source of stem cells, leukocytes, and maturation of B lymphocytes
Thymus	Gland located in the mediastinum, large in children, decreasing size in adults; site of maturation and proliferation of lymphocytes
Lymphatic tissue	Contains many lymphocytes; filters body fluids, removes foreign matter, part of immune response
Cells	
Neutrophils	White blood cells: for phagocytosis; nonspecific defense; active in inflammatory process
Basophils	White blood cells: bind immunoglobulin E; release histamine in anaphylaxis
Eosinophils	White blood cells: participate in allergic responses
Monocytes	White blood cells: migrate from the blood into tissues to become macrophages
Macrophages	Phagocytosis; process and present antigens to lymphocytes for the immune response
Mast cells	Release chemical mediators such as histamine in connective tissue
B lymphocytes	Humoral immunity-activating cell becomes an antibody-producing plasma cell or a B memory cell
Plasma cells	Develop from B lymphocytes and secrete specific antibodies
T lymphocytes	White blood cells: cell-mediated immunity
Cytotoxic or killer T cells	Destroy antigens, cancer cells, virus-infected cells
Memory T cells	Remember antigens and quickly stimulate immune response on re-exposure
Helper T cells	Activate B and T cells; control or limit specific immune response
Natural killer (NK) lymphocytes	Destroy foreign cells, virus-infected cells
Chemical Mediators	
Complement	Group of inactive proteins in the circulation that when activated stimulate the release of other chemical mediators, promoting inflammation, chemotaxis, and phagocytosis
Histamine	Released from mast cells and basophils, particularly in allergic reactions; causes vasodilation and increased vascular permeability or edema, contraction of bronchiolar smooth muscle, and pruritis
Kinins (e.g., bradykinin)	Cause vasodilation, increased permeability (edema), and pain
Prostaglandins	Group of lipids with varying effects; some cause inflammation, vasodilation, increased permeability, and pain
Leukotrienes	Group of lipids, derived from mast cells and basophils, that cause contraction of bronchiolar smooth muscle and have a role in development of inflammation
Cytokines (messengers)	Includes lymphokines, monokines, interferons, and interleukins; produced by macrophages and activated lymphocytes; stimulate activation and proliferation of B and T cells (communication between cells); involved in inflammation, fever, and leukocytosis
Chemotactic factors	Attract phagocytes to area of inflammation

From VanMeter KC, Hubert RJ: *Gould's pathophysiology for the health professions*, ed. 5, Philadelphia, 2013, Elsevier Saunders.

- Both humoral and cellular immunity are carried out by the lymphocytic cells, a specialized type of WBC that originates in the bone marrow.
- T lymphocytes, which provide cell-mediated immunity, pass through the thymus and migrate to the lymph tissues throughout the body.
- B lymphocytes migrate to lymphoid tissue, where they wait in readiness to form either sensitized lymphocytes or **antibodies** (immunoglobulins that identify and neutralize foreign objects).
- The lymph system, in addition to facilitating the work of lymphocytes, also drains tissue fluid and puts it back into the circulation.
- Innate (natural) immunity is nonspecific immunity that is in humans when they are born and makes them not susceptible to diseases of other species.
- Immunity can be acquired actively or passively.

Age in Relation to the Immune and Lymphatic Systems

- Neonates are susceptible to infection because they have an immature immune system.
- The thymus gland is largest during childhood and adolescence. After adolescence it begins to shrink in size, and its production of T lymphocytes decreases.
- Aging causes skin to become thin, less elastic, and more prone to injury. The skin is the first barrier encountered by pathogens.
- Decreased ciliary action in the respiratory system and gastrointestinal tract results in decreased removal of potentially harmful organisms.
- The presence of chronic diseases can decrease the immune response.

Protective Mechanisms of the Immune and Lymphatic Systems

The immune and lymphatic systems work together to defend against threats from multiple sources inside and outside of the body. Some portion of the lymphatic system is found in every part of the body with the exception of the central nervous system. The sensory nervous system interacts with the lymphatic system by helping to alert the body to outside physical threats by relaying chemical signals back to the brain. Internally, the blood and lymphatic systems are constantly protecting against microscopic threats to **homeostasis** (tendency to maintain internal stability and balance). The hematologic system interacts in the production of specialized WBCs that help fight infection and rid the body of foreign invaders. The primary job of the immune system is to protect the body from agents that can cause disease.

The human body has multiple protective mechanisms. The first line of defense begins with the skin, tears, earwax, mucous membranes, and urinary tract. They all provide external barriers to prevent foreign substances and microorganisms from entering the body. Innate immunity is present in the body even before exposure to any unknown antigen occurs. This means that the body has the ability to recognize certain microorganisms as harmful, even without prior encounters, and immediately lodge a defense. The tissue damage created by the invading microorganisms releases certain chemicals within the body. These chemical triggers, such as histamine, lead to the activation of the inflammatory response, which then causes the blood and lymphatic systems to deliver certain types of WBCs, lymphocytes, proteins, and other nutrients to the affected area.

Inflammatory Response

Trauma, pathogenic microorganisms, chemicals, or heat may cause injury to tissues inside and outside the body. The first step in the body's defense mechanisms against this invasion is inflammation or the inflammatory response (see [Chapter 6](#)). If the injury is close to the external surface of the body, there will likely be obvious redness and swelling, and the area may also be warm and tender to the touch. The delivery of select cells, proteins, and chemicals to the affected area increases blood flow to the site by dilating blood and lymphatic vessels upstream of the injury, resulting in warmth and redness. The same substances also affect downstream vessels, causing vasoconstriction and swelling. If the effects of swelling are not quickly controlled, the edema can compress nerve endings surrounding the area of injury, leading to a pain reaction.

The inflammatory response alone may be adequate in killing the invading organism by creating a hostile environment (see [Figure 6-2](#)). Protective proteins that are activated in the inflammatory response include the **complement system** of proteins. Several of these protein enzymes, when sequentially activated, form a membrane attack complex (MAC) that embeds itself into the cell membrane of the attacking microbe. This activation occurs when complement-binding sites are exposed on antibodies after they attach to antigens. This binding causes a break in the cell wall that allows ions, such as salt, to enter the cell. The salt is followed by water, which causes swelling and bursting of the microbe.

The same WBCs, lymphocytes, proteins, and chemicals respond to internal tissue injury. The results are not as readily visible but are detectable if appropriate assessments are conducted. The mechanisms of the inflammatory response combine with the immune response to eliminate foreign invaders ([Figure 10-3](#)).

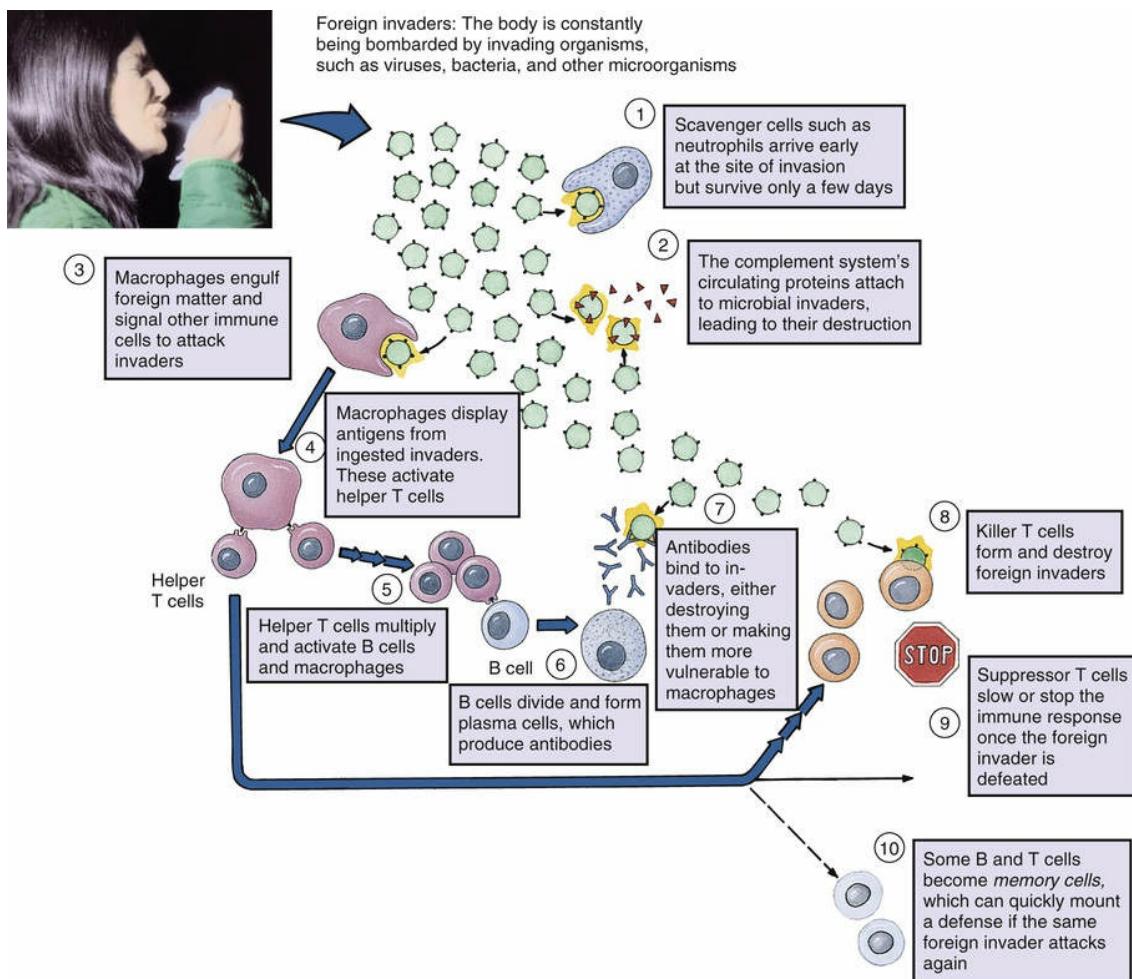


FIGURE 10-3 Action of the immune response against foreign invaders. (From Huether SE, McCance KL: *Understanding pathophysiology*, ed. 7, St. Louis, 2014, Mosby.)

Immune Response

The immune response is a remarkable series of complex chemical and mechanical activities that take place in the body. These activities involve (1) constant surveillance to detect the entry of foreign agents (**antigens**) as soon as they gain access to the body's cells, (2) immediate recognition of the agents as "nonself" (i.e., foreign or alien), and (3) the ability to distinguish one kind of foreign agent from another and to remember that particular agent if it appears in the body again at a later time. The lymphatic system, thymus, spleen, lymph nodes, bone marrow, and Peyer patches in the small intestine play a major role in the immune response (see Figure 10-2). As previously mentioned, many different cells, proteins, and chemicals assist in the body's defense against invading agents.

The immune response is usually triggered by the body's identification of something as foreign, or nonself. This recognition is essential for the body to respond to a foreign threat in an appropriate manner and to not react to tissues or cells that are typically recognized as "self." When an inappropriate response happens, one of two types of disorders occurs. If there is a lack of appropriate response, an **immune deficiency** is present. The second type of disorder occurs when the body produces an immune response to a self cell or tissue, causing an **autoimmune disease**. It is important to understand that although injury can activate a response by the immune system, massive trauma or chronic illness can also inhibit the ability of this vitally important system to respond effectively.

Types of Immunity

Once a particular kind of foreign substance has been detected and identified, the body responds in

two general ways. It immediately produces a protein (called an *antibody*) that is specifically designed to do battle with the *antigen*. The immediate response is called a *humoral response*. *Humoral* refers to any fluid or semifluid. There is also a delayed response that involves the use of sensitized lymphocytes to attack whole cells, such as those of bacteria, viruses, and malignant (cancer) cells. This second kind of response is called a *cellular* or *cell-mediated* response.

The cells that mediate the response are the T lymphocytes. Examples of antigens include bacteria, viruses, fungi, and other infectious microorganisms, as well as the toxins they produce as they invade the body. Nonliving matter such as pollen, dust, and chemicals can also be antigens. For some people, certain foods are perceived by the body as antigens and result in an adverse reaction, such as anaphylaxis, when the particular food is eaten.

T cells and B cells interact with each other in complex ways. T cells differentiate into different types of cells. For example, helper T cells stimulate B cells to produce antibodies against foreign antigens before the B cells can become plasma or memory cells. Large amounts of antibodies are secreted by plasma cells. The suppressor T cells regulate the amount of antibody that B cells produce. Both T cells and B cells are necessary for a normal immune response to occur. Acquired and inherited disorders can inhibit T- and B-cell activity.

Primary humoral response.

Lymphocytic B cells are involved in humoral immunity and the production of antibodies. They arise from stem cells in the bone marrow and undergo a maturation process that involves bone marrow **stromal cells** (cells that contribute to the development of multiple tissues and blood cells) and their **cytokines** (messenger hormones). When mature, the B cells migrate to the lymph nodes. When stimulated by an antigen, a B cell becomes a plasma cell that secretes antibody molecules into the bloodstream. B cells secrete immune globulins called antibodies in response to the specific antigen they encounter. This is antibody-mediated immunity, or **humoral immunity** (Figure 10-4). Some of the antigen-stimulated B cells become memory cells. This mechanism is the basis for acquired immunity. The memory cells reactivate the plasma cells to produce large quantities of the specific type of antibody needed to fight a particular type of antigen when the same antigen enters the body a second time. It is an immediate and potent response, and antibodies continue to be produced for many months.

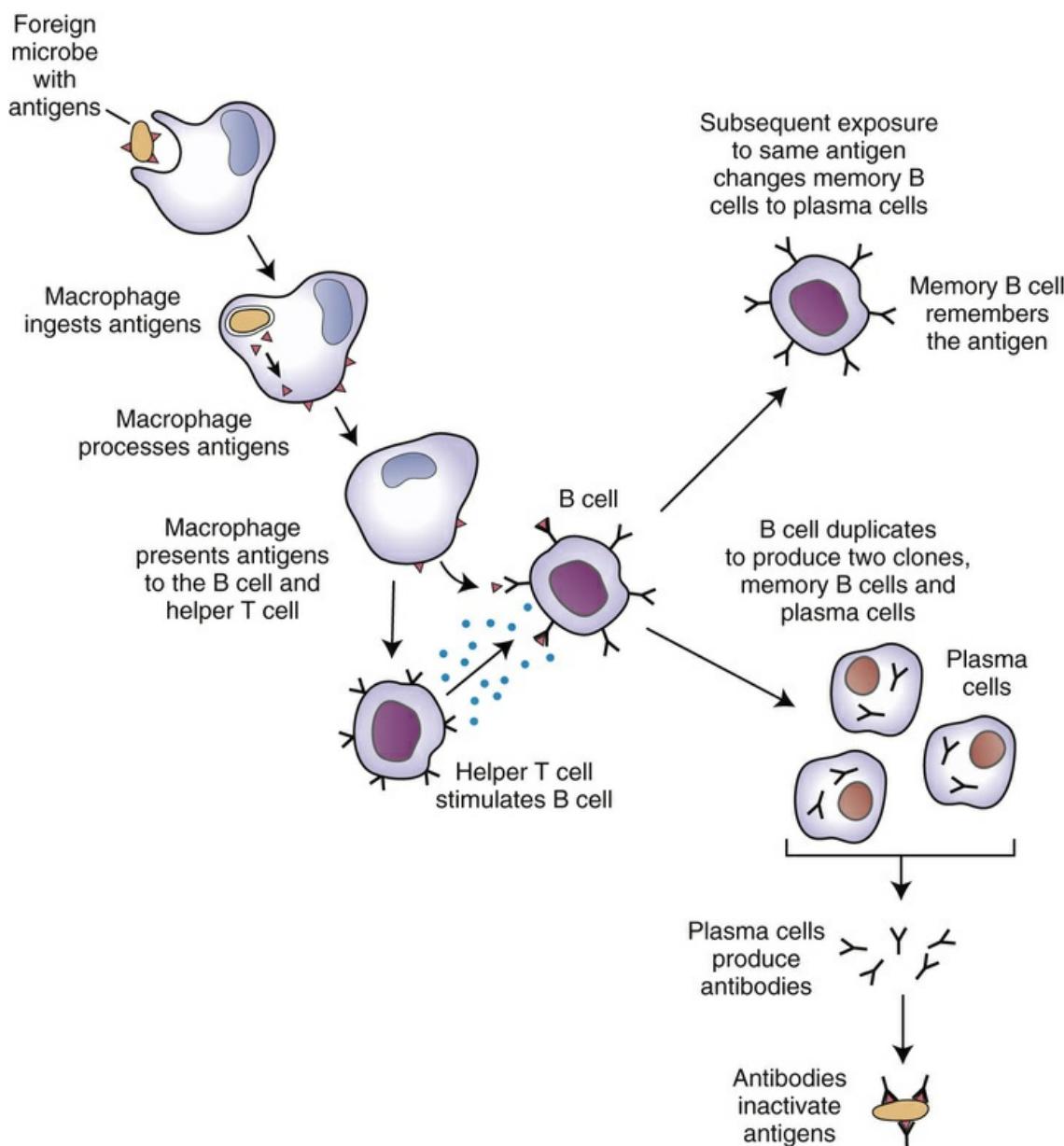


FIGURE 10-4 Humoral (antibody-mediated) immunity.

When the body is exposed to a harmful substance, the immune system produces antibodies, which are a type of protein synthesized by plasma cells. These antibodies are also called **immunoglobulins**. There are five classes of immune globulins (Ig): IgA, IgD, IgE, IgG, and IgM. Each immunoglobulin is able to attach to the kind of antigen for which it is made (Table 10-2). The antibody's ability to form a bond with its antigen is important to the destruction of the antigen, but it can sometimes result in damage to the body's own cells. Antibodies are found in the serum of blood and in other body fluids and tissues, including tears, saliva, breast milk, spinal fluid, interstitial fluid, lymph nodes, the spleen, and urine. An antibody can either destroy or inactivate its particular antigen by (1) mechanically harming it, (2) activating a complement system, or (3) causing the release of chemicals that affect the environment of the antigen.

Table 10-2
Immunoglobulins and Their Functions

CLASS	PERCENT OF TOTAL*	LOCATION	FUNCTION
IgG	75-85	Blood plasma	Major antibody in primary and secondary immune responses; activates complement system; inactivates antigen; neutralizes toxins; crosses placenta to provide immunity for newborn; responsible for Rh reactions
IgA	5-15	Tears, saliva, mucus, breast milk,	Protects mucous membranes on body surfaces; provides immunity for newborn; prevents antigens on food from

		gastrointestinal, pulmonary, prostatic, and vaginal fluids	being absorbed
IgM	5-10	Attached to B cells; released into plasma during immune response	First Ig to respond to microbial invasion; activates complement systems; causes antigens to clump together; responsible for transfusion reactions in the ABO blood typing system
IgD	0.2	Attached to B cells	Receptor sites for antigens on B cells; binding with antigen results in B-cell activation
IgE	0.5	Produced by plasma cells in mucous membranes and tonsils	Binds to mast cells and basophils, causing release of histamine; responsible for allergic reactions; helps fight off parasitic invasion

*Immunoglobulins.

From Applegate E: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2010, Elsevier Saunders.

Through a process called **lysis**, the antibody prepares the antigen for ingestion by damaging the outer membrane of the antigen's cell. The damaged cell then ruptures, making its contents accessible for digestion by phagocytes.

If the antigen is a **toxin** (poison) produced by a bacterial or viral cell, the antibody produced to fight it is called an **antitoxin**. This antitoxin is capable of neutralizing the poisonous chemical of the antigen by covering the antigenic agent. An antitoxin is therefore a specific type of antibody that acts through the process of **neutralization**.

When a bacterium or other antigen enters the body, it may encounter a B lymphocyte that is specific for that bacterium or antigen. The B lymphocyte becomes a plasma cell that secretes IgM (antibody), which attacks the bacterium or antigen. After the particular bacterium or antigen is encountered for the first time, it takes 4 to 8 days for the B lymphocyte to produce immune globulins that can attack. If the same bacterium or antigen enters the body again several months or even years later, the immune globulin response by the memory cells is much quicker and the invading cells are attacked much sooner, typically 1 to 2 days after a reexposure. The major function of the humoral **antigen-antibody response** is to provide protection against acute, rapidly developing bacterial and viral diseases. The antigen-antibody response is also involved in allergic and transfusion reactions.

Secondary cellular response.

The second type of immunologic response of the body involves various interactions with antigens by T lymphocytes. Unlike the humoral response, which takes place in the plasma, the cellular response involves whole cells called *sensitized lymphocytes* and occurs out in the tissues. They are said to be *sensitized* because they have been made sensitive to a specific antigen after their first contact with it. Subsequent exposure to the antigen to which they are sensitive triggers a host of chemical and mechanical activities, all designed to either destroy or inactivate the offending antigen.

Those lymphocytes destined to provide cellular immunity pass through the thymus and migrate to the lymph tissues throughout the body. These are called the *T lymphocytes* (the "T" is for *thymus*), and they are further divided into helper T cells, memory T cells, suppressor T cells, and sensitized T cells (killer cells). T cells provide defense against viral infections. Viruses are difficult to destroy because they inject themselves into host cells and reproduce themselves. T cells respond to foreign or abnormal molecules on the surface of cells. Host cells containing virus have small fragments of the virus slightly protruding from the cell membrane. T cells identify the virus fragment as foreign and kill the host cell. T cells and macrophages produce a variety of substances called *lymphokines* that help destroy antigens. Killer T cells attach themselves to cells bearing antigens and secrete toxic substances that kill the antigen-bearing cells. This cell-to-cell contact response is called **cell-mediated immunity** or cellular immunity (Figure 10-5).

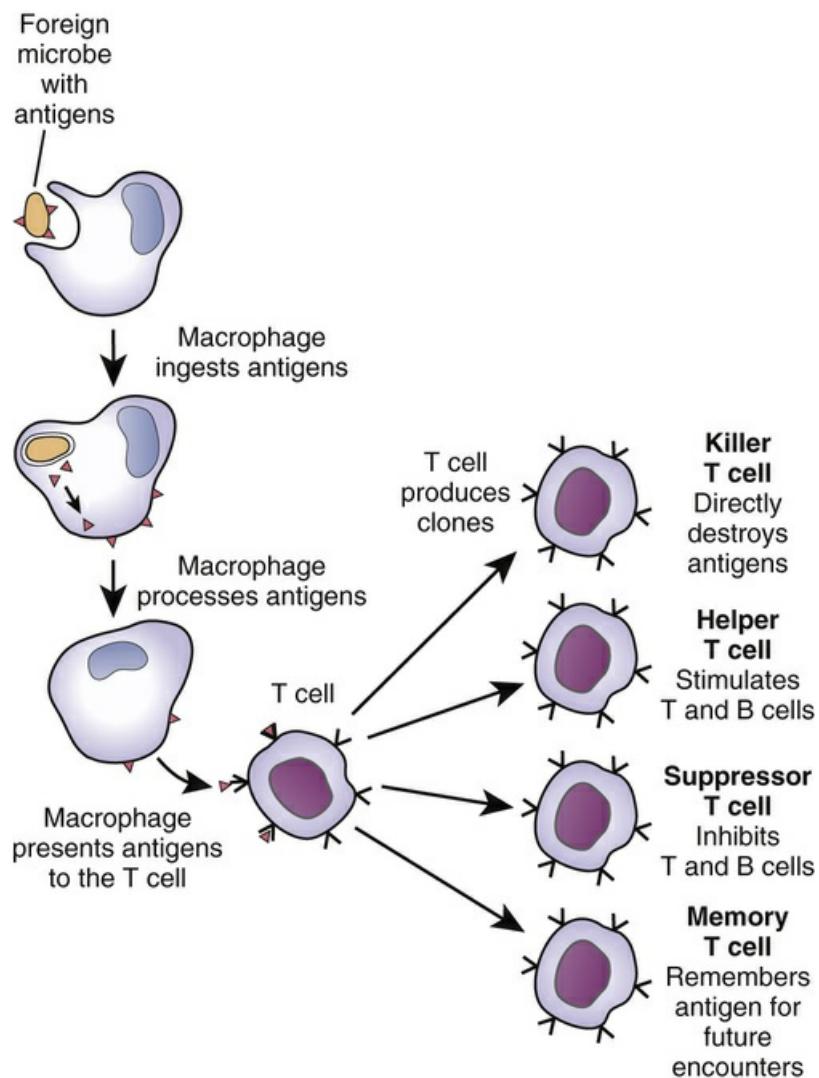


FIGURE 10-5 Cell-mediated immunity.

The T lymphocytes mediate (indirectly accomplish) the cellular response. When an antigen is complex (e.g., a bacterium or another type of living cell), T lymphocytes that are specifically reactive with the particular antigen mediate the cellular response in several ways. These specific T lymphocytes enter the circulating fluids of the body from the lymphoid tissues, migrate widely, and react anywhere in the body where they encounter the particular antigen. Destruction of the antigen may occur by release of chemicals into the membrane of the target cell, by secretion of lymphokines such as interleukin-2 or T-cell growth factor, or by other processes. This direct contact by the T lymphocytes with an antigen is called *killer activity*, and such lymphocytes are named *killer T cells*. Cellular immune response is often termed *delayed hypersensitivity*. The larger the amount of antigen present, the greater the response of sensitized T lymphocytes.

The **complement system of proteins** is a series of proteins produced in the liver that work with antibodies to destroy antigens. Similar to the inflammatory response, the complement system directly kills microbes by attaching to the cell wall and allowing salt and water into the cell, causing it to burst. The proteins of this system "complement," or assist, the immune system.

The T lymphocytes perform immune surveillance for the body by detecting cells that enter the host and have foreign antigens on their surface. T lymphocytes are also defensive cells that patrol the blood and tissues. Sensitized T lymphocytes are the cause of allergic reactions. T cells are responsible for the inflammatory response present in people with a variety of autoimmune diseases. **Autoimmunity** means that there is a defective cellular immune response, and antibodies are produced against normal parts of a person's body. These T lymphocytes, along with migrating macrophages, are responsible for rejecting transplanted organs as well. This is why transplanted tissue must have surface antigens that are very similar to those of the host (transplant recipient).

tissue to be accepted by the host body.

Immunity Against Disease

There are two major types of immunity to specific disease: innate (natural) immunity and acquired (adaptive) immunity. **Innate immunity** is present at birth. **Acquired immunity** occurs through active production of antibodies when the body is invaded by pathogens or through an immunization that causes antibodies to a specific pathogen to form.

Innate (natural) immunity.

Unique innate, or inborn, features of human cells make a person naturally immune to certain diseases. Humans are immune to some diseases simply by being human and are not susceptible to the same diseases as animals of other species. Some immunity is related to race, gender, or a particular inherited genetic makeup. Genetic factors present at birth may **predispose** individuals to immune disorders (Figure 10-6).

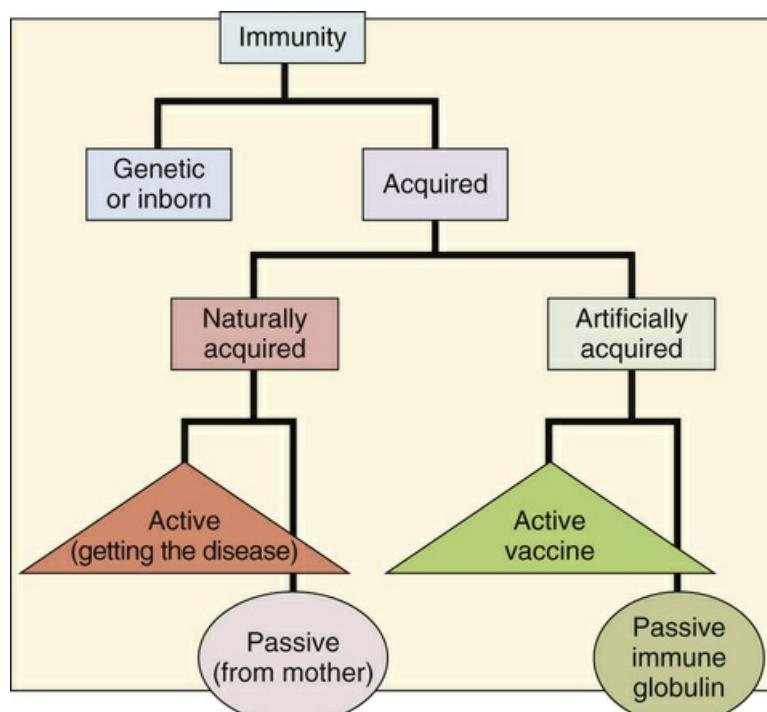


FIGURE 10-6 Types of immunity. (From Herlihy B: *The human body in health and illness*, ed. 5, Philadelphia, 2013, Saunders.)

Acquired immunity.

In acquired immunity, a person can either actively produce her own antibodies or passively receive antibodies produced by another person or animal (**passive immunity**). *Passive natural immunity* is the type that is transmitted from mother to baby. The mother passes antibodies to the fetus in utero or after birth through breast milk. When the fetus is in utero, it passively receives some natural immunity when antibodies from the mother's bloodstream pass through the placenta and mix with the blood of the fetus. Those maternal antibodies are then present in the infant's blood at birth. More immunity can be passed to the infant through breast milk. Breast-feeding is the best way to protect the newborn from infectious disease. Depressed immune function in the mother can limit the benefits typically received from breast milk to her baby.

Administration of human immune globulin to boost the immune system is an example of *passive artificial immunity*. Human immune globulin, formerly called gamma globulin, contains antibodies against not just one, but many infectious diseases. It is developed from donated blood plasma and purified to prevent the spread of additional disease. This type of immune globulin is used when a

susceptible person is exposed to or contracts a communicable disease such as hepatitis A, rubella, or varicella to help lessen the effects of the disease.

The blood serum from a horse that has been prepared with increasingly strong injections of tetanus antigen contains ready-made antibodies and antitoxins against that antigen. Antivenoms that contain antibodies against snake venoms and the poisons produced by the black widow spider are also available. Injections that provide passive immunity should be given as early as possible in the disease, because they only protect against further tissue damage. It is important to note that immune globulins, regardless of the source, cannot reverse damage already done.

Passive immunity is usually time-limited, because the antibodies provided only last for a specific period.

Think Critically

What type of immunity is provided by a “flu shot”? How does an injection of human immune globulin protect a world traveler from hepatitis A?

Active naturally acquired immunity occurs when a person contracts and survives a disease. Once survival from a particular disease has occurred, the person is considered immune and will not contract that particular disease again, for example, measles or rubeola.

Active artificially acquired immunity occurs by vaccination or immunization. To provide active immunity to diseases by artificial means, the actual pathogenic microorganisms are grown and cultured in the laboratory. They are divided into single doses under rigid controls and made into vaccines. These specially treated microorganisms are weakened (attenuated) or killed so that they will stimulate the production of antibodies but will not cause the disease itself. Vaccines from cowpox, tetanus, polio, influenza, measles, mumps, chickenpox, and hepatitis A and B viruses are examples of immunizing agents used to produce an active immunity in humans.

This method of stimulating the production of immunizing substances in the body is successful in situations in which there is time to wait for the person to build up her own defenses. This immunity does not last indefinitely. The body must be reminded of the need to produce more antibodies. To achieve this, a booster dose of an immunizing agent is given to boost the memory of the specific B cells and cause them to actively produce more antibodies. This is one reason why a yearly influenza vaccine is recommended and a booster for tetanus is recommended every 10 years.

Immune and Lymphatic System Disorders

With all of the complexity of the human immune response, there are multiple natural areas of dysfunction that occur. One of the more commonly encountered reasons for alteration in immune function not caused by pathogenic factors is **iatrogenic**—a condition caused by medical treatment. Current therapies for asthma, inflammatory disorders, autoimmune disorders, and organ transplantation are all aimed at suppressing or attenuating the body's natural immune response. Although this effect is helpful in addressing the primary disorder, it also makes the patient more vulnerable to infection or other autoimmune diseases. Many over-the-counter medications have anti-inflammatory effects and are used to decrease pain caused by inflammation. The inflammation is the initiation of the immune process. Suppression of this response can hinder the body's ability to fight infection or disease.

Older Adult Care Points

Older patients are at risk for problems with immunity because of decreased immune function. They also are more likely to have chronic illness and decreased nutritional intake. For those in long-term care or assisted living facilities, living in close proximity to others makes transmission of communicable diseases easier if the appropriate Standard Precautions are not taken (see [Chapter 6](#) and [Appendix B](#)).

Consumption of alcohol can alter the body's ability to launch an immune response. There are both long- and short-term effects of alcohol on the immune system. Two drinks can impair the ability of the B lymphocytes to produce antibodies and can affect T-cell activity. Long-term alcohol use leads to alteration in liver function and impaired nutrition, also altering immune function. Many other drugs, including cocaine, marijuana, and methamphetamines, also compromise the immune system.

Autoimmune disorders are caused by a malfunction of the body's immune system. When the body does not recognize tissues as self, defense mechanisms are launched against the body's own tissues. The trigger for this attack is largely unknown; however, some of these disorders are believed to be initiated by a systemic infectious process or by inherited factors that are still not fully understood.

Health Promotion

Maintaining a Healthy Immune System

A healthy immune system is a function of a healthy body. Eating right and getting enough rest and exercise are all important in maintaining resistance to infection and disease. Frequently skipping meals, eating unhealthy meals, sleeping too little, or not exercising weakens the immune system and makes people more susceptible to pathogens.

Clinical Cues

Treat any patient with chronic substance abuse as immunocompromised until proven otherwise.

Prevention of Immune and Lymphatic System Problems

Immunization

Before **immunization** and inoculation became commonplace, the only way an individual could acquire immunity was to contract a disease and survive. Today, immunity from immunizations is usually achieved by administering the vaccine in divided doses over weeks or months. This sets in motion the more powerful, longer lasting secondary immune responses. For example, infants are given immunizations at intervals during infancy and then periodically throughout early adolescence. To stimulate continued immunity, adults should have immunizations against tetanus

and diphtheria every 10 years. The Centers for Disease Control and Prevention (CDC) also recommends that adults receive a one-time vaccine referred to as *Tdap*, which helps fight against tetanus, diphtheria, and pertussis. Patients should also be encouraged to discuss with their health care providers whether they should receive a hepatitis B vaccine booster.

Nursing implications.

Nurses play a major role in providing education regarding the importance of immunizations. Vaccine-preventable diseases cause disabilities and deaths every year. Nurses can have significant influence by encouraging the public to participate in immunization programs recommended by public health officials and by helping to identify people in need of immunization. *Healthy People 2020 Immunization and Infectious Disease Goal 1* is to reduce, eliminate, or maintain cases of vaccine-preventable diseases.

An important aspect of health teaching is to improve the general public's awareness of the importance of immunization as a means of preventing certain diseases and their consequences. Despite the availability of vaccines against poliomyelitis, measles, rubella, mumps, and other potentially dangerous diseases, there still are many children who have not been adequately immunized. This is particularly true in areas where people do not have easy access to the health care system. Nurses have a responsibility to inform the public about the purpose and importance of immunization in terms the layperson can understand. [Figure 10-7](#) shows the secondary response and longer lasting immunity provided by a second injection of an antigen.

Legal and Ethical Considerations

Immunizations

Immunizations are a proven way to decrease illness for individuals and the spread of diseases in communities. Some religious and cultural practices forbid immunizations. How can the needs of society be balanced with the rights of individuals?

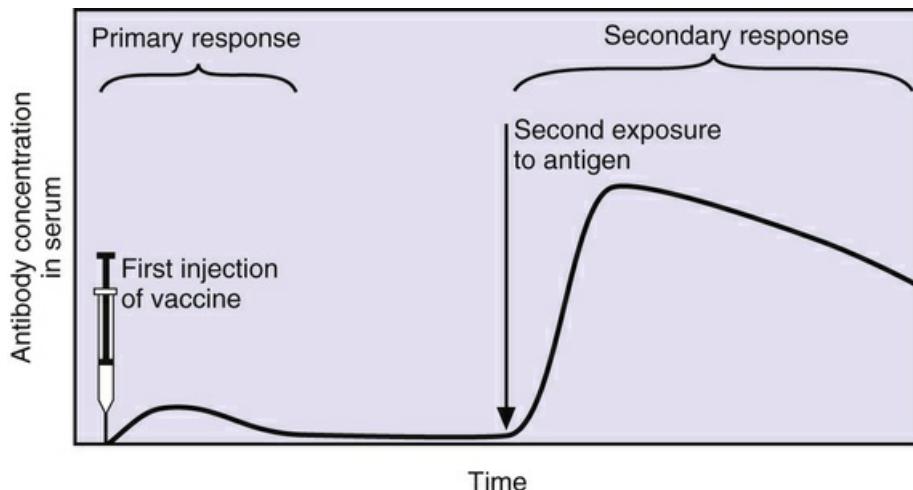


FIGURE 10-7 Comparison of primary and secondary immune response. (From Applegate E: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2010, Saunders.)

Parents should be told why immunization is important for their children and be warned of the dangers faced by children who are not adequately immunized. This information must be presented in such a way that the parents do not feel threatened or badgered. Older adults and others who are particularly susceptible to influenza and pneumococcal pneumonia should also be immunized according to the recommendations of public health officials. Health care workers should be immunized annually for influenza so they do not transmit the disease to susceptible patient populations. The [CDC \(2015\)](#) has recommended immunization schedules for all ages, including those who have never been vaccinated. The most current recommendations are available at

<http://www.cdc.gov/vaccines/schedules/index.html>.

Circumstances that require modifying or postponing immunization include fevers; immune deficiency disease; immunosuppressive therapy; and administration of human immune globulin, plasma, or whole blood transfusion 6 to 8 weeks before the immunization. Some immunizations, such as live attenuated influenza vaccine (contains weakened live flu virus), are also contraindicated immediately before and during pregnancy and when a person is taking certain drugs, such as chemotherapy; however, the inactivated (killed virus) influenza vaccine is rarely contraindicated. Information inserts accompanying these vaccines will identify restrictions prohibiting the administration of an immunizing agent. The vaccine for tuberculosis (TB), bacille Calmette-Guérin (BCG), is not routinely used in the United States because of the low incidence of TB. However, BCG is given in countries where TB is more prevalent, and individuals who have received vaccine may have a positive TB skin test for a number of years. The Mantoux tuberculin skin test (TST) administered in the United States typically does not cause a positive skin test result unless the person has been infected with *Mycobacterium tuberculosis*.

Whenever an immunizing agent is to be administered, precautions must be taken to ensure, as much as possible, that the patient is not hypersensitive to the components of the agent. Religious orientation is also important to consider, because some vaccine products are made using pork or bovine serum and are strictly forbidden by certain religious tenets. Common substances used in the manufacturing of vaccines include chicken embryos, horse serum, bovine serum, and preservative agents (CDC, 2011). These substances can produce a serious allergic reaction in people who are hypersensitive to them. Immunizing agents that are most often associated with anaphylaxis, a potentially fatal reaction, include tetanus antitoxin, botulism antitoxin, diphtheria antitoxin, rabies antitoxin, and antilymphocyte globulin.

It is imperative that a history of allergies in the patient and her family be obtained before administering an immunizing agent. It also should be determined whether the patient has an immune deficiency disorder of any kind that would prevent a normal immune response to the immunizing agent. If a patient does have a history of allergies or an immune deficiency, the health care provider should be made aware of this fact before the immunizing agent is given. If the patient has had an allergic reaction to the specific agent she is supposed to receive, the vaccine must not be given.

There are serums that require a skin sensitivity test before they may be administered to a patient. Skin testing for sensitivity should not be confused with skin testing for diagnostic purposes. Testing for sensitivity is performed to determine whether a minute amount of the immunizing agent will produce a local reaction. If it does, chances are the patient will have a severe reaction if the agent is given systemically. Botulism antitoxin is an example of a treatment for which a "scratch test" is mandated before its administration.

Despite these precautions, it is possible that a patient will suffer from hypersensitivity to an immunizing agent. To avoid serious problems, always be prepared to act quickly and effectively in such an emergency. In all patient care areas where immunizing agents are administered, emergency equipment should be readily available. As an extra precaution to ensure prompt treatment of a hypersensitivity reaction, it is advisable for people receiving immunizing agents to remain in the clinic or office for 15 to 20 minutes after an injection is given. This practice is in accordance with the National Patient Safety Goal of recognizing and quickly responding to changes in a patient's condition.

In addition to enhancing the immune system by administering immunizations, instruct the patient about other measures for maintaining a healthy immune system. Keeping the body healthy is the best way to preserve immune function. Not smoking, staying physically active, getting adequate rest, and eating a balanced diet are all measures that should be encouraged.

Complementary and Alternative Therapies

Garlic Assists Immune Action

Garlic has been used for centuries to increase resistance to the common cold and other infections. It has a variety of actions, including antilipidemic, antitriglyceride, antiplatelet, antioxidant, cancer preventive, and antimicrobial. It inhibits the growth of both gram-positive and gram-negative organisms and is effective against certain fungi, viruses, and helminths. Because garlic interacts

with many drugs, the health care provider should be consulted before administration. It should not be used by pregnant women, because it may induce labor. Patients taking anticoagulants need to know that it may extend their action.

❖Nursing Management

■ Assessment (Data Collection)

If the immune system is functioning normally but not activated, there will be an absence of physical signs and symptoms of an immune response or infection. It is when the system is activated and doing its job or is unable to mount an active defense, detectable physical signs and symptoms may become evident.

Because the function of the immune system is to guard the body against microbial invasion, it is important to assess for signs and symptoms of infection. These include fever, redness, swelling, and exudate from open skin areas. Patients who have a known infection but do not exhibit obvious signs and symptoms of infection should be evaluated for an immune deficiency. Another indicator of a depressed or inadequate immune response is recurrent infections or infections of common organisms to which individuals with normal immune systems are not susceptible. A thorough history should be gathered.

▣ Focused Assessment

Data Collection for the Lymphatic and Immune Systems

- What immunizations have you had? When were you last immunized for tetanus, diphtheria, and influenza?
- Have you had a recent infection or a recurrence of infection?
- Do you have any allergies to medications, food, or other substances?
- Do you have any chronic illnesses such as diabetes mellitus, rheumatoid arthritis, inflammatory bowel disease, Crohn's disease, lung disease, renal disease, or HIV or AIDS?
- Have you ever had cancer? Radiation therapy? Chemotherapy?
- Have you recently had surgery or a blood transfusion?
- Do you get sick frequently?
- Have you recently traveled out of the country?
- What do you usually eat in a day?
- Has your weight changed lately?
- Do you smoke, drink, or use illicit drugs?
- Have you been exposed to industrial or agricultural chemicals?
- Have you been exposed to industrial radiation?
- Are you on any medications?
- Do you take any supplements or herbal preparations?
- Do you see a health care provider regularly?
- Are you under excessive stress at home or in your job?

- Are you sexually active? Do you use protection such as latex condoms? Are you monogamous?

Previously diagnosed diseases that affect the immune system, immunizations, medications (including herbal supplements), allergies, and nutritional status are important areas to explore. The patient should also be questioned about any recent surgeries, blood transfusions, and diagnoses of chronic illnesses. Habits and lifestyle questions are also important to include in the data collection. Because diseases that affect the immune system can be transmitted through the exchange of blood and body fluids, asking about the use of illicit drugs and sexual history are very important. Information regarding smoking history and exposure to environmental and industrial radiation or pollutants should also be obtained.

Physical Assessment

The skin is a major defense against access to the body by microorganisms. It is important to do a thorough assessment of the skin to identify any potential entryways for organisms. Remember to assess those areas where catheters, tubes, and other medical devices may penetrate the skin barrier. The skin may show an excessive immune reaction, such as an allergic response resulting in hives, rash, or other skin eruptions.

Clinical Cues

Latex allergy can be another cause of redness at tube sites if the tube or the occlusive dressing contains latex.

When the immune response is activated, lymph nodes may become swollen and tender and can be evaluated by palpation. Nodes in the neck, axillae, and groin areas are those most commonly examined, because they are closer to the skin surface. Data obtained from a head-to-toe physical assessment provide important information regarding immune and lymphatic system function.

Focused Assessment

Physical Assessment of the Lymphatic and Immune Systems

- Take vital signs, noting if there is an increase in temperature or pulse rate.
- Measure height and weight.
- Inspect the skin for color, turgor, texture, and presence of lesions.
- Assess extremities for edema.
- Inspect ears, eyes, nose, and throat for drainage, redness, or exudate.
- Palpate lymph nodes in the neck to identify enlargement or tenderness.
- Auscultate lung fields and assess work of breathing.
- Analyze laboratory results such as complete blood count (CBC), C-reactive protein, and antibody screening tests.

Diagnostic Tests, Procedures, and Nursing Implications

Skin testing. Skin testing is one of the most commonly used techniques to measure immunity and to identify people who may have a dormant infectious disease. These tests include the **Schick test** to determine susceptibility to diphtheria and the **TST** (Mantoux test) to identify those who might need treatment for TB. The Mantoux test and other tests for TB are covered in [Chapter 14](#).

Several types of skin testing may also be performed to identify allergens that are causing allergic symptoms in an individual. A scratch test (also called a prick or puncture test) involves dropping extracts of allergens into scratches made on the skin. Intradermal injection of allergens is used to

detect allergies to insect venom or penicillin. Patches containing allergens that might cause contact dermatitis are placed in direct contact with the skin. Inflammation and itching identify those allergens that provoke the immune system.

Laboratory tests. Laboratory tests on blood and serum also give important information regarding the status of the immune system. A CBC gives information regarding the number of circulating WBCs. The differential indicates what percentage of the total WBC count is accounted for by the different cell types. An increased WBC count indicates that the immune system has been activated (Table 10-3). If a specific disease or condition is suspected, blood testing can determine whether antibodies to that disease or condition are present.

Table 10-3

Diagnostic Tests for Disorders of the Immune and Lymphatic Systems*

TEST AND NORMAL RANGE	PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
Complete Blood Count (CBC)			
	Determines whether abnormalities are present in the numbers of blood cells or types of blood cells; assesses the amount of hemoglobin present Useful to diagnose anemia	Fill a lavender-top tube containing EDTA with a venous sample of blood. Use a site where there is little chance of dilution from intravenous solution. Mix the blood and the EDTA by gently rotating the tube.	Warn the patient that a "stick" is about to occur, but that the pain will be short lived. Apply pressure directly to the puncture site after withdrawing the needle; at the antecubital space, do not have the patient flex the arm, because this tends to cause a hematoma.
Erythrocytes			
Hemoglobin: females, 12.0-16.0 g/dL; males, 13.0-18.0 g/dL Red blood cell count: females, 4.2-5.4 million/mm ³ ; males, 4.6-6.2 million/mm ³ Hematocrit: females, 37%-47%; males, 40%-54%			
Leukocytes			
White blood cell (WBC) count: 4500-11,000/mm ³			
Differential Count			
Granulocytes Neutrophils: 54%-62% of WBCs Eosinophils: 1%-3% of WBCs Basophils: 0%-1% of WBCs Agranulocytes Lymphocytes: 25%-33% of WBCs Monocytes: 3%-7% of WBCs Thrombocytes (platelets): 150,000-400,000/mm ³ of blood Mean corpuscular hemoglobin (Hgb) (MCH): 26-34 pg/cell Mean corpuscular Hgb concentration (MCHC): 32-36 mg/dL Mean corpuscular volume (MCV): 80-96 µm ³			
Lymphangiogram			
Normal-size vessels and nodes without filling defects	Detects abnormalities in the lymphatic system, especially cancer	Dye is injected intradermally between the first three toes of each foot while the patient is supine. Local anesthesia is injected, and an incision is made in the dorsum of the foot to inject iodine contrast material directly into a lymphatic vessel over 1.5 hr. X-rays are taken of the abdomen, pelvis, and upper body.	Repeat films are taken in 24 hr. Obtain written consent. Assess for allergy to iodine or shellfish. Explain procedure. After the procedure, elevate the legs for 24 hr to decrease swelling. Assess for signs of infection and oil embolism q4h for 24 hr.
Spleen Sonogram			
Proper size, shape, and position	Detects structural abnormalities of the spleen	An ultrasound wand is moved over the abdomen in the area of the spleen with the patient supine on the examining table.	Explain that the test typically takes about 30 min.
Spleen Scan			
Looks at the distribution of radioactive erythrocytes throughout the spleen	Detects anatomic changes in the spleen; determines invasion of Hodgkin or metastatic disease Usually done in conjunction with a liver scan	A radioactive nuclide colloid is injected intravenously. After about 20 min, a minimum of three views are obtained. Radiation exposure is about 0.5 rad (equal to about 1 yr of natural radiation exposure to the body). Schedule scan before tests using barium.	Explain that a substance will be injected and scanning will begin after about 20 min. Radiation exposure is minimal. The test takes about 60 min.
Immunoglobulins (Ig), Serum			
IgG: 564-1765 mg/dL IgA: 85-385 mg/dL IgM: 53-375 mg/dL IgD: 0-14 mg/dL IgE: 0 <100 International Units/mL	Detects and monitors quantities of antibodies circulating in the blood Useful for monitoring hypersensitivity diseases, immune deficiencies, autoimmune diseases, and chronic infections	Serum is placed on a slide containing agar gel, and an electrical current is passed through the gel. The immune globulins are separated out and electrophoresed according to the quantity and difference in electrical charge.	No fasting or special preparation is required. Requires drawing 7-10 mL of blood.
Complement Assays			
Total serum complement (CH ₅₀): 40-1000 units/mL C3 (mature T cells): 1200-1500 mcg/mL C4 (helper T cells): 350-600 mcg/mL	Monitors immune disorders, genetic complement deficiencies, and treatment response	In the presence of antibody/antigen complexes, the complement system is overly activated, and the complement components are "consumed" or used up.	No fasting or special preparation is required. Requires drawing 7-10 mL of blood.
C-reactive protein (CRP) <8 mcg/mL	Detects the presence of an inflammatory process	CRP is initiated by antigen-immune complexes, bacteria, fungi, and trauma. It interacts with the complement system.	Explain that fasting may be required for 4-12 hr. Water is permitted. Requires drawing a blood sample. Cigarette smoking can cause increased levels. Alcohol consumption can decrease levels. Estrogens and progesterones may cause increased levels. Statins, fibrins, and niacin may cause decreased levels.
Lymph Node Biopsy			
Negative for abnormal cells or infectious agents	Detects changes in tissue; identifies autoimmune disease or detects the spread of malignancy	Tissue is obtained by needle aspiration, excision, or needle punch using aseptic technique.	Fasting may be required. Sedation and/or local anesthesia will be administered. Biopsied material is placed in formaldehyde. Label and transport to the laboratory immediately. A dry sterile dressing is applied to the biopsy site. Instruct the patient to watch for signs of infection: increasing pain, redness, swelling, purulent drainage, or fever >101° F (38.3° C).
Culture			
	Determines organism responsible for infection	A sample of exudate, fluid, or tissue is taken from the suspected infected area.	The procedures for collecting bacterial, viral, and fungal samples are different. Consult agency protocol.

		Gather the correct culture tubes and culture media. Label all containers before collecting the specimen(s). Transport the specimen(s) to the laboratory immediately.
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¹Diagnostic tests for human immunodeficiency virus are presented in Chapter 11. Bone marrow aspiration is covered in Chapter 16.

EDTA, Ethylenediaminetetraacetic acid.

Imaging studies. **Immunoscintigraphy** is a nuclear medicine imaging procedure in which antibodies labeled with radioactive isotope are injected into the bloodstream. The isotope emits gamma rays that can be detected by the imaging equipment. Computers construct a picture of sites in the body where the antibody accumulates. The primary use of this technique is for identification of neoplasms, as well as in locating and confirming areas of infection, such as in osteomyelitis. Current research is investigating techniques for “tagging” other cellular components of the immune system with radioactive substances that can then be visualized with nuclear medicine equipment.

Computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) can all be used to evaluate the thymus gland and other tissue structures of the immune system.

Nursing Diagnosis

Problems of the immune and lymphatic system involve body systems and cause psychosocial problems as well and are identified from the assessment and data collection. Table 10-4 lists the most common problems. Numerous nursing diagnoses for patients with immune and lymphatic disorders are available on the NANDA-I list (see inside back cover).

Table 10-4
Common Problem Statements and Interventions for Patients With Alteration in Immune and Lymphatic Function

PROBLEM STATEMENT	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Excessive Immune Response		
Altered breathing pattern due to excessive immune response	Patient will maintain a patent airway and adequate oxygenation.	Maintain patent airway. Assess respiratory function q2-4h. Provide supplemental oxygen as needed and ordered.
Altered thermoregulation due to inflammatory response	Patient will maintain core temperature within normal range.	Monitor temperature. Administer antipyretics as indicated. Initiate cooling measures if indicated. Monitor intake and output. Encourage fluid intake.
Potential for altered skin integrity due to allergens	Patient's skin will be intact and without redness or rash or hives.	Assess for rash or hives. Administer topical and systemic medications as ordered. Keep skin clean and dry; use lotions for lubrication. Refrain from bathing in hot water. Suggest use of ice to decrease itching. Keep nails short to reduce risk of injury from scratching. Provide distraction activities to shift focus from itching.
Anxiety due to threatened health status	Patient will assist with relieving symptoms through various techniques. Patient's anxiety will decrease by discharge.	Assess level of anxiety. If patient is having respiratory difficulty, stay with the patient. Explain to the patient what is being done to help her and what she can do to lessen the symptoms. Teach relaxation exercises.
Deficient Immune Response		
Potential for infection due to decreased resistance	Patient will remain free of infection or, if infection occurs, it will be promptly identified and treated.	Maintain infection control standards to prevent health care-associated infections. Assess for signs and symptoms of infection. Aggressively treat infection if it occurs. Instruct patient in techniques to prevent acquisition of infection.
Altered social activity resulting in social isolation	Patient will participate in social activities within ability.	Encourage interaction using technology to maintain relationships and prevent infections. Provide positive reinforcement when the patient participates socially. Provide education regarding modes of transmission so that social interactions can be safely undertaken.
Potential for altered thermoregulation due to illness	Maintain body temperature within normal range.	Monitor core body temperature. Maintain a comfortable ambient temperature. Restore/maintain temperature within patient's normal range.
Altered nutrition due to loss of appetite	Maintain stable weight.	Assess presence and degree of nausea or loss of appetite. Assist patient to make a dietary plan including favorite foods. Consult with dietitian and health care team. Offer frequent small meals. Promote an odor-free, relaxing atmosphere for meals.
Insufficient knowledge regarding disease process and prevention of infection transmission	Patient and family will verbalize understanding of disease process, treatment, and necessary precautions.	Assess readiness to learn. Provide information in multiple formats: verbal, visual media, written. Teach necessary precautions to prevent infection. Provide positive reinforcement. Use team and group teaching as appropriate. Provide access to other information sources. Refer to community agencies and support groups.
Lymph System Disorders		
Acute pain due to disease process	Patient's pain will be reduced and kept within range acceptable to patient.	Teach patient use of pain scale for reporting of pain. Accept patient's report of pain. Monitor vital signs. Provide comfort measures. Instruct and encourage relaxation, imagery, and diversional activities. Administer analgesics as needed to maintain acceptable comfort level. Encourage adequate rest periods. Work with patient and family to identify effective strategies for

Altered nutrition due to disease process	Patient will maintain present or ideal body weight.	pain management. Determine ability to chew and swallow. Identify patient food preferences. Offer frequent small meals. Weigh daily. Promote relaxing meal environment. Provide oral care before and after meals.
Lack of power due to disease process	Patient will become actively involved in care and will make choices related to care.	Asses patient's knowledge and perception of condition. Identify patient support systems. Listen to patient's expressions of feelings. Show concern for patient as an individual. Treat patient's decisions with respect. Encourage realistic goal setting. Provide opportunities for the patient to control as many events as restrictions allow.
Altered body image due to lymphedema	Patient will verbalize understanding of body changes.	Teach patient and family about pathophysiology of lymphedema. Institute measures to reduce lymphedema: elevation of extremity and use of pressure sleeve as ordered. Teach measures to prevent lymphedema recurrence. Support patient decision making. Refer to appropriate support groups.

■ Planning

Planning is based on the particular problems identified for the individual patient (see [Table 10-4](#)). General nursing goals include the following:

- Protect from infection
- Improve health status
- Maintain a high degree of wellness to promote optimal immune function

■ Implementation

Nursing interventions include all methods to prevent the spread of infection. Meticulous adherence to Standard Precautions, including appropriate hand hygiene, is essential. Additional protection from infection may include implementation of protective isolation. Promotion of balanced, adequate nutrition is essential in maintaining or regaining optimal immune function.

■ Assignment Considerations

Instructing CNAs and UAP

When assigning patients or tasks to CNAs or UAP, remember to share that a patient is immunocompromised (very susceptible to infection) and that it is important to be extra diligent about complying with hand hygiene. Ask them to adhere to transmission-based isolation precautions, including restricting people who have an infection from entering the patient's room. Remind them that it is important that the patient obtain sufficient rest and not be continually disturbed. Ask the CNA/UAP to report any new skin lesion, irritation, or redness that is noticed during bathing, toileting, or repositioning. State that you want to know if the urine has a foul odor. Remember at the end of the shift to thank the person for the help provided.

Psychosocial care to decrease fear, help deal with lifestyle or role changes, and reduce stress is important in caring for the whole person. Patient teaching regarding the disorder, treatment, signs of complications, and self-care is an effective way to reduce stress and fear. Nursing care for specific disorders of the immune and lymphatic system is presented in [Chapter 11](#).

■ Evaluation

Determining whether expected outcomes are being met includes assessing for signs and symptoms of immune function. This includes gathering physical data, as well as monitoring laboratory and diagnostic study results for improvement. Temperature and other vital signs are also good indicators of immune function. General well-being and side effects of medications should also be monitored in evaluating the effectiveness of nursing and medical interventions.

Common Problems Related to the Immune and Lymphatic Systems

Fever

A rise in body temperature typically signals a normal immune system response to infection. The rise in temperature is only one component for fighting off the invaders by promoting a hostile environment. There is a significant amount of evidence-based research that shows how fever is helpful to the immune system. However, there is continued controversy about when to treat an elevation in body temperature. **Hyperthermia** or fever related to infections can cause discomfort, and excessive fever can lead to complications such as seizures. Decreasing body temperature by physical or pharmaceutical means promotes comfort for the individual but may decrease the effectiveness of the body's efforts to eliminate pathogenic microorganisms. Excessive fever (**hyperpyrexia**) is usually treated with antipyretics and cooling measures.

Nursing Management

Cooling measures can be as simple as removing excess coverings or as complex as using mechanical cooling blankets and cooled intravenous fluids. Usual nursing measures for decreasing body temperature include sponging with tepid water. Cold water is contraindicated because rapid cooling can induce shivering, which can drive the temperature back up.

Clinical Cues

Sometimes body temperature can be lowered by placing ice bags in the axillae and groin area. Be sure to insulate the packs with a cloth before placing them on the body. These areas have good blood circulation and can help with cooling the core body temperature.

The ideal treatment for fever is to address the cause. Appropriate antibiotic therapy can reduce fever by fighting the infection, if it is bacterial in origin. Allergic inflammatory responses can be treated with corticosteroids. Anti-inflammatory medications such as aspirin, ibuprofen, or naproxen may also be administered to lower the temperature.

Nutrition

Anorexia (decreased desire for food) often accompanies fever, infection, and use of some antimicrobial agents. Adequate amounts of fluid, calories, vitamins, and protein are essential in rebuilding tissues affected by infection and maintaining the immune system. Increased body temperature causes an increased metabolic rate. This increase in cellular metabolism uses more oxygen and water than under normal circumstances. Respiratory and heart rates increase with the core body temperature; therefore if a high temperature is not lowered and fluids replenished, the body ceases to function at an optimum level, which could lead to shock or even death.

Nursing Management

Offering favorite fluids and foods in small portions can sometimes tempt the appetite. When febrile, individuals often prefer cold or frozen items. Easily digested food items are usually more tempting, such as soup, ices, pops, and clear (nonpulp) juices.

Immunosuppression

Patients can be immunosuppressed either from the disease process or from medical treatment. This makes the person highly susceptible to common microorganisms. Patients who have to take daily corticosteroids for any reason, such as those with chronic asthma, post-organ transplantation patients, or patients who are receiving chemotherapy, are immunosuppressed. Individuals with diabetes mellitus may also have a depressed immune system.

Nursing Management

Hospital settings are known for having a high concentration of pathogens simply because of the variety of patient illnesses. In the hospital environment, **it is critical that all standard infection prevention and control protocols be implemented and followed by everyone without fail.**

Patients with **neutropenia** (less than normal amount of WBCs) may need additional precautions. *Transmission-based isolation precautions* refer to procedures that may be implemented to protect immunosuppressed patients from exposure to infectious microorganisms (see [Chapter 6](#)). In some cases, the precautions may also include restrictions on fresh fruits, vegetables, and flowers. Visitors who may have an infectious disorder may also be restricted from walking in the halls or going into populated areas such as a gift shop or cafeteria. Regardless of what is implemented, the principle is the same—preventing the transmission of potentially infective microorganisms to other patients, regardless of their immune status. These measures may include specially constructed rooms with positive airflow, monitoring of water purity, and monitoring of air vents for the presence of pathogenic microorganisms. The degree to which these measures are implemented is determined by the degree of immunosuppression. Any patient who is ill and hospitalized has an immune system under stress. Health care staff meticulously adhering to Standard Precautions and, if needed, Transmission-Based Precautions will help protect patients. [Chapter 15](#) presents more on the care of neutropenic patients.

Think Critically

What devices, tools, equipment, or other objects are routinely carried from patient to patient without disinfection? Where do they fit in the chain of infection? What can you, as a health care provider, do about reducing transmission of microorganisms?

Get Ready for the NCLEX® Examination!

Key Points

- The immune and lymphatic systems protect the body against microscopic threats to homeostasis.
- The inflammatory response is the first step in the immune response.
- Antibodies are proteins that fight antigens.
- B and T lymphocytes are major forces in fighting infection.
- The body produces a humoral (immediate) and cellular (delayed) response to antigens.
- Chronic consumption of alcohol can alter the body's ability to launch an immune response.
- Active artificially acquired immunity occurs by vaccination or immunization.
- Immunizations introduce pathogens to the body in a controlled way, allowing the body to produce antibodies to prevent future illness.
- The nurse plays a major role in providing patient education regarding the importance of immunizations to public health.
- Decreased immune response puts the patient at risk for infection.
- Measures such as hand hygiene and strict adherence to Standard Precautions should always be implemented, regardless of immune status, to prevent health care-associated infections.
- Good nutrition and healthy lifestyle choices are important for a healthy immune system.
- Immunosuppression can be caused by treatment for conditions such as asthma, autoimmune disorders, and cancer.

Additional Learning Resources

- SG** Go to your Study Guide for additional learning activities to help you master this chapter content.
- Online Resources
 - Centers for Disease Control and Prevention, www.cdc.gov

Review Questions for the NCLEX® Examination

1. _____ is the administration of weak or attenuated microorganisms to stimulate the production of antibodies without causing a full-blown disease.

NCLEX Client Need: Health Promotion and Maintenance: Disease Prevention

2. The nurse demonstrates understanding of passive natural immunity when he makes which statement?

1. “Breast-feeding is the best way to enhance the infant's immunity.”
2. “Timely vaccination could easily provide protection from hepatitis.”
3. “The skin provides passive natural immunity for warding off diseases.”
4. “Administration of human immune globulins boosts the immunity.”

NCLEX Client Need: Physiological Adaptation: Basic Pathophysiology

3. Testing for antibodies is indicated for which immunization? (*Select all that apply.*)

1. Rabies
2. Botulism
3. Mantoux
4. Tetanus

NCLEX Client Need: Physiological Adaptation: Basic Pathophysiology

4. During a health promotion outreach for older adults, the nurse discusses the physiologic changes in aging that increase susceptibility to infection. Which statement is true?

1. "With advanced age, the skin becomes tough and leathery."
2. "Decreased cilia in the lungs provide a more hospitable environment to harmful organisms."
3. "Decreased normal flora in the intestines causes the harboring of pathogens."
4. "Repeated infections build up immune responses."

NCLEX Client Need: Physiological Adaptation: Alterations in Body Systems

5. A patient is newly diagnosed with an autoimmune thyroid disease. When the nurse discusses the patient's questions and concerns, the patient asks, "What did the provider mean by autoimmune disease?" What is the most appropriate response?

1. "The body's immune defenses fail to respond to the pathogenic agents."
2. "Immune defenses are attacking the normal body cells."
3. "There is a break in the body's defenses."
4. "The provider was able to identify the underlying cause of the disorder."

NCLEX Client Need: Psychosocial Integrity: Therapeutic Communication

6. A nurse is assessing the condition of a sacral pressure ulcer on an immobilized patient. Which sign or symptom indicates the presence of infection?

1. Warm to touch
2. Pink wound surface
3. Wound culture <10,000 colonies
4. Purulent drainage

NCLEX Client Need: Physiological Integrity: Physiological Adaptation

7. While caring for an immunocompromised patient, which action by a nursing assistant indicates a need for instruction and supervision by a licensed nurse?

1. Reporting changes in the physical characteristics of the urine
2. Allowing all family members in the patient's room at all times
3. Meticulous hand hygiene before entering the patient's room
4. Turning the patient while bathing her

NCLEX Client Need: Safe and Effective Care Environment: Coordinated Care

8. During the data collection process, a patient indicates, "I take garlic pills to reduce my risk for cancer." What is an appropriate nursing response?

1. "How much and how often do you take your garlic pills?"
2. "Have you been screened for cancer?"
3. "What other herbal medications are you taking?"
4. "You sound worried. Could you talk more about it?"

NCLEX Client Need: Health Promotion and Maintenance: Data Collection Techniques

9. The patient needs to have blood drawn for C-reactive protein. What is an important preprocedure instruction?

1. Hormone replacement therapy can increase the level of C-reactive protein.
2. Cigarette smoking is never advised but will not affect the level of C-reactive protein.

3. Your morning dose of niacin and simvastatin will not affect the outcomes of the test.
4. The procedure requires a 4- to 12-hour fast with no water intake.

NCLEX Client Need: Reduction of Risk Potential: Diagnostic Tests

10. Before receiving antivenom, a patient asks, "How does the antivenom work?" Which statement demonstrates that the nurse has knowledge of the medication?

1. "The antivenom provides a lifelong protection from any snake bite."
2. "The antivenom must be given as early as possible to afford immediate reversal of the subsequent effects of the venom."
3. "The antivenom reverses the effects of the poisonous snake bite."
4. "The antivenom cannot be given to patients who are allergic to eggs."

NCLEX Client Need: Physiological Integrity: Basic Pathophysiology

Critical Thinking Questions

Scenario A

Mr. Green, an 80-year-old farmer, is admitted with pneumonia. His vital signs are: temperature 103° F (39.4° C) (oral), blood pressure 136/78 mm Hg, heart rate 100 bpm, respirations 28 breaths/min, and no complaint of pain.

1. What assessment data indicate that the immune system is active?
2. Describe how the body is reacting to the lung infection. Which type of immunity will help fight the infection?
3. List appropriate nursing interventions for Mr. Green.

Scenario B

Mrs. Hope brings her newborn into the pediatrician's office. She is seeking information.

1. Mrs. Hope asks when she should bring her baby in for immunizations. What will you tell her?
2. Explain how immunizations help protect the body.
3. Discuss what information should be given so that Mrs. Hope could identify if her baby has had a reaction to an immunization.

CHAPTER 11

Care of Patients With Immune and Lymphatic Disorders

Trena Rich

Objectives

Theory

1. Discuss the key differences between primary and acquired immune deficiency disorders.
2. Summarize the ideal actions of therapeutic immunosuppressive drugs.
3. Illustrate the modes of transmission for HIV.
4. Discuss how pre-exposure prophylaxis reduces the risk of contracting HIV.
5. List diagnostic tests for HIV and those used to monitor the immune status of individuals who are HIV positive.
6. Explain opportunistic infections (viral, bacterial, fungal, parasitic) that occur in HIV patients.
7. Give examples of each of the three categories of autoimmune disorders and diseases.
8. Compare and contrast the two types of lymphoma, including how they are diagnosed.
9. Explain why the process of diagnosis and treatment for fibromyalgia would be difficult or frustrating for the patient.
10. Construct how an allergic reaction occurs during an excessive immune response.
11. Relate the nurse's role in helping a patient to control allergies.

Clinical Practice

12. During a clinical rotation, review the facility's policy for exposure to blood or body fluids from an HIV-positive patient.
13. List nursing measures for the prevention of infection for an immunocompromised patient.
14. Perform data collection on a patient in whom an immune-suppressant disorder is suspected.
15. Review a nursing care plan for a patient who has low immunity.
16. Write nursing interventions for a patient with fibromyalgia.
17. List the usual measures for treating an anaphylactic reaction and locate the necessary emergency equipment on your clinical unit.

KEY TERMS

- acquired immunodeficiency syndrome (AIDS) (ă-KWĪRD īm-ū-nō-dě-FĪSH-ěn-sē SĬN-drōm, p. 217)
- allergy (p. 241)
- allodynia (p. 240)
- anaphylaxis (ă-nă-fă-LĂK-sĭs, p. 241)
- angioedema (än-jĕ-ōh-ě-DĒ-mā, p. 247)
- atopy (ĀT-ōh-pē, p. 242)
- disseminated (dī-SĒM-ĭ-năt-ěd, p. 239)
- histamine (HĬSS-tă-mĭn, p. 241)
- human immunodeficiency virus (HIV) (HŪ-mă̄n īm-ū-nō-dě-FĪSH-ěn-sē VĬ-rūs, p. 217)
- hyperalgesia (hī-pĕr-ăl-JĒ-zhă, p. 240)
- hypersensitivity reactions (p. 241)
- iatrogenic (p. 217)
- immunocompetence (p. 216)
- immunosuppression (p. 217)
- lymphadenopathy (p. 237)
- opportunistic infections (OIs) (öp-pōr-tū-NĬS-tĭk īn-FĚK-shŭnz, p. 220)
- patch test (p. 242)
- primary immune deficiency disorders (PIDDs) (p. 217)
- protease inhibitors (PIs) (prō-tē-ās īn-hĭb-ě-tōrz, p. 225)
- relapse (RĒ-lăps, p. 238)
- remissions (rē-MĬ-shŭnz, p. 240)
- replicate (RĒP-lī-kāt, p. 220)
- retrovirus (rē-trō-VĬ-rūs, p. 220)
- reverse transcriptase (rē-VĚRS trānz-SCRĬP-tās, p. 220)
- scratch test (p. 242)
- sentinel infections (SĔN-tĭ-nĕl īn-FĚK-shŭnz, p. 224)
- suppression (sū-PRĒ-shūn, p. 220)
- syndrome (SĬN-drōm, p. 249)
- urticaria (ür-tĭ-KĀ-rē-ăh, p. 247)
- wasting syndrome (p. 224)

Immune Function and Dysfunction

An immune system that functions properly creates immunocompetence. With **immunocompetence**, when a threat to the immune system occurs, it stimulates certain physiologic responses (i.e., the vascular system, initiation of chemical responses, and the release of white blood cells) to protect the body against invasion from microorganisms or toxins. Abnormal responses of the immune system are typically the result of an infection, medical therapy, or exposure to select toxins. These abnormal responses are divided into two basic categories: immune deficiency disorders and autoimmune diseases.

In **immune deficiency** disorders, there is an insufficient production of antibodies, immune cells, or both; the disorders may be congenital or acquired. A deficiency in the immune system leaves the body unable to resist foreign microbes or toxins. Common viral infections, such as influenza or infectious mononucleosis, can cause a short-term weakened immune response.

Autoimmune disorders involve the overreaction or hypersensitivity to antigens from the external environment that cause the immune system to be unable to tell the difference between "self" (the body's own cells) and "nonself" (foreign cells). Autoimmunity can be organ specific, such as in type 1 diabetes mellitus in which the body attacks the pancreatic cells that produce insulin, or it can be like systemic lupus erythematosus (SLE), in which antibodies are produced that assault healthy cells throughout the body.

Immune Deficiency Disorders

There are two forms of immune deficiency: primary and acquired. In **primary immune deficiency disorders (PIDDs)**, the cause is an inherited genetic mutation, and some PIDDs are detected during infancy or early childhood. Approximately 500,000 Americans have some form of PIDD, and approximately 15% of those are severely affected. Patients with this type of disorder experience repeated infections that clearly increase their risk of morbidity and mortality as well as the cost of health care. Refer to [Box 11-1](#) for a modified list of PIDDs.

Box 11-1

Primary Immune Deficiency Disorders

Autoimmune lymphoproliferative syndrome (ALPS)

Chronic granulomatous disease (CGD)

Common variable immunodeficiency (CVID)

Severe combined immunodeficiency (SCID)

Adapted from National Institute of Allergy and Infectious Diseases. Retrieved from
<http://www.niaid.nih.gov/topics/immunodeficiency/Pages/Default.aspx>.

Acquired immune deficiency disorder can result from medications such as immunosuppressants that are used to prevent tissue/organ transplant rejection or chemotherapeutic agents to treat cancer that temporarily reduce the ability of the bone marrow to produce white blood cells (WBCs). **Acquired immunodeficiency syndrome (AIDS)** is perhaps the most commonly known disorder that is caused by the **human immunodeficiency virus (HIV)**. This virus affects the body's ability to fight off an array of infections and diseases if recommended treatments are not followed.

Therapeutic Immunosuppression

A variety of disorders or conditions can be treated or controlled by medications or therapies such as corticosteroids, hemodialysis, organ transplantation, or radiation. However, some of these treatments can lead to chronic medical conditions or **iatrogenic** (a side effect of medical treatment) complications such as diabetes mellitus, osteoporosis, chronic infections, and significant weight gain. Drug-induced **immunosuppression**, often referred to as *therapeutically induced immunosuppression*, requires a delicate balance between the control of the body's immune response and the side effects. The ideal balance of therapeutic immunosuppressive drugs would inhibit the normal immune system response; defend against invasion from assorted pathogenic agents; and control the occurrence of the usual side effects, such as stomach ulcers and tremors (Box 11-2).

Box 11-2

Ideal Actions of Immunosuppressive Drug Therapy

- Offer a wide margin of safety between therapeutic and toxic dosing
- Produce selective effects on lymphoid cells without harming the rest of the body
- Suppress only the specific immune processes on the cells involved in causing the disease
- Require drug administration for a limited amount of time so the body's immune response becomes familiar with the foreign antigen and sees it as a part of the self
- Once the new immune response has been developed, be effective against the immune processes of the body

An example of an iatrogenic immune suppression occurs with an organ transplant recipient. The patient must take multiple medications, such as mycophenolate mofetil (CellCept) and cyclosporine (Sandimmune), for the rest of his life (Table 11-1). Lifelong immunosuppressive therapy does not completely eliminate the danger of organ rejection or other health complications, and the drugs need to be adjusted according to the systemic and immune response of each patient and to prevent toxicity. This treatment regimen must be strictly followed or the risk of organ rejection is increased from activation of the patient's own immune system to destroy the "foreign" organ.

Table 11-1
Types of Antirejection Medications

NAME	ACTION
Antithymocyte globulin	Immunosuppressive agent that selectively destroys T lymphocytes.
Basiliximab	Binds and blocks T cells from replicating and from activating B cells, thereby decreasing the production of antibodies that can lead to rejection.
Daclizumab	Inhibits the function of interleukin-2 (IL-2) receptors on the T cells, which prevents the cells from activating and stimulating the formation of antibodies.
Lymphocyte immune globulin	Reduces the number of circulating thymus-dependent lymphocytes in the blood.
Methylprednisolone	A corticosteroid with anti-inflammatory properties.
Muramab-CD3	Blocks the function of CD3 molecules in the membrane of human T cells.
Rapamycin	An antimicrobial that demonstrates antifungal, anti-inflammatory, antitumor, and immunosuppressive properties, which inhibits IL-2 so the T and B cells are not activated.

There is significant evidence that use of antirejection medications increases the survival rate of patients with certain organ transplants. These immunosuppressive agents are also helpful in the management of autoimmune disorders such as multiple myeloma, non-Hodgkin lymphoma, rheumatoid arthritis, and certain neoplastic growths.

Diagnostic Tests and Treatment of Immune Deficiencies

In the early stages of an autoimmune disorder, definitive diagnosis may be difficult. The health care provider must look at the complete health history, current complaints or symptoms, and physical examination findings so that the appropriate diagnostic studies can be performed (Box 11-3).

Box 11-3**Examples of Diagnostic Tests to Detect an Autoimmune Disorder**

- Complete blood count with differential
- Red blood cell count
- Creatinine level
- Antinuclear antibody (ANA)
- Bone marrow studies
- Serum protein
- Protein electrophoresis
- Immunoelectrophoresis
- T-cell and B-cell assays
- Enzyme-linked immunosorbent assays (ELISAs)

Some patients' immune systems have virtually no ability to respond to antigens, because they are unable to produce lymphocytes that are sensitized, or to synthesize antibodies, whereas others have a temporary minor defect in the humoral or cell-mediated immune response. In some types of immune deficiency, passive immunity can be accomplished by transfusing specifically sensitized lymphocytes to help the patient resist infection. Immune globulin (Ig) is a blood product that is given for the treatment of primary immunodeficiency diseases and certain autoimmune and other diseases in which antibody levels are low or dysfunctional. Immune globulin is also used to remove harmful antibodies and to block damage from immune cells. Administration of immune globulin may be given on a regular basis to provide passive immunity for those who are unable to produce their own antibodies. When impaired function of the bone marrow is involved, such as in leukemia, the patient may receive a bone marrow transplant to provide the stem cells that will eventually become immune bodies. To help prevent or combat infection in immunosuppressed patients, granulocyte colony-stimulating factor (filgrastim [Neupogen]) can be used to promote the growth of neutrophils, especially in patients with significant immunodeficiency.

As soon as an infection is evident, antimicrobial agents are usually given. However, these drugs can also be immunosuppressive and can lead to the development of multidrug-resistant organisms (MDROs), leaving the patient more vulnerable to infection and other complications. (Refer to [Chapter 6](#) for more on MDRO.)

Treatment in an immunocompromised patient is aimed at controlling the disease or eliminating the condition that led to an inadequately functioning immune system. For some immune disorders, treatment consists of minimizing the effects of the illness in the immunosuppressed patient in an effort to optimize quality of life.

▣ Older Adult Care Points

After age 70 years there is a definite decline in the function of the immune system. Many of the blood-forming tissues in the bone marrow are replaced with fat (lipids). B-cell numbers usually remain the same, but T-cell circulation is diminished.

❖Nursing Management**■ Assessment (Data Collection)**

When an immune deficiency is suspected, information about the current physical status of the

patient, such as his general state of health, infections he may have recently had, how the infections affected him, and how frequently they occur is gathered. It is important to determine whether occupational or environmental exposure to assorted agents has occurred. Nutritional status should be assessed by measuring height and weight and inspecting the skin, hair, and overall appearance. If a significant decrease in weight is noted (usually greater than 10%), ask if it was intentional. If not, ask when the loss first started. It is also essential to assess for risk behaviors such as intravenous (IV) drug use, multiple sexual partners, exposure to HIV, immunosuppressive drug therapy, alcohol consumption, and family history of genetic immune disorders.

Physical assessment should include palpation of the superficial lymph nodes in the neck, axilla, and groin to detect any abnormalities, as well as assessing the body systems involved in the patient's chief complaints. For example, the patient tells the nurse that she feels a bulge around her stomach, so the nurse would palpate both upper quadrants of the abdomen.

Body temperature should be closely monitored for significant changes, **although immune-deficient patients may not have a temperature elevation even in the presence of infection**. The body may not be able to recognize that an infection is beginning until much later in the process because of the body's impaired immune response. Therefore you must assess the whole patient and not just one or two areas, because important signs or symptoms of potential complications can be easily missed if assessment is not performed correctly.

Nursing Diagnosis and Planning

Problem statements for patients with immune deficiency should always include one regarding the potential for infection, which is a major problem. Psychosocial problems often accompany physical problems. Problem statements are based on the data gathered. Specific nursing diagnoses can be chosen from the NANDA-I list. The primary nursing goals when caring for a patient who has an immune deficiency are to (1) protect the patient from infection, (2) improve her health status, and (3) promote as high a degree of wellness as possible. Expected outcomes based on the patient problems might include:

- Patient will remain free from infection.
- White blood cell counts are within normal limits.

Planning care for the patient with an immune deficiency focuses on preventing exposure to pathogens. A patient whose immune deficiency is severe will likely need to be placed in protective isolation precautions. (See [Chapter 16](#) for additional information on neutropenia.) Working with patients in this type of isolation requires more time because of the need for donning and removing the personal protective equipment (PPE) before entering and on leaving the patient's room (see [Chapter 6](#)). Integrating care of this patient along with the rest of the patient assignments for the shift needs to be carefully planned. It is also important to teach patients with immune compromise the actions that should be taken once they are discharged from the hospital to prevent the onset of infection.

Patient Teaching

The Patient With Compromised Immunity

- Perform hand hygiene frequently and particularly before eating, after toileting, after petting an animal, after touching or shaking hands, and when returning home from shopping or errands.
- Wash the armpits, groin, genitals, and anal area at least twice a day with an antimicrobial soap and dry areas thoroughly.
- Obtain adequate rest daily to allow the body to function as well as possible.
- Take the temperature at least once a day.
- Assess for signs of infection on a daily basis and report such signs immediately to the doctor.
- Take all prescribed medications per instructions.

- Refrain from mingling in crowds, especially during flu season.
- Avoid others who are displaying signs and symptoms of an infection.
- Avoid travel to areas with poor sanitation or inadequate health care facilities.
- Cook foods well and avoid eating raw, unwashed foods.
- Wash dishes in the dishwasher or with hot, soapy water.
- Cutting surfaces, knives, and food preparation areas that have come in contact with raw poultry, meat, and seafood should be cleaned thoroughly after use.
- Do not dig in the soil or work with houseplants.
- Use stress reduction techniques on a regular basis.

■ Implementation

Proteins are needed to synthesize antibodies. If a patient has a condition or is on medications that suppress appetite or cause nausea, nutritional intake can be inadequate. Nutritional supplements may be added, and multiple small meals of high-protein foods chosen by the patient may need to be scheduled throughout the day. However, if the patient is on corticosteroid therapy, controlling overeating may be a challenge, and the patient must be carefully monitored for weight gain. Providing low-calorie snacks such as cooked vegetables and fruits instead of high-calorie chips, cookies, and sodas is helpful.

? Think Critically

How would you explain to a patient why good-quality protein is important in the diet when an immune deficiency is present?

! Safety Alert

Preventing Infection Among Immune-Deficient Patients

Transmission-based isolation precautions may be indicated when providing care to immune deficient patients (see Chapter 6). It is well known that while providing nursing care, scrupulous hand hygiene is the standard of care for all patients, but for an immunocompromised patient this basic measure could mean the difference between life and death. Disinfect any object, such as your stethoscope, that may serve as a source of infection. Observe strict surgical aseptic technique when performing invasive nursing care procedures such as catheterization, dressing changes, and IV infusions.

Excessive stress can further depress immune function. Many factors related to family, employment, finances, or transportation can significantly increase the stress level for the patient or loved ones. As illness progresses, many patients may have difficulties at school or work.

Collaboration with a social worker is often indicated. Referrals to community resources can greatly assist the patient and family in dealing with the added stress. You can be instrumental in teaching the patient stress-reduction strategies, such as light exercise, meditation, relaxation techniques, and guided imagery (see Chapter 7) (See the Evolve website.). 

Providing instruction regarding the immune disorder, any therapies recommended for the patient, and follow-up care are essential nursing interventions. Teach the patient and family to assess for signs of infection and to report them immediately. If traveling, the patient may need to employ additional safeguards to ensure he remains healthy. (See the Evolve website.)

■ Evaluation

Ensure that strict hand hygiene is being performed and adhere to transmission-based isolation

precautions. Check laboratory test results to assess whether immune function is improving. B-cell and T-cell assays are particularly important to monitor. Evaluate the patient for adequate recovery from any infection that might have been present, as well as for general well-being, appetite, weight changes, and side effects of medications or other therapies.

Human Immunodeficiency Virus and Acquired Immunodeficiency Syndrome

HIV/AIDS is one of the most commonly known immune deficiency disorders. When first identified in 1981, HIV/AIDS was a fatal disease, and the only treatments available were comfort measures and hospice care for several years. Today, there is still no cure, but there are now close to 40 U.S. Food and Drug Administration (FDA)-approved medications for treating HIV/AIDS. If HIV-positive patients are compliant with their HIV treatment, including routine testing to monitor overall health status and managing the effects of this chronic disease, it can be controlled and a good quality of life can be maintained ([Figure 11-1](#)).

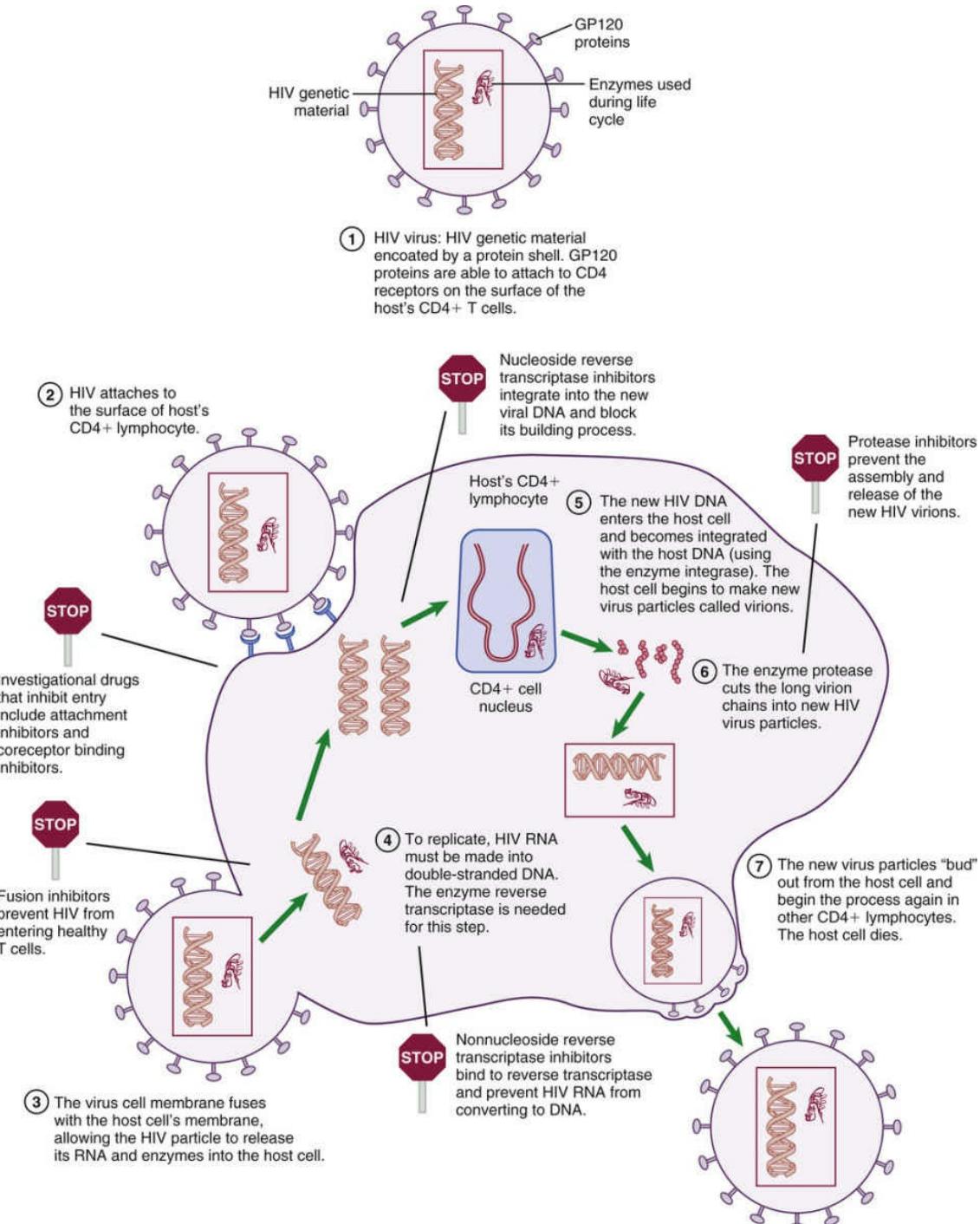


FIGURE 11-1 The steps in the life cycle of HIV and the effects of medications. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Elsevier Saunders.)

There are two forms of HIV infection. HIV-1 is the most common cause in the United States, Europe, and Asia. HIV-2 is widespread in western Africa. Research shows that HIV-2 spreads at a lower rate, has a lower plasma viral load, and takes longer to incubate, and individuals with this strain have a lesser risk of developing AIDS (AIDS Education and Training Center). Laboratory criteria can recognize recent (occurring within the past 5 months) or long-standing HIV infection (CDC, 2015). (See Evolve for the classification system for HIV.)

Clinical Cues

A person with AIDS also has HIV; however, a person with HIV does not necessarily have AIDS.

Pathophysiology

HIV-1 and HIV-2 are retroviruses that have only ribonucleic acid (RNA) as their genetic material. A **retrovirus** differs from other viruses because of an enzyme called **reverse transcriptase**, which helps the virus **replicate** (reproduce) and place its genetic material in the deoxyribonucleic acid (DNA) of the host cell. The resulting new DNA continues the process of replication and produces as many as 2 billion viral particles a day that are released from the host cell into the circulatory system, infecting other cells in the body.

In a healthy immune system, the T cells that have the protein CD4 on their surface are known as *CD4 positive (CD4+)* and as *T-helper cells*. Normally CD4+ T cells activate B cells, natural killer cells, and phagocytes. These cells participate in both cellular and humoral immunity. HIV primarily attaches to the CD4 cell wall receptors found on lymphocytes and some monocytes. The virus must go through several stages (**Table 11-2**) before it can effectively infect a host cell. Once infected with HIV, the host cell and the ability of the cell-mediated immune response is seriously impaired. Once the infection occurs in the CD4 lymphocytes and produces HIV, the CD4 cell itself dies. Overall, detection in the infected person's blood takes around 10 days for HIV-RNA and 25 days for HIV antibodies.

Table 11-2

Life Cycle of Human Immunodeficiency Virus

STAGE	ACTION
Viral attachment	Virus binds to envelope protein of T cells or CD4 molecules, causing virus to fuse to host cell. HIV-1 injects proteins into the target T-cell cytoplasm.
Uncoating	Protective coating surrounding cell is dissolved, and genetic material is used to reproduce the virus.
Reverse transcription	Single-stranded RNA is transcribed into double-stranded DNA with the help of the enzyme reverse transcriptase. This phase is very error-prone and can lead to mutations.
Integration	The new DNA inserts into the cell nucleus.
Viral latency	Virus has to wait for more protein building blocks to be formed by the cells to complete the reproductive process.
Final assembly	Viral protein production is activated, and T cells are modified by HIV-1 protease.
Budding	With its genetic material tucked away and a new outer coat made from the host CD4 cell's membrane, the newly formed HIV pinches off and enters into circulation, ready to start the whole process again.

An individual infected with HIV becomes more prone to **opportunistic infections (OIs)**, including those derived from normal flora found in the body (see **Chapter 6**). **Suppression** or inhibition of the immune response as a result of HIV infection is the cause of AIDS. The diagnosis of AIDS is usually made when an HIV-infected patient's CD4 T-lymphocyte count is less than 200 cells/ μ L or when a specific OI is diagnosed.

Transmission

Research has shown that HIV cannot be transmitted by casual contact, routine nursing care (which includes following Standard Precautions), or by household contact. The **only** mode of transmission is by exposure to HIV-infected blood, body fluids, or tissue (**Box 11-4**). Any break in skin or mucous membranes is an entry portal for HIV. The highest risks for becoming infected with HIV are having unprotected sex (oral, vaginal, or anal), sharing needles and syringes with an HIV-infected person, and maternal-fetal exposure.

Box 11-4

Additional Modes of Human Immunodeficiency Virus Exposure

- Percutaneous exposure through an open-bore needle stick with an HIV-contaminated needle
- Not using a latex condom or dental dam during sexual intercourse or activity
- Maternal transmission, referred to as vertical transmission, to an infant through vaginal delivery or breast milk
- Receiving a transfusion of HIV-infected blood or blood products
- Receiving an organ transplant from an HIV-positive person

A CDC report in 2012 stated that more than 1.1 million people in the United States are living with HIV infection and that 1 in 6 are unaware they are infected. Over the past decade, an increasing number of people are surviving with HIV, and the annual number of newly diagnosed cases has remained at around 50,000. In a CDC report looking at data for 2010, the largest proportion of new cases (78%) was found in men who have sex with men (known as MSM). The second highest rate (25%) of new HIV-positive cases was found in the heterosexual population, especially among those involved in the high-risk behaviors (CDC, 2012). The increased numbers of heterosexual cases may be from bisexual MSM engaging in unprotected sex with female partners. Participating in anal intercourse unprotected (no form of barrier precaution such as a latex condom) with an HIV-positive partner increases the risk of exposure because of the microscopic tears that occur in the lining of the anus (a lining that is thinner than the vaginal walls) during sex.

Exposure Prophylaxis

Pre-Exposure

In 2012, the FDA approved the use of Truvada (tenofovir disoproxil fumarate [TDF] 300 mg) and emtricitabine (FTC 200 mg) in combination with safer sex practices for pre-exposure prophylaxis (PrEP). Daily oral PrEP has been shown to be safe and effective in reducing the risk of acquisition for HIV-1. Reducing the possibility of HIV infection with its resulting morbidity, mortality, and cost to individuals and society is the primary goal of PrEP. Therefore PrEP is recommended for at-risk individuals such as sexually active adult MSM, a non-HIV-infected sexual partner, and illicit drug injection users (IDU). Before starting PrEP, acute and chronic HIV infection must be excluded by symptom history and HIV testing (Box 11-5). HIV status should be assessed every 3 months while taking PrEP to determine the feasibility of continuing this form of preventive therapy. Patients should be taught that a prescription of oral PrEP is to be taken daily and not just coitally timed or taken intermittently.

Box 11-5

Tests for Human Immunodeficiency Virus

- Rapid HIV antibody test
- Can use blood, saliva, or urine.
- Results available within 10 to 20 minutes.
- If positive, must be confirmed by Western blot (WB) test.
- Enzyme-linked immunosorbent assay (ELISA), a type of enzyme immunoassay (EIA)*
- Can use blood, saliva, or urine.
- If positive, must be confirmed by WB test.
- Antibody assays do not detect HIV antibody in the earliest stages of the infection. (HIV antibody may be detected normally from 2 weeks to 6 months after the acute infection.)
- False-positive ELISA may be seen in the presence of maternal antibodies.

- Sensitivity: 98%.
- WB test*
- Normal value: Negative.
- HIV-antibody test used to confirm a positive rapid HIV and ELISA.
- Can take up to 2 weeks to obtain results.
- False-positive WB may be seen in the presence of maternal antibodies.
- Polymerase chain reaction (PCR)
 - Can detect HIV in blood within 2 to 3 weeks of infection
 - Also used to determine viral load
 - Used to confirm whether an infant born to an HIV-positive mother is also positive for HIV.
- Sensitivity: 100%.
- Immunofluorescent antibody assay (IFA)
- Normal value: Negative.
- Sensitivity: 99.8%.
- CD4 cell count†
 - Normal value: 500 to 1500 cells/ μL .
 - Values below 350 cells/ μL prompt treatment.
 - Values below 200 cells/ μL , if accompanied by opportunistic infection, confirm diagnosis of AIDS.

*Test is not able to differentiate between HIV-1 or HIV-2.

†Not an HIV test; used to monitor immune system function.

Postexposure

Research has also found that postexposure prophylaxis (PEP) is more likely to be effective when the exposure is a single episode, such as unprotected sex (not using a latex condom) with an HIV-

positive partner, and the PEP is initiated less than 72 hours after exposure. PEP is not appropriate for cases of multiple unprotected sexual exposures or frequent IDU.

Health Promotion

People who take antiretroviral medications and have unprotected sex or who share needles and syringes with IDUs increase the risk of spreading the drug-resistant strains of HIV. Different factors can increase or decrease transmission risk. For example, taking antiretroviral therapy (i.e., medicines for HIV infection) can reduce the risk of an HIV-infected person transmitting the infection to another by as much as 96%, and consistent use of condoms reduces the risk of getting or transmitting HIV by about 80%. Using both condoms and antiretroviral therapy reduces the risk of HIV acquisition from sexual exposure by 99.2% ([Cohen et al, 2011](#)).

Safe Sexual Practices

Barrier protection must be practiced with every sexual encounter to prevent transmission of HIV or other infectious diseases. Latex condoms are more impermeable than other types of condoms. Polyurethane and deproteinized latex condoms are available for those allergic to latex. Condoms should not be stored in wallets, glove compartments, or hot or sunny areas, because the temperature will degrade the integrity of the condom material. Lambskin condoms help prevent pregnancy but may allow the virus to seep through; therefore they do not prevent transmission of HIV. Spermicides may help in preventing pregnancy, but they may cause tissue irritation and thereby increase the risk of injury to the mucous membranes. **The only guaranteed way to prevent sexual transmission of HIV is through abstinence.**

Another unsafe practice is orogenital (fellatio or cunnilingus) or oroanal (rimming) stimulation without a barrier (dental dam). Direct contact with any body fluids, such as semen or vaginal secretions and blood, must be avoided when the partner has HIV. There is no reason for HIV-infected individuals to completely discontinue sexual activity. Touch and various forms of intimacy are important parts of any relationship. However, there is a need to reduce the risk of transmitting the virus to others and to prevent exposure to other sexually transmitted infections, because additional infection is more difficult to treat when the immune system is compromised by HIV. It is important to note that if two people with HIV have sex with each other, condoms should still be used, because one partner may have a drug-resistant strain of HIV and can transmit that resistance to his or her partner, thereby increasing the risk of failed drug therapy for the partner's HIV infection.

Blood Products

For more than 30 years, all blood, blood products, and prospective organ donors have been screened for blood-borne pathogens such as hepatitis and HIV. According to the [CDC \(2010\)](#), the current risk of contracting HIV from receiving a blood transfusion, blood products, or a donated organ or tissue is extremely small, about 1 in 1.5 million.

Vaccine Development

HIV mutates rapidly, and countless mutations have been found, making it difficult to develop an effective vaccine against HIV ([CDC, 2010](#)). Mutations are found in newly infected as well as chronically infected individuals.

Prevention Through Education

Providing basic understandable information helps to dispel the myths and fears associated with HIV/AIDS, and assessing for high-risk behaviors helps develop and implement individualized education. A nurse can contribute to the prevention of HIV/AIDS by obtaining accurate facts and by educating others—patients, colleagues, and the community—about individual roles in helping to prevent the spread of HIV as stated in the *Healthy People 2020* objectives (<https://www.healthypeople.gov>).

Cultural Considerations

Human Immunodeficiency Virus and Minorities in the United States

HIV reporting in the United States indicates that more than 74% of new HIV infections occur among minorities, specifically African Americans and Hispanics (CDC, 2012). Several factors may contribute to the increased incidence of HIV/AIDS among minority groups:

- Lack of culturally sensitive and high-quality information about HIV risk and prevention
- Socioeconomic status and limited access to health care
- Health beliefs concerning sexual practices, roles of women, the value of children, and HIV treatment
- The cost of highly active antiretroviral therapy (HAART)

Data from <http://www.cdc.gov/hiv/basics/index.html>.

Signs and Symptoms

A person's preexisting health status influences the length of time needed for the humoral (antibody-mediated) and cellular (cell-mediated) immune responses to lodge a defense against HIV. HIV has variable clinical presentations and latent periods without obvious symptoms. Often, the initial signs and symptoms of infection are similar to flu: fever, fatigue, diarrhea, and loss of appetite. These symptoms may be ignored until the immune system begins to fail, as evidenced by the appearance of symptoms related to **sentinel infections** (opportunistic infections that indicate immunosuppression), such as oral thrush, recurrent infections, skin disorders, night sweats, swollen lymph glands, and significant unintended weight loss. It is typically at this point that the person seeks health care.

Diagnosis

Testing is available through a health care provider, local public health clinic, community agency, or by home test kit (Box 11-5). Currently, only two FDA-approved home testing kits are available in the United States. They are the Home Access HIV-1 Test System and OraQuick In-Home HIV. These kits allow a person to anonymously perform the test and obtain the results in their own home. Follow-up with a health care provider is strongly recommended, **regardless** of the test result.

The most common confirmatory test used in a clinical laboratory setting for any positive rapid HIV test is the enzyme-linked immunosorbent assay (ELISA). A positive HIV ELISA test is usually confirmed by performing a Western blot (WB) HIV gene sequence test. The patient may also require other tests for concurrent hepatitis or sexually transmitted infections.

It is estimated that 25% of HIV-infected patients are unaware of their infection and thus may be unintentionally infecting others (CDC, 2013). This is why it is recommended that any sexually active person between ages 13 and 64 be offered HIV testing at the time of a complete physical examination. It is no longer necessary to get specific consent for HIV testing or perform pretest and post-test HIV counseling in most states; however, it is important for the nurse to be familiar with state or local HIV testing requirements. The results of HIV antibody tests are confidential patient information and are HIPAA protected. If the patient elects to "opt out" of HIV testing, a note about the declination should be documented in the clinical record.

Management of Human Immunodeficiency Virus Infection

When an individual is confirmed to have HIV, a comprehensive history and physical examination for health status should be conducted, including additional baseline laboratory and diagnostic studies (Table 11-3). A CD4 lymphocyte count should be performed. If the count is less than 350 cells/mm³, it is recommended that the patient initiate antiretroviral therapy (ART) and prophylaxis for OIs.

Table 11-3

Additional Laboratory and Diagnostic Studies for Patients Newly Diagnosed With Human Immunodeficiency Virus*

LABORATORY/DIAGNOSTIC STUDY	PURPOSE
HIV antibody confirmatory study	Confirms diagnosis of HIV
CD4 count (reported as cells/ μ L)	Identifies what stage of HIV infection patient may be in; determines when to start antiretroviral therapy (ART) and prophylactic therapy for OIs; should be obtained every few months to assess immune and/or therapeutic response and evaluate need for starting ART
Quantitative plasma HIV-RNA level (viral load, reported as copies/mL)	Estimates level of HIV replication; helps determine need for starting or effect of ART and whether it needs adjustment
Drug resistance test (genotype: mutations; phenotype: viral replication)	Determines which ART will be most effective; prevents further development of drug-resistant strains of HIV; should be done as early as possible
Complete blood cell (CBC) count	Assesses for anemia, leukopenia, and thrombocytopenia; certain ARTs may be less effective if any of these are present
Comprehensive chemistry panel (includes electrolytes, BUN/creatinine, liver enzymes, cholesterol, triglycerides, glucose)	Determines baseline kidney and liver function, as well as lipid profile; results can be used to determine potential for complications with proposed ART
Sexually transmitted infections	Establishes whether treatment is needed
<i>Toxoplasma gondii</i> IgG	Detects prior exposure; if positive in the newly diagnosed, patient is at increased risk of developing CNS difficulties when CD level is <100 μ L
Hepatitis A, B, C	Determines prior exposure to hepatitis and also indicates need for vaccination against hepatitis A and B

*Additional testing may also include tuberculosis, PAP and pregnancy tests for women and prostate-specific antigen level and prostate examination for men, cytomegalovirus antibody screening, varicella IgG test, and eye examination along with routine health maintenance examinations based on the age of the patient.

BUN, Blood urea nitrogen; CNS, central nervous system; IgG, immunoglobulin G; OIs, opportunistic infections.

Adapted from UDHHS/HRSA: HIV/AIDS Bureau: *Guide for HIV/AIDS clinical care*, 2014.

Choice of optimal therapy is based on clinical data and individual factors, such as past health status, medication history, quality-of-life issues, and patient expectations of therapy. The World Health Organization (WHO) has established standard criteria for staging HIV infection (see Evolve).⑩ Genotyping or phenotyping blood tests to detect a drug-resistant strain of HIV are strongly recommended before starting drug therapy. Certain viral subtypes have a higher likelihood of developing drug resistance than others, and patients with these types may require closer monitoring.

The most effective current treatment is highly active antiretroviral therapy (HAART), a combination of available drugs recommended for HIV. This therapy is also effective against other conditions common to HIV/AIDS. OIs are treated with drugs specific to their cause, and sometimes antimicrobials are given to prevent infection. Table 11-4 presents the current classes of antiretroviral medications with select nursing implications and side effects. Regardless of the medications prescribed, it must be stressed that the more compliant the patient is with the proposed treatment regimen, the less likely he is to experience OIs.

Table 11-4

Antiretroviral Drugs Commonly Used to Treat HIV/AIDS

CLASSIFICATION	ACTION	NURSING IMPLICATIONS AND SIDE EFFECTS*
Nucleoside reverse transcriptase inhibitors (NRTIs)	Block conversion from RNA to DNA, thus preventing HIV genetic material from entering host cells	Monitor hepatic and renal function, complete blood cell count. Assess for signs of abdominal pain, nausea, vomiting, dizziness, neuropathy, difficulty in vision, hearing, touch, and balance. If sore throat, fatigue, shortness of breath, or flulike symptoms occur, drug class may need to be modified or discontinued completely.
Nonnucleoside reverse transcriptase inhibitors (NNRTIs)	Act by binding to and disabling reverse transcriptase, a protein that is needed for replication of HIV	Monitor renal and hepatic function and, if on anticoagulants, coagulation levels. Monitor for headaches, dysphoria, dizziness, insomnia, and nightmares. Diarrhea occurs in some patients. Contraindicated in pregnancy.
Protease inhibitors (PIs)	Work at the last stage of the viral reproduction cycle by preventing the virus from maturing and causing the release of immature viruses, which are then unable to infect other host cells	Monitor serum lipid levels, glucose, bilirubin levels. Cause a higher incidence of nephrolithiasis. Most must be given with food, and adequate hydration is required.
Fusion inhibitors	Block HIV from entering the CD4 cells of immune system	Must rotate injection sites because of local irritation. Associated with a higher risk of pneumonia.
Entry Inhibitors	Block proteins on CD4 cells	Associated with a higher incidence of hepatotoxicity, severe rash, and systemic allergic reaction.
Integrase inhibitor	Block the integrase enzyme needed for HIV to make copies of itself	Monitor hepatic function. Can cause life-threatening and fatal skin reactions.
Combination HIV medications	Block virus from binding, fusing, and entering into CD4 cells	Usually given to patients with a higher risk of drug resistance.
Coreceptor antagonist		Assess for headaches, nausea, vomiting, and skin rash.

*Refer to current drug reference materials for drugs prescribed and review side effects and patient teaching recommendations.

Adapted from UDHHS: HIV/AIDS Bureau: *Guide for HIV/AIDS clinical care*, 2014. For the most current recommendations, visit the AIDS Education Training Center (AETC) website: <http://www.aidsetc.org/resource/hrsa-guide-hiv-aids-clinical-care>.

As the disease progresses, many patients with HIV/AIDS and/or chronic conditions become too ill to work. It is estimated that drug therapy and laboratory testing for HIV/AIDS combined costs at least \$25,000 a year per patient and well over \$367,134 if a patient lives with HIV/AIDS for 20 years or more. The cost savings in 2009 from prevention programs were \$129.9 million, with at least 361,878 HIV infections averted (CDC, 2013a).

Think Critically

How would you go about helping a patient who has HIV find a way to afford the medications needed to control the disease?

Complications

Opportunistic Infections

OIs are diseases caused by microorganisms commonly present in the environment or the body that only cause disease when there is a weakening or suppression of the immune system. They are caused by many types of organisms: virus, bacteria, fungi, parasites, and even protozoa. OIs are often the hallmark of a transition from HIV infection to AIDS (Table 11-5). Each OI is treated with specific medication. With the increased effectiveness of HAART therapy for HIV patients, the incidence of OIs has decreased (Masur, 2012).

Table 11-5

Opportunistic Infections that Occur With Human Immunodeficiency Virus Infection

ORGANISM OR DISEASE	MANIFESTATIONS
Herpes simplex types 1 and 2	Type 1: vesicles and ulcerations on lips, oral membranes, and eye and possible meningitis; type 2: genital and/or perianal vesicles and ulcerations
Varicella-zoster (chickenpox virus)	Vesicles along dermatomes (nerve tracts); "shingles" with itching and burning pain, low-grade fever
Cytomegalovirus	Retinitis; esophagitis; stomatitis; gastritis with diarrhea, cramps, anorexia, and weight loss
Hepatitis B and C	Often no symptoms; jaundice, dark urine, abdominal pain, loss of appetite, nausea, vomiting, joint pain
Mycobacterium tuberculosis	Respiratory and CNS, bone, skin, GI tract, liver, and spleen; productive cough, fever, night sweats, weight loss
Mycobacterium avian complex (MAC)	Respiratory and GI tract; other systems may be affected; nonproductive cough, fever, malaise, fatigue
Cryptococcosis	Fungal meningitis, fever, headache, seizures, motor dysfunction, altered mental status
Histoplasmosis	Fever, pneumonia, lymphadenopathy, weight loss, CNS symptoms
Coccidiomycosis (Valley fever)	Pulmonary infection, fever, purulent sputum, rash
Candidiasis	Thrush; esophagitis; vaginitis; yellow patches in mouth, GI tract, and vagina
<i>Pneumocystis jiroveci</i> (formerly <i>P. carinii</i> , PCP)	Nonproductive cough, shortness of breath, fever, malaise, night sweats, fatigue, weight loss
Toxoplasmosis	Flulike symptoms, inflammatory response
Cryptosporidiosis	Gastroenteritis, dehydration, malnutrition, debilitation

CNS, Central nervous system; GI, gastrointestinal.

Wasting Syndrome

Wasting syndrome is defined as losing more than 10% of weight along with at least 30 days of either diarrhea or weakness accompanied by fever. There is loss of body fat and muscle mass. This syndrome has a strong correlation to progression of AIDS and typically leads to death. Contributing factors include decreased appetite, the inability to absorb nutrients through the small intestines because of diarrhea, and an altered metabolism that may be associated with hormone levels.

Neoplasms

Kaposi sarcoma.

Kaposi sarcoma (KS) is one of the most common causes of malignancy in HIV-positive people and is more common in HIV-infected men than women and in African American men than in whites (American Cancer Society, 2013). KS is caused by the human herpesvirus type 8. KS does not usually cause death. KS appears as discolored areas on the skin but can also form inside the mouth, lungs, and intestines (Figure 11-2). The skin discoloration may range from pink to red or purple. The lesions tend to darken over time. In people with olive or black skin, the lesions may appear dark brown or black. The discoloration is caused by the formation of many tiny blood vessels and cancer cells under the skin.



FIGURE 11-2 Kaposi sarcoma. (From Van Meter KC, Hubert RJ: *Gould's pathophysiology for health professions*, ed. 5, Philadelphia, 2015, Elsevier Saunders.)

HAART has been shown to halt or even eliminate the progression of skin lesions in some individuals and has decreased the incidence of KS. Skin lesions can be concurrently treated with liquid nitrogen, surgical removal, or injection with anticancer drugs. Low-dose radiation therapy is used for small skin lesions. Larger doses are required for internal organs and lymph node involvement. Radiation treatment can reduce the size of tumors near lymph nodes; this improves lymph flow and decreases lymphedema (see Chapter 38). If KS has spread into internal organs and HAART treatment is insufficient, chemotherapy or immunotherapy is used.

Lymphomas.

Lymphomas are tumors of the tissues and cells of the lymphatic system. Non-Hodgkin lymphoma (NHL) is the most common lymphoma in people with HIV/AIDS. Most cases of NHL in these patients are large B-cell lymphomas and have an approximate 2-year mortality rate. HAART therapy appears to slow its progression; however, death is the outcome in a large percentage of cases (Quinn, 2011).

Neurologic Complications

HIV encephalopathy and AIDS dementia may occur at any point in the disease process. In some individuals it may be the only symptom. The neurologic signs and symptoms displayed could arise from the progression of the virus or they could be a result of opportunistic infections, tumors, or drug-related complications. The symptoms have a very subtle beginning and are difficult to differentiate from depression, Parkinson disease, and Alzheimer disease.

Treatment with HAART appears to be the most effective intervention by targeting the primary cause of the problem. Nursing interventions focus on preventing the individual from doing harm to self or to others and ensuring that daily needs are being met.

❖Nursing Management

■ Assessment (Data Collection)

The assessment should include a review of signs and symptoms; functional level (ability to perform activities of daily living [ADLs]); safety; self-care abilities; support systems; financial status; risk behaviors; living environment; and understanding of disease process, transmission, and therapeutic regimen. The assessment of the functional level is an ongoing assessment using a tool such as the Karnofsky Performance Scale (see the Evolve website). 

History and Physical Assessment

The history should include a general assessment of the patient's past and present status. Previous history of HIV testing, such as blood donations or military service, might be important for determining the timing of HIV infection. Current prescription medications and treatments should be documented, and documentation should include whether the patient is on any experimental, herbal, immune complex boosting agents or other complementary and alternative therapies. If the patient has been HIV positive for some time, it is important to obtain a history of OIs. Ask if there is any history of respiratory illnesses that increase risk for current problems, such as bacterial or opportunistic pneumonia, chronic obstructive pulmonary disease, or asthma. Assess for smoking

history. Determine whether the patient has been tested for *Mycobacterium tuberculosis* (MTb)—if so, when, and what were the results? The neurologic history should include questions about pain or numbness in the extremities and changes in mental status (because HIV/AIDS can cause serious neurologic changes as the disease progresses). A sexual history is needed to ascertain risk behaviors such as multiple sexual partners, possible exposure to other sexually transmitted infections, and a history of substance use to determine the risk of transmission. Discussing notification of sexual or needle-sharing partners is essential.

A complete head-to-toe physical assessment should be performed.

Focused Assessment

Data Collection for Patient With Human Immunodeficiency Virus

First gather a general health history, then:

- Obtain height and weight; note any loss from usual weight.
- Obtain vital signs. Assess for hypotension, orthostatic hypotension, and fever.
- Determine level of consciousness, orientation to time and place, cognition, and concentration ability.
- Assess for visual changes.
- Assess mouth condition and presence of any lesions.
- Determine whether there has been a change in eating pattern.
- Evaluate ability to swallow.
- Determine presence of nausea, vomiting, or diarrhea. If diarrhea is present, note the volume, quantity, and duration.
- Check lymph nodes for any swelling or hardness.
- Assess for dehydration and electrolyte imbalances.
- Auscultate the heart.
- Assess quality of respirations; auscultate breath sounds.
- Determine character of the cough and sputum if cough is present.
- Assess condition of skin and mucous membranes.
- Assess for peripheral and periorbital edema and lymphedema.
- Identify any psychosocial issues that may complicate or enhance care.

When there is considerable weight loss, referral to a nutritionist or dietitian and providing written materials, such as how to plan a nutritious balanced diet using the USDA Choose My Plate (available at <http://www.choosemyplate.gov/>), can also be helpful. Changes in nutritional status could be caused by nausea, vomiting, or diarrhea related to the HAART regimen.

Psychosocial History

The psychosocial assessment should include a history of interpersonal relationships, educational level, and career information. It is important to determine whether the patient has told his family of his HIV status. Examples of questions to ask include: Have you experienced multiple losses, such as your job, house, or partner? What is your living situation? Do you live with someone who is

helpful? Referrals (such as community-based AIDS organizations) are needed if the patient does not have a support network.

Think Critically

A diagnosis of HIV affects a person's self-concept. How could you help a patient to voice his feelings about the diagnosis and find an effective means to cope with the disease?

Table 11-6 identifies common patient nursing problems, expected outcomes, and interventions that may be associated with systemic, psychosocial, or specific body system responses to HIV/AIDS.

Table 11-6

Problem Statements and Interventions for a Patient With Immune Deficiency or Autoimmune Disorder

PROBLEM STATEMENT	EXPECTED OUTCOMES	NURSING INTERVENTIONS
Potential for infection due to depressed immune function	Patient will exhibit no signs of infection; normal temperature.	Monitor body temperature daily. Monitor for outward signs of infections and for symptoms of opportunistic infection. Assess for signs of dehydration and altered mental status.
Altered gas exchange due to excessive lung secretions and shallow breathing	Patient's oxygenation will improve to within baseline levels within 3 wk of beginning treatment.	Encourage deep breathing and coughing as indicated. Conserve strength and oxygen by assisting with activities of daily living. Position patient to allow for maximum chest expansion. Monitor breathing patterns and breath sounds q4h. Provide supplemental oxygen as ordered. Monitor blood gases as ordered. Suction airway PRN as ordered.
Altered skin integrity due to multiple areas of skin abrasion and dehydration	No further areas of skin breakdown will occur. Areas of abrasion will heal within 2 wk.	Assess skin status q4h; assess for areas of excoriation, lesions, rashes, and discoloration. Report changes from baseline findings. Change linens as needed if diaphoresis or incontinence is present to keep skin clean and dry. Use elbow and heel protectors and special mattress if patient is bedridden. Encourage adequate fluid intake per physical status. Monitor intake and output. Assess for signs of dehydration or fluid overload/edema q4h.
Altered nutrition due to eating and swallowing difficulties	Patient will not experience further weight loss.	Assess patient's ability to take in food, chew, and swallow. Monitor weight twice a week. Record input and output. Administer antiemetics as ordered. Assess the availability of food within living situation. Assess ability of caregiver to meet patient's nutritional needs. Administer dietary supplements if required.
Pain due to pressure on nerves and discomfort from peripheral neuropathy	Pain will be controlled within tolerable levels within 4 days.	Assess pain level and patient's methods to relieve it. Relieve causes of pain by correcting underlying condition if possible. Administer pain medications as ordered; assess amount of relief provided by medication; if relief is not adequate, consult with provider for more effective protocol for pain relief; explore use of NSAIDs and antidepressant medications for pain relief in conjunction with other analgesics. Implement adjunctive therapies to assist with pain relief: massage, cold or hot applications, repositioning, distraction, meditation, imagery. Teach relaxation techniques.
Altered activity tolerance	Level of activity intolerance will improve within 1 mo.	Encourage periods of rest alternated with periods of activity; plan activities according to usual stamina levels; change schedule of activities as degree of fatigue indicates need; assist with activities of daily living as needed to conserve energy.
Limited coping ability due to diagnosis of life-threatening illness, fatigue, and anxiety	Patient will exhibit usual effective coping techniques to meet challenges of the illness.	Establish rapport with the patient, the partner, and family. Assess past methods of effective coping. Assess patient's strengths. Schedule activities that may cause stress when the patient is most rested or has support person available. Review effective methods for problem solving.
Inability for self-care due to fatigue, deterioration of physical condition, mental changes, and neurologic impairment	Patient will accomplish as many activities of daily living as possible without undue fatigue. Patient will accept assistance with activities of daily living within 2 wk.	Assess ability to perform own activities of daily living. Provide assistance for activities the patient is unable to perform. Refer to occupational and physical therapy for assistive devices and home equipment needed. Instruct significant other and family members how to assist with activities of daily living.

NSAIDs, Nonsteroidal anti-inflammatory drugs; PRN, as needed.

Planning

An HIV-positive patient can have significant issues related to finance, employment, housing, mental health, substance abuse, or other medical problems. HIV care is usually performed in an outpatient clinical setting, and the health care team may include the patient, nurses, health care providers, dietitian, pharmacist, case manager, and primary caregiver at home. Information related to the patient's social and economic status is critical for the team to develop and implement a successful treatment plan. The patient's ability to participate in the delivery of the plan of care must be periodically reassessed. If the patient is able to have a role in decisions and adjustments to the treatment plan, it increases the likelihood of compliance. The major nursing goals are listed in Box 11-6.

Box 11-6

Major Nursing Goals for Adults With Human

Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

- Prevent secondary bacterial, viral, and fungal infections.
- Prevent wasting resulting from malnutrition.
- Maintain or improve the present level of immune function.
- Maintain adequate social functioning.
- Maintain or improve current mental status.

Instruct the patient on how to take the medication and which medications should be taken with or without food. By consistently taking antimicrobials and antiretroviral medications as ordered, less resistance to the drugs occurs, and the effectiveness of the drugs is thus prolonged.

Encourage social interaction and independence in activities as tolerated. Support groups can boost feelings of self-esteem and self-worth. Social interaction may reduce situational depression and can empower the patient. Promoting a positive attitude may reduce feelings of powerlessness. Referral to community-based AIDS organizations is appropriate, with the patient's consent.

■ Nutrition Considerations

Improving Food Intake for a Patient With Acquired Immunodeficiency Syndrome

Encourage the following measures:

- Eat small amounts frequently.
- Eat high-calorie snacks or commercially available liquid supplements or "power" bars.
- Eat foods at room temperature.
- Soften dry grain foods such as breads, crackers, and cookies in milk before eating them.
- Eat nonabrasive foods that are easy to swallow such as pasta, well-cooked eggs, baked fish, soft cheese, pudding, and ice cream.
- Suck on ice pops to numb or soothe mouth pain.

The patient should avoid:

- Raw fruits and vegetables, unless they are thoroughly washed.
- Spicy, acidic, or salty foods.
- Alcoholic and carbonated beverages.
- Excessively hot food.

■ Implementation

In accordance with the CDC, Standard Precautions must be consistently used when caring for all patients (see [Chapter 6](#) and [Appendix B](#)). Hand hygiene is critical for health care providers, the patient, and the family to prevent secondary infections. Role modeling and teaching about the importance of hand hygiene happens during routine care. You must also teach about decreasing infection risk in the home setting.

■ Evaluation

A patient's expectations may not be the same as those of the health care team or the primary caregivers, so when outcomes are evaluated, variations in expectations should be addressed by all of those involved. Monitoring laboratory tests to determine immune status, viral load, blood cell status, and effects of medications is a large part of the evaluation process.

Human Immunodeficiency Virus Risk in Patients Older than 50 Years

The life expectancy in the United States has increased to greater than 78.74 years ([CDC, National Center for Health Statistics, 2013](#)). By 2015, it is estimated that more than half of the people with HIV in the United States will be older than 50 years and 17% of all new HIV/AIDS cases are in this population ([CDC, 2013b](#)). The media tend to report more on younger populations with HIV/AIDS, including MSM, transgendered individuals, the homeless, and IV drug users. Many older adults are single because of divorce or death of a spouse or partner. A persistent myth is that older adults are no longer interested in sex. Because pregnancy is not a consideration, condoms are typically not used as they should be. Also, erectile dysfunction medications allow sexual activity for longer periods in many men.

Many older adults are not aware of the risks, but old age is no barrier to becoming infected with HIV. The primary modes of transmission in adults older than 50 years are through heterosexual contact and sharing of contaminated needles among IV drug users. An older adult may ignore symptoms because of a belief that they are a normal part of aging. By the time an older at-risk adult is actually diagnosed, the survival rate is markedly less than that of a younger person. This is probably because of comorbidities (simultaneous presence of two chronic diseases or conditions in a patient) common to the older population. Skin and mucous membranes are more fragile in the older adult, possibly making transmission easier. Menopausal women are more vulnerable to HIV infection from sexual transmission, because decreased estrogen levels cause thinning and decreased lubrication in the vagina. In the older population, the virus is also spread more easily because of the thinning and microscopic tearing of the anal mucosa. Educate and encourage this age group about the need for HIV testing in **both** partners before entering into a new sexual relationship, along with recommendations to use barrier techniques.

Older Adult Care Points

New diagnoses of HIV infection are growing faster among adults older than 50 than among those younger than 50 years. All sexually active adults should be assessed for at-risk behaviors, regardless of their age. Age-specific referrals to a geriatric nurse practitioner or counselor with experience working with older adults may also be appropriate.

Community Education and Care

All nurses should be alert to the possibility of transmission of HIV and the methods of prevention and should share this information with at-risk populations. Patients and their partners, families, and friends should all be included in the educational opportunities.

Human Immunodeficiency Virus Confidentiality and Disclosure Issues

When a patient signs a form to release medical information, the form must also state whether the patient wants his HIV/AIDS diagnosis and treatment information released. If protected health information (PHI) is released without following Health Insurance Portability and Accountability Act (HIPAA) guidelines, a lawsuit and even loss of the nursing license may be the penalty for a nurse who is indiscreet and discloses PHI without specific patient authorization. For the patient, the consequences may be the loss of a job, housing, or insurance benefits and possible discrimination and rejection by families and friends.

■ Legal and Ethical Considerations

Confidentiality and Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

The diagnosis of HIV/AIDS is a medical diagnosis and can be discussed among health care personnel like any other medical diagnosis for the purpose of rendering care to the patient and does not require a patient's consent. The right to disclose HIV status is regulated by the state in which you are working, but all states do require the reporting of new HIV/AIDS cases for public health statistical tracking. It is important for every licensed nurse to be aware of the state regulations and institutional policies. It is always preferable for the patient to disclose diagnostic information and HIV status to the family. If the patient has given permission (preferably in writing), the family can be informed about the health status and what progress or lack of progress is occurring.

■ Legal and Ethical Considerations

When a Nurse Has Human Immunodeficiency Virus

If a health care worker is HIV positive, there is a risk of transmitting the virus to others. What are the ethical, moral, and legal responsibilities to patients in such a situation?

Blood-Borne Pathogen Exposure and Health Care Workers

The CDC and the Occupational Safety and Health Administration (OSHA), along with other health care agencies, have developed evidence-based guidelines to prevent exposure to blood, body fluids, and other potentially infectious microorganisms (OPIM) (see [Box 6-4](#)). If the health care worker correctly follows these guidelines, the risk of being exposed is markedly reduced.

■ Safety Alert

Possible Exposure to Human Immunodeficiency Virus

After an unintended exposure to the blood or body fluids of a person who either is HIV positive or whose HIV status is unknown, the need for PEP must be assessed within 2 hours. Exposure can be from a large-bore needle stick, significant mucosal contact with body fluids, or contact with body fluids via a break in the skin. The facility's Infection Preventionist or employee health office should

be notified of the exposure. Two- or three-drug therapy, depending on the degree of determined risk, may be initiated as soon as possible after the exposure event. The drugs used are from different drug classes (nucleoside reverse transcriptase inhibitors, nonnucleoside reverse transcriptase inhibitors, or protease inhibitors). The medications may need to be taken until HIV status from the source patient has been determined; if the patient is known to be HIV positive, the drugs should be taken for 4 to 6 weeks. If PEP is indicated, the nurse may be unable to work for the first few weeks while taking the medications because of the significant side effects (i.e., headaches, nausea, vomiting, and diarrhea).

Autoimmune Disorders

Autoimmune disorders are caused by the immune system reacting against the body's own cells. The three categories of autoimmune disorders are classified according to how extensively the disorder affects body tissues: (1) **local**, which affects only a single organ or tissue; (2) **systemic**, which affect many organs or tissues; and (3) **mixed localized and systemic**, which can cause problems both in a localized area and systemically.

Signs and Symptoms

Table 11-7 gives a partial list of diseases, with signs and symptoms, possibly caused by autoimmunity. Not all experts agree, but at this time more than 80 diseases are thought to be triggered by an alteration in immune function. Some of the diseases have other causes in addition to autoimmunity, and some may be primarily a disorder of the immune system.

Table 11-7
Autoimmune Disorders and Body Systems Affected

DISORDER	AREA AFFECTED	SIGNS AND SYMPTOMS
Systemic Autoimmune Disease		
Autoimmune hemolytic anemia	Red blood cells	Anemia, splenomegaly, hyperbilirubinemia, fatigue
Bullous pemphigoid	Skin, more typically on arms, legs, and trunk	Large fluid-filled vesicles on a swollen erythematous base
Goodpasture syndrome	Lungs and kidneys	Shortness of breath, hemoptysis, fatigue, edema, pruritis
Polymyalgia rheumatica	Large muscle groups, primarily neck, shoulders, upper arms, thighs, and hips	Moderate to severe aching and stiffness, fatigue, unintentional weight loss, anemia Can literally appear overnight; usually goes away on its own
Rheumatoid arthritis	Heart, lungs, joints, nerves, and skin	Variety of symptoms depending on what is most affected: fever, fatigue, joint pain and stiffness, deformity of the joints, shortness of breath, chest pain, edema, loss of sensation, rashes
Systemic lupus erythematosus (lupus)	Brain, heart, lungs, kidneys, joints, blood cells, and skin	Fatigue, weakness and light-headedness, shortness of breath, chest pain, edema, rash, butterfly rash on the face in some cases
Temporal arteritis/giant cell arteritis	Arteries of the head and neck	Can affect all vessels within the body Symptoms vary depending on location
		Can have headache, loss of vision, chest pain, dyspnea, kidney failure, abdominal pain, weight loss, skin rash
Wegener granulomatosis (a form of vasculitis)	Nasal sinuses, lungs, and kidneys	Causes end organ damage and can be life threatening if not treated
		Rhinitis is generally first sign in most patients
Localized Autoimmune Diseases		
Addison disease	Adrenal glands	Slow progression Fatigue, dizziness, muscle weakness, diarrhea, diaphoresis, orthostatic hypotension, hyperpigmentation of the skin
Celiac disease	Gastrointestinal tract	Intolerance of gluten products; impaired nutrient absorption, abdominal pain, chronic diarrhea, vomiting, weight loss, pale, foul-smelling or fatty stools
Crohn disease	Ileum and beginning of large colon	Persistent diarrhea, rectal bleeding, fever, loss of appetite, bloody stools
Graves disease (hyperthyroidism)	Thyroid gland	Tachycardia, tremors, nervousness, weight loss, intolerance to heat
Guillain-Barré syndrome	Peripheral nervous system	Ascending paralysis, starting in legs, then arms, then face Deep tendon reflexes disappear Some patients require mechanical ventilation until recovery occurs
Hashimoto thyroiditis (hypothyroidism)	Thyroid gland	Weight gain, coarse skin, drowsiness, intolerance to cold
Multiple sclerosis	Brain and spinal cord	Abnormal sensations, weakness, vertigo, vision problems, muscle spasms
Myasthenia gravis	Connection between nerves and muscles (neuromuscular junction)	Muscles weaken and tire easily, especially the eyes
Pernicious anemia (vitamin B ₁₂ deficiency)	Select cells in stomach	Anemia results in inadequate production of mature blood cells and maintenance of nerve cells and leads to fatigue and weakness; nerves can be damaged with resulting loss of sensation
Primary biliary sclerosis, primary sclerosing cholangitis, autoimmune hepatitis	Liver	Occurs more commonly in women Chronic cholestasis, which leads to destruction of the smaller bile ducts Fatigue, pruritus, hepatomegaly, jaundice, hyperpigmentation
Raynaud disease (isolated)	Fingers, toes, nose, ears	Can be triggered by changes in temperature
Raynaud phenomenon (accompanied by other autoimmune disorders [scleroderma, lupus])		Numbness and tingling in digits, which then become pale and turn blue because of lack of oxygen; as digits warm up, they turn red because of influx of blood Restricts blood flow of the microvascular system, can cause pitting ulcerations In some cases, gangrene requiring amputation
Type 1 diabetes mellitus	Islet (beta) cells of pancreas (insulin production)	Excessive thirst, appetite, and urination (initial symptoms) Can lead to significant multisystem disease (blindness, kidney failure, impaired circulation, amputations, especially of lower extremities)
Mixed Localized and Systemic Autoimmune Disorders		
Scleroderma	Localized: skin	Skin and connective tissue tightens and hardens
	Systemic: heart, lungs, kidneys, and intestines	Skin will have patches that are thick, white, or pale in the center surrounded by a purple border Heart may develop dysrhythmias; congestive heart failure and pericarditis can also occur Lungs become scarred (pulmonary fibrosis); pulmonary hypertension may develop Kidneys will release more protein into the urine; can trigger hypertension
Sjögren syndrome	Salivary glands, lacrimal glands, joints	Dry eyes and mouth, gum disease, dental caries
	Can also affect lungs, lymphatic system, kidneys, and muscles	

Data from Cooper K, Gosnell K: *Adult health nursing*, ed. 7, St. Louis, 2014, Elsevier; Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2012, Elsevier Saunders.

Diagnosis

Diagnosing autoimmune disorders can be difficult. A detailed health history and complete physical examination must be conducted. Symptoms may be vague and intermittent and may occur over a period of years. Some health care providers may hesitate to initiate diagnostic studies based on a

patient's self-report, because results are inconclusive in the earlier phase of the disease process. This can be frustrating for patients who "just have not felt well for some time" and are looking for an explanation or diagnosis. There are many tests that can be performed to rule out conditions, but they can be costly and inappropriate in earlier phases of the disorder.

Blood tests, such as a complete blood count with differential, will typically be performed (see Box 11-3). Some immune disorders are associated with a specific antibody that can be detected in the blood. Other laboratory tests evaluating inflammation, such as an erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels, are not specific to immune disorders but may help confirm the diagnosis when used with other information. For disorders that are organ specific, a biopsy of the affected tissue may be used to confirm or exclude the diagnosis.

Treatment and Nursing Management

Treatment falls into two categories: (1) replacement or support of lost or ineffective body function and (2) therapies targeted to halt the destructive process. The goal of physical, occupational, speech, or even psychological therapeutic interventions is to help the patient learn how to effectively deal with the disorder and be able to function at the highest achievable level for as long as possible. In medication therapy for autoimmune disorders, the chemical treatment is aimed at altering cell function to prevent further harmful effects, not kill the cells. However, some medications are able to minimize side effects, whereas others can cause additional medical complications. Other autoimmune disorders are discussed in relevant chapters (multiple sclerosis, Chapter 24; rheumatoid arthritis, Chapter 32; and psoriasis, Chapter 42).

Assignment Considerations

Protecting the Patient

Any health care team member that has a potentially infectious condition, such as a cold or the flu, should not be assigned to care for patients with alterations in immune function. If symptoms develop in the middle of the shift, the staff member should wear a mask and use gloves until the assignments are reorganized.

Systemic Lupus Erythematosus

Systemic lupus erythematosus (SLE), also known as lupus, is an autoimmune disease. The term *erythematosus* refers to the **erythema** (patchy congestion of capillaries of the skin with blood) that often accompanies the disease. As with most autoimmune disorders, the cause is largely unknown. Genetics, hormones, immunologic response, and environmental influences may play a role in the development of this disease; however, no specific link has been established. In SLE, the body begins to produce abnormal antibodies that attack the target tissues or cells instead of foreign agents such as bacteria, fungi, and viruses. This assault can go on for years before onset of symptoms become evident and health care is sought.

SLE has a discoid form (skin is affected but internal organs are not), a systemic form (involves internal organs and is the most common type), and a drug-induced form (tends to be milder and less damaging to the body). Although SLE is incurable, symptoms can be treated.

Individuals of all ages have been diagnosed with SLE, but the typical age of onset appears to occur after puberty and peaks between 15 and 40 years of age. It occurs more often in women than men (a ratio of 11 : 1). The overall rate is 5 new cases per 100,000 individuals in the United States (CDC, 2012). Of note, African Americans and Hispanic women of childbearing age in the United States are affected more often than other ethnicities. In 2006 the 5-year survival rate was around 97% at 5 years; now the 10-year survival rate is 90%, and many affected individuals live out a normal life span (Schur, 2014).

Etiology and Pathophysiology

SLE occurs from an abnormal reaction of the body's immune system, especially against proteins found in the nucleus of body cells. Inflammation of the muscles, blood vessel abnormalities, and immune complex deposition in tissues occur throughout the body. SLE usually waxes and wanes

throughout the course of the disease. Some individuals have a very mild form of the disorder and have infrequent flare-ups with minimal symptoms. Others have severe, debilitating symptoms that, if left untreated, can lead to death.

Prolonged exposure to sunlight can initiate a flare-up of SLE, so use of sunblock and covering of the skin are important. A variety of drugs exacerbate lupus, such as oral contraceptives (especially in women who test positive for the presence of antiphospholipid antibodies), sulfa-based antimicrobials, and penicillin. In addition, hydralazine, procainamide, and minocycline are known to produce a lupuslike syndrome.

Signs and Symptoms

Signs and symptoms tend to come and go and include painful or swollen joints and muscle pain, extreme fatigue, unexplained fever, red rash usually on the face ([Figure 11-3](#)), unusual loss of hair, sensitivity to the sun, weakness and profound fatigue, mouth ulcers, poor appetite, weight loss, abnormal menses, edema, and swollen glands. All body systems can be affected ([Figure 11-4](#)). Weakness is a hallmark of the SLE disease process. It is not unusual to see skeletal abnormalities such as asymmetrical arthritis, especially in the fingers, hands, wrists, and knees. Azotemia, hematuria, proteinuria, and pyuria indicate renal involvement, such as nephrotic syndrome or acute or chronic renal failure (see [Chapter 34](#)). Neurologic symptoms may include headaches, seizures, psychosis, and other cognitive disorders. Pleurisy may develop in the lining of the lungs and can lead to chest pain, shortness of breath, and pulmonary hypertension. Heart failure, pericarditis, and coronary disease may also be symptomatic of SLE (see [Chapters 19](#) and [20](#)).



FIGURE 11-3 The characteristic “butterfly” rash of systemic lupus erythematosus. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2013, Elsevier Saunders.)

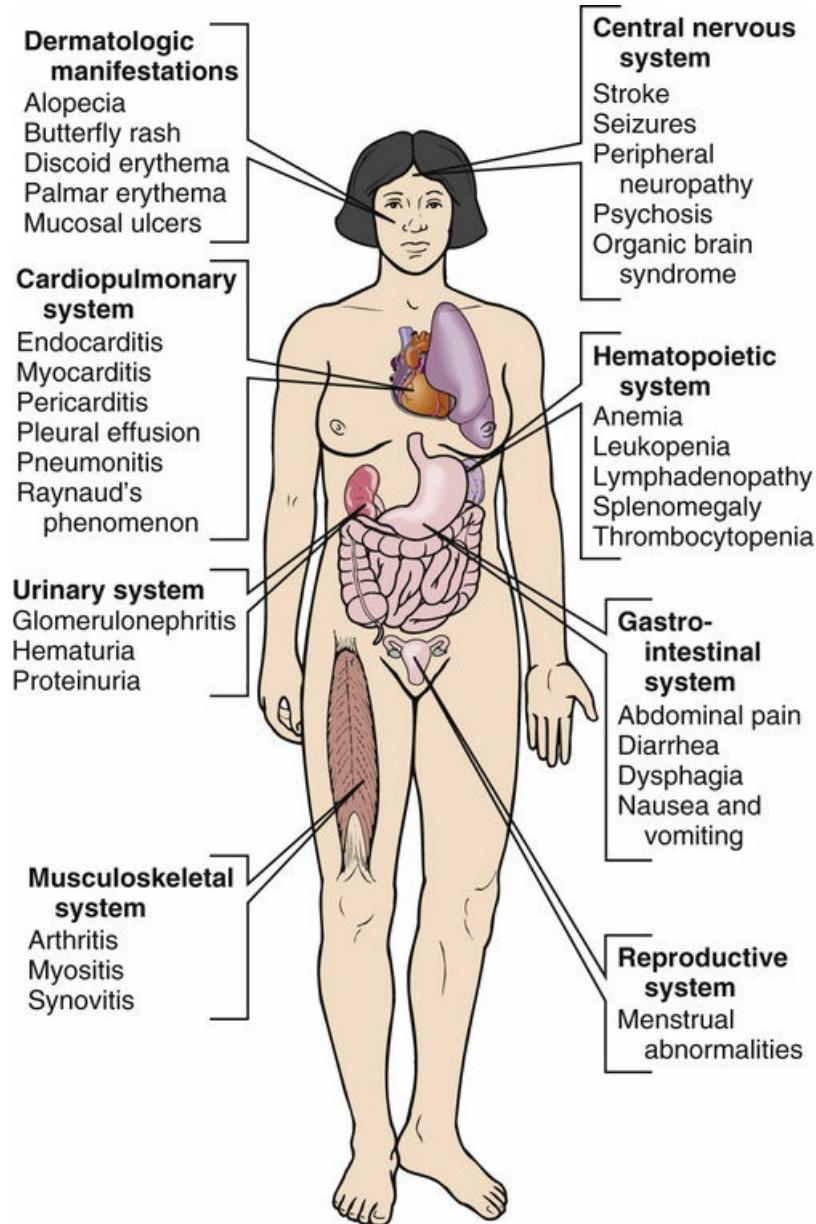


FIGURE 11-4 Multisystem involvement in systemic lupus erythematosus. (From Lewis SL, Dirksen SR, Heitkemper MM, Bucher L: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Diagnosis

Currently, no single test can confirm a diagnosis of SLE. A complete medical history is necessary to guide the diagnostic studies. To confirm SLE, a patient must have at least 4 of the 11 clinical presentations or laboratory test results performed for SLE (see the Evolve website).¹⁰ Typically the patient shows evidence of a multiorgan disorder. Initially serum blood studies, along with a urinalysis and tests for renal and liver function, are performed. Levels are obtained for anticardiolipin antibody (ACA), antinuclear antibody (ANA), antiphospholipid antibody (APA), autoantibodies (anti-dsDNA), anti-Smith (anti-SM), anti-U1RNP, anti-Ro/SSA, and anti-La/SSB, and kidney and skin biopsies are performed.

A syphilis test measures antiphospholipid antibodies in the blood, which are known to be present in lupus, so a false-positive syphilis test is another indicator of SLE. Tests for signs of inflammation include obtaining an ESR and CRP level. Current research is focusing on identifying biomarkers that would indicate the presence of SLE.

Treatment

There is no cure for SLE. Current treatments are targeted toward symptom control or management to prevent exacerbations, treat flare-ups when they occur, and minimize organ damage and long-term complications. Hydroxychloroquine, an antimalarial drug, aids in long-term control of SLE. Glucocorticoids, such as prednisone, are taken to reduce symptoms experienced during major flare-ups. Nonsteroidal anti-inflammatory drugs (NSAIDs) are used to reduce inflammation and control pain. Dehydroepiandrosterone (DHEA), a mild male hormone, is given to treat hair loss, joint pain, fatigue, and memory issues. Immunosuppressant agents are given to suppress the immune system, thereby reducing the risk of a systemic attack. Immunosuppressive agents, such as azathioprine (Imuran), are used to interfere with immune function by damaging autoantibody-producing cells. Belimumab (Benlysta), an IV medication that targets B-lymphocyte stimulator (BLyS) protein, may reduce the number of abnormal B cells, which are believed to be a contributing factor in lupus. Rest, balanced diet, and exercise are also primary treatments for patients with SLE. Women with lupus are at higher risk for pregnancy complications, and those with antiphospholipid antibodies have an increased risk of miscarriage and preeclampsia. Oral contraceptives are not contraindicated in women with mild lupus or who have a low risk of clotting.

Complementary and Alternative Therapies

Use of Alternative Therapies by Patients With an Immune System Disorder

Relaxation, meditation, Reiki, and imagery can help decrease stress. Acupressure and acupuncture may help control pain. There is controversy regarding using herbal and other substances to boost the immune system, because some can interfere with prescription medication. The health care provider should be consulted before starting use of complementary and alternative therapies.

Nursing Management

Assessment of the patient's ability to participate in activities of daily living (ADLs) is important. Joint pain is also common; thus management of pain and assisting with mobility are priorities. Ongoing assessment of body systems is important to determine whether the disease process is affecting additional systems. [Nursing Care Plan 11-1](#) presents interventions for the more common problems experienced by most patients with SLE.

Nursing Care Plan 11-1

Care of a Patient With Low Immune Response

Scenario

Julie Hansen, age 37, has just been diagnosed with systemic lupus erythematosus (SLE). She has flat erythema in a butterfly pattern over the face, is complaining of joint pain in her knees and elbows, and has experienced constant fatigue and weakness for the past 6 months. Her erythrocyte sedimentation rate (ESR) is elevated and she has a positive antinuclear antibody (ANA) test. Other tests helped confirm the provider's diagnosis. She lives with her husband, 12-year-old son, and 14-year-old daughter.

Problem Statement/Nursing Diagnosis

Altered activity tolerance/*Activity intolerance related to inflammatory nature of the disease as evidenced by need for increased rest and sleep and inability to keep up with household chores along with work.*

Supporting Assessment Data

Subjective: States she cannot keep the laundry done or the house clean because she is so tired when she comes home from work; has been using more and more "fast food" for family dinners.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will manage household along with work with help within 6 wk.	Explore chores that other family members may be able to take over. Assist to work out a schedule for rest periods at lunchtime, after work, and on the weekends.	Husband and children could help with cleaning, laundry, errands, and meal preparation. Resting for 30 min at lunchtime eases fatigue.	Daughter will wash the clothes and son will fold and put them away. Husband will do errands. All members will assist with meal preparation and cleanup. Will try to find a place at or near her workplace where she can rest at lunchtime. Continue plan.

	Assist to plan meals for the week and to cook large quantities of items on the weekend that can be divided into individual meals and frozen for family dinners.	It is less fatiguing to cook large quantities of entrees once a week and to freeze portions than to prepare a dinner every day.	Will consider what meals might be cooked on the weekends and frozen. Continue plan.
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Problem Statement/Nursing Diagnosis

Pain/Chronic pain related to inflammation from disease process.

Supporting Assessment Data

Subjective: "My knees and elbows ache whenever I have walked for more than a block or used my arms to lift things frequently during the day."

Objective: Tenderness around elbow and knee joints.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will experience fewer days of pain with regular use of anti-inflammatory medication.	Instruct to take 400 mg of ibuprofen tid on a regular basis.	Keeping a steady blood level of the drug will help decrease and prevent inflammation.	States will begin taking the prescribed regimen of ibuprofen. Continue plan.
	Advise to let family lift heavy items and do chores requiring repetitive elbow motion or squatting.	Refraining from lifting, repetitive joint motion, and squatting helps prevent joint strain and added inflammation.	States will let family bring in groceries and put them away. Will remind family to pick up around the house every other day. Will refrain from gardening while bending down on her knees. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for altered skin integrity/Risk for impaired skin integrity related to "butterfly" rash and sun sensitivity from disease process.

Supporting Assessment Data

Subjective: States sunburns very easily.

Objective: Inflamed rash in butterfly pattern over large part of face.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient's skin will remain intact.	Instruct in proper skin care with mild soap and alcohol- and astringent-free products.	Avoiding harsh skin care products will help prevent excoriation and breaks in the skin.	States will check her skin-care products for alcohol and astringents.
	Instruct to moisturize the skin twice daily.	Moisturizing products will help keep skin supple and prevent breaks.	Will begin moisturizing a second time a day before bedtime. Continue plan.
	Instruct to inspect the skin closely for any breaks or new lesions.	Finding breaks in the skin promptly and caring for them properly will help prevent infection.	Will begin to inspect skin after shower daily. Continue plan.
	Instruct to cover skin when out in the sun and to avoid ultraviolet rays as much as possible.	Protecting the skin from sunlight will help prevent flare-ups of the disease and will protect the skin from further damage.	Will wear suggested clothing of long sleeves, long pants, and a wide-brimmed hat when out in the sun.
	Instruct to use a sunblock product with an SPF of 30 or more when outdoors.	Sunblock helps prevent the damage that can occur from ultraviolet rays.	States will use sunblock on a daily basis on exposed parts of skin.
	Instruct to stop going to the tanning salon.	Ultraviolet light damages the skin and can cause a flare-up or progression of SLE symptoms.	States that she hates to give it up, but will refrain from going to tanning salon.

SPF, Sun protection factor.

Critical Thinking Questions

- What types of entrees could you suggest that could be fixed ahead in large quantities and then frozen in family-sized portions?
- What might you suggest as ways to rest at lunchtime when the patient is at work on weekdays?

Educate the patient about the disease and how to prevent possible complications. For example, any flulike illness lasting more than a few days should be reported to the health care provider. Review appropriate skin care, including the correct method of applying and reapplying sunblock with a sun protection factor (SPF) of 30 or higher. Infections can also exacerbate the symptoms, so the patient should avoid being around anyone who is showing signs or symptoms of a communicable disease.

Patient Teaching

Skin Protection for Patients With Systemic Lupus Erythematosus

- Avoid direct sunlight and any other type of ultraviolet lighting, including tanning beds.

- Use an SPF 30 or higher sunblock when outdoors.
- Wear long pants, a long-sleeved shirt, and a wide-brimmed hat when in the sun.
- Cleanse the skin only with a mild soap that has a glycerin base.
- Dry the skin thoroughly by patting rather than rubbing it.
- Apply nonperfumed lotion liberally to dry skin areas at least twice a day.
- Avoid using alcohol-based skin care products, face powder, or other astringent agents.
- Use cosmetics that contain moisturizers.
- Inspect the skin daily for rashes and open areas.

Adapted from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2012, Elsevier Saunders.

Disorders of the Lymphatic System

Lymphoma

Lymphoma is a form of lymphatic cancer that starts in the lymphocytes. These cells become malignant and multiply, crowding out the normal cells, which leads to the creation of solid tumors in the lymph nodes. The two main types of lymphoma are Hodgkin lymphoma (HL) and NHL. The primary differences between the two are the types of lymphocytes involved in the disease. If, under microscopic examination of tissue, Reed-Sternberg (R-S) cells are present, the patient has HL. If the R-S cells are not present, the patient has NHL, which is further identified as B-cell and T-cell lymphoma and has around 30 subtypes. There are two main types of HL—classical HL and lymphocyte-predominant HL.

Classification and staging of these two diseases is complicated. It relies heavily on microscopic examination of tissues and diagnostic studies, including serum blood testing and select types of scans to determine the type and true extent of the disease. Many of the NHL subtypes look similar, but they are quite different and respond to different therapies with varying degrees of success.

Hodgkin Lymphoma

Etiology.

HL, also known as *Hodgkin disease*, is one of the more curable forms of cancer when diagnosed and treated early. It accounts for less than 1% of all cancers. HL primarily affects young adults, but it can occur in those older than 55 years of age. Incidence rates are higher in whites than African Americans. Because of the advent of radiation and chemotherapy, the cure rate has more than tripled over the past 40 years, and the overall survival rates are 85% at 5 years and 80% at 10 years ([American Cancer Society, 2015](#)).

The cause of HL is not known, but there is a possible genetic as well as environmental component that, in combination, can initiate the onset of this disease. Studies have shown that there is a 10 times higher risk of developing the disease in same-sex siblings of patients with HL. An association has been found among patients with HL who had few or no siblings, lived in a single-family house, were early in the family's birth order, and had few playmates. This form of life environment tends to decrease exposure to infectious agents at an early age, so the immune system is not exposed to as many microorganisms, and therefore less antibodies are produced. Other possible triggers are viral infections, such as Epstein-Barr and HIV. Previous exposure to various chemical agents has also been implicated.

Pathophysiology.

The B cells in the immune system begin to develop atypical cells. The abnormal R-S cells have two unique features: (1) they rapidly replicate more defective B cells and (2) they do not die off as normal cells do. These R-S cells replace normal cells in the nodes and lymph tissue. The disease spreads from one area to another via the lymphatic system and can invade other body systems. As it progresses, the ability of the body to fight off infection can become severely impaired.

Signs and symptoms.

More than 80% of cases present with **lymphadenopathy** (enlarged lymph nodes) above the diaphragm. The enlarged, painless lymph nodes can be easily felt in the neck, mediastinum, and axilla and less easily in the abdomen and inguinal (groin) area. The patient may also complain of abdominal fullness, fatigue, profuse night sweats, unintentional weight loss, and pruritus. High suspicion for HL exists when the patient has complaints of swollen lymph glands lasting for several weeks and no recent history of any type of infection. The patient will likely require a series of diagnostic studies. If there is a mediastinal mass of involved lymph tissue, the patient may have a nonproductive cough because of the narrowed airways from the swollen lymph glands. Many other organs can become affected, as displayed in [Figure 11-5](#).

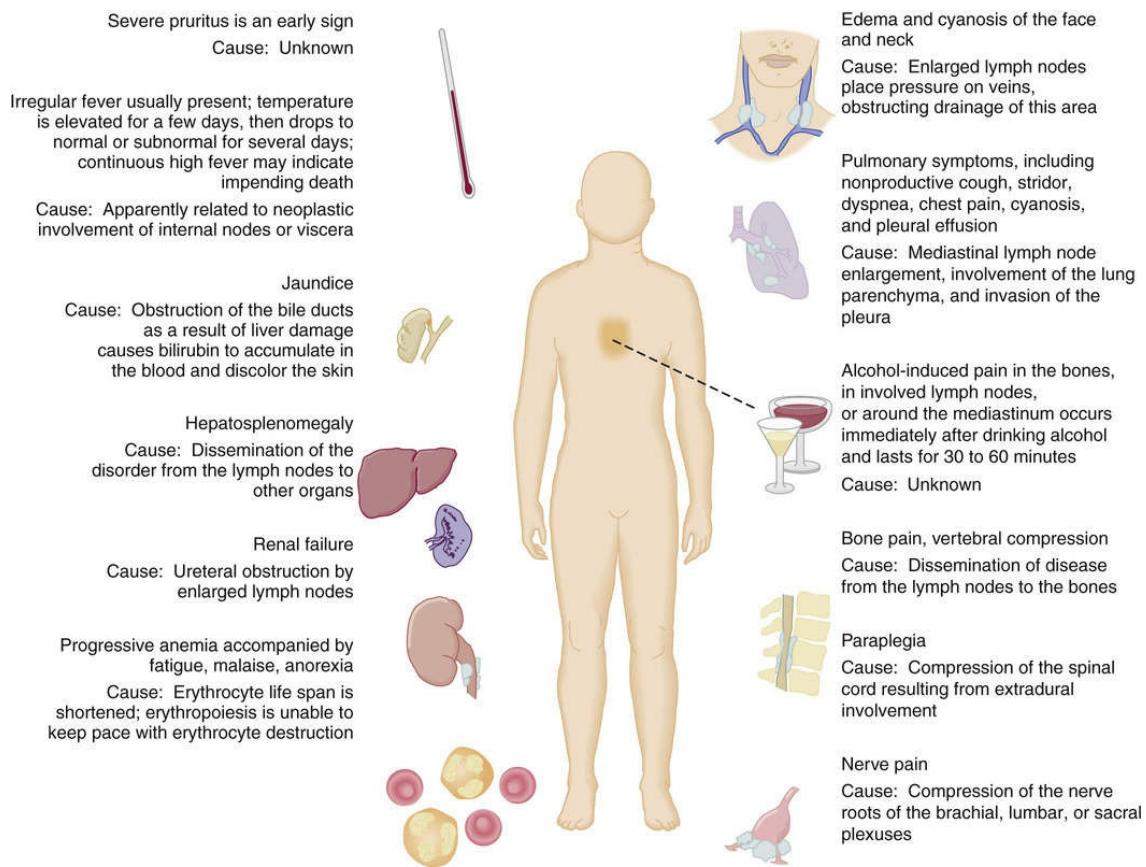


FIGURE 11-5 Clinical manifestations and pathophysiologic basis of Hodgkin lymphoma. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Elsevier Saunders.)

Diagnosis, treatment, and nursing management.

A definitive diagnosis for HL is confirmed by the presence of R-S cells in the tissues obtained by biopsy of the lymph nodes. Radiographs, computed tomography (CT) scans, positron emission tomography (PET) scans, and bone marrow biopsy can also be used to help determine the extent or stage of the disease.

Treatment depends on the stage of the disease and whether involvement is above or below the diaphragm or both. (See the figure on staging classifications on the Evolve website.) Once the stage is known, the absence or the presence of one or more of the following symptoms is noted: unintentional weight loss of more than 10% of body weight over the previous 6 months; an unexplained fever greater than 100° F (38.5° C) for 3 days or longer; and profuse night sweats not related to weather conditions. In patients with four or more involved nodal areas, who are older than 50 years, and have an ESR greater than 30, the outlook is less favorable.

Chemotherapy can be given in all stages of the disease. Once it is completed, a more precise form of radiation therapy called *involved-node radiotherapy (INRT)* may be considered. Typically, INRT is delivered only to the affected areas of the body, so less damage occurs to the surrounding tissue. For stages I and II, administration of doxorubicin (Adriamycin), bleomycin, vinblastine, and dacarbazine (ABVD therapy), followed by INRT, has proven to be the most successful treatment. Stages III and IV disease show better improvement with mechlorethamine, vincristine (Oncovin), procarbazine, and prednisone (MOPP therapy) in combination with ABVD therapy. The number of cycles of chemotherapy depends on the stage of the disease, the response of the patient to the therapies, and whether a **relapse** (reappearance of abnormal cells) occurs. Patients may experience many complications from HL and the treatments. Examples of some of the adverse effects include permanent sterility, temporary hair loss, subclinical hypothyroidism, and an increased risk of developing cancer in other organs years after completing radiation therapy.

Nursing care should focus on symptoms the patient is currently experiencing and the side effects of the prescribed therapies. Prevention of health care-associated infections is essential. The problems/nursing diagnoses, expected outcomes, and interventions for patients with HL are the

same as those for patients with leukemia (see [Chapter 16](#)).

Non-Hodgkin Lymphoma

Etiology and pathophysiology.

The United States has the highest rate of NHL, the sixth most common cancer in men and the fifth most common cancer in women ([ACS, 2015](#)). The overall incidence is higher in men than women. The National Cancer Institute estimated that in 2015, 71,850 new cases of NHL will be diagnosed and that at least 19,790 people will die of NHL ([American Cancer Society, 2015](#)). Part of the increase has been linked to the increased number of patients with HIV and hepatitis C patients and those who have contracted an Epstein-Barr virus infection. The median age of diagnosis of NHL is 50 years of age. The overall rise in incidence is believed to be related to the continued advances in the successful diagnosis and treatment of a variety of diseases.

NHL is similar to HL, but NHL is less predictable and tends to spread to other body sites much more rapidly. There is also an abnormal proliferation of defective B cells or T cells in NHL. Only biopsy of pathologic lymph nodes and tumor tissue can provide a definitive diagnosis of NHL. There are several types of NHL. One type of NHL is an indolent, slow-growing form in which symptoms are usually not present until the advanced stages of the disease. Bone marrow involvement and intra-abdominal adenopathy may occur with this form of NHL, and it has a better prognosis if treatment is given in stage I or II of the disease. Usually radiation therapy is used, because most indolent forms of NHL are nodular in shape.

The other forms of NHL are more aggressive; if treated with intensive chemotherapy, there is a survival/cure rate of 67% at 5 years and 55% at 10 years ([Simon, 2013](#)). The symptoms manifest early in the aggressive forms, and with vigorous therapy, there is a potential for cure. The rate of cure is reduced if NHL is diagnosed in a late phase. Five risk factors for **disseminated** (widely spread) tumors, elevated levels of lactate dehydrogenase, poor functional ability of the patient, age older than 60 years, and spread beyond lymph nodes), are used to predict the outcome of patients with the more aggressive forms of B-cell lymphoma, which is the most common type. Having none or one of the risk factors suggests a good outcome, but having four or five indicates a poor prognosis. When relapses occur, they typically do so within the first 2 years after treatment.

Signs and symptoms.

NHL tends to have more widespread involvement of lymphoid tissue than is found in HL. Unlike HL, NHL typically shows up in one node, then one or more nodes are skipped, and then another node is affected (referred to as *noncontiguous*). NHL usually manifests as a unilateral, painless enlargement of a lymph node that may progress to generalized, painless lymphadenopathy. NHL tumors can occur in the brain, respiratory system, spleen, GI tract, bone, or other parts of the body. As the disease progresses, the patient notices more symptoms, probably because of the increasing size of the affected lymph nodes. Symptoms related to other organs are site specific and can include complaints of high fevers, chills, drenching night sweats, unexplained weight loss, cough, dyspnea, chest pain, nausea, vomiting, a sense of fullness in the abdomen, and constipation. Hepatomegaly or splenomegaly occurs in about one third of patients. The nodes closer to the skin tend to be more easily palpated, are very pruritic, and may be either red or purple in hue. Laboratory tests may show elevated liver enzymes. Physical examination may reveal a change in level of consciousness related to an elevation in intracranial pressure, especially in patients with aggressive NHL.

Diagnosis and treatment.

The effectiveness of treatment depends on the stage of the tumor at the time of diagnosis and the type of lymphoma (indolent or aggressive). Staging considers the number and location of affected lymph nodes, whether the nodes are on one or both sides of the diaphragm, and whether the disease has spread to other tissues. To aid in staging, CT, magnetic resonance imaging (MRI), PET, or ultrasound can be used to determine the extent of tissue involvement and to assess therapeutic response after therapy has been completed. Biopsy of various body tissues may also be performed in one of three ways to determine the type of NHL: (1) an excisional biopsy, in which an entire node is removed; (2) an incisional biopsy, in which only a piece of the node is removed; or (3) fine-needle aspiration (FNA), in which a needle is used to aspirate tissue from the mass of cells. Bone marrow biopsy is usually performed after the diagnosis has been confirmed or is done to determine whether

the disease has reached the bone marrow.

Treatment can be with chemotherapy or irradiation, depending on the stage of disease. Stage I or II or low-grade NHL may be cured with radiation therapy alone. Various combinations of drugs are used for other stages of the disease depending on the type and aggressiveness. Cyclophosphamide (Cytoxan), hydroxydaunomycin (doxorubicin), vincristine (Oncovin), and prednisone (CHOP therapy) is standard treatment and has proven particularly effective for many stages when used with rituximab (Rituxan). Several other chemotherapy combinations are also often used. Bone marrow transplantation, autologous stem cell transplantation, and immunotherapy with monoclonal antibodies are possible treatment options. There are a number of drugs that provide radiolabeled monoclonal antibody agents. Once infused, these antibodies recognize and react to kill specific tumor cells. Other experimental therapies are under study.

Surgery may be attempted if the tumor is localized or as palliative care. Vaccines for this disease are currently in clinical trials.

Nursing management.

Nursing care is directed toward supporting the patient through the diagnostic process and observing for and treating the side effects of radiation and chemotherapy. If bone marrow or stem cell transplants are performed, nursing care and patient education must focus on prevention of infection and other complications. [Chapter 8](#) provides information on specific nursing problems/diagnoses and interventions for patients with cancer. Common problems for a patient with NHL include the following:

- Potential for infection due to neutropenia
- Risk for hemorrhage from thrombocytopenia
- Fatigue
- Nutritional deficit with weight loss

Expected outcomes might include the following:

- Patient will not experience infection.
- Patient will not experience hemorrhage.
- Fatigue will lessen after 6 weeks of treatment.
- Patient will gain 1 lb per week until desired weight is reached.

Nursing interventions are similar to those for the problems of leukemia (see [Chapter 16](#)).

Lymphedema

The lymphatic system drains water, proteins, lipids, and waste from the interstitial spaces throughout the entire body and returns them to the lymph nodes, where waste materials and foreign cells, such as bacteria, are filtered out. Once "clean," the lymph fluid returns to the lymphatic vessels, and the whole process is repeated. When the lymph system is unable to circulate normally, large amounts of fluid accumulate (**lymphedema**), causing swelling. If not controlled, this swelling can lead to further damage to surrounding nerves, blood vessels, and tissues.

There are two types of lymphedema: inherited and acquired. The inherited form (primary) is a congenital condition in which there is deficient growth of the lymphatic system, especially in a lower extremity. This condition chiefly affects women and most often becomes apparent during the middle teens to early twenties.

The acquired form (secondary) typically results from an obstruction caused by trauma to the lymph vessels and nodes, such as occurs during mastectomy when lymph nodes are removed, after radiation therapy, or after a liposuction procedure where some of the lymph nodes may have been damaged. Other causes of obstruction include extensive soft-tissue injury and scar formation and, in tropical countries, parasites that enter lymph channels and block them (e.g., elephantiasis).

Patients may have a variety of symptoms, including restricted range of motion; heavy feeling; aching discomfort; recurrent infections; and thick, hard skin. To confirm the cause, an MRI of the affected body part, lymphangiography, or a lymphoscintigraphy may be performed to determine whether there are any blockages in the lymphatic system or some other form of pathology.

Regardless of the cause, treatment goals are to minimize the effect of the disease process on the individual.

Lymphedema of an extremity can often be treated conservatively through light aerobic exercise and by using simple nursing measures. For example, the patient can be taught to wrap the extremity with an elastic bandage, beginning at the most distal portion and working up the extremity. This compression bandage may help minimize the degree of lymphedema. Surgical intervention is palliative at best and is therefore controversial as a treatment option. There is no cure for this condition. Prevention and treatment of lymphedema of the arm and hand after mastectomy are covered in [Chapter 38](#).

Fibromyalgia

In the 1970s, fibromyalgia was identified as a condition of chronic systemic pain and multiple symptoms that could not be explained as caused by any other source or disease. This disorder affects 5 million people in the United States. Women are 10 times more likely than men to experience fibromyalgia symptoms, and the condition is typically seen in women ranging in age from 25 to 60 years. Researchers believe the way the brain perceives pain is changed in some way as a result of stressors such as infection, trauma (physical and psychological), family history, and autoimmune disease. The change in pain perception can trigger fibromyalgia and its related symptoms ([Box 11-7](#)). The most common feature of this disorder is musculoskeletal pain. It is typically described as diffuse or multifocal pain, with flare-ups and **remissions** (disease is under control), along with migration from one area of the body to another. Fibromyalgia interferes with a person's ability to perform ADLs and can cause significant fatigue and pain; it is considered as part of the arthritis spectrum and may accompany SLE or rheumatoid arthritis.

Box 11-7

Fibromyalgia Symptoms

- Chronic muscle pain, spasms, or tightness
- Stiffness on waking or after staying in one position for too long
- Moderate to severe fatigue and decreased energy levels
- Reduced exercise tolerance and increased muscle pain after exercise
- Tension or migraine headaches
- Jaw and facial tenderness
- Insomnia or waking up feeling just as tired as when you went to sleep
- Anxiety, depression
- Difficulty with concentration, memory recall, and performing simple mental tasks
- Abdominal pain, bloating, nausea, and constipation alternating with diarrhea (irritable bowel syndrome)
- A sensation of swelling (without actual swelling) in the hands and feet
- Increase in urinary urgency or frequency (irritable bladder)
- Sensitivity to one or more of the following: odors, noise, bright lights, medications, certain foods, and cold

Patients typically have either **hyperalgesia** (heightened response to painful stimuli) or **allodynia** (pain response to nonpainful stimuli). This disorder may also be caused by a deficiency in the neurotransmitters dependent on serotonin and norepinephrine within the central nervous system. The criteria were originally established in 1990 but were updated in 2011 and include whether

symptoms have been present for at least 3 months; whether they occur on both sides of the body; and whether there are any tender points in at least 11 of 18 sites (Figure 11-6). Other symptom diagnostic criteria are sleep problems, poor cognition, fatigue, headaches, depression, and abdominal pain (Henderson, 2014).

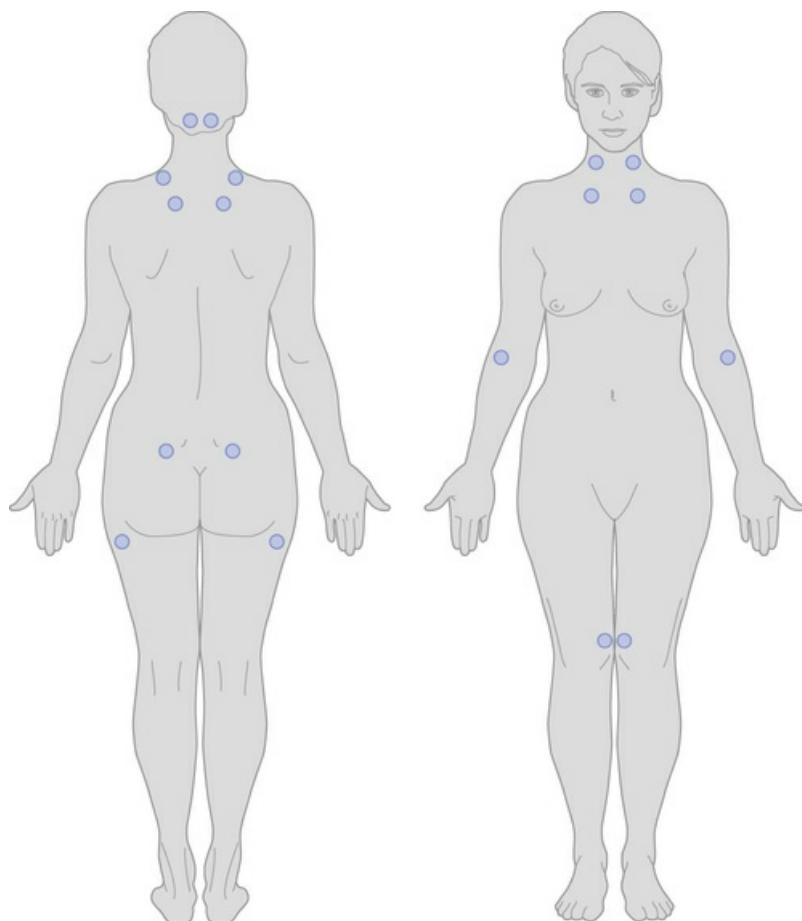


FIGURE 11-6 Tender points in fibromyalgia. (From Freundlich B, Leventhal L: Diffuse pain syndromes. In Klippel JH (Ed.): *Primer on the rheumatic diseases*, ed. 13, Atlanta, 2008, Arthritis Foundation.)

There is no specific diagnostic test that can confirm the diagnosis of fibromyalgia, so treatment focuses more on symptom relief. Currently, there are three antidepressant medications approved by the FDA that also help with pain management: pregabalin (Lyrica), duloxetine (Cymbalta), and milnacipran (Savella). Low-dose antidepressants that can also be used include tricyclics, serotonin reuptake inhibitors (SSRI), and benzodiazepines. NSAIDs and long-term use of narcotic pain relievers are not as effective in treating the pain experienced in this disorder because of the abnormal reactions of pain receptors. Additional treatment is based on the symptomatology and could include light exercise, massage therapy, guided imagery, dietary changes, and referral to a mental health provider. Nursing responsibilities include taking a detailed history of symptoms and measures the patient has tried to relieve the pain. Interventions should focus on helping the patient to manage fatigue, pain, activity intolerance, sleep disruption, and stress. Family should be included in the education process.

Disorders of Inappropriate Immune Response

Allergy and Hypersensitivity

An **allergy** is an abnormal response to certain substances; it is considered a systemic immune disorder, rather than a localized one, and the reaction can be seen or expressed in one or more body systems. **Hypersensitivity reactions**, better known as allergic reactions, are the body's excessive response to a normally harmless substance. The severity of the condition can range from a mild rash to **anaphylaxis** (an extreme allergic reaction that is life-threatening).

Etiology and Pathophysiology

As the environment has become cleaner over the past decades, there has been an increase in the development of allergies, especially among those of higher socioeconomic status, those living in an urban area versus rural, and first-born children (who have less exposure to other illnesses from siblings). Complex hereditary, environmental, and site-specific factors contribute to allergic reactions.

Allergies are divided into two major categories: (1) immediate hypersensitivity reactions that are mast-cell mediated (type I hypersensitivity) and (2) delayed-reaction allergies involving T cells (type II hypersensitivity). As with all types of normal and abnormal immune responses, a reaction will not occur until an individual's body cells have been sensitized to the specific substance that triggers the response. This means that on first contact with the antigen (allergen), the body's immune system is triggered to produce immune globulin E (IgE) antibodies to recognize the specific antigen. On the second and subsequent contacts with the allergen, the antibodies specific to the allergen are rapidly produced and released into the circulating blood or in the lymphoid tissues, in larger and larger quantities. See Evolve[®] for **mechanisms activated in hypersensitive reactions**. Because of the increased amount of antibodies, they can be quickly transported to the location of the allergen, causing a more rapid, and sometimes virulent, allergic reaction. This type of reaction is typically seen within 15 to 30 minutes from exposure to the antigen and results from the increased production of mast cells and basophils from IgE antibodies. During this reaction, **histamine** is released from a mast cell mediator. When histamine is released because of an immune response, it triggers increased mucus secretions, vascular permeability, and vasodilation, which leads to tissue edema. Dilated blood vessels transport the IgE antibodies, histamine, and other chemicals to the site of exposure to the allergen ([Figure 11-7](#)).

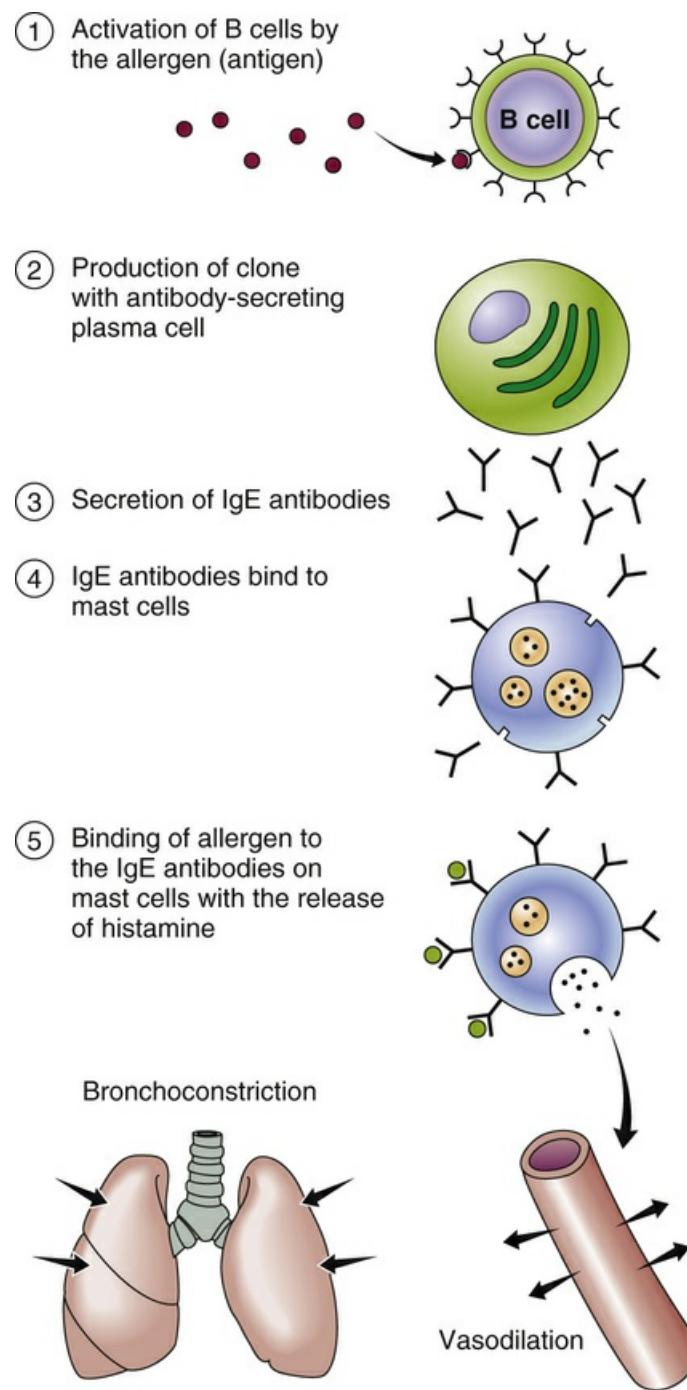


FIGURE 11-7 Immediate-reaction allergy.

If the mast cells are IgE dependent, they typically produce only a localized allergic response. Examples of this are allergic conjunctivitis or allergy-induced asthma. A person who has **atopy** (a response that affects various parts of the body without being in direct contact with the allergen), such as is seen in eczema, tends to be hypersensitive to a variety of allergens. Type II or delayed reactions result from increased production of IgG.

Signs and Symptoms

The body system most affected by the offending agent may present more specific symptoms. For example, when the nose and eyes are exposed to a contact allergen, symptoms of itchy, red, watery eyes; soft palate pruritus; clear rhinorrhea; and sneezing are common. Should the allergen be inhaled, the release of histamine can cause the contraction of smooth-muscle tissues in the bronchioles of the lungs. These internal changes also produce an allergic response, notably

erythema, edema, increased exudate, and breathing difficulties such as dyspnea and wheezing. [Table 11-8](#) presents the four broad types of allergens.

Table 11-8
Four Broad Categories of Allergens*

CATEGORY	METHOD OF EXPOSURE	TRIGGERS	EFFECTS
Contactants	Direct contact with mucosa/skin/tissue	Dust, wool fabrics, detergents, soaps, lotions, cosmetics, plants such as poison ivy, dyes, metals in jewelry, and latex	Irritation to the conjunctiva of the eyes, urticaria, rashes, hives, dermatitis, and eczema
Ingestants	Swallowed	Food: citrus fruits, tomatoes, strawberries, cow's milk, wheat, eggs, dairy products, seafood, chocolate, nuts, monosodium glutamate (MSG), other preservatives, and artificial food coloring	Abdominal pain, flatulence, nausea, vomiting, and diarrhea
		Drugs: aspirin, barbiturates, anticonvulsants, and antimicrobials; any drug may cause an allergic reaction	Can also cause atopic dermatitis, rash, and dyspnea
Inhalants	Entry through nose or mouth	Dust mites, molds, pollen, fragrances, animal dander, insect feces, and some chemicals	Edema of nasal mucosa, allergic rhinitis or sinusitis, rhinorrhea, sneezing, laryngeal edema, coughing, dyspnea, bronchoconstriction, and wheezing
Injectables	Via needle (i.e., hypodermic, intramuscular, intravenous; animal or snake bites, insect stings)	Medications, vaccines, animal saliva, and snake or insect venoms	Swelling and pain at injection site, bruising, discoloration, necrotic skin

*Any allergen can cause severe allergic reactions, including anaphylaxis and death, if not recognized and treated immediately.

Diagnosis

Identification of allergens.

Identification of allergens can be a tedious process. Many times more than one substance produces the symptoms of an allergy. Reactions to certain food products, animals, insect stings, drugs, and other substances that are out of the norm are noticeable because of the relationship between cause and effect. Ask about exposure to substances that appear to have, or are known to cause, an adverse response. Help the patient to recognize that vague symptoms, such as consistently becoming "stuffed up" only at night when in bed, could be an allergic reaction, perhaps to the pillow.

Diagnostic tests.

Two primary methods are used to test for allergies. One is performing a radioallergosorbent test, known as *RAST*. This test uses blood serum from the patient to determine whether the IgE to the suspected allergen is present. The major advantages to this type of allergy testing are that antihistamine medications can continue; it is safer for patients with serious heart and lung problems; there is no chance of an anaphylactic reaction; it is more useful to identify a true food allergy; and it can be used when severe skin conditions prevent skin testing. The disadvantages to the RAST are that it is more expensive than skin testing; it can take several days to weeks before results are known; and it is less specific, meaning this test tends to produce more false-positive and false-negative results to allergens.

The skin **scratch test** has been the most reliable method of allergy testing for more than 100 years. The skin is pricked by a needle, and a drop of the suspected allergen is applied to the area. A needle is then used to slightly scratch the skin just below the epidermis. The **patch test** is similar to the scratch test except the allergen is simply placed on the surface of the skin and covered with an airtight dressing (patch). For both of these tests, a negative reaction occurs when there is no erythema, swelling, or complaint of itching. A positive reaction to either of these tests is indicated by the appearance of a small (usually dime-size) wheal at the site of contact with the allergen and possibly by complaints of itching by the patient.

Drug allergy.

A patient may have a confirmed allergy to a medication that is required and for which there are no alternatives. Before administration, a test dose of the drug may be given. For IV medications, a very small dose can be given and then, at 10-minute increments, increasing amounts of the drug are infused until the full dose ordered by the health care provider is administered. Continuously stay with the patient and closely monitor for signs and symptoms of a reaction during this process. Resuscitation drugs and emergency equipment must be immediately available. This same process is repeated with each subsequent administration of the medication, and detailed documentation is required. If it is known in advance that the drug will be needed, the patient can be desensitized to the drug before its use.

Safety Alert

The Patient With Allergies

The medical record should be checked and the patient questioned about allergies before (1) giving medications or immunizations, (2) beginning radiographic studies using contrast media, and (3) minor or major surgery.

Food allergy.

Even though other diagnostic methods are available to test for food allergies, a less expensive approach known as the *elimination diet* should be tried first. Teach the patient to read product labels to identify offending substances used in the preparation or preserving of the food item. Tell the patient to eliminate one food at a time and to keep a detailed diary, recording everything ingested each day, including the additives and preservatives in each food product. The patient should start with a food that is believed to be the cause of adverse reactions (e.g., itching, bloating). If symptoms persist for a week to 10 days after eliminating one food product (e.g., milk and dairy products), the patient would resume intake of that particular food, and choose another one for elimination. This process continues until the offending food source is identified.

Latex allergy.

Assess each patient for latex allergies, because their presence may change the method of care delivery. Most items routinely manufactured with latex are now being produced with nonlatex alternatives, including gloves, Foley catheters, surgical drains, bandages, and condoms.

Safety Alert

Personal Protective Equipment

OSHA requires that employers furnish personal protective equipment for their employees at no cost to the employee, and nonlatex items should be made available for those with an allergy to latex. Severe latex allergies have caused some health care workers to change their work environment to one with little or no latex exposure.

Treatment

Drug therapy.

Drugs that help alleviate systemic reactions to allergens include epinephrine, antihistamines, bronchodilators, corticotropin (adrenocortotropic hormone), and cortisone (see [Chapters 13](#) and [14](#) for specific drug information).

Antihistamines (histamine-blocking agents) help control the symptoms of hay fever and hives by preventing the release of histamine during an allergic reaction ([Table 11-9](#)). The histamine-blocking action relieves itching, decreases swelling of mucous membranes and production of secretions, and reduces other symptoms of an allergic reaction. Diphenhydramine (Benadryl) is commonly used orally and topically to counteract many allergic symptoms.

 **Table 11-9**

Drugs Commonly Used to Treat Allergy

CLASSIFICATION	ACTION	SIDE EFFECTS	NURSING IMPLICATIONS
Antihistamines			
First-Generation Agents: tend to be short acting; impair concentration and can cause drowsiness			
Ethanolamines	Bind with H ₁ receptors on target cells, blocking histamine binding	First-generation agents cross blood–brain barrier, bind to H ₁ receptors in brain, cause sedation (diminished alertness, slow reaction time, somnolence), and stimulation (restless, nervous, insomnia).	Warn patient that operating machinery and driving may be dangerous because of sedative effect; drowsiness usually passes after 2 wk of treatment.
Clemastine (Tavist Allergy)	Relieve acute symptoms of allergic response (itching, sneezing, excessive secretions, mild congestion)	Sleepiness, fatigue, dizziness, headache, dry mouth, urinary retention.	Teach patient to take with full glass of water; report palpitations, change heart rate, a change in bowel/bladder habits.
Diphenhydramine (Benadryl)	Competitively blocks the effects of histamine at peripheral H ₁ receptor sites; has anticholinergic (atropine-like) and sedative	Patients vary in their sensitivity to these side effects.	Instruct patient not to use alcohol with antihistamines because of additive depressant effect.

	effects		
Tripeleannamine (PBZ)	Competes with histamine receptor sites	May cause palpitations, tachycardia, urinary retention or frequency.	Must take with food whole; do not crush.
Alkyamines		Cause less drowsiness.	
Brompheniramine maleate (Dimetane)	Antagonist of histamine H ₁ receptors	Severe constipation, urinary retention, dry mouth, blurred vision, tachycardia.	Do not use if patient is diagnosed with glaucoma.
Chlorpheniramine (Chlor-Trimeton)	Antagonist of histamine H ₁ receptors; serotonin-norepinephrine reuptake inhibitor	Dizziness, blurred vision, euphoria, anxiety, increased appetite.	
Azatadine (Optimine)	Histamine blocker	Dizziness, drowsiness	Teach patient to take with a full glass of water.
Promethazine (Phenergan)	Antihistamine and neuroleptic	Strong sedative effect, long-term use can lead to tardive dyskinesia.	Given preoperatively to some patients.
Second-Generation Agents: less likely to cause drowsiness			
Loratadine (Claritin)	H ₁ -receptor agonist with minimal sedative side effects; blocks H ₁ receptors and blocks effects of histamines (vasodilation, increased capillary permeability)	Second-generation agents have limited affinity for brain H ₁ receptors.	Teach patient to expect few, if any, side effects.
Cetirizine (Zyrtec)	Some also have anti-inflammatory properties	Causes minimal sedation; few effects on psychomotor activities or bladder function.	More expensive than classic antihistamines.
Fexofenadine (Allegra)	Interfere with mediator released from mast cells	Can cause menstrual cramping, diarrhea, nausea, and stomachache.	Rapid onset of action, no drug tolerance with prolonged use.
Desloratadine (Clarinex)			General interactions: Do not take with alcohol or any form of tranquilizer or sedative.
Decongestants			
Oral			
Pseudoephedrine (Sudafed)	Stimulate adrenergic receptors on blood vessels, promote vasoconstriction, and reduce nasal edema and rhinorrhea	CNS stimulation, causing insomnia, excitation, headache, irritability, increased blood and ocular pressure, dysuria, palpitations, tachycardia.	Advise patient of adverse reactions.
Phenylpropanolamine	Same as above	Same as above	Advise that some preparations are contraindicated for patients with cardiovascular disease, hypertension, diabetes, glaucoma, prostate hypertrophy, or hepatic and renal disease.
Topical (Nasal Spray)	Same as above	Same as above, plus rhinitis medicamentosa (rebound nasal congestion).	Teach patient that these drugs should not be used for >3 days or >4 times/day; longer use increases risk of rhinitis medicamentosa.
Oxymetazoline (Dristan)	Blocks action of histamine	Headache, bitter taste, somnolence, nasal irritation.	Teach patient can cause irregular heart rate, insomnia, high blood pressure. Stop medication and contact health care provider.
Phenylephrine (Neo-Synephrine)	Stimulate adrenergic receptors on blood vessels, promote vasoconstriction, and reduce nasal edema and rhinorrhea	CNS stimulation, causing insomnia, excitation, headache, irritability, increased blood and ocular pressure, dysuria, palpitations, tachycardia.	Advise patient of adverse reactions.
Azelastine (Astelin [nasal spray]; Optivar [eye drops])	Histamine antagonist, mast-cell stabilizer	Bitter taste, headache, nasal burning.	Advise patient not to drink alcohol or take other CNS depressants.

CNS, central nervous system; GI, gastrointestinal.

Antihistamines can cause drowsiness and impaired coordination, so there are restrictions on driving automobiles and operating machinery at the beginning of therapy. Other common side effects include dry mouth, urinary retention, weakness, and blurred vision. Antihistamines and decongestants can aggravate hypertension, narrow-angle glaucoma, or benign prostatic hyperplasia (enlarged prostate) and should be used with caution. Older adult men taking antihistamines may experience hesitancy while voiding, urinary retention, and difficulty with ejaculation; the offending drug should be discontinued if the problem cannot be resolved.

Anti-inflammatory drugs such as corticotropin and cortisone are administered to reduce the inflammatory response that occurs in an allergic reaction. If the respiratory tract is involved, bronchodilators can be given to help relieve dyspnea and wheezing. Tranquilizers and sedatives may be ordered to promote the rest needed for successful recovery from a severe reaction and aid in relieving the stress that may have occurred. Local reactions involving widespread and deep skin lesions are treated with salves such as calamine lotion, wet compresses, and soothing baths. The patient must also be protected from a secondary bacterial infection.

Desensitization.

When exposure to allergens cannot be avoided or if the symptoms cannot be managed successfully, desensitization (immunotherapy) may be suggested. The purpose is to decrease sensitivity to allergens. Regular injections of extremely small quantities of selected antigens are given daily, weekly, or monthly. The amount given is gradually increased until there is noticeable clinical improvement, and then a maintenance dosage is given. The program may last for years, but improvement should be noted in about 6 to 24 weeks after it is begun.

❖ Nursing Management

■ Assessment (Data Collection)

Identifying or isolating the allergens causing the patient's symptoms requires time and diligence.

☒ Focused Assessment

Indicators of Allergic Response

General

- History of food intolerances; colic; abdominal cramping; bloating; or pain, vomiting, and diarrhea in the absence of general illness
- History of unusual reaction to any drug, food, insect sting, odor, or fumes
- History of recurrent respiratory problems or seasonal flare-ups of any symptoms
- History of fatigue, wheezing, or shortness of breath on exertion
- Exposure to new personal hygiene products or cleaning products

Skin

- Itching, burning, dryness, scaling, irritations, inflammations, hives, rash (note symmetry and location), scratches, or urticaria

Eyes

- Burning, itching, tearing, history of sties
- Redness, discoloration below eyes (allergic shiners), conjunctivitis, rubbing, or excessive blinking

Nose

- History of nose twitching, stuffiness, recurring nosebleeds, sudden episodes of sneezing or snorting
- Allergic salute (pushing nose upward and backward with heel of hand), nasal polyps, nasal voice

Mouth and throat

- Open-mouth breathing, continual throat clearing, mouth wrinkling with facial grimaces, redness of throat, swollen lips or tongue, itchy palate

Ears

- History of hearing loss, drainage from ears

Neck

- Palpable, enlarged lymph nodes

Besides a food diary, the patient may need to keep track of any chemicals that are used (e.g., cosmetics, soaps, deodorants, household cleaners, garden products, etc.) for a few weeks. Recalling a family history of allergies and types of symptoms they displayed may also prove helpful. Repeated assessments may need to be planned over a period of weeks or months if the patient is reactive to a variety of allergens.

Health Promotion

Nursing Goals for Patients With Hypersensitivity Reactions

- Assist in the diagnosis of hypersensitivity.
- Help the patient identify the particular substance or substances that trigger an allergic response.
- Assist the patient in devising ways to avoid or at least limit exposure to these allergens.

- Relieve the symptoms of an allergy.
- Decrease the exaggerated response to the allergen(s).
- Provide health teaching.

Households have common allergens such as pet dander, dust, dust mites, cosmetics, cleaning agents, and dyes in fabrics and materials used in home furnishings. Overstuffed furniture, heavy draperies, and thick carpets contribute by holding particulate matter. Removal of carpeting, routine cleaning as well as daily dusting and vacuuming, and elimination of dust-harboring furnishings can help remove some allergens. Compliance with daily dusting and vacuuming is more likely if the individual's allergy is severe, prompting every effort to control it. Electrostatic filters and top-quality vacuum cleaners with high-efficiency particulate air (HEPA) filters are essential for those with severe inhalant allergies. It may be necessary to part with a cherished family pet or to overcome the habit of smoking and to ask others not to smoke. Purchase of HEPA air filters for the heating and air-conditioning unit may also be helpful. Molds grow in moist environments, so basements, building foundations, showers, and bathing areas are typically prone to mold growth. Routine cleaning and adequate ventilation can help reduce or eliminate mold growth in most homes. Houseplants should be removed if there is an allergy to mold. Dehumidifiers can reduce moisture in basements. Successful compliance with recommendations should reduce the frequency, severity, and symptoms of the allergic reaction.

Patients with allergy-induced skin conditions should be taught that a warm environment and sweating increase the sensation of itching. Advise the patient to keep cool without chilling and not to take excessively hot showers or baths. Over-the-counter topical lotions, as well as prescription medications and salves, can help relieve itching.

Avoiding exposure to allergens requires knowledge of the nature of the allergen, method of transmission, source or reservoir, and portal of entry. Alteration in habits and location may also help eliminate exposure. Successful management of hypersensitivity depends in large measure on the ability of the patient to understand the allergy and to follow the prescribed treatment regimen.

Clinical Cues

Nurses and others who handle certain drugs may develop allergies to these drugs. For example, penicillin and streptomycin can cause contact dermatitis in those who are regularly exposed to them. Hands should be washed thoroughly after handling antimicrobial agents.

Think Critically

What actions would you suggest for removing allergens from the home environment for someone allergic to mold, animals, dust mites, and smoke?

Anaphylactic Reaction and Anaphylactic Shock

Etiology and Pathophysiology

Anaphylaxis is a serious, life-threatening, whole-body allergic reaction. The cardiovascular system, respiratory system, gastrointestinal (GI) system, and skin all contain copious amounts of mast cells. Any agent that causes a severe hypersensitivity reaction can cause anaphylaxis. Substances commonly known to cause hypersensitivity and possible anaphylaxis are listed in **Box 11-8**. For anaphylaxis to occur, the allergen usually needs to be delivered systemically before the sensitized mast cells are triggered to react. An example of this is the parenteral delivery of an antimicrobial agent such as penicillin. When the reaction occurs, the affected cells swell and rupture, with the subsequent release of histamine. Histamine causes dilation of small blood vessels, a pooling of blood, and release of fluid into tissues. This may lead to circulatory collapse and profound shock ([Figure 11-8](#)). A less severe reaction usually occurs if the allergen is delivered by direct contact, inhalation, or ingestion.

Box 11-8

Substances Known to Cause Hypersensitivity and Possible Anaphylaxis

Drugs

- Aspirin
- Cephalosporins
- Chemotherapy agents
- Insulins
- Local anesthetics
- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Penicillins
- Sulfonamides
- Tetracyclines

Diagnostic and treatment agents

- Allergenic extracts for desensitization
- Blood products
- Iodine-containing contrast media used for radiographs

Antitoxin sera

- Botulinum antitoxin
- Diphtheria antitoxin
- Poisonous spider antitoxin
- Snake venom antitoxin
- Tetanus antitoxin

Foods

- Chocolate
- Milk
- Eggs
- Shellfish
- Fish
- Strawberries
- Wheat
- Nuts (especially peanuts)

Insect stings

- Ants (particularly fire ants)
- Bees, hornets, wasps, yellow jackets

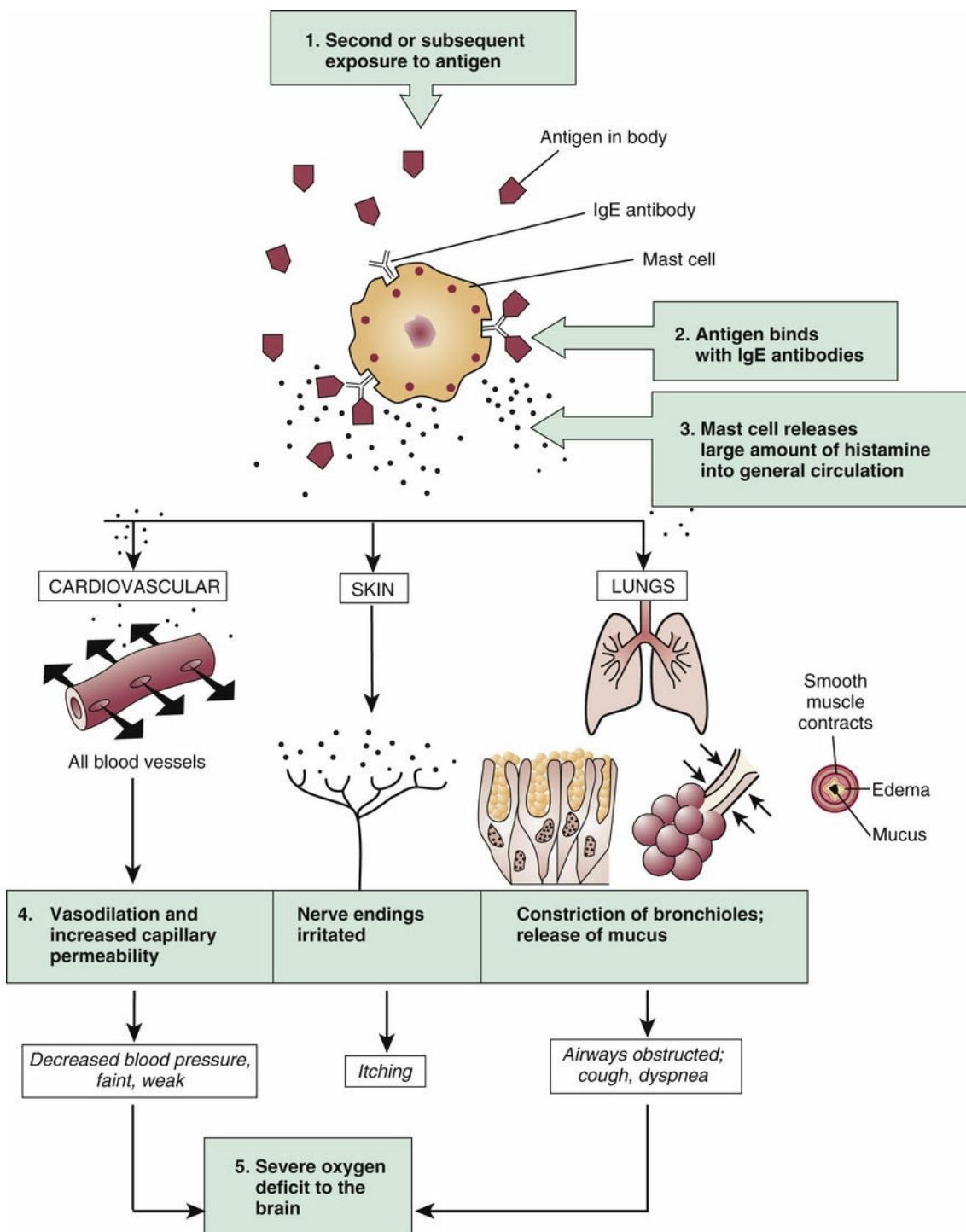


FIGURE 11-8 The effects of anaphylaxis. (From Van Meter KC, Hubert RJ: *Gould's pathophysiology for health professions*, ed. 5, Philadelphia, 2015, Elsevier Saunders.)

Non-IgE-dependent allergens.

IgE-mediated immune responses typically require repeated exposures for a reaction to occur. In the non-IgE-allergen response, a single encounter can lead to anaphylaxis or even death if not recognized immediately. Examples include iodine-based dyes for select radiologic studies and certain narcotics such as morphine and vancomycin, especially if they are administered too rapidly.

Nurses must be alert for previous allergic reactions and identify patients who are likely to experience a serious reaction. Before administering any medication or drug, verify the patient's known allergies. Patients and families should be actively involved in knowing and reporting allergies. The National Patient Safety Goals view this as a safety measure. **Check all the areas in the medical record where allergies are usually documented.** For example, the home page for the patient's electronic health record may have an allergy alert flag on it; the medical history obtained by the provider should contain information related to allergies; and the medication administration record (MAR), the multidisciplinary care plan, and the nurse's admission history may also contain allergy information.

Clinical Cues

Allergies to seafood indicate intolerance to iodine. This means there is potential for an allergic reaction to iodine-based contrast agents used in radiologic imaging studies. Be certain that the shellfish or iodine allergy is noted on the home page of the medical record, on the MAR, and in other locations where allergies are likely to be noted.

Signs and Symptoms

An anaphylactic reaction requires immediate action. The appearance of hives (**urticaria**) or swelling beneath the skin (**angioedema**) may signal the onset of an anaphylactic episode. Hives or sudden outbreaks of **wheals** (small areas of swelling) on the skin that itch and burn may appear without subsequent anaphylaxis.

Tachycardia, decreased pulses, and a rapid drop in blood pressure signal circulatory collapse, which can occur very rapidly. The patient will also exhibit increasing dyspnea because of the narrowing of the air passages (bronchoconstriction), accumulation of mucus, and wheezing. If an airway is not maintained, convulsions may occur because of oxygen deprivation. Treatment must be started immediately to avoid hypoxic brain injury or death within a matter of minutes.

Emergency supplies should be readily available whenever vaccines, serum for passive immunization, and highly allergenic drugs are administered. Anaphylaxis may be prevented if complete information is obtained before administration. Premedication with steroids and/or antihistamines can be administered if a substance needs to be given that the patient has shown sensitivity to in the past.

Clinical Cues

Many patients report allergies to medications that are actually manifestations of side effects, intolerance, or nonallergic adverse reactions. Nausea, constipation, diarrhea, coughing, or drowsiness may be side effects of medications, but reactions to drugs that do not involve the immune system are considered nonallergic adverse reactions. Careful questioning of the patient can help distinguish what kind of reaction the patient has experienced in the past.

Diagnosis

There is no test to confirm the diagnosis of anaphylaxis; rather it is the presenting symptoms, including sudden onset involving one or more body systems, producing one or more symptoms such as itching, hives, stridor, wheezing, or shock, that confirms the clinical diagnosis of anaphylaxis. Once the patient's condition has been stabilized, laboratory and other diagnostic tests may be performed to rule out other possible causes for the symptoms.

Treatment and Nursing Management

Treatment of anaphylaxis includes the following:

- Establishing a patent airway and administering oxygen to relieve the symptoms of dyspnea and hypoxia.

- Administering IV epinephrine to counteract the effect of histamine: relax the bronchioles, increase the cardiac output, and elevate the blood pressure.
- Administering antihistamine (e.g., diphenhydramine hydrochloride [Benadryl]) to stop the effects of the histamine released by the body cells.
- Instituting measures to prevent or control shock.
- Providing psychological support during the course of the **syndrome** (a group of symptoms that characterize a disorder or condition) and its treatment.

When there is difficulty with breathing because of swelling in the airway, provide high-flow oxygen. Although the patient is still able to move air in and out, giving inhaled medications to relax the airways helps maintain air exchange. If these measures are not effective, an emergency intubation, tracheotomy, or cricothyrotomy may be necessary.

Epinephrine is given to counter the allergic reaction. It can be given IV, intramuscularly, subcutaneously, or through an established endotracheal tube. **If the patient is taking beta blockers, they will hinder the effectiveness of the epinephrine.** Diphenhydramine is also used to alleviate the symptoms of the allergic reaction. Corticosteroids may also be given to control the inflammatory response and reduce symptoms.

During the crisis, vital signs and respiratory effort must be monitored continuously. Adequate pharmacologic support and IV fluids are important to maintain perfusion and an adequate blood pressure. See [Chapter 44](#) for additional information on treating shock.

Think Critically

What is the first thing you would do if a patient starts complaining of shortness of breath and wheezing just after you have administered an antibiotic by injection or IV infusion?

People who have extreme sensitivities to certain allergens should carry a medical alert card or wear an identification bracelet or necklace that contains the information. Several companies offer “medical jewelry” that can relay pertinent information. It also is advisable for individuals who are highly allergic to stings from bees, wasps, or other insects or who are severely allergic to nuts or some other food to carry an EpiPen or a small kit containing epinephrine, syringe, needle, tourniquet, and diphenhydramine hydrochloride with them at all times. These pens and kits are available at pharmacies but require a prescription. They are strongly recommended by allergists because of how quickly an insect sting or inadvertent ingestion of a food can produce a fatal reaction in someone who is highly sensitive. It is also advised that the patient inform coworkers or family members where it can be found should the kit be needed.

Get Ready for the NCLEX® Examination!

Key Points

- In immune deficiency disorders there is an insufficient production of antibodies, immune cells, or both, and the disorders may be congenital or acquired.
- Immunosuppression may be used therapeutically for a variety of conditions, such as tissue transplants, rheumatoid arthritis, and NHL.
- Body temperature should be closely monitored for significant changes, although immune-deficient patients may not have a temperature elevation even in the presence of infection.
- HIV disease in the United States is now a chronic controllable disease.
- HIV testing should be offered at the time of a complete physical examination for all sexually active patients.
- A barrier, such as a latex condom, should be used during insertive or receptive sexual intercourse to decrease the risk of acquiring HIV.
- Performing genotyping and phenotyping in a newly diagnosed HIV-positive person helps determine whether the person has any drug-resistant strains of HIV and guides therapy.
- The diagnosis of AIDS is made when the CD4 count is less than 200 cells/ μ L or by the presence of specific OIs.
- OIs secondary to AIDS cause increased morbidity and mortality.
- Wasting syndrome in an AIDS patient is defined as a weight loss of more than 10% of usual body weight.
- If a health care worker is exposed to blood or body fluids of an HIV-positive patient, the occupational health or the Infection Preventionist should be notified to assist with treatment and follow-up.
- The two most common sites of CMV infection are the retina and the GI tract.
- Autoimmune disorders are believed to be caused by the immune system reacting to the body's own cells and are typically treated by suppressing the immune system.
- In SLE, the body produces abnormal antibodies that attack the target tissues or cells. Inflammation of muscles, blood vessel abnormalities, and immune complex deposition in tissue occurs.
- Lymphoma starts in the lymph tissue when malignant lymphocytes multiply and crowd out normal cells; treatment depends on staging and the aggressiveness of the particular type of the disease.
- In HL, R-S cells are seen on microscopic examination of tissue.
- In NHL, the R-S cells are not present. NHL is further identified as B-cell or T-cell lymphoma.
- Nursing care for lymphomas focuses on preventing infection, managing the symptoms, and reducing the side effects of the therapies.
- In fibromyalgia, the most common feature is musculoskeletal pain that is diffuse and multifocal with flare-ups and remissions.
- Any agent that causes a severe hypersensitivity reaction can cause anaphylaxis.
- Nursing responsibilities in caring for patients with allergic conditions include assisting in the diagnosis of hypersensitivity, helping to identify substances that trigger an allergic response, assisting the patient to avoid or limit exposure to allergens, and relieving symptoms.
- Emergency equipment and medications must be available for an anaphylactic reaction, which is a life-threatening condition.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.
 Online Resources

- Centers for Disease Control and Prevention, <http://cdc.gov/hiv>

- World Health Organization, www.who.int/hiv/en
- HIV Cost Effectiveness, <http://www.cdc.gov/hiv/prevention/ongoing/costeffectiveness/index.html>
- SEER Stat Fact Sheets: Non-Hodgkin Lymphoma, <http://seer.cancer.gov/statfacts/html/nhl.html>
- National Fibromyalgia Association, www.fmaware.org/PageServer.html
- Systemic Lupus Erythematosus, www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001471
- Hodgkin Lymphoma: <http://www.cancernetwork.com/cancer-management/hodgkin-lymphoma/page/0/1#sthash.Qno7QF0Q.dpuf>

Review Questions for the NCLEX® Examination

1. The nurse reinforces the provider's order to draw blood for HIV genotyping. The patient asks, "How does that help in my treatment?" What is the best explanation for the test?

1. Confirms the presence of a viral autoimmune disease
2. Informs how much of the virus has been replicated
3. Determines the presence of any mutations in the virus
4. Reveals the viral load or count of the virus

NCLEX Client Need: Health Promotion and Maintenance

2. A patient known to be positive for HIV is admitted with oral thrush, recurrent vaginal yeast infections, and skin infections. What do these signs indicate?

1. Opportunistic infection
2. Antimicrobial resistance
3. Resistant strain of HIV
4. Sentinel infection

NCLEX Client Need: Physiological Adaptation: Alterations in Body Systems

3. Which statement(s) is/are true regarding HIV transmission? (*Select all that apply.*)

1. Breast milk can harbor the virus.
2. Proper use of PPE reduces the risk of disease transmission.
3. Needle exchange programs facilitate the spread of the virus.
4. Being assessed 2 hours after a blood-borne pathogen (BBP) exposure decreases the risk of conversion.

5. Monogamous relationships provide the best defense from the virus.

NCLEX Client Need: Physiological Adaptation: Pathophysiology

4. In determining the optimal therapy for a patient infected with HIV, what would the nurse consider in developing a nursing care plan? (*Place in order of priority.*)

1. Clinical data
2. Compliance with therapy
3. Medication tolerance
4. Support system
5. Patient expectations

NCLEX Client Need: Physiological Adaptation: Illness Management

5. A nurse is reviewing medication orders for a female patient with SLE who is positive for the presence of antiphospholipid antibodies. The nurse would seek clarification from the provider about which type of medication?

1. Oral contraceptives
2. Hydroxychloroquine (antimalarial)
3. Glucocorticoid medication
4. NSAID

NCLEX Client Need: Pharmacological and Parenteral Therapies: Medication Administration

6. A patient has the medical diagnosis of fibromyalgia. Which nursing problem is the highest priority for on this patient's care plan?

1. Airway congestion
2. Inability to comply with treatment regimen
3. Chronic pain
4. Potential for fluid imbalance

NCLEX Client Need: Physiological Adaptation: Illness Management

7. The nurse admits an older adult man with NHL. On initial assessment, the nurse notes that the patient is slightly confused, is irritable, is emaciated, has poor dentition, and is homeless. What is the priority nursing problem?

1. Potential for infection
2. Lack of coping ability
3. Alteration in body image
4. Inadequate knowledge of disease process

NCLEX Client Need: Physiological Adaptation: Alterations in Body Systems

8. A systemic autoimmune disease affects more than one type of body tissue or organ. Which would be considered systemic autoimmune disease(s)? (*Select all that apply.*)

1. Addison disease
2. Rheumatoid arthritis
3. Systemic lupus erythematosus
4. Goodpasture syndrome
5. Primary lymphedema

NCLEX Client Need: Physiological Adaptation: Pathophysiology

9. What are the advantages in performing a RAST? (*Select all that apply.*)

1. The patient does not have to refrain from taking antihistamine medications.
2. It is safer for patients with serious heart and lung problems.
3. There is no chance of experiencing an anaphylactic reaction because it is performed on the blood.
4. It can be used on patients whose skin condition is too severe to perform skin testing.
5. The results can be obtained within several hours.

6. It has greater specificity for allergens than other tests.

NCLEX Client Need: Reduction of Risk Potential: Diagnostic Tests

10. A patient with an immune disorder is very susceptible to infection. Which intervention(s) would be used in the care of this patient? (*Select all that apply.*)

1. All health care workers should perform scrupulous hand hygiene.
2. The patient should be instructed on how to wear PPE.
3. The patient is placed in Contact Isolation as soon as possible.
4. Caregivers with any type of infection should not be assigned to the patient.
5. A high-protein diet with nutritional supplements is encouraged.

NCLEX Client Need: Safety and Infection Control: Standard Precautions/Transmission-Based Precautions

Critical Thinking Questions

Scenario A

A nursing assistant was instructed to clean up equipment that was used in a bedside procedure. She accidentally sustains a needle stick while putting a used syringe into an overly filled sharps container in the room of an HIV-positive patient. The nursing assistant is crying hysterically and unable to act on her own behalf.

1. What should you do first?
2. Outline the steps of treatment and reporting for this type of incident.
3. What factors may have contributed to the accident?

Scenario B

Marilyn Jost, age 15, is highly allergic to penicillin and bee stings. The last time she experienced a reaction to a bee sting on her leg, the entire limb became swollen. Marilyn is active in the teen church group and frequently goes on camping trips. Her provider has suggested that she wear an identification bracelet stating her allergies and that she carry an emergency kit when she is on a camping trip. Her mother sees no need for these precautions because Marilyn is a perfectly healthy girl. Marilyn says she would not know what to do with the kit if she did get stung by a bee or wasp.

1. How would you explain to Marilyn and her mother the need for the identification bracelet and the kit?
2. How would you go about teaching Marilyn to use the emergency kit?

UNIT IV

Respiratory System

OUTLINE

Chapter 12 The Respiratory System

Chapter 13 Care of Patients With Disorders of the Upper Respiratory System

Chapter 14 Care of Patients With Disorders of the Lower Respiratory System

CHAPTER 12

The Respiratory System

Objectives

Theory

1. Describe the structure and function of the respiratory system.
2. Analyze three causative factors related to disorders of the respiratory system.
3. Summarize nursing responsibilities for patients undergoing diagnostic tests and procedures for disorders of the respiratory system.
4. Provide instructions to patients on measures to prevent long-term problems of the respiratory system.

Clinical Practice

5. Employ proper techniques for assessing the respiratory system.
6. Verify that problem statements/nursing diagnoses chosen for patients with problems of the respiratory system are appropriate.
7. Propose interventions for a patient who has a problem with oxygenation.
8. Teach a patient about smoking cessation.

KEY TERMS

adventitious (ăd-vĕn-TĬ-shŭs, p. 265)
antitussive (ăn-tĭ-TÜS-ĭv, p. 267)
aphonia (ă-FŌ-nē-ă, p. 263)
apnea (ĂP-nē-ă, p. 254)
bradypnea (brăd-ĕp-NĒ-ă, p. 263)
compliance (kōm-PLĪ-ăns, p. 254)
crackles (KRÄK-ŭlz, p. 265)
cyanosis (sī-ă-NŌ-sĭs, p. 263)
dyspnea (DĨSP-nē-ă, p. 262)
expectorate (ĕk-SPĚK-tō-rāt, p. 252)
hypercapnia (hī-pĕr-KĀP-nē-ă, p. 268)
hypocapnia (hī-pō-KĀP-nē-ă, p. 269)
hypoxemia (hī-pōk-SĒ-mē-ă, p. 255)
hypoxia (hī-PŌK-sē-ă, p. 266)
kyphosis (kī-FŌ-sĭs, p. 254)
orthopnea (ör-thōp-NĒ-ă, p. 264)
perfusion (pĕr-FŪ-zhūn, p. 255)
sputum (SPŪ-tūm, p. 263)
stridor (STRĪ-dōr, p. 265)

tachypnea (tăk-ĕp-NĒ-ă, p. 263)

ventilation (vĕn-tĭ-LĀ-shŭn, p. 255)

wheezes (WĒZ-ĕz, p. 265)

Overview of Anatomy and Physiology of the Respiratory System

Functions of the Structures of the Upper Respiratory System

- Air passes through the nose, mouth, pharynx, larynx, and trachea and then into the lungs ([Figure 12-1](#)).

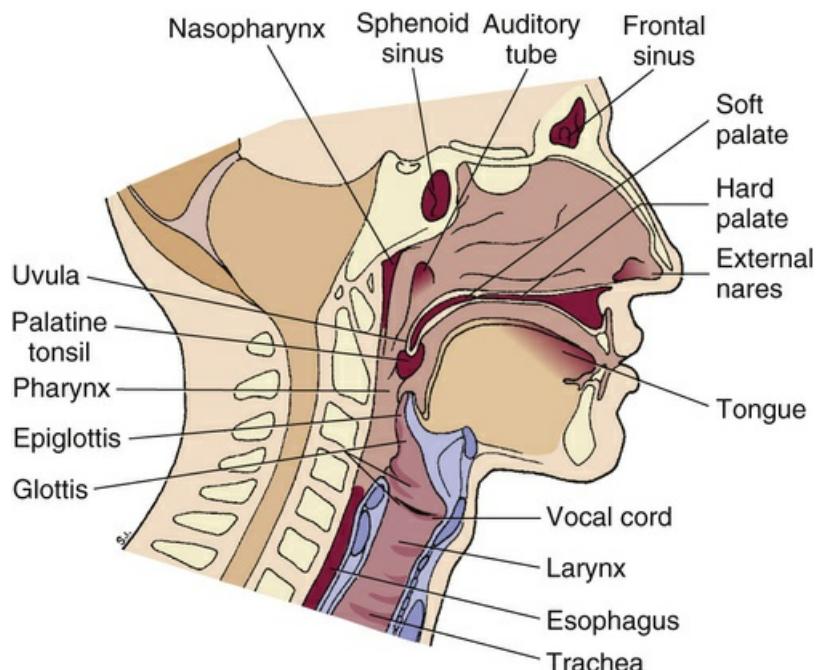


FIGURE 12-1 Structures of the upper respiratory tract.

- The nasal cavity is lined with mucous membrane that warms and moistens the air as it passes through.
- The mucous membrane secretes mucus, which traps dust particles and bacteria.
- The **cilia** (small, hairlike projections) propel the mucus toward the larynx, so the person can swallow or **expectorate** it (cough up and spit out).
- The paranasal sinuses (maxillary, frontal, sphenoid, and ethmoid) are air-filled cavities lined with mucous membrane and situated among the facial bones around the nasal cavity ([Figure 12-2](#)).

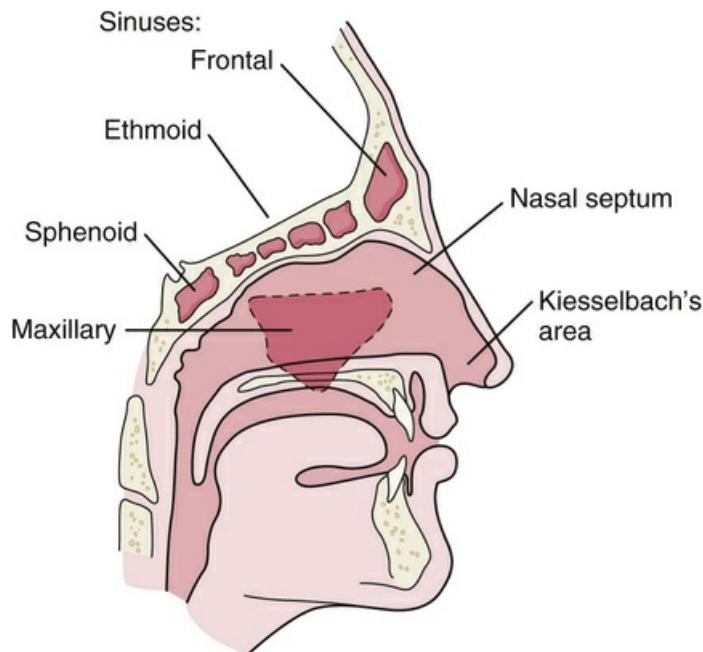


FIGURE 12-2 The paranasal sinuses.

- The sinuses reduce the weight of the skull, produce mucus, and influence voice quality.
- The pharynx, consisting of the nasopharynx, oropharynx, and laryngopharynx, is about 5 inches long and extends from the back of the mouth to the esophagus.
- The pharynx is a passageway for moving air to the lungs and food to the esophagus.
- The tonsils, which are part of the lymphatic system, are located in the oropharynx; the adenoids (also part of the lymphatic system) are located in the nasopharynx. If they become inflamed and enlarged, they may interfere with breathing. The epiglottis forms a hinged “door” at the entrance to the larynx.
- The larynx sits between the pharynx and the trachea. The vocal cords are located in the larynx.
- The trachea is made up of cartilage, smooth muscle, and connective tissue and is lined with mucous membrane and extends from the larynx to the bronchi; it is the “windpipe” and carries air to the lungs.

Epiglottis Protection of the Airway

- When swallowing begins, the epiglottis closes over the larynx, preventing aspiration of food and secretions into the lungs. Food is then directed into the esophagus.
- When the swallowing reflex is weak or absent, aspiration is a risk.

Production of Speech in the Larynx

- The glottis is the space between the folds of the vocal cords, which are made up of mucous membrane attached to the front and back of the larynx.
- When air from the lungs exits through the larynx, it causes rapid opening and closing of the glottis. Movements of the mouth, lips, jaws, and tongue convert the sounds made by the rush of air through the glottis into speech sounds.

Functions of the Structures of the Lower Respiratory System

- On inhalation, after passing through the nose, pharynx, larynx, and trachea of the upper respiratory system, air enters the left and right bronchi, which branch off of the trachea.
- The bronchi carry air into the lungs; the right lung has three lobes, and the left lung has two lobes.

Oxygen Delivery to the Alveolar Membrane for Diffusion Into the Blood

- The main bronchi divide into smaller and smaller bronchi, and then divide into bronchioles that

deliver the air to the alveoli (Figure 12-3). The right bronchus has less of an angle than the left bronchus; inhaled foreign objects tend to go into the right bronchus.

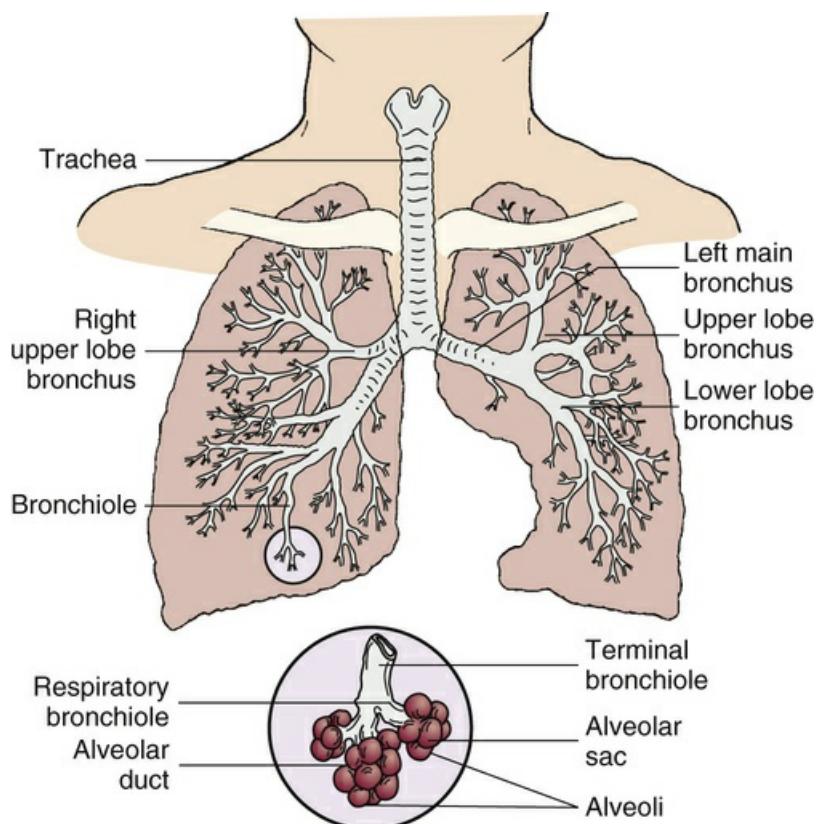


FIGURE 12-3 Structures of the lower respiratory tract and alveoli.

Protection of the Lungs

- The **pleura** is a serous membrane of two layers. One layer, the **visceral pleura**, covers each lung, and the **parietal pleura** lines the inner wall of the chest cavity. These two layers make up the **pleural sac**, which encloses each lung and the chest wall and is an airtight compartment. **If the pleural sac is punctured, air will rush into the pleural cavity and collapse the lung.**
- The pleural cavity is a potential space between the pleural layers where there is normally only a small amount of fluid.
- This small amount of fluid between the two layers of pleura lubricates the pleural cavity and prevents friction between the pleural layers with inhalation and exhalation.
- The mucous membrane lining the many small branches of the bronchial tree contains tiny hairlike projections (cilia) that trap and propel small inhaled foreign particles toward the entrance of the respiratory tract; the cough reflex works to expel the secretions and particles.
- If the particles advance to the lungs, the alveoli contain macrophages that quickly destroy inhaled bacteria and other foreign particles.

Control of Respiration

- The central nervous system controls both involuntary and voluntary respiration via the pons and the medulla. The vagus nerve supplies the pharynx, larynx, respiratory airways, and lungs.
- The brainstem chemoreceptors are sensitive to changes in carbon dioxide (CO_2) and hydrogen ions in the cerebrospinal fluid; the chemoreceptors in the aorta and the carotid arteries are sensitive to oxygen levels in the blood.
- The signals of changing levels of hydrogen ions (measured by pH), CO_2 , and oxygen (O_2) trigger

the respiratory center to send signals through the spinal cord and spinal nerves to the peripheral nervous system and to the phrenic and intercostal nerves that control the diaphragm and respiratory muscles.

- When CO₂ levels in the cerebrospinal fluid become higher than normal or the pH drops, the central receptors in the brainstem signal the nerves to initiate faster respiration to “blow off” the excess CO₂. Carbon dioxide levels give the primary signals for respiration.
- When arterial blood O₂ levels fall below normal, the respiratory centers in the aorta and carotid arteries signal the nerves to cause the lungs to inflate more fully, making the person breathe more deeply and at a faster rate.
- **When CO₂ levels are constantly high (as occurs with chronic lung disease such as emphysema), the body becomes accustomed to high CO₂ levels, and the respiratory drive is triggered by the receptors for low arterial O₂ instead of high levels of CO₂. If these patients are given too much oxygen, their respiratory drive is suppressed and they will stop breathing.** (Normal blood gas levels are listed in [Table 12-1](#).)

Effect of the Bones of the Thorax and the Respiratory Muscles on the Respiratory Process

- Inspiration (inhalation) and expiration (exhalation) occur by movement of the diaphragm and the intercostal muscles in the chest wall. During normal breathing, about 500 mL of air moves in and out of the lungs with each breath. The diaphragm is the primary respiratory muscle.
- When the diaphragm contracts, it moves downward; the other chest muscles contract, pulling the rib cage up and out, expanding the lungs and creating an area of negative pressure. Air from the atmosphere, which has a positive pressure, flows into the lungs.
- When the muscles relax, the rib cage moves back to its normal position, and the lungs return to a resting position, causing air to be passively pushed out in exhalation.
- **If damage to the spinal cord occurs above the level where the phrenic nerve branches off to control the diaphragm (C4), voluntary respiration ceases.**
- If the muscles of the diaphragm and chest (intercostals) are paralyzed, **apnea** (absence of breathing) occurs.
- The thoracic cage—composed of the thoracic vertebrae, the sternum, and the ribs—forms a stable unit that allows the respiratory muscles to function correctly. If any bones of the thorax or chest wall are injured or fractured, breathing can be affected. **Compliance** describes the elasticity of the lungs or how easily the lungs inflate; when compliance is decreased, the lungs are more difficult to inflate. Chronic obstructive pulmonary disease (COPD) and aging alter compliance because of damage in the alveoli.
- **Weakness of the respiratory muscles, such as occurs with neuromuscular diseases, also causes decreased respiratory ability.**
- **Kyphosis** (inward curvature and collapse) of the spine constricts the thoracic cavity and restricts the capacity of the lungs to expand fully.

Factors That Affect the Exchange of Oxygen and Carbon Dioxide

- Alveoli are tiny air sacs covered with a permeable membrane that come into contact with the pulmonary arterioles and venules; oxygen passes into the arterial blood, and carbon dioxide passes from the venous blood into the alveoli for exhalation.
- Surfactant is secreted by cells in the alveoli; it decreases surface tension on the alveolar wall so that diffusion of O₂ and CO₂ can take place. Surfactant facilitates expansion with inspiration and prevents alveolar collapse on expiration. When surfactant levels are low, alveoli cannot properly expand, and O₂ and CO₂ cannot cross the membrane adequately.
- When interstitial edema occurs in the lung tissue, the alveolar membrane is thickened and gases cannot diffuse across the membrane as easily. If fluid fills the alveoli, gases cannot diffuse across the membrane.

- Edema in the lungs occurs with infectious processes such as pneumonia and in disorders such as congestive heart failure.
- The major portion of the O₂ (about 97%) attaches to the heme portion of the hemoglobin molecule carried by the **erythrocytes** (red blood cells) and forms **oxyhemoglobin**. The plasma also transports a portion of each gas; about 3% of O₂ is dissolved in the plasma.
- CO₂, a cellular waste product, combines with water, forming carbonic acid; **dissociation** (uncombining) occurs, forming hydrogen ions and bicarbonate ions. About 77% of CO₂ is transported in the blood plasma in the form of bicarbonate ions. The remaining 23% of CO₂ combines with hemoglobin and is carried to the lungs. In the lung, the process reverses and the bicarbonate ions combine with hydrogen ions to form carbonic acid, which then dissociates into water and CO₂. The CO₂ diffuses across the alveolar membrane and is exhaled. The ability of the lungs to acquire oxygen is measured clinically by pulse oximetry (SpO₂). The ability of the lungs and chest to move air in and out of the body is termed **ventilation** and is clinically measured by end tidal CO₂ (ETCO₂ or capnography)

Effects of Aging on the Respiratory System

- The decrease in the immune system's efficiency makes older adults more susceptible to upper respiratory infections.
- Aging results in a decreased cough reflex and an increased potential for aspiration.
- Osteoporosis may cause kyphosis, which impinges on lung expansion.
- Adults age 70 years and older have some degree of change in connective tissue that causes decreased elasticity and affects lung function and ventilation.
- Total body water decreases to 50% after age 70 years; thus mucous and respiratory membranes are not as moist and mucous becomes much thicker.
- There is some impairment of the ciliary action, which makes it more difficult for older adults to remove mucus, and retained mucus provides a breeding ground for bacterial infection.
- There is a loss of normal elastic recoil of the lung during expiration, and older adults must use muscle action to complete expiration. This increases the work of breathing.
- Muscle atrophy may affect the respiratory muscles, diminishing their strength.
- Connective tissue changes and loss of elastic tissue in the alveoli causes the alveolar membranes to become baggy. Oxygen levels decrease for the older adult, with partial pressure of oxygen (PO₂) dropping to 75 to 80 mm Hg from the usual 80 to 100 mm Hg.
- There is a decreased response to **hypoxemia** (oxygen deficit in the blood) and hypercapnia (excessive amounts of carbon dioxide in the blood).

Causes of Respiratory Disorders

Trauma or disease can affect structures of the respiratory system, nerves controlling respiration, or diffusion of oxygen or carbon dioxide across the alveolar membranes. **Perfusion** (blood flow into cellular tissue) is essential to provide oxygen to the cells of the body. Blood must flow past the alveolar membrane for **diffusion** (Box 12-1) of oxygen and carbon dioxide to take place. Cardiac disease, emboli, and other disorders of the heart and pulmonary blood vessels may cause problems in the respiratory system.

Box 12-1

Terms Commonly Used in Respiratory Care

- *Diffusion:* The movement of oxygen and carbon dioxide across the alveolar-capillary membrane. It takes place between the gas in the alveolar spaces and the blood in the pulmonary capillaries.
- *Elastance:* The extent to which the lungs are able to return to their original position after being stretched or distended.
- *Hypoxemia:* Deficient oxygenation of the blood.
- *Hypoxia:* A broad term referring to diminished availability of oxygen to the body tissues.
- *Lung compliance:* The ability of the lungs to distend in response to changes in volume and pressure of inhaled air. Lung compliance first increases and then decreases with age as the lungs become stiffer and the chest wall more rigid.
- *Perfusion:* The delivery of fluid through the blood vessels to body tissues.
- *Pulmonary hygiene:* Methods used to clear secretions from the airways.
- *Resistance:* The force working against the passage of air. The major determinant is the radius of the airway.
- *Respiratory failure:* An abnormality of gas exchange with either an excess of carbon dioxide or a deficit of oxygen, or both.
- *Shunting:* Intrapulmonary shunting is the diverting of blood so that it does not take part in the gas exchange at the alveolar sites. When intrapulmonary shunting occurs, blood enters the left side of the heart without being oxygenated. It is, therefore, a possible cause of hypoxemia.
- *Surfactant:* A complex lipoprotein produced by cells lining the alveoli, which lowers surface tension within the alveoli. It prevents collapse of the lung by stabilizing the alveoli and decreasing capillary pressures.
- *Ventilation:* The movement of air from the external environment to the gas exchange units of the lung. It can be spontaneous or done by a mechanical ventilator.

The respiratory system is particularly susceptible to harmful substances in the environment. Inhalation of bacteria and other organisms can quickly produce an infection in either the upper or lower respiratory tract. Tobacco smoke, allergens, poisonous gases, and other toxic substances cause irritation and inflammation of the air passages and can lead to chronic inflammation, obstructive diseases, and tumors. There may be a familial tendency related to sensitivity to these toxins, which may result in asthma and other lung problems.

There are two major types of ventilatory diseases: **restrictive** and **obstructive**. **Restrictive diseases are characterized by decreased lung capacity or compliance.** The expansion of the lung and chest wall is limited either by abnormalities in the bony structures **or by inability of the lung**

tissue to expand. Arthritis increases stiffness of the chest wall and results in a decreased ability of the chest cavity to expand and contract. Scoliosis and kyphosis decrease the size of the chest cavity. **Pneumothorax** (collapsed lung) diminishes lung surface; neuromuscular disorders weaken the strength of the muscles of respiration (e.g., myasthenia gravis), and disorders of the lung (e.g., pneumonia, atelectasis, and fibrosis) increase stiffness and decrease lung volume.

Obstructive pulmonary diseases are characterized by problems moving air into and out of the lungs. Narrowing of the openings in the tracheobronchial tree increases resistance to the flow of air, making it difficult for oxygen to enter and contributing to air trapping; therefore exhalation is also difficult. Asthma, emphysema, and chronic bronchitis are examples of obstructive lung diseases. Tumors in the lung can also obstruct airflow to the alveoli.

Respiratory Disorders

Prevention

The best ways to prevent infection and inflammation of the respiratory system are to practice hand hygiene frequently; stay out of crowds, especially during cold and flu season; refrain from smoking; avoid known allergens as much as possible; maintain adequate nutrition; and obtain sufficient rest to help keep the immune system healthy. Nurses should identify persons who have a high risk for infection (Box 12-2) and refer them for appropriate vaccinations or teaching.

Box 12-2

Factors that Increase Risk for Respiratory Infection

- Age older than 65 years
- Cigarette smoking
- Residing in extended-care facilities
- Chronic respiratory disorders (includes asthma)
- Congenital or chronic cardiovascular disorders
- Chronic renal disease
- Diabetes mellitus or a chronic metabolic disorder
- Compromised immune response

Allergy to airborne substances causes the mucous membranes of the nose and sinuses to become irritated and inflamed. When these membranes are inflamed, bacteria and viruses can more easily invade the cells and cause infection. By controlling inhaled allergens, the incidence of upper respiratory infection (URI) can be decreased.

Older Adult Care Points

Older adults should not be exposed to children with colds and coughs. If an older adult is confined to the house or a long-term care facility, he or she will not have the immunity to common viruses and bacteria that younger, more socially active people do.

Elimination of widespread respiratory diseases such as the common cold and influenza is not possible; therefore nurses must practice good hand hygiene and use Standard Precautions and airborne or droplet precautions when working with patients with respiratory infections as per the Centers for Disease Control and Prevention (CDC) guidelines. For certain groups such as older adults and the chronically ill, immunization against influenza and pneumonia is an effective means of reducing the incidence of respiratory disease. Providers, nurses, and others involved in providing health care should also be immunized. Among the more serious reactions to influenza vaccine are allergic reactions, fever, malaise, or muscle soreness. Current research indicates that influenza vaccinations may increase the risk of Guillain-Barré syndrome (CDC, 2012). This immune-mediated disorder occurs in about 1 in 100,000 individuals. The incidence of Guillain-Barré has been noted to be higher in the patient population who had the flu than in the group just receiving the vaccine, so vaccination is recommended. The vaccine is prepared from chicken embryos; therefore screening patients for egg allergy is important; nonegg formulations are available. One of the most important preventive measures of lung tissue injury is avoiding prolonged and repeated inhalation of irritating substances. Such substances include tobacco smoke, industrial gases, coal dust, particulates from agricultural activities, soot and other carbons, and air polluted by

automobile exhaust. *Healthy People 2020 (2015)* goals include addressing outdoor air quality as well as reducing “illness, disability and death related to tobacco use and secondhand smoke exposure.” Smoking cessation efforts are supported by increasing insurance coverage for evidence-based interventions, increasing smoke-free environments, and strengthening tobacco laws. The Joint Commission has developed Core Measures for the assessment and treatment of tobacco use. Nurses participate by identifying patients at risk for tobacco-related disease and encouraging cessation programs.

Think Critically

Can you think of three changes in lifestyle that might prevent you or a family member from developing a chronic or serious respiratory disorder?

Health Promotion

Smoking and Tobacco Cessation

The Agency for Healthcare Research and Quality (AHRQ) provides a guide for clinicians that states the following: There are “five As” for helping your patients to quit smoking: **Ask** about tobacco use. **Advise** about the health benefits of quitting. **Assess** readiness to quit. **Assist** in creating a cessation plan. **Arrange** follow-up. For those patients who are resistant to the five As model, an alternative model is the “Five Rights.” Help the patient identify the personal **Relevance**, **Risks**, **Rewards**, and **Roadblocks**, and **Repeat** these at every visit (Agency for Healthcare Research and Quality, 2008). Other toolkits and strategies are available on the AHRQ website.

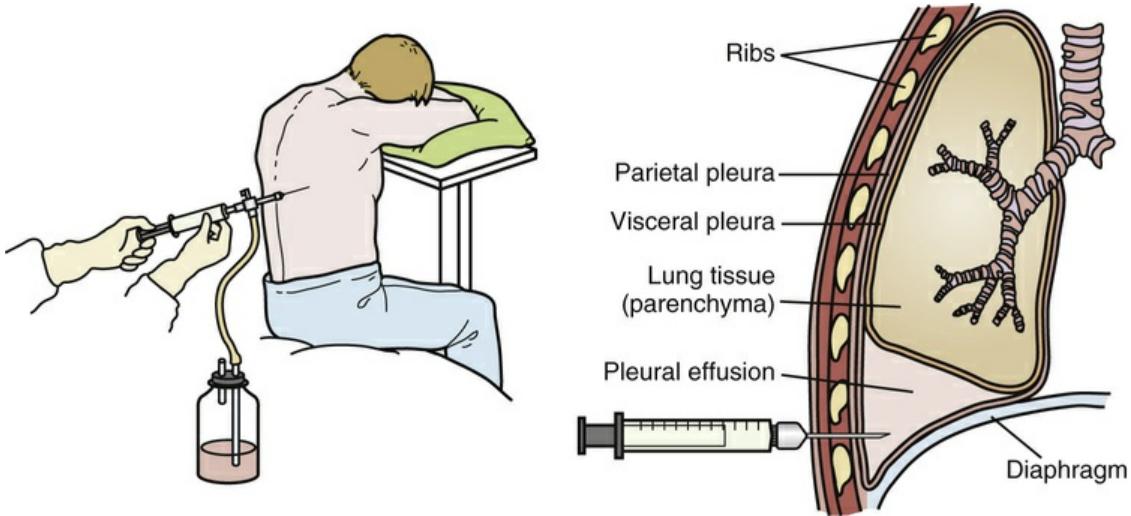
Diagnostic Tests and Procedures

Table 12-1 presents the most common diagnostic tests performed for problems of the respiratory system. A complete blood cell count with hemoglobin and hematocrit determinations is done to detect any deficiency in oxygen-carrying capacity of the blood. An elevated white blood cell count may indicate the presence of infection. Anterior-posterior and lateral chest radiographs are usually ordered when the patient has a lower respiratory tract problem that does not quickly resolve.

Table 12-1
Diagnostic Tests for Respiratory Problems*

TEST/PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
Pulse Oximetry (SpO_2)	Device attaches to earlobe, pinna of ear, or fingertip.	Keep sensor intact on patient. Monitor and record SpO_2 readings.
To allow comparison of oxygenated hemoglobin to total hemoglobin	Sensor detects blood cells in capillaries using an infrared light source.	Report readings persistently below 95% to provider. Obstructions to blood flow, such as inflated BP cuff, peripheral artery disease, hypotension, or hypothermia, can cause false readings. Metallic nail polish and harsh ambient light interfere with readings. Performed by the nurse at the bedside, in home or clinic setting.
CO ₂ Monitoring (Called Capnography When Equipment Displays a Waveform)	Device can be part of an oxygen delivery system measuring end tidal CO ₂ (ETCO ₂) or a skin sensor measuring transcutaneous CO ₂ (PtCO ₂).	Make sure sensor is positioned properly to obtain readings. Explain the reason for the monitoring to the patient. Done at bedside by the nurse.
Sublingual CO ₂ Level	Probe of handheld device is placed under the tongue.	Reading takes 60-90 sec. Explain the procedure to the patient.
Arterial Blood Gas (ABG) Analysis	To determine whether there is adequate exchange of carbon dioxide and oxygen across alveolar membrane; to determine acid-base balance within the body; to determine hypoxemia	Explain procedure to patient; arterial puncture is briefly painful. Apply firm pressure for 5-10 min after specimen drawn. Compare laboratory results to normal values: pH: 7.35-7.45. Usually obtained by respiratory therapy or nursing personnel. In some states, phlebotomists need additional training to obtain arterial specimens. Arterial blood sample is drawn and tested for pH, PaO ₂ , PaCO ₂ , and HCO ₃ ⁻ . PaO ₂ : 80-100 mm Hg. PaCO ₂ : 35-45 mm Hg. HCO ₃ ⁻ : 22-26 mm Hg.
D-Dimer (Fibrin Split Products, Fibrin Degradation Products)	To assess thrombin and plasmin activity	Blood test that provides assay of fibrin degradation. No fasting is required.
Useful for assisting in the diagnosis of pulmonary embolism and disseminated intravascular coagulation (DIC)		Collect a venous blood sample in a light blue-top tube.
CBC	To identify adequacy of hemoglobin to carry oxygen and to determine whether an infection is present	Provides information on red cells and the body's immune response. Collect a venous blood sample in a lavender-top tube. Performed by the nurse or phlebotomist at the bedside in home or clinic setting.
Sputum Analysis		

To examine sputum from lower respiratory tract for bacteria, bacilli, or malignant cells; to determine color, consistency, and sensitivity of bacteria to specific antibiotics	Sputum specimen is examined and cultured for bacteria; acid-fast stain and Gram stain are done for tuberculosis bacillus; cytologic studies may be done to search for malignant cells. If bacteria are present, sensitivity studies to antibiotics are performed. Nucleic acid amplification can detect <i>Mycobacterium tuberculosis</i> earlier than culture and should be interpreted in correlation with acid-fast results.	Explain that specimen is desired from lower areas of lungs; may require respiratory therapy to obtain proper specimen. coaching in proper coughing technique. Best specimen is obtained in morning before eating or mouth care. Promote mouth care after obtaining specimen. Specimen is expectorated into sterile container.
Pulmonary Function Tests (PFTs)		
To determine integrity of mechanical function and gas exchange function of the lungs: volume of air lung can hold; rate of flow of air in and out of the lung; and elasticity, or compliance, of lung	Patient breathes in as much air as possible and then breathes out as much air as possible into a spirometer, indicating the forced vital capacity (FVC); forced expiratory volume in 1 sec (FEV ₁) is measured. Other measurements include total lung capacity (TLC), vital capacity (VC), tidal volume (TV), functional residual capacity (FRC), and residual volume (RV).	Should not be done within 1-2 hr of eating. No smoking for 4-6 hr before test. Patient is not to take any drugs or sedation. Patient may be instructed to stop bronchodilator and corticosteroid medications before the procedure. Explain procedure to patient. <i>Post-test:</i> Monitor vital signs and allow patient to rest, because test can be fatiguing. Some of the readings can be obtained at the bedside for an inpatient. Most full studies are done in a pulmonary laboratory as an outpatient procedure.
Chest Radiograph (X-Ray)		
To determine pathologic conditions in the lungs, such as pneumonia, lung abscess, tuberculosis, atelectasis, pneumothorax, and tumor; also gives indication of heart size and any abnormalities of bony structures	Front, back, and lateral views may be taken; fluoroscopy may be used to visualize lung and diaphragm movement.	Imaging procedures require specially trained personnel to perform. For outpatient procedures, tell patient to remove clothes down to the waist and put on gown provided so that i back. Will be asked to take a deep breath and hold it while the radiograph is taken. Portable x-rays can be taken when the patient is unable to stand or be transported to the stationary x-ray equipment.
Chest Computed Tomography (CT)		
To visualize soft tissue densities, tumors, and blood clots	Chest CT with 5- to 10-mm cross-sectional views of the entire thorax with 1-mm scans of suspicious areas. High-resolution CT may be used with computer enhancement of 1-2 mm sections.	Patient must be able to lay flat and still for several minutes. Must be done in the Imaging Department. Provide information about the test.
	Contrast agent may be used.	Check for sensitivity to iodine, shellfish, or the specific contrast medium
Lung Ventilation and Perfusion Scan (V-Q Scan)		
To assess lung ventilation and lung perfusion; to locate pulmonary embolism and diagnose tumor, emphysema, bronchiectasis, or fibrosis	<i>Perfusion scan:</i> An IV injection of radionuclide-tagged, macroaggregated albumin is given; decreased blood flow to any part of the lung is shown by decreased radioactivity in that area. <i>Ventilation scan:</i> Radioactive gas is inhaled and, when scanned, presents a pattern of ventilation in the lungs.	Assess for allergies. Ask patient to remove all metal jewelry from around the neck. Assure patient that amount radioactivity used is very small and is not harmful. An IV access will be inserted. Patient will be asked to hold i short period for the ventilation scan. Images are viewed by use of a scintillation scanner. This test is a nuclear medicine study and will be done by radiology technologists who are certified in conductir procedures.
Pulmonary Angiography		
To visualize pulmonary vasculature; to locate pulmonary embolus or other abnormality	Radiopaque contrast agent is injected via a venous catheter into the right side of the heart or the pulmonary artery. Radiographs are taken; fluoroscopy is used.	Check consent form. Assess for allergy to dye. Explain that patient may feel warm flush as dye is injected. The test will be done in a special procedure room in the Imaging Department by a physician. <i>Post-test:</i> Monitor vital signs and check dressing for signs of bleeding. The femoral vein is used for access, so bleed not as common as with arterial access. If procedural sedation was used, monitor patient per policy.
Bronchoscopy		
To inspect bronchi; to remove foreign objects or mucus plugs; to biopsy lesions	Preoperative sedation may be given. Throat is sprayed with local anesthetic and/or the patient is asked to gargle with topical anesthetic agents. With neck hyperextended, a flexible fiberoptic bronchoscope is guided into bronchi; biopsies are taken if needed; bronchial washings may be done, and debris is suctioned. Oxygen is administered; a patent IV line is necessary in case emergency drugs are needed and for administration of procedural sedation.	Keep patient NPO for 6 hr before test. IV access is initiated. Check consent form; administer preoperative sedat mouth care just before test. <i>Post-test:</i> For 2-4 hr, monitor vital signs, pulse oximetry readings, and level of consciousness. Observe for bleed dyspnea, wheezing, discomfort, and swelling of face and neck; sputum may be slightly blood-tinged at first. Pt on side until gag reflex has returned. Check for return of gag reflex by having patient take small sips of water. When gag reflex has returned, throat lozenges may be used for sore throat. The procedure must be performed in a negative airflow room with HEPA filtration. All personnel in the room personal protective gear appropriate to airborne precautions. Procedural sedation should only be administered credentialed to do so. The procedure is performed by a physician usually with assistance from respiratory therapy.
Laryngoscopy		
<i>Direct:</i> To detect or remove lesions, polyps, or foreign bodies in the larynx or to obtain biopsy specimens or tissue for culture	<i>Direct:</i> A fiberoptic laryngoscope is used; sedation and local or general anesthetic is administered. Performed by a physician in a surgical facility.	<i>Direct:</i> Patient should be NPO for several hours before procedure. Administer preprocedure medications; ensure respiratory status will be monitored closely. Advise that the room will be darkened. An ice collar may be applied postprocedure. A mild sore throat and hoarseness may occur.
<i>Indirect:</i> To assess function of the vocal cords or obtain tissue for biopsy	<i>Indirect:</i> A laryngeal mirror, head mirror, and light source are used. Inspection is performed at rest and during phonation. Performed by a physician. Can be done in an office or clinic setting.	<i>Indirect:</i> Patient will be upright for procedure. <i>Postprocedure:</i> Keep patient NPO until gag reflex has returned. Encourage fluid intake.
Mediastinoscopy		
To inspect the mediastinum and biopsy mediastinal lymph nodes To gain information from biopsies about lung metastasis, sarcoidosis, and granulomatous infections	Mediastinoscope is inserted via a small incision made at the suprasternal notch by a physician in an operating room.	Informed consent is required. Preoperative and postoperative care are the same as for other surgeries. The patient remains NPO after midnight the night before a morning procedure. Administer preoperative sedation before the procedure. <i>Postprocedure:</i> Observe for crepitus around insertion site indicating air from pneumothorax. Observe for disten and pulsus paradoxus, because a hematoma may be preventing cardiac filling.
Thoracentesis		
To remove pleural fluid, instill medication, or obtain fluid for diagnostic studies	With local anesthetic, and ultrasound guidance, a large-bore needle is inserted through the chest wall into the pleural space, and fluid is withdrawn with a syringe or into vacuum bottles by a physician at the patient's bedside. Aseptic technique must be used. Specimens are obtained for culture, microscopic examination, and stains. Medication may be instilled.	Requires signed consent. Explain procedure to patient. Take baseline vital signs. Position patient sitting, facing bed, and leaning over the overbed table with arms crossed on it; pillows or the back of a chair can also be used. respirations and skin color during procedure. Assist patient to remain still. Chest radiograph may be ordered a procedure. Monitor vital signs q15min for 1 hr or until stable, then routinely. Auscultate breath sounds frequently, cyanosis, hemoptysis, changes in breath sounds, and tachycardia should be reported immediately. C amount and appearance of fluid and condition of patient. Send specimens to the laboratory as ordered.



*Note: For tuberculosis test, refer to [Chapter 14](#).

BP, Blood pressure; HCO_3^- , bicarbonate ion; *HEPA*, high-efficiency particulate arresting; *IV*, intravenous(ly); *NPO*, nothing by mouth; P_{CO_2} , partial pressure of arterial carbon dioxide; P_{AO_2} , partial pressure of arterial oxygen.

Diagnostic visual examination of the nose, mouth, and throat.

The interior of the nose, mouth, and pharynx and the tonsils can be inspected by using a tongue blade and a good source of light. The nose is inspected for redness, swelling, discharge, and lumps. Using a nasal speculum, the head is tilted upward and the inside of the nares is inspected for pallor, redness, swelling, and polyps and for mucus color, consistency, odor, and amount. The hard and soft palates are inspected, and the mobility of the soft palate is evaluated by asking the patient to say "ah." The pharynx can be brought into view by asking the patient to say "ee." Presence of inflammation, lesions, plaques, or exudates is noted. The paranasal sinuses are assessed by observing for purulent discharge in the nares and by palpating over the sinus areas for tenderness. Sometimes sinus radiographs are ordered. Magnetic resonance imaging may be ordered to locate tumors and pathologic abnormalities of the esophagus and larynx.

Throat culture.

The most common reason for culturing pharyngeal secretions is to establish a definitive diagnosis of infection with *Streptococcus pyogenes* (strep throat). Rheumatic heart disease and glomerulonephritis can result if strep throat is not properly identified and treated. A "rapid strep test" is commonly performed in the provider's office or ambulatory clinic. A throat culture also is sometimes taken to establish a diagnosis of pneumonia, tonsillitis, meningitis, or whooping cough. These diseases can be particularly harmful to older adults, the debilitated, or very young patients.

Tuberculosis tests.

Sputum testing for acid-fast bacilli is ordered when tuberculosis (TB) is suspected. Sputum specimens should be collected just after the patient awakens in the morning. Ideally a total of three specimens on 3 consecutive days should be collected. Suctioning may be required to obtain the specimen. Airborne isolation precautions should be used until TB has been ruled out. Some strains of TB are resistant to conventional drug therapies. A test for TB drug susceptibility called *microscopic-observation drug susceptibility (MODS)* can produce results more rapidly and for less cost than standard cultures ([Wilson, 2013](#)). Current technology allows for molecular detection of drug resistance (MDDR), which examines TB DNA sequencing ([CDC, 2012](#)). A new simple blood test may replace the tuberculin skin test used for tuberculosis screening. The test identifies T-cell response to the TB antigens. Like the skin test, this test only identifies the activation of the body's immune response to the TB organism and does not distinguish between active and latent disease ([CDC, 2013](#); [Menzies, 2013](#)). 

Lung function tests.

Pulmonary function tests (PFTs) are useful in screening gross abnormalities in the respiratory system (Figure 12-4). The **forced vital capacity** (FVC) is affected by diseases that restrict lung motion. **Forced expiratory volume in 1 second** (FEV₁) gives an estimate of the amount of **obstruction** to the patient's airflow. The FEV₁ is lower in patients with obstructive pulmonary diseases such as emphysema and chronic bronchitis.



FIGURE 12-4 Patient undergoing pulmonary function testing administered by a respiratory therapist in the pulmonary laboratory.

The results of pulmonary function tests often are recorded in the following terms:

- *Total lung capacity (TLC)*: The volume (amount) of gas the lung can hold at the end of a maximal inspiration
- *Vital capacity (VC)*: The volume of gas that a person can exhale after inhaling as much air as possible (maximal inspiration)
- *Tidal volume (TV)*: The volume of gas either inspired or exhaled during each breath
- *Functional residual capacity (FRC)*: The volume of gas remaining in the lungs when the lungs and chest wall are at resting end-expiratory position (i.e., at rest at the end of a normal expiration)
- *Residual volume (RV)*: The volume of gas remaining in the lungs after a person has exhaled as much air as possible (maximal expiration)

Figure 12-5 shows the various subdivisions of total lung capacity.

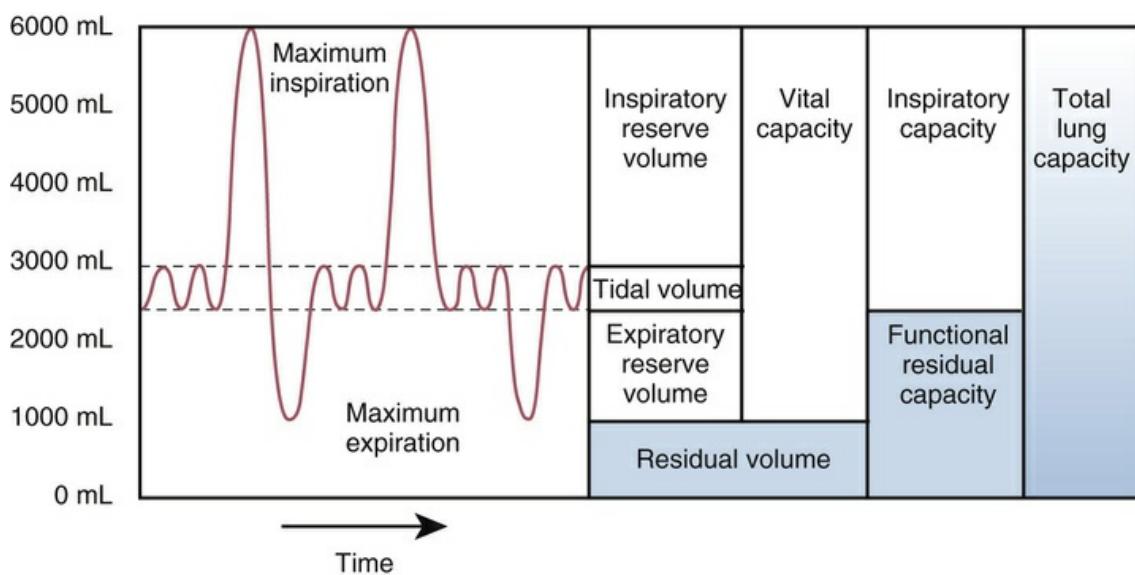


FIGURE 12-5 Comparison of respiratory volumes and capacities as measured by spirometry. (Volumes can vary by age, gender, height, or weight.)

Peak flowmeter.

Patients with asthma or COPD are often asked to check their peak expiratory flow with the use of a peak flowmeter (Figure 12-6). Normal peak flow values for adults are based on age, gender, height, and underlying lung disorder. Normal values range from 300 to 700 L/min but are assessed by comparison against a patient's baseline values. While standing or sitting upright, the patient exhales into the mouthpiece; a small arrow points to the maximum expiratory flow volume. The peak flowmeter is useful for knowing when additional medications are needed to prevent acute exacerbation of disease.

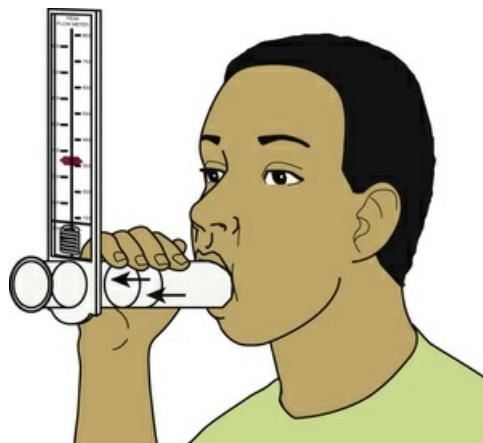


FIGURE 12-6 Use of a peak flowmeter to measure peak expiratory flow volume.

Lung biopsy.

When tumor is suspected, a lung biopsy may be obtained by bronchoscopy (Figure 12-7) or during open thoracotomy. Postprocedure care includes observing sputum for blood and monitoring vital signs closely. Nothing is given by mouth until the gag reflex returns. An open surgical biopsy will require usual postoperative care, including monitoring for bleeding, shortness of breath, and infection.

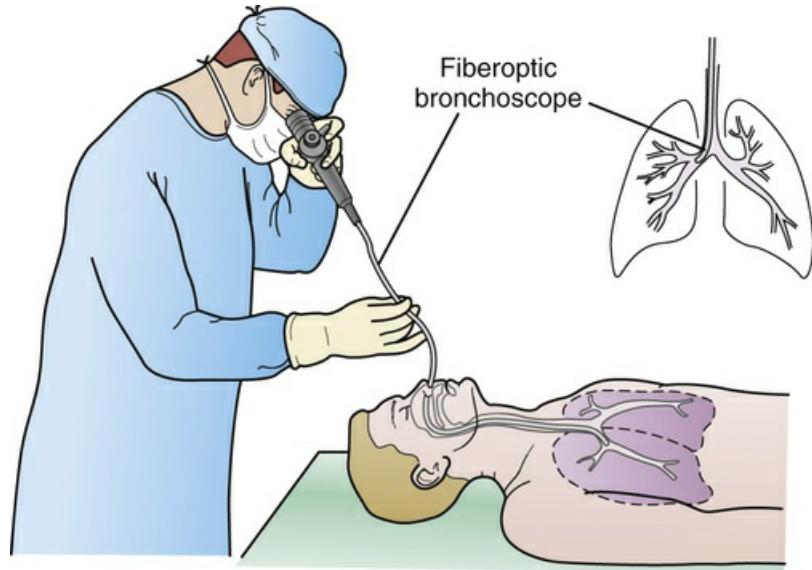


FIGURE 12-7 Fiberoptic bronchoscopy.

❖Nursing Management

■ Assessment (Data Collection)

History Taking

Observe respiratory function while you are talking with the patient and ask about frequency of URIs, known inhalant allergies, and sinus problems. If the patient is in obvious respiratory distress or complains of **dyspnea** (difficult breathing), ask only a few questions about the present illness and chief complaint. Later, during a formal admission interview and informal discussions with the patient and family, obtain more information to plan individualized nursing care.

Chest pain can occur with frequent coughing, pleurisy, or trauma to the lungs; however, whenever there is a complaint of chest pain, seek additional information and always consider cardiac problems. Patients with sinus problems may complain of headache, malaise, a bad taste in the mouth, nasal congestion or obstruction, purulent drainage from the nose, and painful upper teeth. Those with pharyngitis often report a sore or “scratchy” throat, malaise, headache, and sometimes a cough. Dysphagia also might be a problem for patients with pharyngitis, because swallowing involves pushing the food back against the inflamed oropharynx. **Hoarseness and loss of the voice (aphonia) are common symptoms of laryngitis.** Hoarseness or a sore throat that lasts longer than 2 weeks should be noted, because this may assist in the early detection of throat malignancy.

▣ Focused Assessment

Data Collection for the Respiratory System

History Taking

- Chief complaint and precipitating factors
- New onset of dyspnea or orthopnea
- Cough frequency with or without sputum production
- Measures used for symptom relief
- Medications, over-the-counter medicines, supplement use

- Personal smoking history, family smoking history
- History of respiratory disorders, such as asthma
- History of allergy or hay fever
- History of conditions such as sinusitis or bronchitis
- History of night sweats or tuberculosis
- History of other lung diseases, injuries, or surgeries
- History of alcohol consumption
- Occupational and environmental respiratory hazards
- Influenza and pneumonia immunization

Physical Assessment

- Skin color, peripheral and central
- Rate, depth, rhythm, and character of respiration; pulse oximetry readings; CO₂ readings
- Restlessness or agitation
- Posture: need to be upright or to lean forward
- Nose: deviation, flaring of nostrils, discharge, patency of nares
- Trachea position, palpation of neck lymph nodes
- Sinus pain on palpation
- Shape of chest and symmetry of chest expansion
- Use of accessory muscles for respirations: intercostal or supraclavicular retractions
- Shape of fingers, angle of nailbed
- Cough: frequency, characteristics
- Sputum: amount, character, color, presence of blood
- Systematic pattern of auscultation
- Listen for abnormal breath sounds or absence of breath sounds
- Any wheezes, fine or coarse crackles, or “rubs”?
- Do abnormal sounds clear up when patient coughs?

☒ Older Adult Care Points

When assessing an older adult patient, it is important to obtain a thorough smoking history and a history of alcohol intake throughout adulthood. **Approximately 90% of throat cancer occurs in people who both smoke and immoderately drink alcohol**, and it is four times more common among men ([American Cancer Society, 2015](#)).

⌚Physical Assessment

If the patient is not experiencing respiratory distress, start the assessment at the head and end with

lung auscultation. There may be facial puffiness over inflamed sinuses. Palpation of the neck may reveal enlarged lymph nodes. Observe skin color; **cyanosis** (bluish discoloration) of the skin is not a reliable indicator of hypoxemia. **Cyanosis occurs late in the process of oxygen depletion** and could indicate problems of circulation or hemoglobin deficiency. However, the presence of cyanosis is always of concern and prompts further assessment.

Note the posture of the patient, the amount of effort exerted to breathe, the way abdominal muscles and other accessory muscles of respiration are used, the number of words that can be said between breaths, and the rate and character of respirations. Is respiration rapid (**tachypnea**) or slow (**bradypnea**)? Is chest expansion equal when a breath is taken? Are there retractions? Is kyphosis or scoliosis present? Does the patient display or report coughing? A **productive** cough is moist and deep, often accompanied by bronchial crackles or wheezing, and ends in production of sputum. A **nonproductive** cough is dry and harsh, and no sputum is produced. **Sputum** refers to material brought up from the bronchial tree. It is not mucus from the sinuses, nasal secretions, or saliva. **Table 12-2** describes various characteristics and implications of sputum specimens.

Table 12-2
Characteristics of Sputum and Possible Causes*

CHARACTERISTIC	POSSIBLE CAUSE
Thick, tenacious, and “ropey”; difficult to cough up	Chronic bronchitis, emphysema
Scant, sticky, rust colored	Pneumococcal pneumonia
Frothy, pinkish or blood tinged	Pulmonary edema
Yellow, yellow-green, or grayish yellow, with foul odor or taste	Pulmonary infection
Blood tinged, bloody, or blood streaked	Tuberculosis, ulcerated pulmonary vessel, or bronchogenic carcinoma
Large amounts	Pneumonia or bronchitis
Scanty	Asthma
Very thick and viscous	Inadequate hydration
Large amounts, foamy, purulent, foul odor	Bronchiectasis

*Normal sputum is white and slightly viscous and has no odor or taste.

A patient with COPD may lean forward in a sitting position and use the abdominal muscles to force air out of the lungs. Other indications of difficulty breathing are elevating the shoulders and ribs, tensing the neck and shoulder muscles, and flaring of the nostrils. A retraction of the spaces below and around the sternum also might be observed in a patient in respiratory distress. Obstructive disorders can cause enlargement of the front-to-back (anterior-posterior) measurement of the chest wall, giving a barrel-like appearance to the chest (Figure 12-8) because of the presence of trapped air in the lungs and inadequate recoil. Over time there is a gradual elevation of the resting level of the diaphragm, which produces an increase in the size of the chest wall. Exhaling through pursed lips is a clue to obstructive disorders. By exerting back pressure into the lungs, the alveoli stay open longer, allowing for trapped air to escape. Clubbing of the fingers (Figure 12-9) may be seen in patients with lung tissue or heart disease, gastrointestinal disorders, or genetic causes. The cause of clubbing has not been identified (Schwartz, 2013). Note the number of pillows the patient uses to prop up in bed or if the head of the bed needs to be raised to facilitate breathing. This position indicates **orthopnea**.

Clinical Cues

Restlessness, agitation, or mental confusion or an increase in heart rate are early indicators of inadequate oxygenation of the blood. Make sure you have a baseline assessment of mental status and vital signs to be able to identify early changes.

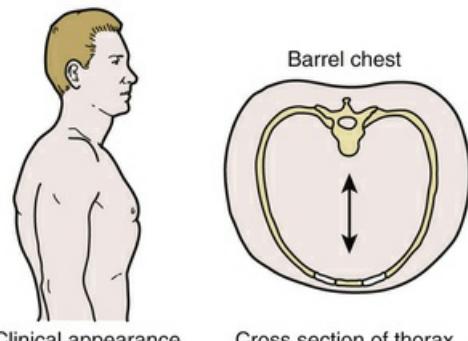
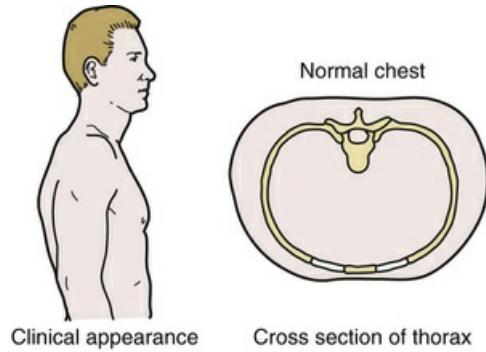


FIGURE 12-8 Barrel chest typical of a patient with chronic obstructive pulmonary disease.

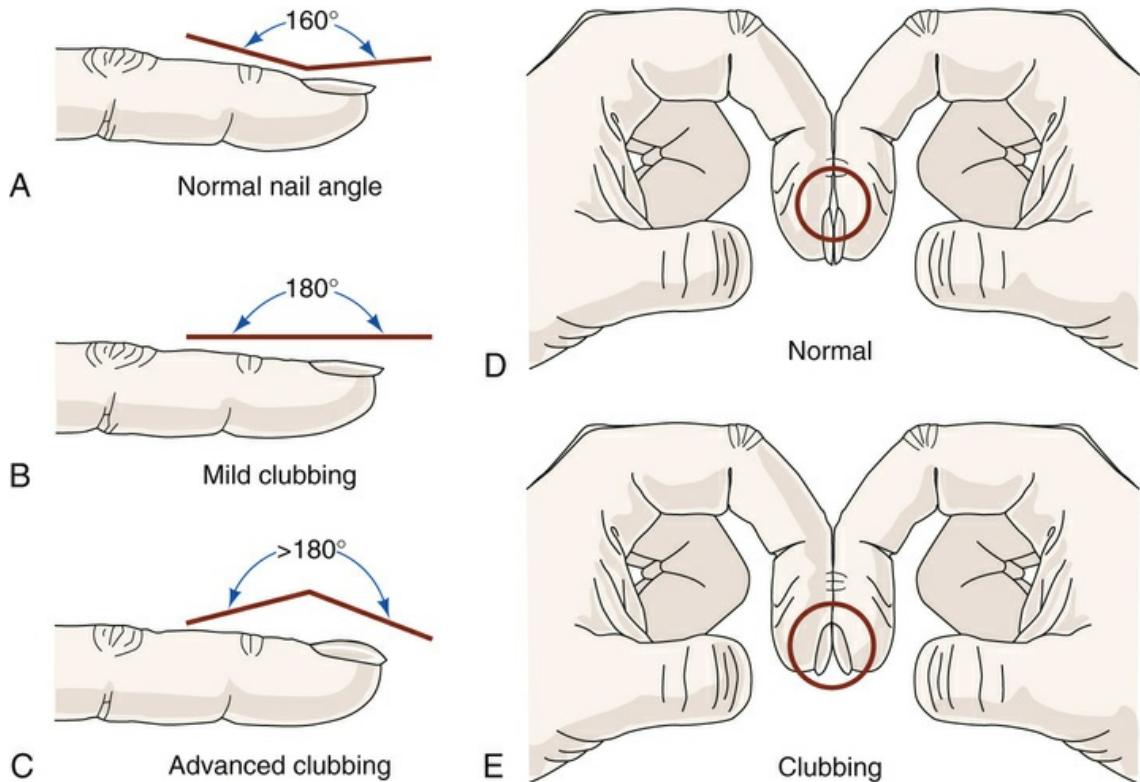


FIGURE 12-9 Clubbing of fingers. (From Copstead LC, Banasik JL: *Pathophysiology*, ed. 5, Philadelphia, 2012, Elsevier Saunders.)

To auscultate the lungs, first eliminate room noise and instruct the patient to sit up, if possible, so that the bed or back of the chair is not interfering with chest expansion. Ask the patient to remain

quiet and to breathe slowly and deeply through the mouth. Listen to one full breath in each location (Figure 12-10). Place the stethoscope diaphragm against the skin with moderate pressure. Move from one side of the midline of the chest to the other side; compare the sounds. Begin above the clavicles and progress downward in the intercostal spaces to above the sixth rib. On the back, start above the scapula and progress downward along the sides of the spine, and then toward the lateral areas above the tenth thoracic vertebra. Laterally, listen in the midaxillary line in three descending locations to just above the diaphragm. If the patient is short of breath, begin posteriorly at the bases of the lungs and work upward, because the patient may not be able to cooperate for the full sequence. Table 12-3 presents sounds normally heard in various locations.

Clinical Cues

Clean your stethoscope with alcohol or a disinfectant wipe between patients to decrease health care-associated infections.

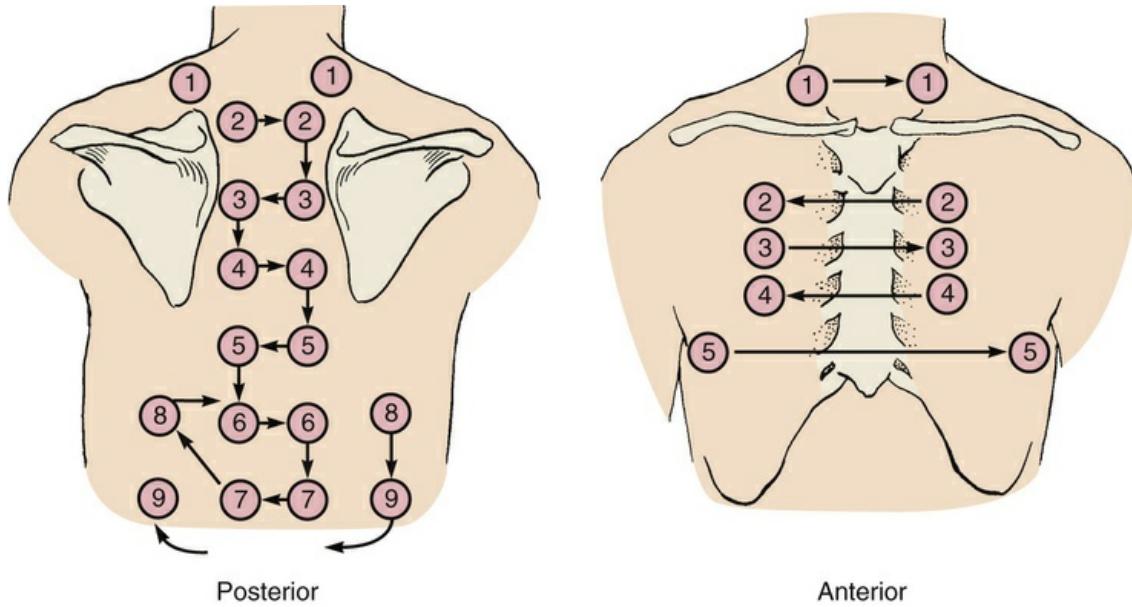


FIGURE 12-10 Sites for auscultation of the lungs.

Table 12-3

Normal Lung Sounds

TYPE OF SOUND	LOCATION WHERE NORMALLY HEARD*	DESCRIPTION OF SOUND
Vesicular breath sounds	Over lung tissue to level of sixth intercostal space	Low to medium pitch with a soft whooshing quality; inspiration is two to three times the length of expiration
Bronchovesicular breath sounds	Over the mainstem bronchi, below the level of the clavicles, beside the sternum; posteriorly: between the scapulae	Moderate to high pitch with a hollow, muffled quality; equal time of inspiration and expiration
Bronchial breath sounds	Over the trachea above the sternal notch (these sounds are abnormal elsewhere and often indicate atelectasis)	High pitch with a loud, harsh, tubular quality; inspiration half as long as expiration

*See Figure 13-6.

Listen for abnormal or **adventitious** sounds. **Wheezes** are a whistling, musical, high-pitched sound produced by air being forced through a narrowed airway. They are common in patients with asthma. Another type of coarse or sonorous wheezing sound (formerly known as *rhonchi*) is coarse, low-pitched, rattling sounds caused by secretions in the larger air passages. **Crackles** are produced by air passing through moisture in the smaller airways. **Fine crackles** are high in pitch and can be heard in patients who have atelectasis, fibrosis, pneumonia, or early congestive heart failure. **Coarse crackles** are louder and low in pitch and are heard in patients with bronchitis, pulmonary edema, and resolving pneumonia. **Fine crackles sound similar to the sound produced by rubbing hairs between the fingers close to the ear.**

Another abnormal sound is that of a **pleural friction rub**, which is a grating or scratchy sound similar to creaking shoe leather or an opening squeaky door; it occurs when irritated visceral and

parietal pleura rub against each other. This also produces pain. The sound (and pain) will stop if the patient is asked to hold the breath.

Stridor (“croaking” sounds) can be heard (without using a stethoscope) when there is partial obstruction of the upper air passages. These sounds are typically heard in children with croup but can also occur in adults with upper airway obstruction. The inflammation that is producing the obstruction often also affects the larynx, producing hoarseness. It is important to distinguish between airway swelling and foreign body obstruction as a cause of stridor. Presence of stridor requires prompt assessment and intervention.

Think Critically

How does shortness of breath affect a person's ability to speak?

Nursing Diagnosis

There are a variety of patient problems/nursing diagnoses that arise when breathing is altered or impaired. Lack of oxygen intake or distribution may cause fatigue and decreased ability to engage in activity. Alteration in roles, coping ability and body image may cause psychosocial issues. Pain from coughing or surgery on the respiratory system requires nursing interventions. Specific nursing diagnoses are chosen depending on the patient's actual problems. [Table 12-4](#) provides common problem statements for patients with respiratory problems. Other problems may be included in the care plan as they relate to secondary problems.

Table 12-4

Common Problem Statements, Expected Outcomes, and Interventions for Patients With Respiratory Disorders

PROBLEM STATEMENT	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Insufficient gas exchange due to decreased airflow and respiratory muscle fatigue	Patient will use modified breathing techniques to facilitate ventilation.	Instruct in techniques of pursed-lip breathing, diaphragmatic breathing, deep breathing, and effective coughing; teach relaxation techniques. Review medication dosages and schedule and proper technique for use of measured-dose inhaler with patient; assess effectiveness and compliance. Encourage use of incentive spirometer. Monitor pulse oximetry before, during, and after exertion. Begin stepped exercise program to improve plan for pacing activities of daily living.
Altered airway clearance due to viscous sputum	Patient will have thinner mucus that is easier to cough up. Fluid intake will increase to 3000 mL/day. Patient will demonstrate proper use of nebulizer.	Explain effect of inadequate fluid intake on liquidity of mucus; assess what fluids patient likes; advise to drink 8 oz of fluid every hour while awake; suggest use of room humidifier at home; review technique for using nebulizer and mucolytic agents. Obtain peak flow readings before and after nebulizer treatment.
Potential for respiratory infection due to compromised respiratory system and decreased resistance	Patient will reduce the number of respiratory infections per year.	Review ways to decrease contact with respiratory infectious organisms: avoiding people with colds, flu, and other infections; frequent hand hygiene. Teach to avoid respiratory irritants; stay in house when air pollution index is high; avoid smoke, dust, and cold air. Observe sputum for changes in color, consistency, odor, and amount; instruct to call clinic promptly if signs of infection occur; obtain culture for infective organism if indicated. Give influenza and Pneumovax vaccines. Encourage to maintain adequate nutrition.
Potential for decreased self-esteem due to inability to do ordinary activities	Patient will express improvement in self-concept within 3 mo. Patient will be able to resume desired activities within 3 mo.	Allow to verbalize concerns; assist to focus on activities possible; explore ways of continuing favorite activities using modifications. Give encouragement and praise for efforts in stepped exercise program.
Altered activity level due to dyspnea	Patient will be able to perform bathing and dressing without dyspnea within 3 mo. Patient will participate in and comply with stepped exercise program. Patient will display increased ability to tolerate activity by walking short distance without breathlessness.	Encourage use of pursed-lip and diaphragmatic breathing. Begin stepped exercise program as soon as acute respiratory infection has resolved. Alternate activity with rest periods, beginning with small increments of activity. Use oxygen as prescribed during acute episodes of dyspnea.
Anxiousness due to hypoxia and dyspnea	Patient will verbalize that anxiety has lessened within 1 wk.	Allow to verbalize concerns within ability to speak without becoming dyspneic. Encourage use of pursed-lip and diaphragmatic breathing to decrease dyspnea. Teach best positions to decrease dyspnea. Teach relaxation techniques; encourage practice. Interact with calm, reassuring manner.
Potential for health problems due to continued smoking	Within 1 wk patient will look at alternative ways to quit smoking. Patient will begin a smoking cessation program within 3 wk.	Explain the harmful effects of continued smoking. Motivate patient to quit smoking by emphasizing benefits of increased stamina and decreased dyspnea. Introduce to various methods and programs for quitting smoking. Get referral from physician for interventions requiring prescriptions. Introduce to people with equivalent lung disease who have quit smoking. Praise any effort at decreasing or quitting smoking.

Planning

A patient who has chronic **hypoxia** (oxygen deficiency) moves more slowly, takes more time to answer questions, and has less energy. For patients with a respiratory disorder resulting in hypoxia, consider comfort measures, time needed for eating or feeding, time for patient education, and consideration of psychosocial needs. Working with patients who have dyspnea requires planning

extra time to accomplish treatments and care.

The nursing goals for patients with a respiratory disorder are to:

- Promote oxygenation
- Prevent infection
- Prevent further lung damage
- Promote rehabilitation

Specific expected outcomes are individualized for each patient (see the Nursing Care Plans in [Chapters 13 and 14](#)).

■ Implementation

Examples of interventions and teaching for patients with respiratory disorders are presented in [Table 12-4](#). Interventions are discussed later in this chapter and in [Chapters 13 and 14](#).

■ Evaluation

Effectiveness of interventions for and treatment of patients with respiratory disorders is based on improved breathing pattern, pulse oximeter readings, arterial blood gas values, and lung sounds. Decreases in coughing, sputum production, wheezing, and signs of infection are other parameters that indicate improvements. Patient reports of lessened dyspnea, as well as more energy and ability to perform more self-care and other activities, indicate that interventions are effective. Reassessment is an ongoing nursing activity for patients with respiratory problems.

Common Respiratory Patient Care Problems

Airway Maintenance

A cough is usually a reflex triggered by a foreign substance or some other irritant in the respiratory tract. Coughing can be beneficial and should be encouraged if it is effective in clearing the air passages and removing accumulations of stagnant mucus. Explain that deep-breathing and coughing maneuvers help to remove sputum and decrease the likelihood of complications, such as pneumonia. (See [Chapter 4](#) for deep-breathing and coughing maneuvers.)

If coughing is excessive, the patient will tire and the respiratory tissues and thoracic structures can be traumatized, so **antitussive** agents may be used to inhibit the cough reflex in the cough center in the brain. Many sedative cough mixtures contain codeine or other drugs that decrease the desire to cough. The liquefying agents and diluents thin secretions and help the patient to expectorate (cough up secretions). Adequate hydration is the most effective method to liquefy secretions so they can be expectorated. Cough syrups are given to soothe the nerve endings in the upper respiratory mucosa. These medications are given in small doses to coat and protect the throat. **Water should not be taken immediately after a cough syrup, because it rinses off the topical application of the medication.**

In bacterial infections and chronic respiratory diseases, the sputum often is foul smelling, leaving a bad taste in the mouth and offensive breath odor. Mouth care is especially needed before meals, when the taste or odor of the sputum may adversely affect appetite. **Frequent mouth care also helps remove pathogenic microorganisms from the oral cavity and thereby diminishes the possibility that they will be aspirated deep into the air passages.**

Mechanical suctioning is indicated when the patient cannot clear the airway of excessive amounts of secretions. Removing secretions from the nose, mouth, and throat is a relatively safe and simple procedure. However, deep tracheal suctioning—whether through the nose, mouth, or endotracheal tube—should only be performed using strict aseptic technique and by someone experienced in the correct procedure.

The need for suctioning is based on patient assessment. Some patients may require suctioning only once or twice daily to remove deeply situated pools and plugs of mucus that cannot be coughed up. Others require suctioning every 10 to 15 minutes to clear their air passages. Remember, the purpose of suctioning is to facilitate breathing and to allow for an adequate exchange of carbon dioxide and oxygen in the lungs. Even though the procedure may be necessary, suctioning removes oxygen and is uncomfortable for the patient.

See Skill 13-1: Endotracheal and tracheostomy suctioning on Evolve. 

Altered Breathing Patterns

Dyspnea or Breathlessness

Administer O₂ as prescribed. Use a calm manner and assure the patient that everything possible is being done to bring relief of dyspnea. Coach the patient to perform pursed-lip and diaphragmatic breathing (see [Chapter 14](#)).

The high Fowler position is best for patients with dyspnea. Proper positioning and support allow the respiratory muscles to function at maximum efficiency. For severe dyspnea, the orthopneic position is most effective. *Orthopnea* means that the patient has trouble breathing when supine. The patient should sit upright, lean over the overbed table (which is padded with pillows), and elevate and round the shoulders to allow maximum expansion of the lungs ([Figure 12-11](#)).



Other pillows are placed on an overbed table to support the weight of the arms, shoulders, and head.

FIGURE 12-11 Orthopneic position.

Pressure from organs, fluid, or tissue below or near the lungs and diaphragm can impair breathing. A full stomach can contribute to dyspnea by limiting the amount of space available for expansion of the lungs. Abdominal distention resulting from edema or collection of flatus and fecal material can also make breathing more difficult. Obesity is a risk factor for dyspnea.

Dyspnea may or may not be a result of **hypoxemia** (low blood oxygen levels). Hypoxia (low levels of tissue oxygen) results from not enough oxygen being delivered in the bloodstream to the tissues. For oxygen to reach the tissues, the patient must be breathing adequately, have a patent airway, have lung tissue able to exchange gases, and have adequate hemoglobin to carry the oxygen. Alteration in any of these can affect delivery of oxygen to tissues.

The tissues most sensitive to changes in oxygen levels include the brain and heart; therefore clinical signs and symptoms of hypoxia show up first in these organs. Alterations in brain function include restlessness, anxiety, and confusion. Initially, subtle changes in cognitive ability may not be noticed until vital signs are affected. The heart rate will increase in an attempt to increase oxygen delivery. Blood oxygenation is monitored by pulse oximetry (SpO_2), which is a reflection of the arterial oxygen saturation (SaO_2). An SpO_2 greater than 95% is considered normal, and an SpO_2 of 92% or less (at sea level) suggests hypoxemia.

Hypercapnia

Hyperventilation, hypoventilation, and the effect of these abnormal breathing patterns on the acid-base balance of body fluids are discussed in [Chapter 3](#). Ventilation is the movement of air in and out of the lungs. The body's ventilation ability is measured by CO_2 levels. Levels of exhaled CO_2 can be monitored by devices inline to oxygen delivery systems (ETCO_2) ([Figure 12-12](#)). Blood CO_2 levels can be monitored by equipment similar to pulse oximetry. CO_2 levels obtained from these devices are similar to arterial blood gas PCO_2 levels. Capnography is the measurement and display of CO_2 levels. **Hypercapnia** (also called *hypercarbia*) is the retention of excessive amounts of CO_2 . It is the result of hypoventilation, during which the usual amount of CO_2 is not eliminated by exhalation.



FIGURE 12-12 Nasal cannula with ETCO₂ detection device

Hypocapnia

Hypocapnia, which is a deficit of CO₂, occurs as a result of hyperventilation and can result in respiratory alkalosis. Conditions associated with hypocapnia include (1) those in which there is an increased metabolic rate, such as thyrotoxicosis, persistent fever, and acute anxiety; (2) salicylate overdose; and (3) improper use of mechanical ventilation.

Clinical signs of respiratory alkalosis include hyperactive neuromuscular reflexes, tetany, carpopedal spasms, vertigo, blurred vision, and diaphoresis. Blood gas analysis will show a low partial pressure of arterial carbon dioxide (PaCO₂) and a high pH (alkalinity). CO₂ monitoring devices will show low levels of CO₂. The [Agency for Healthcare Research and Quality \(2012\)](#) recommends use of PtcO₂ and PtcCO₂ monitoring for patients requiring close observation of oxygenation and ventilation status.

Respiratory Failure

Carbon dioxide is a respiratory stimulant; hence **the body responds to excessive levels of CO₂ by increasing the rate and depth of respirations**. However, if the respiratory centers in the brain are exposed to higher than normal levels of CO₂ over a long time, they cease to react and do not adjust respirations in response to mildly elevated carbon dioxide levels. Over time the accumulation of CO₂ can cause a decreased level of consciousness up to and including coma.

Respiratory failure is defined by arterial blood gases: arterial oxygen (PaO₂) is below 50 mm Hg and the partial pressure of carbon dioxide (PCO₂) is equal to or greater than 50 mm Hg. Cardiac arrest can result from respiratory failure because of hypoxia and acid-base changes.

Other Ineffective Breathing Patterns

Additional respiratory patterns are shown in [Figure 12-13](#). Diseases, trauma, changes in neurologic function, and metabolic disorders can all alter breathing patterns. Careful assessment of the rate and characteristics of a patient's breathing and recognizing changes in patterns can give valuable information regarding overall clinical status.

Think Critically

Name four nursing interventions that will help a patient suffering from dyspnea.



Eupnea
Normal rate and rhythm



Tachypnea
Increased respirations



Bradypnea
Slow, regular respirations



Kussmaul's
Fast, deep respirations, with no expiratory pause. Seen in patients with diabetic acidosis and coma.



Biot's
Fast, deep irregular respirations, with periods of apnea. Seen in patients with increased intracranial pressure.



Cheyne-Stokes
Respirations become faster and deeper, then slower and shallower with a period of apnea. Seen in patients in coma resulting from disorders affecting the central nervous system.



Apneustic
Prolonged inhalation with a pause at peak inspiration, then a short exhalation followed by short periods of apnea. Seen when there is damage to the respiratory centers in the brain.

Apnea

Absence of breathing

FIGURE 12-13 Respiratory patterns. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 3, Philadelphia, 2009, Elsevier Saunders.)

Risk of Infection

Many acute URIs are transmitted by droplets; that is, the causative organisms are expelled along with the liquid secretions released during coughing and sneezing. These droplets are heavy and fall to surfaces fairly rapidly, usually within 3 feet of the patient. Diseases that are spread by airborne contamination have organisms that remain suspended in the air for long periods of time and float on air currents. These conditions require airborne precautions and special masks for health care providers.

Patients with chronic respiratory disorders—and all health care personnel—should carefully avoid contamination. Avoiding crowded places, performing frequent hand hygiene, and keeping the hands away from the face and mouth decrease the likelihood of infection. Standing to the side of a person who is coughing and sneezing reduces contamination. Hand hygiene should be implemented after each contact with a person with a respiratory disorder that produces airborne or droplet secretions, after removal of personal protective equipment, or after contact with articles contaminated by secretions. Instruct patients to use a folded tissue over the nose and mouth while sneezing and to turn the head away when in close contact with others. An alternative is to sneeze or cough into the crook of the elbow so that the hands are not contaminated. Tissues should be disposed of following Standard Precautions.

Older Adult Care Points

According to The [Joint Commission's Core Measures \(2015\)](#), health care providers should ask patients age 65 years and older if they have received pneumococcal vaccine to prevent pneumococcal bacteremia, and encourage vaccination if indicated.

Alterations in Nutrition and Hydration

Anorexia and inadequate nutrition are common in patients with respiratory disorders, particularly when the disorders are chronic in nature. The patient may have an impaired sense of taste or smell, or sputum can leave a bad taste in the mouth or cause nausea. The patient may fear that chewing and swallowing will bring on an attack of coughing or may be so tired that eating or preparing food is too exhausting.

Keep the patient's environment clean, uncluttered, and orderly. Dispose of used tissues promptly, and keep sputum cups covered and out of sight. Frequent oral hygiene and mouth care before meals can help diminish mouth odor and nausea and improve taste. Smaller, more frequent feedings of nutritious liquids and foods are preferable to three large, heavy meals.

Because there is increased energy expenditure when breathing is difficult, many patients have difficulty maintaining weight, even when they take in normal amounts of calories. Supplements such as Pulmocare have an increased fat content and provide more calories in smaller quantities and decrease the dietary production of CO₂. **When a patient is receiving mechanical ventilation, caloric needs rise.** Sometimes total parenteral nutrition or lipid infusions are necessary to prevent malnutrition for patients with COPD.

A fluid deficit is likely in patients with respiratory disorders because there is an increased loss of fluid in respiratory secretions. The patient usually breathes through the mouth and exhales large amounts of moisture from the body. Unless contraindicated, an intake of at least 3000 mL of liquid should occur each day. This intake may include low-sodium bouillon, fruit juices, and other liquids in addition to water.

Humidifying the air breathed by the patient is an effective way to minimize dehydration and moisturize the air passages. Humidification is especially important for patients whose secretions are thick and tenacious and difficult to cough up. Humidification of inhaled air is covered in [Chapter 14](#).

Fatigue

Hypoxia produces a loss of energy because it causes a disturbance in cellular metabolism. Patients with respiratory disorders often have hypoxia and use their energy just to struggle for breath and cough up secretions.

Patients with respiratory disorders, whether acute or chronic, have some degree of intolerance to physical activity and therefore need periods of rest throughout the day. Treatments and medications should be scheduled so that the patient can rest without interruption. To conserve energy, the patient should intermittently take short naps. Deep-breathing exercises and coughing techniques should be planned whenever the patient is able to do them with or without some assistance. These activities should be followed by good mouth care and a short period of uninterrupted rest. The goal of nursing care should be to achieve a satisfactory balance of rest and activity.

Get Ready for the NCLEX® Examination!

Key Points

- Inhalation of infectious organisms and chemical irritants causes respiratory problems.
- Cardiac disease can interfere with blood supply to the lungs and distribution of gases.
- There are two major types of ventilatory diseases: restrictive (decreased lung volume) and obstructive (narrowed air passages).
- Restrictive conditions, such as scoliosis and kyphosis, decrease lung capacity.
- Obstructive disorders cause problems moving air in and out of the lungs. Asthma, emphysema, and chronic bronchitis are obstructive disorders.
- Prevention of respiratory problems includes good health practices: rest, nutrition, personal hygiene, and avoiding known allergens. At-risk persons should be immunized against influenza and pneumonia.
- The incidence of respiratory ailments decreases for people who stop smoking.
- Effectiveness of interventions and treatment is identified by improvements in breathing pattern, PtcO₂ and SPO₂ readings, arterial blood gas values, and lung sounds. Decreased cough, sputum production, wheezing, and dyspnea are other parameters.
- Positioning in high Fowler position, or sitting with shoulders hunched and arms resting on knees with legs apart, eases breathing.
- Signs of respiratory acidosis are excessive PCO₂ and rapid respirations.
- Signs of respiratory alkalosis are tetany, carpopedal spasms, vertigo, blurred vision, diaphoresis, and low PCO₂ and high pH.
- Respiratory failure is defined as PaO₂ below 50 mm Hg and PCO₂ equal to or greater than 50 mm Hg.
- Abnormal respiratory patterns include Biot's respirations, Cheyne-Stokes respirations, Kussmaul's respirations, and apneustic respirations.
- Respiratory infections are transmitted by airborne or droplet secretions.
- Anorexia and inadequate nutrition are common with chronic respiratory disease.
- Patients should drink at least 3000 mL/day to help thin secretions. Humidification of air can help prevent fluid deficit.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.
 Online Resources

- Recommended Adult Immunization Schedule, www.cdc.gov/mmwr/PDF/wk/mm5753-Immunization.pdf
- The Joint Commission Tobacco and Alcohol Measures, www.jointcommission.org/tobacco_and_alcohol_measures

Review Questions for the NCLEX® Examination

1. A 59-year-old male patient with hypertension and COPD states he is having trouble breathing. He appears to be in distress and has labored breathing. Put in order of priority the nursing actions to be taken.

1. Take vital signs, including pulse oximetry reading.
2. Report condition to provider.

3. Raise the head of the bed.

4. Auscultate lung sounds.

NCLEX Client Need: Reduction of Risk Potential

2. A nurse is caring for several patients who are scheduled for diagnostic testing for respiratory disorders. The patient who needs postprocedural care that includes frequent vital signs is the patient who had:

1. capnography.

2. a D-dimer test.

3. a ventilation and perfusion scan.

4. bronchoscopy.

NCLEX Client Need: Physiological Adaptation

3. A nurse is caring for a patient who is short of breath. The degree of shortness of breath can be assessed by which of the following?

1. Ability to speak

2. Breath sounds

3. Capnography

4. Nailbed color

NCLEX Client Need: Reduction of Risk Potential

4. A nurse is caring for a patient who has asthma. Which lung sound would the nurse expect to hear when auscultating this patient's lung fields?

1. Fine crackles

2. Stridor

3. Pleural friction rub

4. Wheezes

NCLEX Client Need: Physiological Adaptation

5. A nurse should observe for and report which abnormal breathing pattern that is most likely to occur in patients with increased intracranial pressure?

1. Cheyne-Stokes respirations

2. Kussmaul's respirations

3. Biot's respirations

4. Apneustic respirations

NCLEX Client Need: Reduction of Risk Potential

6. A nurse attends to the nutritional needs of a patient with chronic respiratory disease by providing oral care. What is the best rationale for this nursing action?

1. Low energy states diminish appetite.

2. Respiratory secretions leave a bad taste.

3. Chewing is believed to induce coughing spells.

4. Nasal congestion reduces the flavor of food.

NCLEX Client Need: Basic Care and Comfort

7. A nurse is caring for a patient who has had a thoracentesis with the removal of 800 cc of fluid. What finding would the nurse expect in the physical assessment of the patient postprocedure?

1. Slow heart rate

2. Clear lung sounds

3. Increased BP

4. Improved ventilation

NCLEX Client Need: Reduction of Risk Potential

8. While obtaining sputum for culture and sensitivity, the nurse notes that the specimen is thick, tenacious, and "ropey." This finding is most likely to be present in which disorder?

1. Pneumococcal pneumonia

2. Pulmonary edema

3. Chronic bronchitis

4. Tuberculosis

NCLEX Client Need: Physiological Adaptation

9. On initial assessment of a patient diagnosed with an acute exacerbation of COPD, the nurse is likely to find which sign(s) and symptom(s)? (*Select all that apply.*)

1. Tensing of the shoulder muscles
2. Inability to tolerate sitting up
3. Flaring of the nostrils
4. Ability to complete sentences with no effort
5. Sternal retraction

NCLEX Client Need: Physiological Adaptation

10. A 72-year-old patient has just returned to the nursing unit after a lung biopsy. The nurse watches closely for signs of which condition?

1. hypotension
2. hypercapnia
3. hyperventilation
4. hypovolemia

NCLEX Client Need: Reduction of Risk Potential

Critical Thinking Questions

Scenario A

Mr. Keelog is an older adult man who may have cancer of the larynx. He will undergo diagnostic procedures to confirm this diagnosis. You observe that he is not currently having respiratory distress and can answer your questions. He appears willing and able to listen to information.

1. What questions should you ask to identify if Mr. Keelog has risk factors for cancer of the larynx?
2. Identify at least four questions you would ask Mr. Keelog about his present status.
3. Describe the teaching plan that would be used for a patient undergoing a direct laryngoscopy.
4. What other diagnostic tests would have been done on this patient?

5. How can this type of cancer potentially be prevented?

Scenario B

Ms. Tiber has had frequent bouts of bronchitis. Her provider tells her that this disorder has caused some COPD.

1. What measures would you teach her to make breathing easier?
2. Why is it important to be cautious in giving oxygen to a patient with COPD? What might happen?

Scenario C

Mrs. Clampett is an older adult woman who comes to the clinic for an annual flu vaccination. She would like a “good physical check of my lungs” and information about how to prevent respiratory disorders.

1. What questions should you ask in obtaining a history about potential respiratory problems?
2. Describe how you would auscultate her lungs.
3. If you heard an abnormal lung sound such as “fine crackles,” what would you do?

CHAPTER 13

Care of Patients With Disorders of the Upper Respiratory System

Objectives

Theory

1. Recognize symptoms of disorders of the sinuses, pharynx, and larynx.
2. Describe the postoperative care for a patient undergoing a rhinoplasty.
3. Choose emergency measures for a patient with an airway obstruction.
4. Present a nursing care plan for a patient who had a laryngectomy.
5. Analyze safety factors to be considered when caring for a patient with a tracheostomy.

Clinical Practice

6. Institute measures to stop epistaxis.
7. Provide tracheostomy care.
8. Devise interventions for the psychosocial care of a patient who has undergone a laryngectomy.
9. Visit a patient who has a permanent tracheostomy and ask her to share some of her successful coping strategies.

KEY TERMS

crepititation (KRĚP-ě-tā-shūn, p. 279)

endotracheal intubation (ĒN-dō-TRĀ-kē-ăl īn-tyū-bā-shūn, p. 281)

epistaxis (ěp-ě-STĀK-sīs, p. 276)

follicular pharyngitis (fōl-ěk-yě-lěr fěr-ěn-jī-těs, p. 277)

laryngectomy (lär-ěn-JĚK-tō-mě, p. 280)

laryngitis (lär-ěn-JI-těs, p. 277)

laryngoscope (lär-ěn-JĚ-skōp, p. 281)

lozenges (LÖZ-ěn-jěz, p. 277)

obturator (ÖB-tū-ră-tōr, p. 282)

pharyngitis (fěr-ěn-jī-těs, p. 277)

rhinitis (rī-NI-těs, p. 273)

rhinoplasty (Rī-nō-plăs-tě, p. 279)

stoma (STŌ-mă, p. 280)

tracheostomy (trā-kē-ÖS-tō-mě, p. 281)

Disorders of the Nose and Sinuses

The upper respiratory tract includes the nose and sinuses, mouth, pharynx, and larynx. Upper respiratory infections (URIs) include viral and bacterial infections resulting in cold, flu, pharyngitis, rhinosinusitis, epiglottitis, laryngotracheitis, and pertussis.

Upper Respiratory Infections and Rhinitis

The common cold—acute viral **rhinitis**—is an inflammation of the nose and upper respiratory tract. Other names for a cold include nasopharyngitis, rhinopharyngitis, acute coryza, or head cold. It is the most prevalent infectious disease among people of all ages. Many different strains of viruses can produce the symptoms of a common cold, which makes total immunity unlikely and developing a vaccination problematic. Avoiding exposure to those who have a cold and maintaining a state of good health are the only ways one can avoid “catching” a cold.

Etiology and Pathophysiology

Viruses are spread by airborne droplet sprays from infected people during breathing, speaking, coughing, or sneezing or by direct hand contact with a contaminated object and then contact between the hand and mucous membranes. Viruses can live on surfaces for prolonged periods. A chill, fatigue, physical or emotional stress, a compromised immune status, or inflammation caused by allergic rhinitis make one more susceptible to contracting an upper respiratory virus.

Allergic rhinitis may have many of the symptoms of a cold, except there is no fever. It is caused by reaction of the nasal mucosa to an allergen, such as pollen or dust.

Signs, Symptoms, and Diagnosis

The common cold usually starts with a mild sore throat or a hot, dry, prickly sensation in the nose and back of the throat. Within hours after the onset of a cold, the nose becomes congested with increased secretions; the eyes begin to water; and sneezing, malaise, and an irritating, nonproductive cough appear. The invading organism causes inflammation and swelling of the mucosa. Muscle aches and headache may occur. There usually is no elevation of temperature; if a fever does develop, it is low grade (<101° F [38.3° C]), as is typical with viral infections. In most instances, a cold will last 7 to 11 days, but it may take up to 14 days before all symptoms are gone.

Treatment and Nursing Management

There is no cure for the common cold. However, zinc lozenges have proven effective in limiting a cold's duration and severity for many people, if started at the first signs of symptoms (Hemila and Chalker, 2015). It is important to distinguish a cold from other URIs that may be bacterial and need antibiotic therapy or are conditions that in some patients can lead to more severe illness.

The treatment of allergic rhinitis is symptomatic. Antihistamines, steroids, and sprays that stabilize the mucous cell membranes are often prescribed (Table 13-1). The patient is taught to avoid the offending allergens as much as possible. This may include filters for room air. If the disorder is severe, an allergy evaluation is indicated so that a desensitization program can be started.

Complementary and Alternative Therapies

Alternative Treatment for an Upper Respiratory Infection

Echinacea; goldenseal; or a combination of herbs, minerals, vitamins, and amino acids such as those contained in over-the-counter products can be taken at the first sign of a cold or before going into crowded areas during cold season. These substances are believed to boost the body's immune response.

Table 13-1

Drugs Commonly Used to Treat Allergic Rhinitis and Sinusitis

Classification	Action	Nursing Implications	Patient Teaching
Antihistamines			
First-Generation Antihistamines			
Diphenhydramine (Benadryl) Clemastine (Tavist) Brompheniramine (Dimetane) Chlorpheniramine (Chlor-Trimeton)	Relieve sneezing, excessive secretions, itching, and nasal congestion Block histamine binding by binding with H ₁ receptor sites	Tend to cause sedation and slow reaction time May cause stimulation in some people May cause GI side effects: anorexia, constipation or diarrhea, or epigastric distress May cause urinary retention or frequency	Warn patient not to operate machinery and that driving may be dangerous because of sedation; this usually passes after the first 2 wk of treatment. Ask patient to report changes in heart rate, palpitations, or urinary retention or frequency. Warn that alcohol will have additive depressant effect.
Second-Generation Antihistamines			
Loratadine (Claritin) Fexofenadine (Allegra) Cetirizine (Zyrtec) Desloratadine (Clarinex) Levocaberizine (Xyzal)	Relieve sneezing, excessive secretions, itching, and nasal congestion. Are less likely to cross the blood-brain barrier producing less drowsiness than first-generation antihistamines	Have limited attachment to H ₁ receptors in the brain Do not cause sedation, and have less effect on reflexes Do not affect bladder function	Instruct not to take with alcohol or other CNS-active drugs. Warn not to take with any monoamine oxidase inhibitor. These drugs are more expensive than first-generation drugs.
Corticosteroid Sprays			
Betamethasone (Beconase) Budesonide (Rhinocort) Flunisolide (Nasalide) Fluticasone (Flonase) Triamcinolone (Nasacort) Ciclesonide (Omnaris) Mometasone (Nasonex)	Inhibit inflammatory response Have low systemic absorption with normal doses	Use can result in nosebleeds. Directing the nozzle away from the septum may help prevent nosebleeds. If saline irrigation is used as an adjunctive treatment it should be performed prior to the nasal spray.	Teach to use on a daily basis rather than PRN. Instruct to discontinue if infection occurs. May initially cause some burning in nostrils.
Mast Cell Stabilizer			
Cromolyn sodium spray (Nasalcrom)	Stabilizes mast cells, preventing inflammatory reaction	Minimal side effects	Instruct to begin 2 wk before pollen season starts and use throughout pollen season to prevent allergy symptoms. May be used prophylactically for isolated allergy (i.e., cat). Instruct to use 10-15 min before exposure.
Decongestants			
Oral Pseudoephedrine (Sudafed) <i>Spray</i> Oxymetazoline (Dristan) Phenylephrine (Neo-Synephrine) Saline nasal spray or rinse*	Promote vasoconstriction by stimulating adrenergic receptors on blood vessels Reduce nasal edema and rhinorrhea	May cause insomnia, headache, irritability, dysuria, palpitations, or tachycardia Can cause rebound nasal congestion	Some products are contraindicated for patients with hypertension, cardiac disease, glaucoma, diabetes, prostatic hypertrophy, or liver or renal disease. Teach to use only three or four times a day for no more than 3 days.
Other Categories			
Intranasal Antihistamines	Topical H ₁ receptor antagonists Inhibit the release of histamine May help relieve nasal congestion	May be absorbed systemically in some patients, producing sedation	Instruct not to use if patient has glaucoma or prostatic hypertrophy.
Intranasal Anticholinergic Agents	Inhibits vagally mediated reflexes Chemically related to atropine Reduces nasal secretions	Works best if used regularly at evenly spaced intervals	Teach that it may cause dry or bloody nose, throat irritation, or bad taste in mouth.

*Saline nasal sprays and rinses wash away pollen and dust, thin secretions, and soothe the nasal mucosa.

CNS, Central nervous system; GI, gastrointestinal; H₁, histamine-1; PRN, as needed.

A major goal in the care of a common cold is prevention of a secondary bacterial infection. Individuals with a cold should avoid contact with others to avoid contracting a bacterial infection or giving their viral infection to someone else. A person with a cold is contagious for about 3 days after symptoms first appear.

Colds are spread by droplet infection, and most people realize that coughing and sneezing will spread viruses. Coughing and sneezing into tissues does limit the viruses' travel by air, but the viruses are also very likely to be on the person's hands, where they can be transferred to anything touched. Hand hygiene is important in the prevention of spreading infection to others, and patients should also be taught not to share personal-use items, such as drinking glasses.

The patient should stay indoors, preferably in bed or resting, during the first few days of the illness. Fluid intake should be increased. Fruit juices are recommended, especially citrus juices, because of their vitamin C content. Mild nonprescription analgesics can help relieve the muscle aches and headache of a cold.

Older Adult Care Points

Older adults should be encouraged to stay away from people who have a cold or URI, because they have decreased immune function, and if a cold develops a secondary infection is more likely. Older patients should continue the extra fluids and rest until symptoms are resolved.

Safety Alert

Caution With Aspirin

The U.S. Surgeon General, the Food and Drug Administration, the Centers for Disease Control and Prevention, the American Academy of Pediatrics, the National Reye's Syndrome Foundation, and the World Health Organization recommend that aspirin and combination products containing aspirin not be given to children under 19 years of age during episodes of fever-causing or viral illnesses ([National Reye's Syndrome Foundation](#)). Adults taking anticoagulants or nonsteroidal anti-inflammatory drugs should only take aspirin under the direction of their physician, because aspirin will further prolong the clotting time.

Decongestant nose drops or sprays containing vasoconstrictors such as oxymetazoline (for the relief of nasal congestion) can have a rebound effect, leaving the nose "stuffier" if used for more than 3 days. Frequent use of saline nasal spray decreases congestion without side effects.

Antibiotics are not given, because a cold is a viral infection.

A bacterial infection, which requires medical treatment, is likely present when a "cold" persists for more than a week to 10 days without improvement, or if the patient begins to feel worse, has a temperature of 101° F (38.3° C), and develops chest pains or coughs up purulent sputum.

Think Critically

What are the various ways you can prevent contracting a cold?

Sinusitis

Sinusitis is an inflammation of the mucosal lining of the sinuses. *Rhinosinusitis* is the preferred term, because the nasal mucosa is almost always inflamed along with the sinuses. *Streptococcus pneumoniae*, *Moraxella catarrhalis*, or *Haemophilus influenzae* are the usual causative pathogens, and infection can spread from the nasal passages to the sinuses. Sinusitis often occurs after colds or other respiratory infections and during periods of uncontrolled allergic rhinitis. The nasal passages can be blocked by a **deviated septum**, which may occur congenitally, from injury to the nose, or by **nasal polyps**. Polyps occur from repeated inflammation of the nasal mucosa and are tissue growths that obstruct airflow. People with a deviated nasal septum or allergy problems tend to have recurrent sinusitis.

As exudate accumulates in the sinuses, pressure builds up, causing pain. Symptoms include tenderness over the sinuses, purulent drainage from the nose, nasal obstruction, and sometimes a nonproductive cough. The upper teeth may become painful.

Treatment of sinusitis includes relieving pain, promoting sinus drainage, controlling infection, and preventing recurrence. Hot, moist packs over the sinus area can be helpful. Inhalating moist steam keeps mucous membranes moist, and equipment for sinus irrigation to help to promote drainage is available at drugstores. Medications are prescribed to promote decongestion or vasoconstriction and to reduce swelling, to promote drainage, and to relieve pain. The infection may be treated with an antibiotic or anti-infective agent, often for at least 10 days. Rest, reduced stress, a balanced diet, and control of allergies can help prevent recurrence. Fluid intake should be increased. There is no scientific evidence for the common belief that dairy products increase the thickness of secretions or produce mucus. In studies, individuals who believe mucus production increases with dairy products reported increased mucus.

Think Critically

How would you know if you or a patient has a sinus infection rather than just an ordinary cold?

Acute or chronic sinus infection can cause a variety of complications, including septicemia, meningitis, and brain abscess. When sinus infection is chronic, surgery to clean out the sinuses may be necessary. A deviated septum can be surgically repaired, and polyps can be removed endoscopically if medical treatment is unsuccessful.

Complementary and Alternative Therapies

Treatment of Allergic Rhinitis and Sinusitis

Allergens in contact with mucus membranes prompt the inflammatory response. Eliminating the allergens can minimize the inflammation symptoms. Use of a Neti pot or other device to irrigate the sinuses will rinse out the allergens. A nasal filter device can be used to prevent the allergens from getting into the nasal passages.

Epistaxis

Epistaxis (nosebleed) is a common occurrence and usually results from crusting, cracking, or irritation of the mucous membrane covering the front (anterior) of the nasal septum. Anterior bleeds are the most common (90% to 95%). Blood loss is usually minimal, but about 6% of nosebleeds require medical attention. Decreased humidity, excessive nose blowing, allergy with inflammation, and nose picking may cause nosebleeds. Overuse of nasal spray, street drug use (particularly “snorting”), and tumors are other causes. Any condition that prolongs bleeding time or lowers the platelet count may predispose an individual to nosebleeds. Nosebleeds can also result from trauma, hypertension, and blood disorders such as leukemia. They are common in boys during pubescence.

Bleeding from the nose is the only sign of epistaxis. When epistaxis occurs, the patient should sit forward and apply direct pressure by pinching the nose just below the bone, close to the face, for 10 to 15 minutes. This position prevents blood from running down the back of the throat. Cold compresses or ice may be applied to the nose to constrict the blood vessels. If there is still bleeding at the end of a 10- to 15-minute period, repeat the process ([Figure 13-1](#)). If bleeding continues, the patient should go to the emergency department, where a provider will cauterize the bleeding vessels, solidly pack the nose, or insert a small balloon device to stop the bleeding ([Figure 13-2](#)). Once bleeding stops, the patient should rest quietly for a few hours and be instructed to avoid bending over and not to blow the nose, pick at it, or rub it for 24 hours after the nosebleed has stopped.

Clinical Cues

If a patient is having an active nosebleed, instruct her to spit the blood into a basin or tissue rather than swallowing it. Accumulation of blood in the stomach will eventually cause nausea and vomiting, and the patient's cooperation will help you to assess the amount of bleeding and may help prevent aspiration of the blood.

Patients on anticoagulants and antiplatelet medications are at increased risk of nasal bleeding when nasal cannula oxygen is administered for prolonged periods, causing drying of the mucosa.



FIGURE 13-1 Stopping a nosebleed by applying pressure to the nose.

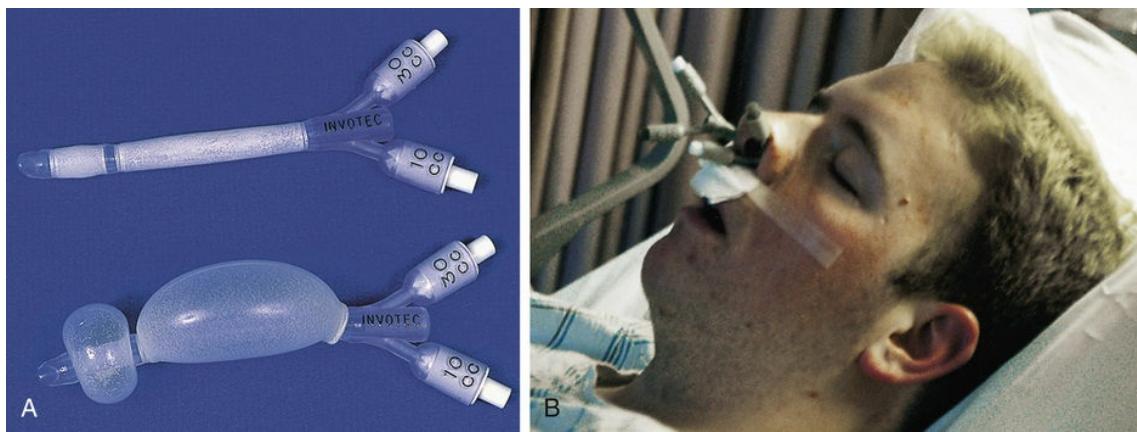


FIGURE 13-2 A nasal balloon device (A) is being used to control bleeding from epistaxis (B). (Courtesy of Invotec Corp.)

Pharyngitis

Etiology and Pathophysiology

Pharyngitis (inflammation of the pharynx), usually called a *sore throat*, may be caused by a virus, bacteria, or fungus. Most cases are viral. Acute **follicular pharyngitis** ("strep throat") is caused by beta-hemolytic streptococcal infection. Fungal pharyngitis occurs with long-term use of antibiotics or inhaled corticosteroids and in patients with immunosuppression, such as occurs with HIV or AIDS or during cancer treatment. **Laryngitis** (inflammation of the larynx with diminished voice or hoarseness) may occur if the infection progresses into the larynx. If the inflammation extends to the epiglottis, **epiglottitis** occurs; this is more common in children. Epiglottitis can cause an acute airway obstruction and should be monitored closely.

Signs, Symptoms, and Diagnosis

The symptoms include a dry, "scratchy" feeling in the back of the throat; mild fever; headache; and malaise. The throat, tonsils, palate, and uvula may be involved and will be reddened. If swelling of these structures is present, dysphagia may occur. Discomfort when swallowing one's own saliva is common but does not usually inhibit the ability to take adequate fluids and nourishment. With laryngitis, the voice may become hoarse or absent. The usual course for uncomplicated pharyngitis or laryngitis is 3 to 10 days. The diagnosis of pharyngitis is confirmed by clinical signs and symptoms. A throat culture is often performed to confirm or rule out streptococcal infection.

Treatment and Nursing Management

Uncomplicated viral pharyngitis usually responds to conservative measures, such as rest, warm saline gargles ($\frac{1}{2}$ to 1 tsp of table salt to a glass of warm water), throat **lozenges** (small medicinal tablets that dissolve in the mouth), antiseptic sprays, plenty of fluids, and a mild analgesic for aches and pains.

Bacterial pharyngitis requires antibiotic therapy, particularly if the infecting organism is *Streptococcus*. Chronic pharyngitis may require diagnostic procedures to determine the underlying cause and therapeutic measures such as humidification and filtering of environmental air. Fungal pharyngitis is treated with an antifungal agent but may be difficult to control in immunocompromised individuals.

Tonsillitis

Etiology and Pathophysiology

An infection with inflammation of the tonsils is usually caused by streptococci, staphylococci, or *H. influenzae* and is different from pharyngitis; however, symptoms may be somewhat similar. Acute tonsillitis may occur repeatedly, especially in those who have a low resistance to infection.

Signs, Symptoms, and Diagnosis

Acute tonsillitis occurs more commonly in young children. Symptoms include high fever, sore throat, general malaise, pain referred to the ears, and chills. Inspection of the throat reveals redness and swelling of the tonsils and surrounding tissues with patches of yellow exudate. The white blood cell count becomes elevated.

Chronic tonsillitis usually produces an enlargement of tonsillar tissue and adenoidal tissue. Chronic infection produces less dramatic symptoms than acute tonsillitis, but discomfort still occurs. A person with chronic tonsillitis and enlarged adenoids has frequent colds and appears to be in poor health.

Diagnosis is by physical examination and history. If a streptococcus infection is suspected, a throat culture or a “rapid strep test” may be performed.

Treatment

A throat culture is performed before treatment to check for the presence of *Streptococcus*, which can cause rheumatic fever or glomerulonephritis if not treated promptly. Acute tonsillitis is treated with warm saline throat gargles and the administration of specific antibiotics (usually penicillin) to destroy the pathogen. Nursing measures include bed rest, fever management, and a liquid diet to minimize trauma to the tissues and maintain hydration. After 24 hours taking antibiotics, the patient is no longer considered contagious (Shah, 2014).

Surgery is used to treat tonsillitis when it is recurrent or when enlargement of the tonsils and adenoids obstructs airways. Surgery is considered if the patient has more than seven episodes of streptococcal tonsillitis per year.

Think Critically

What would be appropriate foods to offer a patient with pharyngitis or tonsillitis?

Nursing Management

Preoperative care.

Tonsillectomy and adenoidectomy are generally done on an outpatient, same-day surgery basis. Preliminary laboratory testing and patient education begin before the patient is admitted. Physical preparation of the patient involves administration of preoperative medications as ordered, restricting the use of aspirin or other nonsteroidal anti-inflammatory medications, and restriction of the patient's diet for 6 to 8 hours before surgery. An elevation of temperature or any signs of URI should be reported, because surgery is usually postponed if these signs are present.

Postoperative care.

Although patients usually recover rapidly from tonsillectomy and adenoidectomy and rarely suffer any complications, be vigilant for signs of hemorrhage. Vital signs are checked frequently, and the patient is observed for frequent swallowing or clearing of the throat, which may indicate bleeding. Restlessness can be another clue to excessive bleeding. Sneezing, coughing, and vomiting can cause bleeding. An ice collar may be placed around the neck to reduce swelling and pain. A side-lying position when drowsy or semi-Fowler position when fully awake will help maintain a patent airway. The postoperative diet usually consists of cold or warm liquids, progressing to semisolid foods, for the first 24 hours. Avoiding red foods can help in distinguishing between ingested food and blood. Citrus fruits, hot fluids, and rough foods should be avoided until the throat has completely healed. Straws are not used because sucking may cause bleeding. Note that stools may be black due to the swallowing of blood. Written instructions for routine care, pain management, and emergency circumstances are reviewed with the caregiver and patient.

Think Critically

What sign would alert you to the probability that a tonsillectomy patient was experiencing bleeding and that the blood was running down the throat where you cannot see it?

Obstruction and Trauma

Airway Obstruction and Respiratory Arrest

Laryngeal edema caused by the inflammation of an infection or an allergic reaction, a crush injury of the larynx, or a foreign object or food that goes down the airway rather than the esophagus may obstruct the airway. If a person seems to be choking, encourage forceful coughing if possible. If the person cannot breathe or speak, he may make the universal signal for choking, signaling for help by grasping at the throat with the hands (Figure 13-3). If breathing is obstructed, abdominal thrusts should be performed² (American Heart Association, 2010). The arms are wrapped around the victim from behind. One hand makes a fist with the thumb inward, then the fist is positioned just above the umbilicus. The other hand wraps around the fist. Upward thrusts are delivered into the abdomen to try to dislodge anything stuck in the airway (Figure 13-4) (see Chapter 44). **In an unconscious adult or child older than 1 year, the most common cause of airway obstruction is the tongue.** An artificial airway may be orally or nasally inserted; it helps to keep the tongue in place (Figure 13-5).

Clinical Cues

Nasal or oropharyngeal airways can be inserted by the nurse. If indicated, an endotracheal tube would be inserted by a provider, respiratory therapist, or nurse anesthetist. The nurse's role in this emergency procedure would include obtaining the emergency airway equipment, including laryngoscope, 5- to 10-mL syringe, Ambu bag, suction equipment, lubricant, stylet, endotracheal tube, and a securing device. The nurse may also be required to oxygenate the patient using the Ambu bag, administer medications for rapid-sequence intubation, or assist in making the equipment available to the clinician performing the intubation.



FIGURE 13-3 The hands grasping the throat is the universal signal for choking.



FIGURE 13-4 Abdominal thrust.

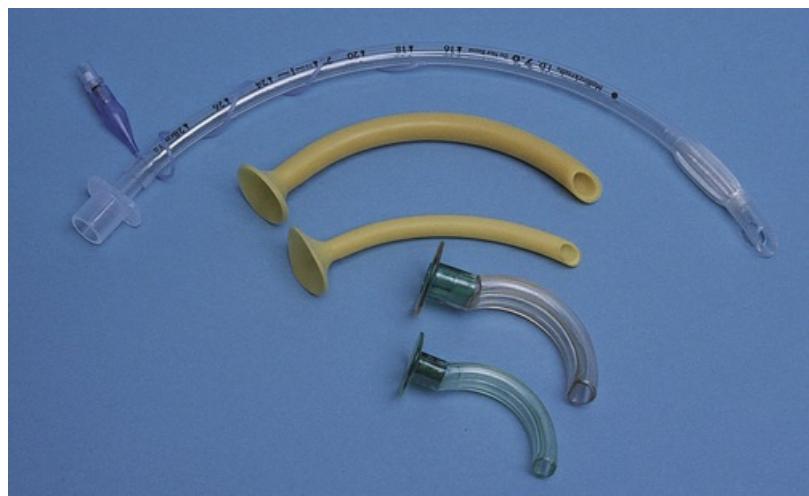


FIGURE 13-5 Types of airways inserted during a respiratory emergency (endotracheal [top], nasopharyngeal [middle], and oropharyngeal [bottom]). (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2013, Saunders.)

If the airway is obstructed for an extended period, the hypoxia may cause the heart to stop. If the obstruction is cleared but the patient has no pulse, cardiopulmonary resuscitation must be started (see Chapter 44).

Obstructive Sleep Apnea

Obstructive sleep apnea (OSA) is a condition in which, during sleep, the person is making breathing

effort but there is no or extremely limited airflow. Muscle relaxation at the back of the throat is the most common cause, allowing the tongue to fall back and block the airway. Snoring is common with this condition, and sleeping partners are usually the first to notice the problem. Daytime symptoms include fatigue, morning headaches, and difficulty concentrating. Physical examination of patients with OSA typically reveals obesity, enlarged neck circumference, and hypertension. A sleep study should be performed to determine the severity of the condition. Those with mild apnea may be treated with conservative measures such as weight loss, avoiding alcohol for 4 to 6 hours before bed, and sleep position modification. The first-line therapy for sleep apnea is nasal continuous positive airway pressure (CPAP) applied with nasal prongs. If that is unsuccessful, bilevel positive airway pressure (BiPAP) may be tried with a facemask or nasal mask (see [Chapter 14, Figure 14-10](#)). Oral appliances may be used to maintain an airway. If noninvasive therapies fail, the patient can be offered surgical interventions, including implantable devices that stimulate the nerves leading to muscles controlling the palate and tongue or surgical alteration of the upper airway. Untreated sleep apnea can contribute to myocardial infarction or stroke. Clinical guidelines require capnography (CO_2 monitoring) for postoperative OSA patients in addition to routine pulse oximetry monitoring after any surgical procedure (The [Joint Commission, 2012](#)).

Nasal Fracture

Nasal fracture often results from sports injuries, motor vehicle accidents, or physical assault and is the most common type of facial fracture. If the cartilage or bone is not displaced, complications are unlikely and no treatment is needed. Displacement of the cartilage or bone can interfere with airflow, cause deformity of the nose, and become a potential spot for infection.

Diagnosis is by visual inspection for deformity, a change in nasal breathing, and presence of **crepitation** (grating sound or a feeling of rough surfaces rubbing together) on palpation. It is important to determine whether other facial bones are also fractured. If the patient is seen within the first 24 hours after injury, a closed reduction is most often performed using local or general anesthetic. Treatment includes pain relief and the use of ice or cold compresses to reduce swelling.

If the fracture is severe, **rhinoplasty** (surgical reconstruction of the nose) may be performed to improve airflow and cosmetic appearance. Nasal packing, splints, or sutures may be used to stabilize the septum postoperatively. The patient will be given specific instructions depending on need. Drainage from the nose is expected, and a drip pad of folded gauze is secured as a "mustache" dressing beneath the nose.

The patient is observed for frequent swallowing postoperatively, which could indicate posterior nasal bleeding. Vital signs are monitored closely, and the amount of drainage on the dressing is observed. The patient should be encouraged to rest in a semi-Fowler position. Cool compresses are used to decrease nose and facial swelling. Forceful coughing and straining at stool (Valsalva maneuver) should be avoided. A humidifier may be used to decrease mucosal drying. Over-the-counter analgesics are usually adequate for pain control. After recovery from anesthesia, the patient is usually discharged to recuperate at home. It may take 6 to 12 months before the final result of the surgery is evident.

Cancer of the Larynx

Etiology and Pathophysiology

It was predicted that there would be 12,000 new cases of cancer of the larynx in 2013 ([American Cancer Society \[ACS\], 2014](#)). Approximately 75% to 90% of all patients who are diagnosed early and treated with radiation and/or surgery are cured. A clear association has been made in relation to cigarette or cigar smoking, excessive use of alcohol, and the development of laryngeal cancer. Lack of fruits and vegetables in the diet, gastroesophageal reflux disease, immunosuppression, and infection with human papillomavirus or *Helicobacter pylori* have all been linked to increased incidence of cancer of the larynx. Exposure over long periods to environmental pollutants, such as asbestos, paint fumes, or wood or coal dust, has been shown to be associated with increased risk ([ACS, 2014](#)). The most common malignant tumor of the larynx is squamous cell carcinoma. It grows from the mucous membrane lining the respiratory tract. Metastasis may occur to the lung.

Signs, Symptoms, and Diagnosis

The larynx (sometimes called the *voice box*) is directly involved with the production of vocal sounds. A tumor of the larynx will quickly produce persistent hoarseness that does not respond to usual methods of treatment.

Health Promotion

Signs of Possible Throat Cancer

Tell patients to seek medical attention if the following signs of cancer of the larynx or throat occur:

- Hoarseness lasting more than 3 weeks
- Sore throat that lasts more than 2 weeks
- Consistent pain in or around the ear when swallowing
- Difficulty swallowing
- Dry, persistent cough for no known reason
- Blood in phlegm or saliva lasting more than a few days
- Lumps or knots on the neck indicating enlarged cervical lymph nodes

After the cancer has spread beyond the vocal cords (and is much more difficult to treat), the symptoms may include difficulty in swallowing or breathing, halitosis, blood-tinged sputum, fatigue and weakness, a sensation of having a lump in the throat, cough, enlarged lymph nodes in the neck, pain in the region of the Adam's apple, or an airway obstruction.

Diagnosis is established by visualizing the larynx with a laryngoscope, by a computed tomography scan of the larynx and throat, by magnetic resonance imaging, and by microscopic examination of a sample of tissues taken from the site.

Treatment

Once the type of cancer is determined, it is staged for appropriate treatment. Outpatient treatment is common. Radiation alone is 85% effective in treating early cancer of the larynx. Radiation may be combined with endoscopic laser cordectomy for certain types of lesions. Brachytherapy (also called internal radiotherapy) along with external-beam irradiation (or external radiotherapy) is used for certain types of lesions. When possible for organ preservation, the surgeon may perform a partial **laryngectomy** in which the thyroid cartilage is split, and only the tumor and involved portion of the larynx and vocal cords are removed. A partial laryngectomy does not permanently eliminate voice sounds. A **tracheostomy** (surgical opening into the trachea) may be performed to facilitate breathing temporarily, but the **stoma** (opening) is eventually closed, and the patient may resume talking after the affected area is completely healed.

Microlaryngoscopy combined with laser treatment is now the method of choice for removing vocal cord polyps and carcinoma that has not spread. Cure rates for malignancy of the true vocal cords treated by laser are about 90%. Other advantages include the absence of mechanical trauma and swelling when laser is used, which means that the patient returns to normal activities within about 3 days. There is no need for extended voice rest; 2 days is usually sufficient.

A total laryngectomy is performed if the tumor has progressed to surrounding tissues, radiation therapy has failed, or better survival can be obtained by the more aggressive surgery. The surgeon excises the entire larynx, epiglottis, thyroid cartilage, hyoid bone, cricoid cartilage, and two or more rings of the trachea (**Figure 13-6**). Near-total laryngectomy preserves voice production and swallowing in advanced disease and is used when possible.

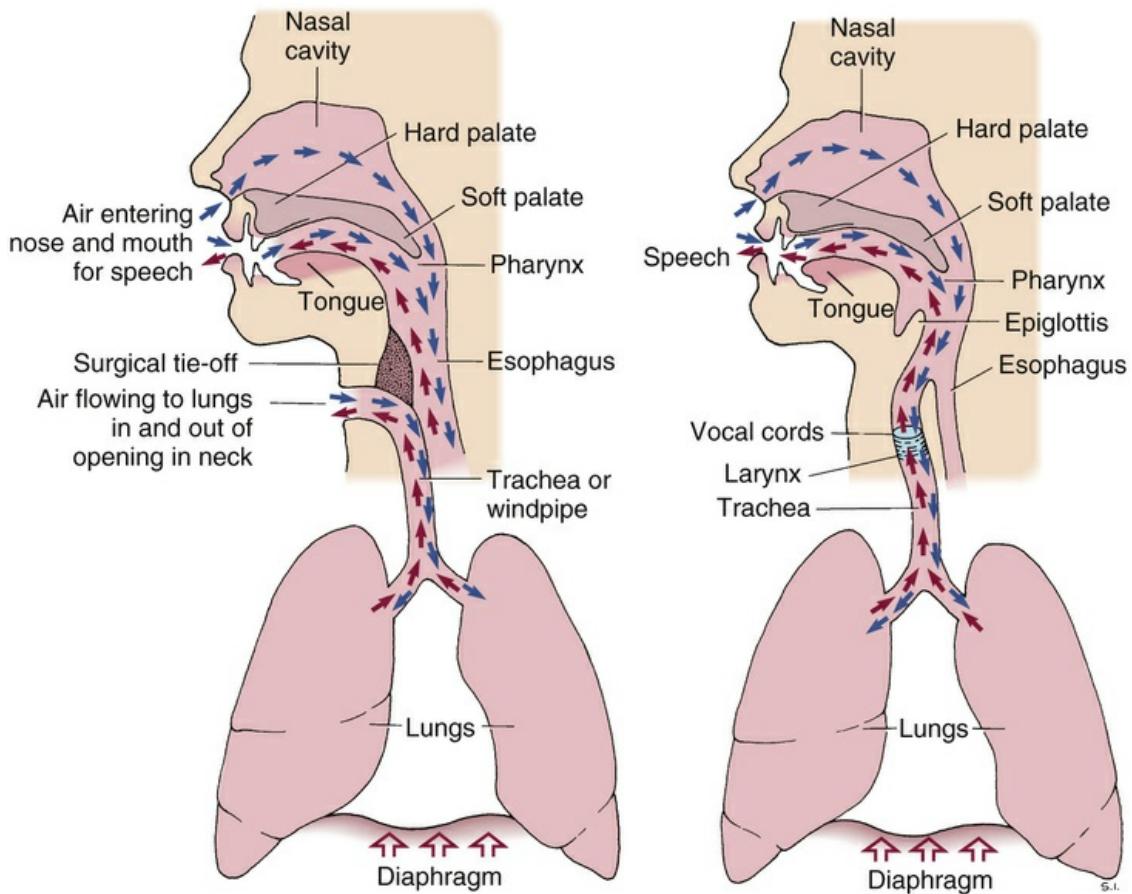


FIGURE 13-6 Airflow after laryngectomy (left) and in a normal respiratory tract (right).

If the tumor has extended to the lymph nodes, neck dissection is performed on the side of the lesion. In a radical neck surgery, all the muscle, lymph nodes, and soft tissue from the lower edge of the mandible to the clavicle and from the top of the trapezius muscle to the midline are removed. A modified radical neck dissection is more commonly performed and excises only the lymph tissue and surrounding structures directly affected by the cancer. A permanent tracheostomy is performed at the same time. A laryngectomy tube, which is shorter and wider than a tracheostomy tube, is put into place before discharge. After the stoma is completely healed and matured, about 6 weeks after surgery, the tube can be taken out as long as there is no compromise of the airway.

A thin feeding tube is placed during surgery for postoperative use for about 10 to 14 days. The patient has only intravenous fluids initially but then progresses to regular tube feedings. With healing, the danger of contaminating the operative site is no longer a concern and training in eating and swallowing are initiated. With the appropriate encouragement and practice, most patients can master the techniques to avoid the sensations of choking and gagging.

When the patient is discharged from the hospital, a visiting nurse, clinic nurse, or occupational therapist will work with the patient on eating skills. Some patients have to rely on a feeding tube if they cannot master the swallowing procedure without aspiration. The indwelling tube may then be replaced with a gastrostomy tube.

Think Critically

How can nurses help decrease the incidence of cancer of the larynx?

Endotracheal intubation and tracheostomy.

Endotracheal intubation means that an endotracheal tube is inserted into the trachea through the nose or the mouth with the use of a **laryngoscope**. An endotracheal tube is placed for airway protection against aspiration, when there is upper airway obstruction, and when mechanical

ventilation is necessary. Endotracheal tubes are used for short-term respiratory support, such as for immediate relief of airway obstruction, for patients with decreased level of consciousness because of trauma, during anesthesia, or for a few days postoperatively.

A **tracheostomy** is a surgical incision into the trachea for the purpose of inserting a tube for breathing. In a patient with a tracheostomy, there is no connection between the nose and mouth and the lower respiratory system (Figure 13-7, B). Tracheostomy is done:

- To assist or control ventilation by mechanical means over a prolonged period of time
- To facilitate suctioning of secretions in the air passages when the patient cannot cough
- To prevent aspiration of oral and gastric secretions (as in unconscious or paralyzed patients)
- To bypass a constricted or obstructed upper airway (e.g., from edema of the larynx, presence of a foreign body or tumor, surgical procedures involving the neck, severe burns, facial trauma, or chest trauma)

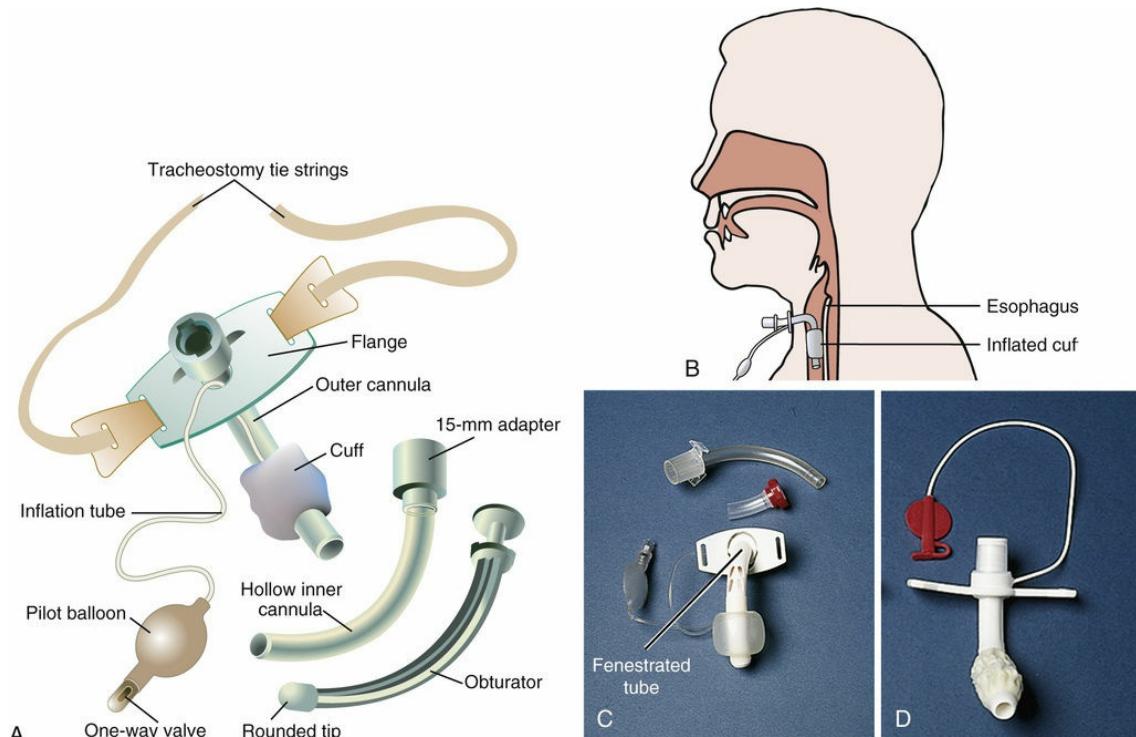


FIGURE 13-7 Types of tracheostomy tubes. **A**, Parts of a tracheostomy tube. **B**, Tracheostomy tube inserted in airway, shown with cuff inflated. **C**, Fenestrated tracheostomy tube with cuff, inner cannula, decannulation plug, and pilot balloon. **D**, Tracheostomy tube with foam cuff and obturator. Cuff is deflated on tracheostomy tube. (From Lewis S, Dirksen S, Heitkemper L, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 8, St. Louis, 2011, Mosby.)

Tracheostomy may be an emergency procedure or an elective operation. If passing an endotracheal tube through the nose or mouth is impossible or extremely difficult, a tracheostomy may be done to provide an airway. Some patients will need a tracheostomy tube for the rest of their lives because of anatomic changes in the throat. When a patient is expected to need an artificial airway for an extended period of time, tracheostomy is preferred over prolonged endotracheal intubation. Tracheostomy is usually considered after 1 to 3 weeks of intubation (Lindman et al, 2013). In the immediate postoperative period, patients with a tracheostomy may need mechanical ventilation and/or oxygen therapy (see Chapter 14).

Types of tracheostomy tubes.

Tracheostomy tubes are available in a variety of materials and styles. Most of the models are made of polyvinyl chloride (plastic) or silicone (see Figure 13-7). Tubes made of metal alloys are used chiefly for patients who need a permanent tracheostomy. The age of the patient and the purpose of the tube will determine what features are selected. They may be cuffed or uncuffed and may have a

reusable inner cannula or a disposable inner cannula. Single cannula tubes do not have an inner cannula. In a **double-cannula tracheostomy tube**, the outer cannula acts as a sleeve for the inner cannula, which can be removed for cleaning. The **obturator** (insertion guide) is used during insertion as a guide (the tip, shaped like an olive, extends beyond the end of the tube) to protect against scraping the sides of the trachea with the sharp edge of the tube (see [Figure 13-7, A](#)).

Fenestrated tubes have a small opening in the outer cannula that allows some air to escape through the larynx (see [Figure 13-7, C](#)). This helps prepare the patient for the time when the tracheostomy tube will be removed and breathing occurs normally again. If the fenestrated tube is cuffed and the cuff is not inflated, then the airflow allows for speech. A one-way tracheostomy valve box can be fitted into the tube opening. It allows air to be inhaled through the tracheostomy opening, but the valve closes when the patient exhales. This diverts the exhaled air through the larynx and enables the patient to speak.

A **cuffed tracheostomy tube** has a small balloon encircling its tracheal end. When the balloon is inflated, it fills the space between the outside of the tracheostomy tube and the trachea, thereby providing a seal and preventing the escape of air around the tube. When positive-pressure mechanical ventilation is administered, the air passes through the tracheostomy tube **only**, thus providing sufficient pressure to inflate the lungs. The cuffed tracheostomy tube may offer some protection against aspiration of mucus and fluids; however, the use of the cuffed tube does not replace careful nursing observation or interventions to prevent aspiration.

Foam-cuffed tracheostomy tubes have the cuff filled with a sponge-like material that is fully expanded at rest. To insert the tube, air must be withdrawn from the cuff so that the foam compresses, allowing for placement (see [Figure 13-7, D](#)). When in place, the cuff inflation line is left open to air, which allows for compression and expansion of the cuff with tracheal movement. Because of this there is minimal pressure exerted on the tracheal wall, decreasing the risk of tissue damage or necrosis.

Nursing Management

A patient with a new tracheostomy requires very specialized nursing care, especially if mechanical ventilation through the tube is required. **Immediate postoperative care focuses on maintaining a patent airway and observing for hemorrhage.** During the first 24 hours, the patient is monitored continuously for signs of respiratory distress. If the patient is unable to cough to remove mucus and drainage, tracheal suctioning is necessary. If the lumen is not kept open, the patient will suffocate. Suctioning is done with strict sterile technique to prevent infection. (Suctioning technique is presented in Skill 13-1 on Evolve.) See also [Nursing Care Plan 13-1](#). Adequate humidification of the inhaled air and hydration of the patient helps to thin secretions.

Clinical Cues

When you are suctioning a patient with a tracheostomy or endotracheal tube and using a sterile suction kit, ask an assistant to accompany you to deliver oxygen before and during the procedure (as needed). Oxygenation of the patient will prevent desaturation, and the assistance of a helper allows you to maintain sterile technique. Patients on mechanical ventilation can be preoxygenated with the ventilator and may have an inline suction device attached to the airway.

Nursing Care Plan 13-1

Care of a Patient With a Laryngectomy

Scenario

Mr. Collins had a supraglottic laryngectomy 5 days ago. He is having difficulty adjusting to his tracheostomy and frequently chokes when trying to eat or swallow secretions. He indicates, with pencil and paper, that he does not feel he can learn to speak again and is very anxious about choking; he is withdrawn.

Problem Statement/Nursing Diagnosis

Alteration in airway clearance/*Ineffective airway clearance related to secretions resulting from surgery and tracheostomy.*

Supporting Assessment Data

Objective: Unable to cough out secretions; becomes hypoxic when secretions build up, decreasing airflow.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Tracheostomy will be cleared by suctioning as needed.	Assess respiratory effort and rate; auscultate upper airways to determine needs for suctioning. Observe ostomy site for secretions. Suction as needed.	If rate or respiratory effort increases, the airway may be obstructed. Coarse sounds heard in the upper airways or secretions at ostomy site indicate need for suctioning. Suctioning secretions clears airway.	Respiratory rate varies; 18/min if patient is relaxed. Rate of 28-30/min when anxious or trying to cough out mucus. (Suctioning improves respiratory rate when mucus is cleared.) Suctioning is effective.
Patient will learn to suction own tracheostomy effectively by discharge.	Encourage patient to assist with procedure (e.g., have patient hold water for moistening catheter).	Having patient assist with small steps helps him to develop confidence for home care.	Patient is making attempts to learn suctioning technique.
	Teach to attach catheter to suction tubing; teach to suction self using mirror.	Knowledge and practice are essential for self-care.	Beginning to attempt to cough out secretions and suction.
	Praise for all attempts.	Praise reinforces patient's efforts and learning.	Positive reinforcement given for any attempt.
	Point out advantages of not being dependent on others for care of airway.	Provides incentive to learn self-care.	States wants to be independent.
Patient will learn to clear tracheostomy by coughing effectively.	Medicate for discomfort and encourage patient to cough to remove secretions without suctioning.	Lessened discomfort makes it possible to cough effectively.	Analgesia provided as ordered.
	Assist to an upright position of at least 45 degrees.	Sitting upright allows for full expansion of chest cavity.	Is able to place self in an upright position and reposition self as needed.
	Remind to hold tissues in front of tube rather than the mouth.	Secretions will be coughed out of the tube.	Holding tissues in front of tube when coughing.
	Instruct to breathe deeply for several seconds and to forcefully cough two or three times using the abdominal muscles.	Use of abdominal muscles increases the force and depth of the cough.	Able to perform deep coughing with support and coaching.

Problem Statement/Nursing Diagnosis

Altered skin integrity/Impaired skin integrity related to surgical incisions.

Supporting Assessment Data

Objective: Supraglottic laryngectomy and tracheostomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
No infection at incision sites as evidenced by absence of redness, swelling, or purulent discharge.	Clean around tracheostomy stoma with normal saline; q 4-8 h change gauze pad PRN.	Cleans away bacteria and helps prevent infection.	No evidence of infection. Slight redness around tracheostomy stoma.
Skin integrity will be intact within 6 wk.	Change tracheostomy ties or holder at least q24h and as needed.		Skin is intact; no redness or signs of irritation.
	Observe for signs of infection.	Early recognition ensures prompt treatment.	No signs of infection. Continue plan.

Problem Statement/Nursing Diagnosis

Altered communication ability/Impaired verbal communication related to loss of larynx.

Supporting Assessment Data

Subjective: No verbal communication.

Objective: Laryngectomy and tracheostomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will show interest in learning new style of speech within 6 wk.	Assist him to use dry erase board or paper and pencil for communication; show patience.	Provides for some means of communication.	Using communication tools.
	Obtain order for visit from rehabilitated patient who has mastered some form of speech.	Seeing an example reinforces the possibility of regaining a form of speech.	Visit scheduled.
	Encourage affiliation with community support group.	Support from people with a similar problem helps to decrease feelings of isolation and helplessness.	Advised about support group. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for injury/Risk for aspiration related to choking when trying to swallow.

Supporting Assessment Data

Subjective: Writes that he does not feel he will be able to swallow or eat by mouth again.

Objective: Chokes when tries to swallow saliva; tends to aspirate.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience injury from aspiration of food or fluids.	Place in an upright position before eating or medication administration and maintain for at least 1 hr.	Gravity facilitates the downward movement of the food bolus.	Able to place self in an upright position; acknowledges need to remain upright for 1 hr after eating.

	Teach to hold his breath and perform the Valsalva maneuver while swallowing.	Valsalva maneuver closes the glottis over the tracheal opening in the throat, preventing food from entering the trachea.	Is practicing, but is having trouble coordinating the breathing and Valsalva maneuver and swallowing.
Patient will learn to swallow without aspirating within 6 wk.	Teach to keep neck relaxed forward, take small bite of food, keep chin toward chest, swallow, then forcibly exhale.	Exhaling forcibly after swallowing will expel particles that accidentally end up in the trachea.	Is still choking when he tries to swallow. Revise plan: Obtain consultation with speech therapist for swallowing exercises.

Critical Thinking Questions

- What psychosocial problems might Mr. Collins experience?
- How can you motivate Mr. Collins to participate in suctioning his tracheostomy?

The lungs should be auscultated (1) before suctioning to assess the need and (2) afterward to verify that the procedure successfully cleared the airways. Head-to-toe assessment is performed as for any surgical patient (see [Chapter 5](#)).

When the patient has a tracheostomy tube with a cuff, the cuff must be inflated just enough to seal the trachea without causing extreme pressure against the tracheal wall; otherwise depression of the surface blood vessels in the tracheal wall will cause necrosis. Cuff pressure is checked with a manometer each shift and each time the degree of cuff inflation is changed.

Assignment Considerations

Reporting on a Patient With a Tracheostomy

Instruct the UAP to immediately report coughing episodes or coarse gurgling sounds produced by a patient with a tracheostomy. Explain that you must be notified so that you can perform an immediate assessment and possible suctioning to alleviate an airway obstruction.

Preventing infection is another nursing responsibility. The incision is an open wound with minimal dressings and is an ideal entryway for infectious organisms. Tracheostomy care is a sterile procedure until the stoma is well healed (see Skill 13-2 [on Evolve](#)). **When changing the ties or Velcro tube holder of the tracheostomy tube, the tube should be manually held in place; otherwise the tube may be dislodged by coughing.** (Coughing frequently occurs when the tube is moved or manipulated.)

If the patient is to go home with a tracheostomy, techniques for suctioning and providing the necessary tracheostomy care are taught to both the patient and a family member or caregiver.

Patient Teaching

Home Care of a Tracheostomy

The patient and family should be taught the following points:

- Clean the stoma with normal saline and cotton-tipped sterile applicators, removing all secretions, on a daily basis and as needed.
- Replace the commercially slit gauze pad around the tube as frequently as needed when it becomes soiled. (Do not cut regular gauze pads, because the loose threads can be aspirated.)
- It is best to have two people help change the ties or tube holder, because movement of the tube can easily cause the patient to cough and expel the tube from the stoma.
- Prepare the new ties before loosening the old ones. If a device with self-sticking ties is used, attach the new holder before removing the soiled holder.
- Hold the tube securely in place with thumb and forefinger while the ties are loose.
- Stand to the side of the stoma when providing care, because if the patient coughs, mucus may be expelled.

Psychological support of the tracheostomy patient and family is essential. The patient has to learn to breathe in a totally different way and cannot speak or call out for help. She may be able to use a Passy-Muir speaking tracheostomy valve ([Figure 13-8](#)). Verbal reassurance will show awareness of apprehension and readiness to help. Explanations about what is being done and why it is being done are given each time tracheostomy care is provided. Teaching begins as soon as the patient is alert after the tracheostomy tube is placed. The patient may experience grief over losing her natural voice and the ability to eat normally if a total laryngectomy has been done. She will need help in facing a future in which she will not be able to speak normally. A radical neck dissection may create body image disturbance, because the procedure is somewhat disfiguring. Initially, depression is common. Contact with others who have had the surgery may help the patient focus on the benefits of lifesaving surgery.

Nutrition Considerations

Assisting the Patient With Swallowing After a Partial Laryngectomy

- Explain that swallowing food without choking is possible.
- Arrange a visit from a partial laryngectomy patient who has mastered the technique.
- Begin practice with soft or semisolid foods.
- Supervise initial practice and explain that someone needs to be with the patient when she eats until swallowing without choking is mastered.
- Teach to swallow by asking the patient to:
 - Take a deep breath and bear down to close the vocal cords.
 - Place a small bite of food in the mouth.
 - Tip the chin toward the chest and swallow.
 - Emit a cough to rid the throat of any food particles.
 - Swallow again.
 - Cough again.
 - Begin breathing normally again.
- Offer encouragement for each effort.



FIGURE 13-8 **A**, Passy-Muir speaking tracheostomy valve. **B**, Patient using a Passy-Muir valve. (Courtesy Passey-Muir, Inc., Irvine, Calif.)

The laryngectomy patient will need to be provided with a means of communication such as a pad and pencil, a dry erase board, a picture board device, or electronic devices with appropriate software.

Once the tracheal stoma is healed, protection of the tracheal opening from dust and lint can be accomplished through the use of a simple gauze covering or high-necked clothing. The patient also should be told to avoid swimming and to use care when taking a shower or tub bath so that water is not aspirated through the opening. To protect the patient from inhalation of extremely cold air (she no longer breathes through her nose and mouth, which normally warm the inspired air), the patient may wear a small scarf over the opening during the winter.

Rehabilitation.

Proper rehabilitation is important in the acceptance of surgery and the consequences. The speech therapist helps the patient to master a new form of speech. Many people are able to learn esophageal speech; first they master the art of swallowing air and then moving it forcibly back up through the esophagus; then they learn to coordinate lip and tongue movements with the sound produced by the air passing over vibrating folds of the esophagus. The sounds may be somewhat hoarse but are more natural than the sounds produced by an artificial larynx. For patients who cannot master esophageal speech, a tracheoesophageal prosthesis can be implanted. A fistula is made between the esophagus and trachea; a silicone prosthesis is inserted after the fistula heals. The patient covers the opening of the prosthesis with a finger or closes a special valve that diverts air from the lungs up through the trachea into the esophagus and out of the mouth. Lip and tongue movements form speech as the air is expelled.

An electronic artificial larynx is a battery-powered device that is externally applied to the skin of the esophagus to simulate speech. The sounds are not voicelike but are understandable and make it

possible for the patient to communicate (Figure 13-9).

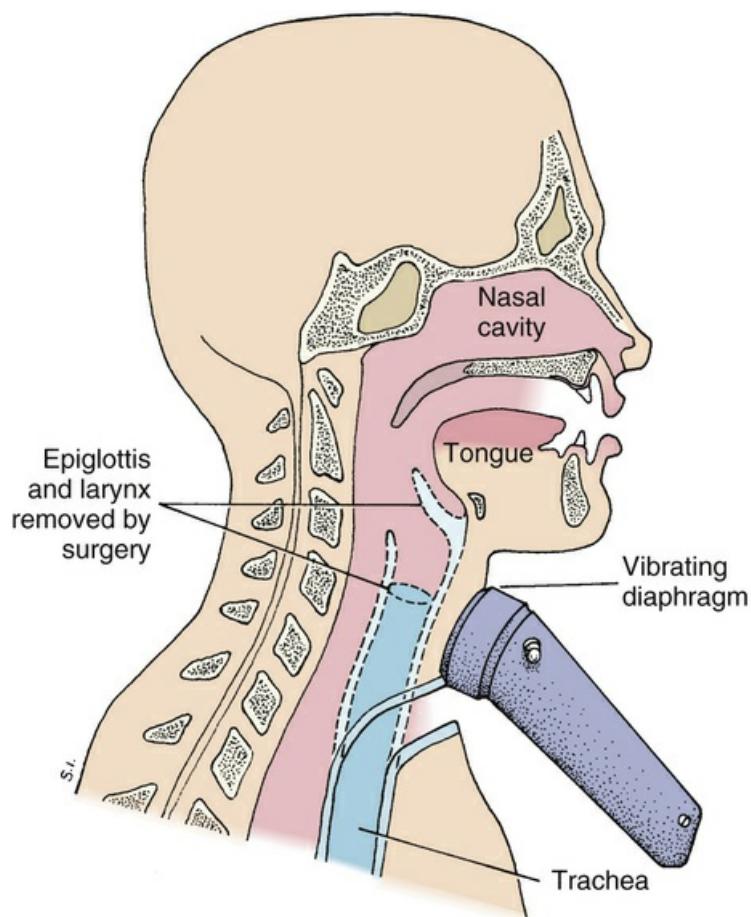


FIGURE 13-9 External electronic larynx. The vibrating cap of the electronic larynx is held against the throat with sufficient pressure to maintain firm contact. Sound vibrations are transmitted into the lower portion of the pharynx and transformed into speech by the normal movements of the tongue, lips, and teeth.

Another option is an electronic speech aid that has a small tube device that can be inserted into the mouth. The patient can push a button device implanted in the throat that allows diaphragmatic speech.

Throughout the United States, groups have been organized for laryngectomy patients who wish to get together for social and rehabilitation purposes (see Online Resources).

Think Critically

Can you identify all of the health care professionals who would be involved in the collaborative care of a patient undergoing a total laryngectomy and radical neck dissection?

Community Care

One of the primary aspects of community care for nurses is to promote immunization for influenza and pneumonia. Remind the public that frequent hand hygiene and covering the mouth when coughing or sneezing are simple measures that prevent the spread of URIs.

Home Care

Home care nurses follow up with patients who have had surgery or need further teaching or assessment. Reminding patients to take all prescribed antibiotics as directed is very important in preventing the development of disease-resistant strains of bacteria ([Centers for Disease Control and Prevention, 2013](#)). The home care nurse will also help patients with throat cancer or surgeries address nutritional concerns, provide wound care, supervise self-care techniques for care of a tracheostomy, and provide psychosocial support.

Tracheostomy care in the home setting differs from hospital procedures. In the home, suction catheters may be used longer and can be disinfected for reuse. Once the stoma is healed, the patient learns to adapt supplies to her needs. The nurse can help identify community resources that can help meet the needs of the patient.

Extended Care

Extended-care facility nurses must be vigilant for signs of URI among residents to prevent the spread of infection. If you have a contagious URI, do not expose your older adult patients. Stay at home or diligently wear a mask and perform hand hygiene. Adequate protein stores and hydration will promote immunity for your patients. Timely immunization against influenza and pneumonia is a top priority. Assist residents with hand hygiene and remind everyone to cover sneezes and coughs to decrease the spread of URIs within the facility.

Get Ready for the NCLEX® Examination!

Key Points

- If a cold persists or high fever develops, the patient should obtain medical attention.
- Rhinitis may be allergic in origin. If it interferes with lifestyle or productivity, desensitization is an option.
- Sinusitis symptoms include headache, fever, tenderness over the sinuses, purulent drainage from the nose, painful upper teeth, and malaise. A nonproductive cough may be present.
- Epistaxis is caused by many factors, such as irritation from nose blowing, hypertension, trauma, blood dyscrasias, decreased humidity, and nose picking. Apply direct pressure to the nose for 10 to 15 minutes to stop bleeding; cold compresses or ice are helpful.
- Pharyngitis is inflammation of the pharynx, or sore throat, that is viral, bacterial, or fungal in origin. Treatment for viral pharyngitis is rest, warm saline gargles, throat lozenges, and a mild analgesic. A throat culture and antibiotics are common for bacterial pharyngitis.
- Treatment and nursing interventions for tonsillitis consist of warm saline gargles, throat lozenges, rest, and antibiotics.
- When a tonsillectomy is performed, check vital signs frequently; keep the patient on her side or abdomen as long as there is drainage from the throat; and limit diet to soft, nonirritating foods until the throat is no longer sensitive. Observe for frequent swallowing, which may indicate blood running down the throat.
- Rhinoplasty is performed for severe nasal fracture; the postoperative priority is to monitor for and control bleeding.
- Risk factors for cancer of the larynx include smoking, immoderate alcohol use, chronic laryngitis, and abuse of vocal cords. Persistent hoarseness is a first sign of cancer of the larynx; later signs are pain in the throat, coughing, dysphagia, a lump in the throat, or pain in the region of the Adam's apple. Surgical treatment for laryngeal tumor is laser treatment, partial or total laryngectomy, and possible radical neck dissection.
- Endotracheal intubation or tracheostomy provides an artificial airway. Major concerns of an artificial airway are maintaining an open airway and preventing infection.
- Promote immunization for influenza and pneumonia. Teach prevention of infection by hygiene measures—proper hand hygiene and covering the mouth when coughing or sneezing.

Additional Learning Resources

- SG** Go to your Study Guide for additional learning activities to help you master this chapter content.
- Online Resources
 - American Speech-Language-Hearing Association, www.asha.org/default.htm

Review Questions for the NCLEX® Examination

1. On initial assessment, a patient who just had tonsillectomy and adenoidectomy is restless and swallows frequently. What is the most likely explanation?

1. Excessive thirst
2. Swelling in the neck
3. Bleeding
4. Sore throat

NCLEX Client Need: Reduction of Risk Potential

2. A 45-year-old man who is eating steak suddenly rises from his seat. His hands are grasping his throat. What actions should be performed? Identify the correct sequence.

1. Position your open hand just above the umbilicus.
2. Wrap your arms around the man from behind.
3. Deliver upward squeeze thrusts.
4. Ask the man if he is choking.

NCLEX Client Need: Physiological Adaptation

3. When caring for a patient who had a rhinoplasty, the nurse should perform which intervention(s) in the immediate postoperative period? (*Select all that apply.*)

1. Observe for frequent swallowing.
2. Monitor amount of drainage on dressing.
3. Position patient flat on the back.
4. Apply warm compresses.
5. Provide humidified oxygen.

NCLEX Client Need: Reduction of Risk Potential

4. The spouse of a patient with a tracheostomy asks, "What is the purpose of the cuff on the tracheostomy tube?" What is the best response?

1. "It holds the tube in place."
2. "It allows the ventilator to deliver a full breath of air."
3. "It prevents the development of pneumonia."
4. "It reduces the risk for tracheal wall necrosis."

NCLEX Client Need: Physiological Adaptation

5. A patient has sinusitis. Which nonpharmacologic intervention(s) would be appropriate? (*Select all that apply.*)

1. Apply ice packs over the sinus area.
2. Suggest inhalation of moist steam.
3. Increase fluid intake.
4. Position with the head lower than the shoulders.
5. Rest and reduced stress.
6. Use of a sinus irrigation kit.

NCLEX Client Need: Basic Care and Comfort

6. While deciding whether to sign the surgical consent for tracheostomy, the patient's spouse asks, "What is the purpose of this procedure?" Which response(s) demonstrate(s) nursing knowledge regarding the procedure? (*Select all that apply.*)

1. "The procedure facilitates suctioning of respiratory secretions."
2. "The procedure prevents recurrence of respiratory arrest."
3. "The procedure prevents hospital-acquired pneumonia."
4. "The procedure bypasses an obstructed upper airway."
5. "The procedure is a temporary airway for face and neck injuries."

NCLEX Client Need: Physiological Adaptation

7. A 55-year-old man with a new tracheostomy is unable to cough. Breath sounds are diminished. Pulse oximetry is 88% on 100% humidified air. What is the priority nursing action?

1. Provide positive ventilation.
2. Suction respiratory secretions.
3. Administer pain medications.
4. Humidify inhaled air.

NCLEX Client Need: Physiological Adaptation

8. A patient is newly diagnosed with a squamous cell carcinoma of the larynx. What is an early sign and symptom for this diagnosis?

1. Crepitation
2. Hoarseness
3. Frothy sputum
4. Drooling

NCLEX Client Need: Health Promotion and Maintenance

9. A student is caring for a patient diagnosed with OSA. The patient is not convinced that the CPAP machine is worth the effort. What is the most important reason for the patient to receive treatment?

1. Use of the CPAP machine will decrease the risk of pneumonia.
2. Use of the CPAP machine will improve energy levels.
3. Untreated OSA can lead to heart attack and stroke.
4. Untreated OSA can lead to upper airway cancers.

NCLEX Client Need: Health Promotion and Maintenance

10. A nurse is caring for a patient who is postoperative for tonsillectomy. Within the first 24 hours, which food item would be the most appropriate to offer the patient?

1. Orange juice
2. Warm tea
3. Snack crackers
4. Popsicles

NCLEX Client Need: Basic Care and Comfort

Critical Thinking Questions

Scenario A

Mr. Kim has undergone diagnostic procedures to confirm suspected cancer of the larynx. He has been admitted to the hospital for a laryngectomy.

1. What is the primary postoperative issue related to Mr. Kim's nutritional status?
2. Identify interventions and teaching points that will allow Mr. Kim to eat and swallow safely.
3. Devise a postoperative nursing care plan for Mr. Kim, including interventions for psychosocial

problems.

4. What resources in the community could be suggested to help Mr. Kim adjust to his laryngectomy?

Scenario B

Mr. George has undergone a total laryngectomy and radical neck dissection.

1. What structures would have been removed during this surgery and how would his life be affected?
2. How often should his tracheostomy be suctioned?
3. How might you facilitate communication with Mr. George during the postoperative period?

Scenario C

You are not scheduled to work today or tomorrow and you are glad, because you don't feel very well and suspect that you might have a cold.

1. What are the signs and symptoms of the common cold?
2. What measures will you take to prevent the spread of the virus to your family?
3. Describe the interventions that you will use to manage your own symptoms at home.

CHAPTER 14

Care of Patients With Disorders of the Lower Respiratory System

Objectives

Theory

1. Compare and contrast nursing care for patients with bronchitis, influenza, pneumonia, empyema, and pleurisy.
2. Choose nursing interventions appropriate for the care of patients with problem statements of Alteration in airway clearance, Altered breathing pattern, Altered gas exchange, and Fatigue due to hypoxia.
3. Analyze ways a nurse can contribute to prevention and prompt treatment of tuberculosis.
4. Summarize the pathophysiologic changes that occur during an asthma attack.
5. Evaluate problems that occur with aging that may cause a restrictive pulmonary disorder.
6. Describe the specifics of nursing care for a patient who has had thoracic surgery and has chest tubes in place.

Clinical Practice

7. Complete a nursing care plan, including home care, for a patient with chronic obstructive pulmonary disease.
8. Review nursing interventions for a tracheostomy patient receiving oxygen therapy.
9. Teach a patient how to use a peak flowmeter.
10. Observe a respiratory therapist (RT) who is responsible for a patient on a mechanical ventilator and identify how RTs and nurses work together to deliver safe care.

KEY TERMS

- aerosols (ÄR-ö-söls, p. 314)
- asthma (ÄZ-mă, p. 301)
- atelectasis (ä-tĕ-LĒK-tă-sĭs, p. 294)
- bronchiectasis (brōng-kē-ĚK-tă-sĭs, p. 299)
- bronchodilators (brōng-kō-Dī-lā-tĕrz, p. 314)
- cor pulmonale (kôr pül-mō-NĂ-lē, p. 300)
- crepitus (KRĒP-ĕ-tüs, p. 312)
- emphysema (ěm-fî-SĒ-mă, p. 300)
- health care–associated pneumonia (HCAP) (p. 293)
- hemoptysis (hē-MÖP-tĭ-sĭs, p. 295)
- hemothorax (hē-mō-THŌ-räks, p. 309)

hospital-acquired pneumonia (HAP) (p. 293)
intrathoracic (in-tră-thōr-RĂ-sīk, p. 312)
latent TB infection (LTBI) (LĀ-tēnt, p. 294)
leukotriene (lĕw-kō-trī-ēn, p. 314)
nebulizer (NĒ-bū-lī-zér, p. 314)
pleurisy (PLŪR-ă-sē, p. 298)
pneumonectomy (nū-mō-NĚK-tō-mē, p. 308)
pneumonia (nū-MŌ-nyā, p. 292)
pneumothorax (nū-mō-THŌ-räks, p. 309)
polycythemia (pōl-ē-sī-THĒ-mē-ă, p. 301)
sarcoidosis (sär-koy-DŌ-sīs, p. 298)
subcutaneous emphysema (süb-kū-TĀ-nē-ěs ēm-fī-SĒ-mă, p. 312)
thoracentesis (thō-ră-sěn-TĒ-sīs, p. 298)
thoracotomy (thō-ră-KÖT-ō-mē, p. 312)
thrombolytic (thrōm-bō-LĪT-īk, p. 309)
tuberculosis (TB) (tū-BĚR-kū-LŌ-sīs, p. 294)
ventilator-associated pneumonia (VAP) (p. 293)

Respiratory Infectious Diseases

Acute Bronchitis

Acute bronchitis is often an extension of an upper respiratory infection involving the trachea (**tracheobronchitis**) and is usually viral in origin. Other causes of acute bronchitis include inhalation of physical or chemical agents such as dust, automobile exhaust, industrial fumes, and tobacco smoke.

Early symptoms of acute bronchitis are similar to those of the common cold. Cough producing some sputum is the most common symptom. Sore throat, runny or stuffy nose, headache, muscle aches, and fatigue are also typical. The provider relies on history and signs and symptoms for diagnosis.

Symptomatic treatment includes humidification using either warm or cool moist air. Cough suppressants or bronchodilators are used to reduce coughing and soothe the irritated tracheal and bronchial mucosa. Nutrition and fluid balance should be maintained. Rest is recommended to prevent progression from an acute condition to a chronic one. Antibiotics are used if a sputum culture identifies specific bacterial organisms.

Influenza

Etiology

Influenza is an acute, highly infectious disease of the upper and lower respiratory tracts that occurs in isolated cases or in epidemics. Every year there are between 25 and 50 million cases resulting in more than 200,000 hospitalizations and between 30,000 and 40,000 deaths. Influenza is caused by three major types (A, B, and C) and numerous subtypes of influenza viruses. Type A is the most virulent and usually affects young adults first and then spreads to the very young and very old in the community. Influenza is spread by direct and indirect contact with infected people by coughing and sneezing and by virus transferred from contaminated hands to objects.

Pathophysiology

The influenza viruses affect the respiratory mucosa, causing inflammation and destruction of tissue, which sheds the virus into the secretions. The inflammation may involve the lungs, pharynx, sinuses, and eustachian tubes. The damaged tissue provides an environment for the growth of bacteria that cause secondary infection.

Signs and Symptoms

The first symptoms of influenza appear suddenly 2 to 3 days after exposure and include headache, fever (often 101° to 103° F [38° to 40° C]), chills, and muscle aches. Sore throat, hacking cough, runny nose, nasal congestion, light sensitivity, nausea, vomiting, and diarrhea can also occur. Virus is usually shed for 1 to 2 days before the onset of symptoms.

Diagnosis

Chest radiographs and auscultation are usually normal. The white cell count is normal or slightly below normal. Diagnosis is usually based on clinical findings. To confirm the diagnosis, viral culture, serology, rapid antigen testing, or polymerase chain reaction and/or immunofluorescence assays must be performed. The Centers for Disease Control and Prevention (CDC) recommends testing only when the results will alter treatment decisions ([CDC, 2013](#)).

Treatment and Nursing Management

Antibiotics are given only if there is evidence of bacterial infection secondary to the viral infection. Antibiotics are not effective against viral illness and are contraindicated. Antiviral medications may be used in specific patient populations. If a person is known to be at high risk for influenza and has been exposed to type A influenza, the provider may choose to provide prophylaxis with an antiviral agent such as amantadine (Symmetrel), rimantadine (Flumadine), zanamivir (Relenza), or oseltamivir (Tamiflu). These drugs must be started within 48 hours of the start of symptoms.

Uncomplicated influenza usually is managed more effectively by nursing interventions than by drugs or other forms of medical treatment. Nursing interventions for patients with flu symptoms might include:

- Increase oral fluid intake to at least 3000 mL per 24 hours, unless contraindicated.
- Encourage patient to take analgesics when discomfort first appears.
- Offer saline gargles for a sore throat.
- Administer suppressant cough medicine at bedtime and during the night as prescribed.
- Perform mouth care at least every 4 hours, before each meal, and more frequently if the patient reports a bad taste in the mouth or has halitosis from sputum.
- Cater to the patient's food and drink preferences within the limits of dietary restrictions.
- Give antipyretics and use cooling measures to reduce high fever.
- Humidify inhaled air.
- Splint chest and abdomen with a pillow during coughing attacks.
- Apply emollient to the lips and nares as needed.
- Clear the nostrils as much as possible to prevent mouth breathing.
- Provide for periods of uninterrupted rest.
- Protect from and monitor for secondary infections such as pneumonia, otitis media, and sinusitis, because the weakened immune system causes greater susceptibility.

Health Promotion

Protection From Influenza

 The 2009 Advisory Committee on Immunization Practices recommends annual influenza vaccination for the following groups ([CDC, 2014](#)):

- People at high risk for influenza-related complications and severe disease, including:
 - Children ages 6 to 59 months
 - Pregnant women
 - People older than 50 years
 - People of any age with certain chronic medical conditions
- People who live with or care for persons at high risk, including:
 - Household contacts who have frequent contact with people at high risk and who can transmit influenza to those individuals
 - Health care workers

Complementary and Alternative Therapies

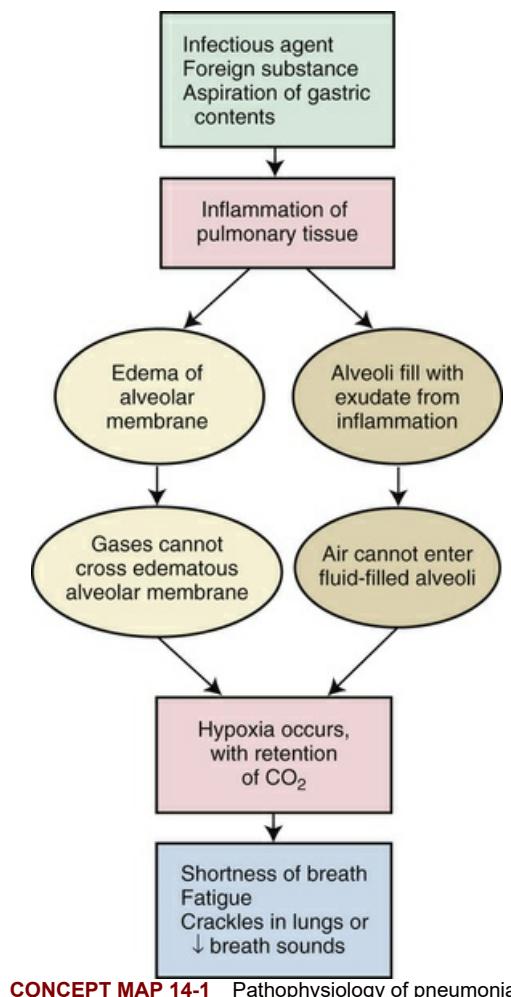
Alternative Therapy for the “Flu”

Elderberry extract has been used for centuries as a treatment to ease symptoms of the flu, colds, and sinus infections. The extract has been proven to inhibit transmission of the flu virus and also has antimicrobial effects on bacteria ([Krawitz et al, 2011](#)).

Pneumonia

Etiology and Pathophysiology

Pneumonia is an extensive inflammation of the lung with either consolidation of the lung tissue as it fills with exudate or interstitial inflammation and edema. It can affect one (most common) or both lungs or only one lobe of a lung (lobar pneumonia). In 2010, 49,597 people died of pneumonia; it is the ninth leading cause (combined with influenza) of death in the United States ([National Vital Statistics Reports, 2013](#)). Bacteria or viruses may cause pneumonia; bacterial pneumonia is more common and is associated with greater symptoms and risks. Pneumonia is classified as community acquired or hospital acquired. Viral pneumonia does not produce exudate; it causes interstitial inflammation and tends to be less severe than bacterial pneumonia. Any respiratory infection in an already debilitated patient can have severe consequences. In otherwise healthy individuals, viral pneumonia is usually a mild, self-limiting illness. *Streptococcus pneumoniae* (pneumococcus) is the most common cause of bacterial pneumonia. Pathogenic microorganisms are always present in the upper respiratory tract; pneumonia can occur when resistance is lowered by some other factor, such as chronic disease, alcoholism, debilitation, physical inactivity, or extremes in age (very young or very old). In many instances pneumonia occurs after an influenza infection. [Concept Map 14-1](#) presents the pathophysiology of pneumonia.



CONCEPT MAP 14-1 Pathophysiology of pneumonia.

Pneumonia also can result from inhalation of irritating gases (*chemical pneumonia*) or accidental aspiration of foods or liquids that cause a pneumonitis progressing to pneumonia (*aspiration pneumonia*). *Hypostatic pneumonia* results from lying in bed for extended periods because of the lack of physical exercise and inadequate aeration of the lungs. Fungi also may cause opportunistic pneumonia in immunocompromised patients. Fungi found in the environment in defined

geographic regions or fungi normally found in the body can both cause pneumonia in patients with congenital or acquired immunocompromise.

Prevention

People who are older than 65 years and those with chronic respiratory disease should receive the pneumococcal pneumonia vaccine. A second dose may be needed 5 years after the first dose for immunocompromised patients or those older than 65 years.

A variety of nursing interventions can help prevent pneumonia, including:

- Strengthening the patient's natural defenses and avoiding infection.
- Ensuring frequent turning, coughing, and deep breathing for postoperative patients or those who are otherwise unable to ventilate their lungs adequately.
- Watching for vomiting and initiating a side-lying position for patients with decreased consciousness, such as patients recovering from anesthesia.
- Maintaining elevation of the head of the bed at 30 to 45 degrees for patients at risk for aspiration with meals or who are receiving tube feedings (unless contraindicated). Check residual before each feeding, or once every 4 hours (Bell, 2011).
- Avoiding thin liquids for patients who are at risk for aspiration.
- Faithfully following principles of cleanliness and asepsis when caring for debilitated patients and those most susceptible to infection.
- Encouraging the pneumonia vaccine for those most at risk for developing the disease.
- Encouraging immunization against influenza.

Cultural Considerations

Ethnic Considerations for the Pneumococcal Vaccine

The Advisory Committee on Immunization Practices (Nuorti, 2010) has recently clarified that routine use of pneumococcal polysaccharide vaccine is not recommended for persons of Alaskan Native or American Indian heritage unless they have underlying medical conditions such as chronic lung, liver, or renal disease. However, local public health authorities may consider recommending the vaccine for occurrences of increased risk.

Patients are at risk for **health care-associated pneumonia (HCAP)** (formerly known as *nosocomial pneumonia*). These at-risk circumstances include **hospital-acquired pneumonia (HAP)**, in which symptoms occur more than 48 hours after admission, or **ventilator-associated pneumonia (VAP)**, in which pneumonia occurs 48 to 72 hours after endotracheal intubation. HCAP is also associated with nursing home or long-term care; intravenous (IV) therapy, chemotherapy, immunosuppressive treatment, wound care; severe chronic obstructive pulmonary disease (COPD); child care facilities, hospitals, and dialysis centers (CDC, 2014). HAP is a major problem that lengthens hospital stays and increases the cost of health care. VAP is the most common health care-associated infection (HAI); however, vigilant and aggressive nursing and respiratory care can greatly decrease the incidence.

People who are on gastrointestinal acid-suppressive therapy should be educated that this may make them more susceptible to community-acquired pneumonia. The research shows mixed results on a direct link, but experts agree that caution should be taken, particularly in the older adult population (O'Neill et al, 2013). Normal gastric acid helps prevent pathogens from colonizing the upper gastrointestinal tract, where they can then be introduced into the respiratory tract.

Signs, Symptoms, and Diagnosis

In typical infectious pneumonia, there is usually a high fever accompanied by chills, a cough that produces rusty or blood-flecked sputum, sweating, chest pain that is made worse by respiratory movements, and a general feeling of malaise and aching muscles. Diagnosis is confirmed by chest radiograph, which reveals densities in the affected lung.

In atypical pneumonia, body temperature can be normal or subnormal, breath sounds can be normal with perhaps only occasional crackles and wheezes, and there may be no pleural

involvement and therefore no pain, dry cough, or feeling of extreme fatigue. Chest radiography reveals diffuse, patchy areas of density.

Treatment

Typical pneumonia is treated with IV or oral antibiotic agents, such as erythromycin, macrolides (clarithromycin [Biaxin]), cephalosporins, aminoglycosides, or fluoroquinolones such as ciprofloxacin (Cipro).

Atypical pneumonia caused by *Mycoplasma* species usually is treated with erythromycin, clarithromycin, or azithromycin. Viral, atypical pneumonia requires no anti-infective therapy, but antiviral medication may be administered. *Pneumocystis jiroveci* (formerly *Pneumocystis carinii* and still referred to as PCP) infection associated with AIDS is treated with aerosolized pentamidine or trimethoprim-sulfamethoxazole (Bactrim) given IV or orally depending on the severity of the infection. According to practice guidelines, the first antibiotic dose should be administered within 4 hours of presentation whenever the admission diagnosis⁸ is community-acquired pneumonia. The timeliness of this therapy is related to decreased mortality rates. Supplemental oxygen is provided as needed. Some patients require mechanical ventilation.

Complementary and Alternative Therapies

Treatment for Pneumonia

Barberry root bark is used against bacteria, fungi, and viruses as well as other organisms and is an alternative treatment for pneumonia. It has antimicrobial action against both gram-positive and gram-negative bacteria. It should not be used during pregnancy, because it can cause spontaneous abortion.

Think Critically

Identify five signs or symptoms found on assessment that might correlate with a diagnosis of pneumonia.

Nursing Management

The nursing care plan for a patient with pneumonia should include interventions to:

- Promote oxygenation
- Control elevated temperature
- Maintain nutritional and fluid intake
- Provide adequate rest
- Monitor vital signs and respiratory status
- Relieve pain and discomfort
- Provide good oral hygiene
- Prevent irritation of the lungs by smoke and other irritants
- Avoid secondary bacterial infections

Clinical Cues

The first signs of decreasing oxygenation may be restlessness or confusion. The patient may want to sit upright to allow for better chest excursion. Respiratory rate will increase, and later there will be flaring of the nares, then retraction of intercostal muscles if the condition worsens. Cyanosis is a very late sign.

The patient should breathe deeply and cough 5 to 10 times each hour while awake to prevent atelectasis, which can lead to pneumonia. It is important to assess for signs of increasing impairment of gas exchange. Unless contraindicated, fluid intake should be increased to 2500 to 3000 mL/day. Because abdominal distention, nausea, and vomiting also may accompany

pneumonia, nursing interventions to deal with these problems may be indicated. Other problems include altered states of consciousness (delirium and confusion) or the development of such complications as empyema and congestive heart failure. For young adults, convalescence with rest should extend for at least a week after acute symptoms subside. Older adults require several weeks before usual activities can be resumed without experiencing fatigue.

Atelectasis

Atelectasis is an incomplete expansion, or collapse, of alveoli. It may occur from compression of the lungs from a lesion in the thorax, a decrease in surfactant, or bronchial obstruction that prevents air from reaching the alveoli. Postoperatively it results from retained secretions that accumulated during anesthesia, positioning on the operating room table for an extended period without movement, and hypoventilation related to surgical pain. It usually is a reversible condition. Breath sounds are diminished when the airways are collapsed, and oxygen saturation (SaO_2) will decrease. Treatment consists of expelling secretions by coughing. Deep breathing and use of the incentive spirometer help to keep the alveoli open and functional.

Clinical Cues

If your postoperative patient has crackles in the bases of his lungs, have him take several deep breaths and cough. Listen again; if the crackles are gone, atelectasis has just been cleared.

Older Adult Care Points

Older adults are more at risk for influenza and pneumonia because of a less efficient immune system, decreased action of cilia, and decreased elasticity and tone of respiratory muscles.

- Confusion often is the most obvious sign of atypical pneumonia in older adults.
- It may take 6 to 12 weeks after a bout of pneumonia for an older adult patient to be able to resume normal activities without experiencing acute fatigue.
- Older adult patients may never quite regain the former level of wellness after a serious episode of pneumonia.
- Teach older adults to seek medical attention quickly if symptoms of pneumonia occur.

Fungal Infections

The most common fungal lung infections are coccidioidomycosis and histoplasmosis.

Coccidioidomycosis occurs primarily in the western United States, and exposure occurs by inhaling dust during desert recreational activities or when working in occupations that require digging in the earth. Typically, there are no symptoms or mild respiratory symptoms, but 40% will have cough, fever, pleuritic chest pain, myalgias, and arthralgias. Sometimes a flat red rash with dark red papules occurs. Histoplasmosis occurs in central and eastern portions of North America. The fungus lives in moist soil such as that in which mushrooms grow, on the floors of chicken houses and bat caves, and in bird droppings. Clinical signs are fever, fatigue, cough, dyspnea, and weight loss over 1 to 2 months.

Other fungal respiratory infections, such as blastomycosis, cryptococcosis, aspergillosis, and candidiasis, are seen mostly in immunocompromised people or those with cystic fibrosis. PCP is found only in immunocompromised patients and is highly lethal (see [Chapter 11](#)). Although classified as a fungal infection, PCP does not respond to antifungal treatment, and trimethoprim-sulfamethoxazole (Bactrim) is the preferred therapy. Fungal infections are diagnosed by history, signs and symptoms, and positive skin test reaction to the fungus.

Tuberculosis

Etiology

Pulmonary **tuberculosis (TB)** is an infectious disease characterized by lesions within the lung tissue. The lesions may degenerate and become necrotic, or they may heal by fibrosis and calcification. The causative organism is the true tubercle bacillus *Mycobacterium tuberculosis*. **Latent TB infection (LTBI)** refers to an infection with *Mycobacterium tuberculosis* but no current active disease. LTBI may develop into active TB if the immune system is weakened by a serious illness such as HIV, or when the system is less efficient, as with advanced age.

Tuberculosis is spread through airborne particles that carry the TB bacilli and are inhaled by a susceptible individual. The droplets can remain suspended in the air for several hours. Infection most often occurs after prolonged exposure, but not everyone contracts the disease, even after close and extensive contact with infected persons.

Cultural Considerations

Ethnic Occurrence of Tuberculosis

American Indians, Alaska Natives, Asian/Pacific Islanders, black non-Hispanics, and Hispanics have a high incidence of TB. The disease is most prevalent in people older than 65 years in these groups. For the first few years of residence in the United States, new immigrants from areas where TB is prevalent have incidence rates similar to those of their former country.

Tuberculosis is a major health problem throughout the world and is second only to HIV-AIDS as the most frequent cause of death for a single infectious agent worldwide ([WHO, 2014](#)). The incidence of TB in the United States has steadily been declining since 1992. In 2012 63% of the reported TB cases in the United States occurred among foreign-born persons ([CDC, 2013](#)). In countries where there are high rates of TB, the World Health Organization strongly recommends the widespread use of bacille Calmette-Guérin (BCG) vaccine, which seems to reduce the morbidity of TB. The vaccine's ability to increase resistance is in question, so it is not used in the United States.

Pathophysiology

Mycobacterium is an acid-fast, aerobic, slow-growing bacillus. When the organism enters the lungs, a local inflammatory reaction occurs, usually in the upper lobe. It takes 2 to 12 weeks for organisms to replicate in sufficient numbers to prompt enough of an immune response to be detected by a TB skin test. Bacilli migrate to the lymph nodes and activate a cell-mediated hypersensitivity response. This triggers granuloma formation with influx of macrophages and lymphocytes at the site of inflammation. The bacillus is walled off, forming a **tubercle**. Caseation necrosis (a core of cheeselike material) develops in the center of the tubercle. In a healthy person, the initial lesions may heal and become latent before any signs or symptoms of the disease occur. Over time the tubercles eventually calcify. Bacilli may remain viable in a dormant state inside the tubercle for many years. In the unhealthy individual, the bacilli spread to other parts of the lung and to other organs.

Signs and Symptoms

The onset of TB is gradual; a patient may have an active, progressive lesion before symptoms appear. Typical symptoms are cough, low-grade fever in the afternoon, anorexia, loss of weight, fatigue, night sweats, and sometimes **hemoptysis** (blood in sputum). Tight or dull chest pain and mucopurulent sputum may occur as the disease progresses. Persons with LTBI are asymptomatic and have a negative chest radiograph.

Older Adult Care Points

The older adult population may not experience the expected signs and symptoms of TB, because the immune response is not as strong. In many instances active TB infections present as chronic pneumonitis.

Diagnosis

Early detection of TB is of great importance because:

- The anti-TB drugs are more effective in the early stages of the disease.

- The period of disability is much shorter.
- The complications are fewer.
- The spread to others can be prevented.

Tuberculin skin testing.

Food handlers, those working with children, and health care workers must be periodically tested. Others who are symptomatic or have been exposed to someone with TB should be tested. Skin testing for TB is done by the Mantoux test. In this test, 0.1 mL of purified protein derivative (PPD) tuberculin is injected intradermally. The test is called the *tuberculin skin test (TST)* (formerly known as *PPD test*). The test is positive when the swelling at the site of injection is more than 5 mm in diameter 48 to 72 hours after injection in people who have a history of contact with infectious TB or in immunocompromised patients. Induration of more than 10 mm in diameter is positive in recent immigrants from countries where TB is prevalent, in medically underserved groups, and the homeless (Figure 14-1). For those persons at low risk, induration of more than 15 mm is considered positive. Skin testing is only contraindicated for those who have had a severe reaction. Vaccination with BCG is not a contraindication but must be considered when interpreting the results (CDC, 2012).

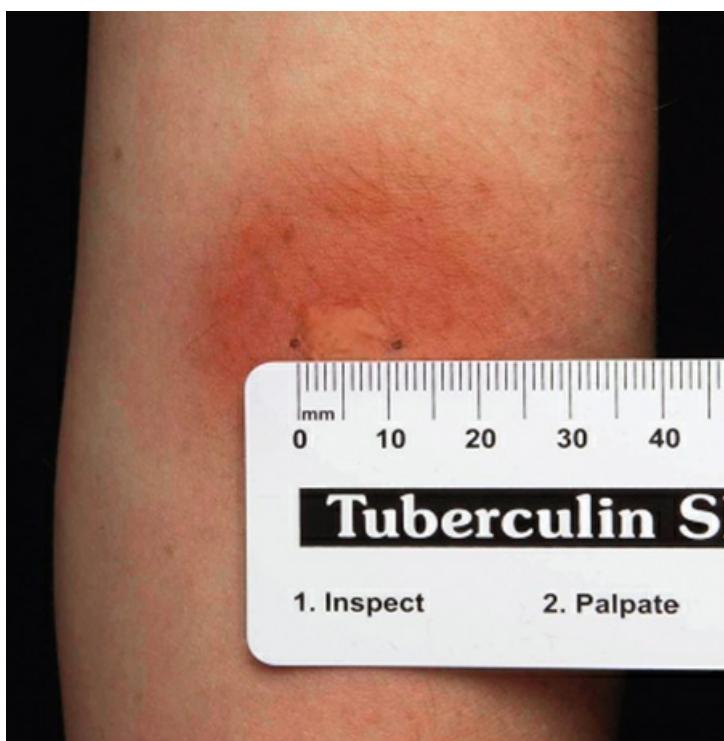


FIGURE 14-1 Positive TB skin test. Raised area (induration) is measured, not the entire reddened area. (Courtesy CDC: Tuberculosis tuberculin skin testing, 2012. Retrieved from: <http://www.cdc.gov/tb/publications/factsheets/testing/skintesting.htm>).

A positive tuberculin test indicates that the person has been infected with the tubercle bacillus; however, it does not indicate whether the disease is active or inactive, only that the body tissues are sensitive to tuberculin. A positive reaction indicates a need for further evaluation. Once positive, subsequent TSTs will always be positive.

Blood testing.

Two blood tests are approved by the U.S. Food and Drug Administration (FDA): the QuantiFERON-TB Gold (QFT-GIT) and T-SPOT.TB test (T-Spot). The tests are interferon-gamma release assays (IGRAs) that measure the patient's immune system reaction to TB. They do not distinguish between active and latent TB. They are less likely to produce false-positive readings and require only one visit to the clinic or office for a blood draw, rather than the two required for the

TST (the second visit is for reading the result). The tests are accurate even for people who have had BCG.

Radiographic examinations and sputum cultures.

A radiographic examination of the chest may or may not reveal tubercular lesions in the lung, but calcified and healed lesions can usually be seen on radiographs. A **diagnosis of active TB is established when the tubercle bacillus has been found in the sputum or gastric washings**. A sample of stomach contents may be examined (*gastric analysis*) if an adequate sputum specimen cannot be obtained. Gastric washings are done rarely in adults but more commonly in children. Sputum cultures are slow growing, and culture results take 1 to 3 weeks to allow identification of the bacillus. The culture report also indicates to which medications the organism is sensitive.

Treatment

Uncomplicated pulmonary TB is managed in the outpatient setting. Only those who are extremely debilitated or suffering from another chronic illness are hospitalized. Treatment of active TB consists of at least four drugs for an extended period of time (Table 14-1). The drugs are given in varying combinations and varying numbers of days per week. The treatment protocols outline the initial 2-month phase followed by a choice of several options for the continuation phase of either 4 or 7 months. Noncompliance is an issue because of side effects, the requirement to avoid alcohol, and the long duration of therapy. Drug combinations are available that make compliance easier for patients: Rifamate, which contains rifampin (RIF) and isoniazid (INH), and Rifater, which contains RIF, INH, and pyrazinamide (PZA). Effective cure can be obtained within 6 to 9 months for most patients with pulmonary TB. A two-drug regimen of INH and RPT on a once weekly dosing schedule for 12 weeks is used for LTBI.

Complementary and Alternative Therapies

Vitamin D Speeds Up Clinical Recovery From Tuberculosis

Vitamin D has been found to be effective in the treatment of TB (Salahuddin et al, 2013). Supplementation with vitamin D activates the immune system. White blood cells convert vitamin D into an active form that helps make a protein that kills TB bacteria. This may be why moving to a sunny climate and a solarium environment helped people with TB in the past.

Table 14-1

Drugs Commonly Used in the Treatment of Tuberculosis

Daily Dosage	Other Dosing Schedules	Most Common Side Effects	Test for Side Effects	Remarks
Primary Drugs				
Isoniazid (INH) 5 mg/kg up to 300 mg/24 hr PO or IM	15 mg/kg PO, or IM 2 or 3 times a week Usual dose 900 mg total	Peripheral neuritis, hypersensitivity, jaundice	AST/ALT monthly Drug levels: 3-5 mg/L at 2 hr	Bactericidal agent. Pyridoxine as prophylaxis for neuritis; 25-50 mg/24 hr as treatment.
Ethambutol (EMB) (Myambutol) 15-25 mg/kg PO up to 1600 mg/24 hr	35-50 mg/kg PO twice per week up to 4000 mg Or 20-35 mg/kg	Optic neuritis (reversible with discontinuation of drug; very rare at 15 mg/kg), skin rash	Baseline and monthly red-green color discrimination and visual acuity Drug levels: 2-6 mg/L at 2 hr	Use with caution with renal disease or when eye testing is not feasible.
Rifampin (RIF) (Rifadin) 10 mg/kg up to 600 mg/day PO or IV	10 mg/kg PO or IV 2 or 3 times per week up to 600 mg/day	Rash, hepatitis, febrile reaction, purpura (rare)	AST/ALT monthly in patients with preexisting liver disease Drug levels: 8-24 mg/L at 2 hr	Bactericidal agent. Orange secretion color. Affects action of other drugs.
Pyrazinamide (PZA) 15-30 mg/kg up to 2 g/day PO	50 mg/kg PO twice weekly up to 2 g/dose	Hyperuricemia, hepatotoxicity	Uric acid, AST/ALT	Under study as first-line drug in short-course regimens.
Rifabutin (RBT) 5 mg/kg (300 mg) PO	5 mg/kg (300 mg) PO 2 or 3 times weekly	Causes discoloration of urine. Neutropenia, leukopenia	CBC	May be used as a substitute for RIF.
Rifapentine (RPT) 600 mg PO once weekly for 4 months during continuation phase.	600 mg twice per week during intensive phase	Hypertension, headache, dizziness	Hepatic enzymes, bilirubin, CBC	May be used once a week in combination with INH in select patients in the continuation phase of treatment.
Secondary Drugs				
Streptomycin (SM) Capreomycin (Capastat) Cycloserine (Seromycin) p-aminosalicylic acid Ethionamide* (Trecator) Kanamycin* (Kantrex) Levofloxacin* Moxifloxacin* Gatifloxacin*				These drugs are reserved for special situations such as drug intolerance or resistance.

*Not approved by the U.S. Food and Drug Administration for use in the treatment of tuberculosis.

ALT, Alanine aminotransferase; AST, aspartate aminotransferase; IM, intramuscularly; IV, intravenously; PO, orally.

Adapted from Lewis SL, Heitkemper MM, Dirksen SR: *Medical-surgical nursing: Assessment and management of clinical*

problems, ed. 8, St. Louis, 2011, Mosby.

A new drug, pretomanid, that seems to be extremely effective in quickly killing TB has completed clinical trials and is in data analysis ([Working Group on New TB Drugs, 2013](#)). A shorter treatment time could improve compliance with medication therapy. There is an increase in the incidence of multidrug-resistant TB, and patients with these infections do not fare well. For this reason, directly observed therapy (DOT) is recommended for patients who are known to be at risk of noncompliance with therapy ([CDC, 2012](#)). DOT involves visual observation of the ingestion of each required dose of medication for the entire course of treatment. Often a public health nurse administers the medication at a clinic site. Follow-up visits are necessary for 12 months after completion of therapy to monitor for the presence of resistant strains.

Legal and Ethical Considerations

Noncompliance With Medication

When someone is found to have TB and the person is noncompliant with the treatment, is it legal or ethical to compel the person to come for treatment? What will happen if the person is allowed to remain in the community without treatment?

Nursing Management

A complete history and assessment of TB risk factors is needed. A focused assessment of the respiratory system is performed (see Focused Assessment).

Nursing objectives are to control the spread of the infectious agent, promote immunity, and strengthen potential recovery in a patient with an infectious disease. Problem statements/nursing diagnoses for the patient with TB may include:

- Altered breathing pattern due to decreased lung capacity.
- Absence of compliance due to lack of knowledge of disease process and long-term requirements for treatment.
- Altered activity tolerance due to fatigue, febrile status, and poor nutritional status.
- Altered Nutrition due to anorexia, fatigue, and productive cough.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Control of infection.

Airborne Infection Isolation in addition to Standard Precautions (see [Appendix B](#)) are recommended for hospitalized patients who have active TB and are just beginning drug therapy. The patient is placed in a negative-pressure isolation room with an anteroom. A high-efficiency particulate air (HEPA) respirator mask that tightly fits the face or use of a powered air purifying respirator (PAPR) is required for all personnel when caring for the patient. The home care patient does not need Airborne Infection Isolation because family members have already been exposed by the time of diagnosis. Patients and families should be educated about the importance of medication compliance and the basic principles of infection control: covering the mouth when coughing or sneezing, disposing of tissues in plastic bags, practicing good hand hygiene, and wearing a mask when in contact with crowds until medication effectively suppresses the infection. Sputum examinations are required monthly during the course of treatment. When sputum cultures are negative and the clinician evaluates the effectiveness of the treatment, the patient is considered no longer infectious and may resume work and other usual social activities.

Close contacts are monitored with skin or blood testing. If the TST or IGRA result is positive, the contact is treated with INH, RPT, or RIF depending on whether the type of TB is known to be drug resistant. HIV infected, pregnant, or breastfeeding individuals as well as infants and children have specific recommended drug combinations and doses. The CDC website has the most current treatment recommendations.

Promotion of immunity.

Improving living conditions and carrying out sound health practices are essential to maintaining a natural resistance to TB. The populations most at risk for contracting TB are those with an

insufficient immune system. That is why the very young and the very old as well as those with immunosuppression from disease or disease treatment are at increased risk.

Several vaccinations are in clinical trials in the hopes of boosting immunity to the TB organism. Good ventilation and healthful living can prevent the spread of TB.

Support.

When a person first learns that he has [tuberculosis](#), he will need support in sorting out his feelings and overcoming any fears and misinformation he might have.

It is also important that the patient name all close contacts, so that they can be notified and appropriately tested and treated. Giving the names of contacts may be very difficult for the patient because of the social stigma that is still attached to TB in certain cultural groups.

Extrapulmonary Tuberculosis

It is possible for the tubercle bacillus to attack and damage parts of the body other than the lungs. This is called *extrapulmonary* or *miliary tuberculosis*. The areas most commonly affected are the lymph nodes, bones, meninges, digestive system, urinary system, and reproductive system. Presenting signs and symptoms are dependent on the body system affected. Tuberculosis of the spine, called *Pott disease*, can cause **kypnosis**, or “hunchback,” but the condition is rare in the United States.

Occupational Lung Disorders

Coal dust; dust from hemp, flax, and cotton processing; and exposure to silica in the air can cause work-related lung disorders. Asbestos exposure may cause mesothelioma, a rare cancer of the chest lining ([Mesothelioma Research Foundation of America, 2015](#)). Asbestos exposure also causes scarring of lung tissue. The other exposures cause obstruction of small airways or scarring and loss of elasticity and compliance. Occupational history is part of the respiratory assessment.

Restrictive Pulmonary Disorders

Restrictive pulmonary disorders are caused by decreased elasticity or compliance of the lungs or decreased ability of the chest wall to expand. Disorders of the central nervous system or of the neuromuscular system can cause a restrictive lung disorder. Myasthenia gravis and arthritis are examples of extrapulmonary causes. **Kyphosis** of the spine or severe **scoliosis** may hamper lung expansion, but the lung tissue remains normal. Obesity is becoming a major cause of restrictive lung disease.

Interstitial Pulmonary Disease

Sarcoidosis

Sarcoidosis is a lung disease characterized by granulomas. This disease causes fibrotic changes in the lung tissue and other tissues over time. A cellular immune response seems to be responsible, but the exact cause is unknown. Sarcoidosis is 10 times more common in African Americans than in whites, and most cases occur between ages 20 and 40 years. The fibrotic changes cause a reduction in functional lung tissue. Although there is no specific treatment for sarcoidosis, most patients recover without treatment.

Pulmonary Fibrosis

Pulmonary fibrosis occurs from environmental pollutants, some medications, and interstitial lung diseases that scar the lungs. Occupational inhalation of lung irritants, smoking, and radiation treatments to the chest are risk factors. Signs and symptoms are exertional dyspnea, nonproductive cough, and inspiratory crackles and sometimes clubbed fingers. Diagnosis is by chest radiograph and pulmonary function testing. There is a 30% to 50% survival rate at 5 years after diagnosis. Treatment is with corticosteroids, immunosuppressants, and the antifibrotic agent colchicine. Lung transplantation is an option for some patients.

Pleurisy

Pleurisy—an inflammation of the pleura—can be caused by tuberculosis, pneumonia, neoplasm, or pulmonary infarction. Pleurisy pain is sharp and abrupt in onset and is most evident on inspiration. This causes shallow breathing. A pleural friction rub may be heard. Treatment is aimed at the underlying cause and providing pain relief. Lying on the affected side or splinting the affected side during coughing may provide some relief. An intercostal nerve block may be performed for severe pleurisy pain.

Pleural Effusion

Pleural effusion is a collection of fluid in the pleural space. Transudate is a thin fluid containing no protein that passes from cells into interstitial spaces or through a membrane. A transudate occurs in noninflammatory conditions and is often a result of congestive heart failure, chronic liver failure, or renal disease. Exudate is thicker; contains cells, proteins, and other substances; and is slowly discharged from cells into a body space or to the outside of the body. Exudative pleural effusion is caused by increased capillary permeability characteristic of the inflammatory reaction. This type of effusion occurs with lung cancer, pulmonary embolism, pancreatic disease, and pulmonary infections.

When pleurisy is accompanied by effusion of serous fluid, the provider may perform a **thoracentesis** (removal of fluid from the pleural cavity) for diagnostic tests or symptom relief. It is not uncommon for as much as 500 mL to be removed during a thoracentesis (see [Table 12-1](#)).

Empyema

Empyema occurs when the fluid within the pleural cavity becomes infected and the exudate becomes thick and purulent. The most common organisms causing this type of infection are staphylococci and streptococci. One or more chest tubes are inserted, and a closed drainage system

is established to remove fluid from the pleural cavity. A specimen of the fluid is sent for a culture and sensitivity, which determines the choice of antibiotic therapy.

Obstructive Pulmonary Disorders

Obstructive pulmonary disorders are characterized by problems with moving air out of the lungs, contributing to air trapping, thus making exhalation difficult. Asthma, emphysema, bronchiectasis, cystic fibrosis, and chronic bronchitis are examples of diseases that cause chronic airflow limitation (CAL). The increase in the morbidity and mortality rates resulting from obstructive disorders is attributed to cigarette smoking and rising levels of air pollution. A third factor is genetic. **Alpha₁-antitrypsin (AAT)** is a serum protein that inhibits the activity of the enzyme **elastase**, which tends to break down lung tissue. In the absence of AAT, lung tissue is more easily destroyed by the enzyme. Patients with a deficiency of AAT may develop severe lung disease at an early age. Cystic fibrosis is also genetically acquired.

Bronchiectasis

Bronchiectasis is a chronic respiratory disorder in which the bronchi are permanently dilated. It occurs as a result of frequent respiratory infections or inflammation. Frequent aspiration of food particles can also cause the condition. In the United States, about one third of all bronchiectasis is caused by cystic fibrosis.

Cystic Fibrosis

Cystic fibrosis (CF) is a genetic disease (more common among whites) in which there is excessive mucus production because of exocrine gland dysfunction. The lungs, intestines, sinuses, reproductive tract, sweat glands, and pancreas are all affected. It is diagnosed by history, physical examination, and a positive sweat test.

Lung damage occurs in CF because of excessive secretion of abnormally thick mucus, impairment of ciliary action in the lungs, airway obstruction, and repeated infections, which cause scarring. It was once a pediatric disease, because children with CF died before reaching adulthood. Individuals with CF now live into their 40s and beyond with aggressive respiratory treatment and antibiotics. Current research has identified that the gene that causes CF can be damaged in more than one way. Ivacaftor is a new treatment that is effective in 4% of patients with CF by supplying the chemicals missing as a result of gene malfunction. A drug in clinical trials will address another 10% of patients, but 70% to 75% of patients with CF have a different problem with the gene for which an effective treatment has not been developed. These medications actually treat the problem rather than the symptoms, and the progress made so far is encouraging and has improved life for many patients. Treatment of symptoms includes bronchodilators, expectorants, oral pancreatic enzymes, double doses of fat-soluble vitamins, and mucolytics. A high-protein, high-calorie, moderate-fat diet is prescribed. Dornase alfa (Pulmozyme) reduces the frequency of respiratory infections and improves pulmonary function for patients with CF by decreasing the viscosity of sputum. DNase, a recombinant deoxyribonucleic acid (DNA) medication, is also used to reduce the thickness of the sputum. Breathing exercises and chest physiotherapy are used daily. A handheld device called a flutter valve, that looks like a fat pipe, is used to loosen secretions. By exhaling actively into the pipe, the device causes vibrations of the airway walls, loosening secretions so that they can be coughed up. Lung transplantation is a possible lifesaving measure. The Cystic Fibrosis Foundation is hopeful that the new drug therapies will eliminate the need for lung transplants for patients with CF.

Chronic Obstructive Pulmonary Disease

The World Health Organization uses the term **COPD** to describe a condition that includes two diseases, **emphysema** (Figure 14-2) and **chronic bronchitis**. Approximately 12.7 million people in the United States have COPD, and 24 million have impaired lung function with probable underlying COPD ([American Lung Association, 2010](#)).

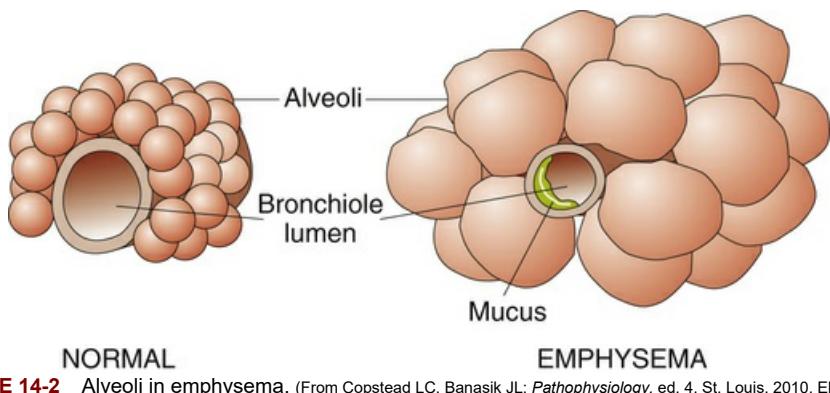


FIGURE 14-2 Alveoli in emphysema. (From Copstead LC, Banasik JL: *Pathophysiology*, ed. 4, St. Louis, 2010, Elsevier.)

Etiology and Diagnosis of Chronic Obstructive Pulmonary Disease

Smoking and AAT deficiency are causes of emphysema and chronic bronchitis. Air pollution and occupational exposure are other risk factors. Tobacco smoke exposure accounts for as much as 90% of COPD risk, including smoking and secondhand smoke. AAT deficiency is the cause for less than 1% of cases. Firefighters, welders, farmers, and others who have repetitive exposure to dust and particulate matter are in the high-risk group. Diagnosis is by history, physical assessment, and spirometry readings before and after bronchodilator treatment. A chest radiograph is not useful in diagnosing COPD, but it can help rule out other causes of the symptoms.

Treatment of Chronic Obstructive Pulmonary Disease

COPD is treated with bronchodilators and anti-inflammatory agents. When bacterial infection is present, antibiotics, and sometimes steroid anti-inflammatory agents, are used. In later stages of disease, when hypoxemia is present, oxygen therapy is initiated. **Oxygen is always used cautiously in patients with COPD, because they have adjusted to high levels of CO₂; they become dependent on low oxygen levels to stimulate breathing.** Smoking cessation is very important. Respiratory rehabilitation programs can help increase exercise tolerance and improve quality of life.

Nutrition is very important for patients with COPD, because the extra work of breathing uses more calories, and anorexia may be present. Extra protein is required to repair damaged tissues. It is beneficial to maintain as normal a weight as possible for height and age.

For severe emphysema, surgical interventions have been shown to be helpful in selected patients. Lung volume reduction surgery (LVRS) removes portions of damaged lung tissue. This allows for greater expansion of the residual tissue. This intervention has had more success for patients with upper-lobe emphysema. Lung transplantation may be considered for patients meeting selection criteria.

■ Nutritional Considerations

Nutritional Suggestions for Patients With Chronic Obstructive Pulmonary Disease

The following tips may help patients with COPD:

- Drink 6 to 8 glasses of noncaffeinated fluids per day to keep mucus thin and easier to cough up. Check with your provider if you are on fluid restrictions.
- Rest before eating.
- Avoid overeating, and avoid foods that cause gas or bloating, because a distended stomach may make breathing more difficult.
- Eat four to six small meals a day rather than three regular meals, to decrease stomach fullness and reduce fatigue.
- Eat a well-balanced diet with adequate protein.

- Avoid lying down for an hour after eating.
- If you become short of breath while eating or right after meals:
- Clear the airway 1 hour before eating.
- Take small bites and chew food slowly.
- Choose foods that are easy to chew.
- Drink beverages at the end of the meal rather than during it.
- Use your oxygen cannula while you eat.
- Take in sufficient calcium via dairy products, vegetables, and supplements—steroid medications put you at risk for osteoporosis.
- Cook when feeling most energetic; make extra portions and freeze them for easy, quick, reheatable dinners.

Complementary and Alternative Therapies

Ginger, Cinnamon, Chili, and Garlic for Emphysema

Ginger and cinnamon are aromatic digestives that provide benefit for emphysema patients. Very small doses of *Capsicum annuum* (chili) or garlic can be useful as mucolytic agents ([Bone and Mills, 2013](#)).

Complications of Chronic Obstructive Pulmonary Disease

Cor pulmonale.

Cor pulmonale is enlargement of the right side of the heart as a result of pulmonary hypertension caused by constriction of the pulmonary vessels in response to hypoxia. To overcome the increased pressure in the lungs, the right side of the heart has to pump more forcefully, causing enlargement. Constant hypoxia stimulates erythropoiesis, with resulting polycythemia and increased viscosity of blood. Eventually right-sided heart failure causes systemic venous congestion, which manifests as distended neck veins, right upper quadrant tenderness from an engorged liver, peripheral edema, weight gain, gastrointestinal distress, and ascites. Treatment is continuous low-flow oxygen and medications to treat both the heart failure and the fluid volume overload.

Gastroesophageal reflux disease.

Gastroesophageal reflux disease (GERD) is twice as likely to occur in patients with COPD. It can worsen the symptoms of COPD; the reflux of acid in the esophagus stimulates bronchoconstriction, and microaspiration may contribute to lung tissue damage ([Kim et al, 2013](#)).

Think Critically

List five nursing interventions that might help your patient with COPD prevent episodes of dyspnea.

Emphysema

Pathophysiology

In **emphysema**, there is destruction of alveolar and alveolar-capillary walls, as well as narrowed and tortuous small airways. This leads to large, permanently inflated alveolar air spaces. Air that is inhaled becomes trapped, and it becomes harder to exhale air than to inhale it (see [Figure 14-2](#)). As emphysema progresses, lung elasticity decreases.

Signs and Symptoms

Dyspnea is an early symptom of emphysema. There is minimal coughing with small amounts of mucoid sputum. As the disease progresses, dyspnea worsens and eventually interferes with activities of daily living. The diaphragm becomes permanently flattened by overdistention of the lungs, the muscles of the rib cage become rigid, and the ribs flare outward. The patient develops a “barrel chest” (see [Chapter 12](#), [Figure 12-8](#)).

To compensate for the loss of normal muscular action, the patient begins to use the neck and shoulder muscles. The shoulders are held high in an attempt to enlarge the space for lung expansion. The patient may look anxious or tense. The skin is a pink tone in whites even though hypoxia may be present. Early in the disease process carbon dioxide is usually not retained, and therefore an acid-base imbalance is unlikely. As the disease progresses, both hypercapnia and hypoxemia as well as chronic respiratory acidosis are usually present.

Chronic Bronchitis

Pathophysiology

In chronic bronchitis there is excess secretion of thick, tenacious mucus that decreases ciliary function, interferes with airflow, and causes inflammatory damage to the bronchial mucosa. Airways become edematous and narrowed, and air trapping occurs. Initially the larger airways are affected, and then the smaller airways also become obstructed. Inflammation of the bronchi is considered chronic when a recurrent cough is present for at least 3 months of each year for at least 2 years. Respiratory infections occur frequently because the thick mucus provides a growth medium for bacteria.

Signs and Symptoms

Symptoms can range from a mildly irritating “cigarette” cough in the morning with production of small amounts of sputum to a severe, disabling condition. The latter extreme is characterized by increased resistance to airflow, hypoxia, and development of hypercapnia (excess CO₂).

Pulmonary function testing reveals an increased residual volume caused by the premature closure of the narrowed airways during exhalation. The patient has a marked increase in partial pressure of arterial carbon dioxide (PaCO₂) levels and a marked decrease in partial pressure of arterial oxygen (PaO₂) levels. **The retention of carbon dioxide and deficiency of oxygen give the skin and/or mucous membranes a reddish-blue color.** The reddish color is also related to an increase in the red blood cell count (**polycythemia**) that is an attempt by the body to compensate for chronic hypoxia. Hemoglobin and hematocrit levels are elevated for patients with chronic bronchitis. [Table 14-2](#) presents a comparison of emphysema and chronic bronchitis.

Table 14-2
Comparison of Pulmonary Emphysema and Chronic Bronchitis

Clinical Features/Characteristics	Emphysema	Chronic Bronchitis
Age of onset (years)	40-50	30-40
Pathophysiology	Destruction of alveolar walls Loss of elasticity, impaired expiration, hyperinflation	Increased mucous secretion, inflammation and infection, obstruction of airways
Health history	Generally healthy	Frequent URI, acute episodes
Smoking	Usually	Usually
Clinical features		
Barrel chest	Yes	May be present
Weight loss	May be severe in late disease	Uncommon
Shortness of breath	Absent early; pronounced late in disease	Early symptom; especially with activity
Decreased breath sounds	Yes	Variable
Wheezing	Usually absent	Variable
Sputum	Absent or develops late in disease	Early sign; frequent infections with purulent sputum
Cyanosis	Usually absent; appears late in disease with low PaO ₂	Yes; worsens as disease progresses
Cor pulmonale	Occasional	Common
Polycythemia	May appear in advanced disease	Commonly present
Blood gases	Normal until late in disease	May display hypercapnia Hypoxemia common

PaO₂, Partial pressure of arterial oxygen; URI, upper respiratory infection.

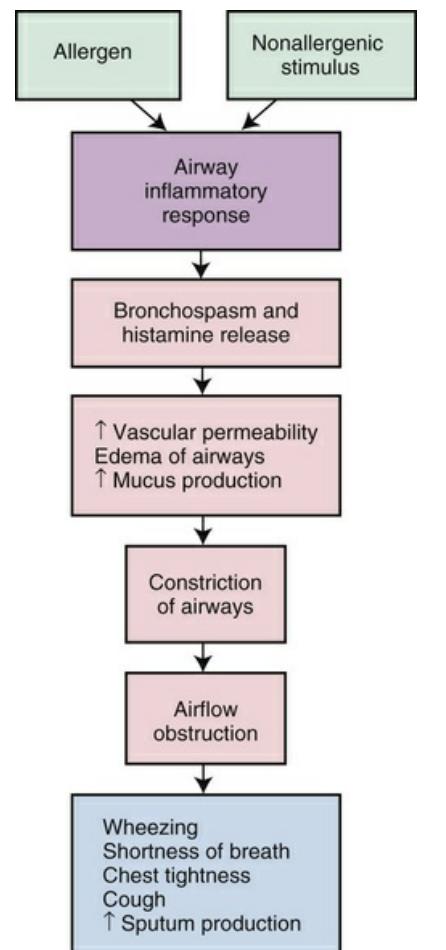
Asthma

Etiology

Factors implicated in the occurrence of asthma include allergens, viruses and other infectious agents, occupational and environmental toxins, exercise, perfumes, genetics, obesity, and emotional stress. *Healthy People 2020* objectives include reducing deaths, hospitalizations, emergency department visits, and activity limitations related to asthma.

Pathophysiology

Asthma is a chronic lung disease characterized by reversible airway obstruction, airway edema or swelling from inflammation, and increased airway hypersensitivity to a variety of stimuli. With asthma, a precipitating factor creates inflammation of the airways, which causes bronchospasm and edema. Cough usually indicates obstruction of the larger airways. Dyspnea, another common symptom, is indicative of inflammation of the airways, mucosal edema, and excessive secretion of mucus, which cause a plugging of the small airways. With bronchoconstriction, there is further obstruction and narrowing of the airways, limiting airflow (Figure 14-3 and Concept Map 14-2).



CONCEPT MAP 14-2 Pathophysiology of asthma.

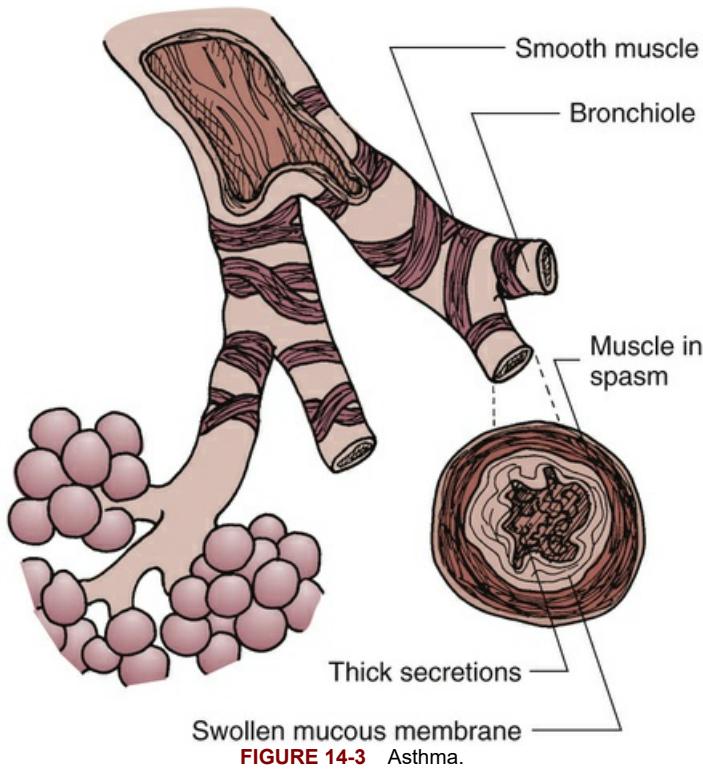


FIGURE 14-3 Asthma.

Signs, Symptoms, and Diagnosis

Diagnosis is by history, physical examination, pulmonary function testing, arterial blood gas analysis, and chest radiograph. The symptoms may be continuous or episodic. Findings include wheezing, cough that is worse at night, difficulty breathing, and chest tightness.

Unrelieved asthma attacks become **status asthmaticus** and are very serious. **Respiratory distress without wheeze is an ominous sign for the asthma patient; this suggests further constriction with very little air movement.** Patients and nurses must know that a severe, acute asthma attack can cause death from hypoxia.

Clinical Cues

If your patient takes an angiotensin-converting enzyme (ACE) inhibitor, teach him to report a cough (which can be caused by this medication). Excessive coughing can trigger or worsen an asthma attack.

Treatment

Asthma is classified by a step system, based on the degree and frequency of symptoms and broken into age groups. See **Table 14-3** for an example of treatment for adults. The goals of medical treatment are to manage the underlying symptoms and include:

- Minimizing irritation of the air passages and relieving obstruction by secretions, edema, or bronchospasm
- Preventing or controlling infection and allergy
- Increasing the patient's tolerance for activity
- Determining the best drug combinations in the smallest dosages that will control symptoms

Table 14-3

The Step System of Asthma Treatment

Clinical Manifestations	Treatment Recommendations
I. Mild Intermittent Symptoms or episodes occur less than once a week.	No daily medication needed.

Episodes/exacerbations are short, lasting only a few hours. Symptoms are present at night no more frequently than twice per month. PFTs are normal between episodes. During episodes/exacerbations, FEV ₁ or PEF is at least 80% of normal. PEF variability is less than 20%.	Use of short-acting inhaled beta agonist during episodes (rescue inhaler). Increased use of rescue inhaler indicates the need to start long-term therapy.
II. Mild Persistent Symptoms or episodes occur more than once per week but not daily. Symptoms are present at night more than twice per month. During episodes/exacerbations, FEV ₁ is at least 80% of normal. PEF variability is 20%-30%. Episodes affect sleep and activity.	Use of a daily anti-inflammatory. Inhaled corticosteroid (ICS). Inhaled cromolyn. Leukotriene antagonist. Use of a rescue inhaler for relief during episodes.
III. Moderate Persistent Symptoms occur daily. Symptoms or episodes occur more than once per week. Symptoms are present at night at least once per week. During episodes/exacerbations, FEV ₁ is only 60%-80% of normal. PEF variability is greater than 30%.	Daily use of ICS (low to moderate dose). Use of long-acting inhaled beta agonist (bronchodilator). Use of a rescue inhaler for relief during episodes (more than 2 days per week, the patient should be evaluated for progression to step IV).
IVa. Severe Persistent Episodes/exacerbations are frequent. During episodes/exacerbations, FEV ₁ or PEF is less than 60% of normal. Physical activity is limited. Symptoms are frequently present at night. PEF variability is greater than 30%.	Daily use of ICS (medium dose) and long-acting inhaled bronchodilator or ICS (medium dose) and either a leukotriene receptor antagonist or theophylline.
IVb. Severe Persistent, Not Responsive to the Previous Step	High-dose ICS and long-acting beta agonist. Omalizumab for patients with exposure to nonseasonal allergens. Lowest possible daily dose of oral corticosteroids.

FEV₁, Forced expiratory volume in 1 second; *ICS*, inhaled corticosteroid; *PEF*, peak expiratory flow; *PFTs*, pulmonary function tests.

Adapted from Ignatavicius DD, Workman L: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 6, Philadelphia, 2010, Elsevier Saunders.

Bronchodilators in the form of beta-adrenergic agonists, theophyllines, or anticholinergic agents such as ipratropium bromide (Atrovent) are mainstays of therapy. Corticosteroids, mucolytics, and antibiotics may also be prescribed (Table 14-4). Oxygen is prescribed for moderate and severe hypoxemia. For acute episodes of hypoxemia, O₂ is given to raise the SpO₂ to 92 mm Hg or greater.

Clinical Cues

A metered-dose inhaler (MDI) is incorrectly used much of the time. The inhaler should be held 1 to 2 inches in front of the mouth. A slow deep breath is started through the mouth, then the activator is depressed. If patients put their mouth around the inhaler mouthpiece, they do not get all of the dose. This is only for liquid inhalers, not dry powder inhalers.

Table 14-4

Commonly Prescribed Drugs for Chronic Obstructive Pulmonary Disease and Asthma*

Classification	Action	Nursing Implications	Patient Teaching
Bronchodilators			
Short-Acting Beta-Adrenergic Agonists			
Albuterol (Proventil, Ventolin) Pirbuterol (Maxair) Levalbuterol (Xopenex)	Stimulates beta-adrenergic receptors, producing bronchodilation Increases ciliary action and mucus clearance Selectively stimulates beta-adrenergic receptors, producing bronchodilation	All may be administered by MDI. Some can be administered orally or by nebulizer. Monitor tachycardia, BP changes, nervousness, palpitations, muscle tremors, and dry mouth. May cause nausea, headache, insomnia, and hypokalemia. Acts in 5-10 min and lasts for 3-4 hr.	Should not be used in patients with cardiac disorders or angina. Increase fluid intake; watch for signs of potassium deficit. Wait 5 min before using a glucocorticoid inhaler (anti-inflammatory). Teach to use MDI correctly.
Anticholinergics			
Ipratropium (Atrovent)	Causes bronchodilation by blocking action of acetylcholine	Do not mix with cromolyn sodium. Use cautiously in those with narrow-angle glaucoma, prostatic hypertrophy, or bladder neck obstruction.	Do not take more than two puffs at a time. Avoid excessive use of caffeine.
Ipratropium and albuterol (Combivent)	Causes bronchodilation by stimulating beta-adrenergic receptors, and blocking action of acetylcholine		
Tiotropium bromide (Spiriva)	Causes bronchodilation by inhibiting receptors on the smooth muscle		
Long-Acting Beta-Adrenergic Agonists			
Salmeterol (Serevent) Formoterol (Foradil) Olodaterol (Striverdi Respimat)	Relaxes bronchial smooth muscle, producing bronchodilation	Monitor for tachycardia, muscle tremors, hypokalemia. Salmeterol should be combined with fluticasone (Advair). Fomoterol should be combined with budesonide.	Not to be used for acute symptoms or exacerbations.
Methylxanthine Derivative			
Aminophylline (Theo-Dur, Slo-Bid, Uniphyl, Aerolate, Uni-Dur)	Relaxes bronchial smooth muscle, improves diaphragm contractility, increases ciliary action and mucus clearance, stimulates respiration and pulmonary vasodilation, improves exercise tolerance	Administered orally or IV. CNS effects cause nervousness, irritability, headache, and insomnia. Causes tachycardia, BP changes, dysrhythmias, muscle twitching, flushing, anorexia, nausea and vomiting, epigastric pain, and diarrhea. Several drugs may increase theophylline levels. Monitor theophylline levels.	Length of drug action is decreased by smoking. Take with food to decrease GI effects. Lie down if dizziness occurs. Take medication regularly and only as prescribed. Teach to take pulse. Instruct not to use OTC medications without checking with health care provider. Wear an ID bracelet stating asthmatic status. Check interactions with herbal products.

Anti-Inflammatory Agents†			
Bclomethasone (Vanceril, Beclot) Triamcinolone (Azmacort) Flunisolide (AeroBid) Fluticasone (Flovent) Budesonide (Pulmicort) Ciclesonide (Alvesco) Mometasone (Asmanex)	Provides anti-inflammatory and immunosuppressive effect, decreasing edema in airways Decreases mucus secretion	All can be administered by MDI. Work synergistically with beta-adrenergic agonists. May affect potassium and glucose levels. Monitor weight. May mask infection. Monitor for edema. May have transient unpleasant taste.	Rinse mouth after each use of inhaler to prevent oral fungal infection. Do not discontinue use abruptly. Wash inhaler with warm water and dry after each use.
Cromolyn (Intal) Nedocromil (Tilade)	Stabilizes cell membranes possibly by inhibiting release of histamine and SRS-A by acting on mast cells	Cromolyn nebulizer may be preferred for some patients if MDI is inadequate.	Therapeutic response may occur within 2 wk, but doctor may suggest a 4- to 6-wk trial. Some patients may experience a bad taste with nedocromil.
Combination Agents			
Leukotriene Modifiers			
Zafirlukast (Accolate) Montelukast (Singular)	Blocks action of leukotrienes in the lung once they are formed Provides both bronchodilation and anti-inflammatory effects	Administered orally. May cause headache, dizziness, nausea, vomiting, diarrhea, fatigue, or abdominal pain. Not to be used for acute asthma episodes.	Should take drug 1 hr before or 2 hr after meals daily. Increase fluid intake. Do not stop taking other asthma medications.
Leukotriene Inhibitor			
Zileuton (Zyflo)	Inhibits the synthesis of leukotrienes, providing bronchodilation and anti-inflammatory effect	Administered orally. Monitor liver enzymes. May cause dizziness, insomnia, dyspepsia, and abdominal pain. May interfere with warfarin (Coumadin) therapy and theophylline. Is not used to treat acute asthma attacks.	Check all medications and OTC drugs for ephedrine, which will increase stimulation. Teach to avoid alcohol. Notify health care provider of nausea, vomiting, anxiety, or insomnia. Continue to take even if symptom free.
Immunomodulators			
Omalizumab (Xolair) Subcutaneous injection	Decreases mast cell mediator release from allergen exposure	Currently FDA is reviewing the possible association between omalizumab and an increased risk of heart attack, abnormal heart rhythm, heart failure, and stroke.	Subcutaneous dose is administered every 2-4 wk.
Phosphodiesterase 4 Inhibitors			
Roflumilast	Reduces the release of inflammatory mediators, countering tissue damage	Not a bronchodilator; is not used for acute bronchospasm. Increased risk of adverse psychiatric effects.	Can be taken with or without food. Risk of weight loss. Consult with provider before using OTC medications.
Cilomilast	Reduces the release of inflammatory mediators Reduces mucus hypersecretion and airway remodeling	Not a bronchodilator; is not used for acute bronchospasm.	Nausea is the principal side effect.
Mucolytic			
Acetylcysteine (Mucomyst)	Breaks down mucoproteins by enzyme action Decreases viscosity and aids in mobilization of secretions	Administered by nebulizer. Nausea and vomiting may occur. May cause bronchospasm or hemoptysis. Usually combined with bronchodilator. Monitor respirations.	Warn that secretions may become profuse. Teach that unpleasant odor will decrease with use. Discoloration of solution after bottle is opened does not impair its effectiveness.

*Many other drugs are also prescribed for asthma.

†Systemic corticosteroids (hydrocortisone, methylprednisolone, or prednisone) may be administered orally or intravenously when severe or refractory asthma attacks occur.

BP, Blood pressure; CNS, central nervous system; FDA, Food and Drug Administration; GI, gastrointestinal; IV, intravenously; MDI, metered-dose inhaler; OTC, over the counter; SRS-A, slow-reacting substance of anaphylaxis.

Asthma patients are taught to use a peak flowmeter to determine the drug dosage needed to control the asthma, to predict the effectiveness of therapy, and to detect airflow obstruction buildup before it becomes serious and requires hospitalization (see [Chapter 12, Figure 12-6](#)). Peak flow monitoring is based on the greatest airflow velocity that can be produced during a forced expiration that starts from fully inflated lungs.

Patient Teaching

Using a Peak Flowmeter

Peak flow should be monitored daily. Readings are recorded and compared with the baseline of the patient's personal best peak flow. If a reading is 60% below the patient's best, treatment should be adjusted. When the reading is in the "green zone," airflow is normal; in the "yellow zone," the usual airflow has decreased and routine medications should be increased; and in the "red zone," rescue medications are needed and the health care provider should be notified. To properly use a peak flowmeter, instruct the patient to:

- Set the pointer to zero.
- While standing, take a deep breath.
- Put the mouthpiece in the mouth and clamp the lips firmly around it for a tight seal.
- Blow into the meter as hard and fast as possible.

- Record the value and reset the pointer.
- Rest for a couple of breaths.
- Repeat the procedure for a total of three readings.
- Record the highest reading on the peak flow sheet.

Clinical Cues

When a patient has respiratory distress in an emergency situation, apply high-flow oxygen and monitor the saturation level with a pulse oximeter. **Observe and monitor continuously.** Immediately alert the RN and the provider. If there is a history of COPD, the O₂ rate should be changed, as ordered, to a lower flow of 1 to 3 liters by nasal cannula after the respiratory crisis has resolved.

Nursing Management and Rehabilitation

Rehabilitation and education of the patient and family are the chief long-term goals of nursing intervention. With proper home care, patients with chronic lung disease can live longer and have a higher quality of life, reduce the number of hospitalizations and provider visits, and have fewer psychosocial problems related to inactivity and a feeling of hopelessness. This means working with the patient, identifying specific difficulties he is experiencing, assessing current ability to cope with them, and devising plans to accomplish specific goals for improvement. To prevent frequent hospitalizations for acute flare-ups of the disease, the patient should be taught how to avoid bronchial irritation and infection and prevent such complications as right-sided heart failure (cor pulmonale).

It is very important for the family to be educated of the need for appropriate exercise and activity, and of the patient's natural desire for independence. Families may be overprotective, because the episodes of dyspnea are very distressing.

Patient Teaching

Instructions for Patients With Chronic Respiratory Disease

- To make mucus more liquid and easier to cough up, drink at least 2 and preferably 3 quarts of liquid every day.
- Normal sputum is white and slightly viscous and has no odor or taste. Changes in sputum should be reported to your health care provider.
- When you exert yourself, as in lifting something or getting up from your chair, exhale slowly through pursed lips. You should do the same when you are walking for exercise. It is natural to hold your breath during exertion, so you may need practice exhaling on exertion.
- Eat three or four small, balanced meals rather than one or two large ones each day.
- Practice your breathing exercises every day without fail.
- Try to avoid crowds during the flu and cold seasons.
- Do not take over-the-counter drugs unless directed by your provider. They can interact with your prescribed drugs. Antihistamines can dry out the mucus even more and make it more difficult for you to clear your air passages.
- Do not smoke or inhale the tobacco smoke of others.

Smoking cessation.

All patients should be encouraged to quit smoking; however, smoking cessation is critically important for those with asthma or COPD, because quitting in the early stages of COPD can slow the progression of the disease. After quitting smoking, pulmonary function gradually improves, and after 10 to 20 years the chance of lung cancer is again equal to that of a nonsmoker. Smoking cessation information must be offered to all inpatients as part of The Joint Commission's Core Measures. Hospitals are required to track efforts and report them as part of the accreditation process. In addition to community resources such as support groups and information sessions, nicotine patches, nicotine gum, nicotine nasal spray, and nicotine inhalers can help wean patients off the addictive nicotine. Prescription medications such as bupropion (Wellbutrin), an antidepressant that helps alleviate some of the nicotine withdrawal symptoms, and varenicline (Chantix), which prevents withdrawal symptoms, are currently being used and might be most effective in combination use.

Work with the patient to develop a plan that seems possible to achieve. Decreasing stress levels and improving coping techniques aid success for patients who are trying to quit smoking. Help patients to review what has helped or hindered past attempts to quit. Identify social settings that contribute to smoking, and explore substitute activities. Encourage patients to share their decision to quit with friends and family, and ask friends and family not to undermine the attempt to quit. Set a definite stop smoking date, and include specific ways to reach the goal. Exercise is a good distracter for the urge to use tobacco. A support group can be very helpful. Encouragement and praise for progress in quitting smoking are essential components of the treatment program. The American Lung Association has both literature and community programs available to assist patients.

Psychosocial care.

The patient often needs help with adjustment to alterations in roles and lifestyle. He may have problems with self-esteem, body image, and sexuality that stem from his chronic disease. A trusting relationship between nurse and patient facilitates discussion of personal concerns and provides a means to explore possible solutions or adaptations for problems in these areas. Referral to community support groups also can be beneficial, because the patient then has an opportunity to see and hear how others in his situation have learned to cope and adapt.

Patient and family teaching.

The teaching plan for a patient with a restrictive airway disease is extensive and includes:

- Management of medications and side effects
- Use of respiratory therapy measures and care of equipment
- Management of dyspnea
- Control of the immediate environment and avoidance of allergens
- Maintenance of nutrition
- Balancing exercise and adequate rest
- Awareness of signs of complications
- Need for close medical supervision

Education of the patient and family can be overwhelming; allow enough time for them to gain confidence in one aspect of care before introducing more information. An action plan for patient education and self-management can be helpful. See www.nhlbi.nih.gov, www.lung.org, www.cic.gov, or other online sources for an asthma action plan.

Most patients with chronic respiratory disease have difficulty getting sufficient rest and sleep because of dyspnea, anxiety, and decreased mobility. Sedatives and tranquilizers are contraindicated because they tend to depress respiration. Tension and anxiety often can be relieved if the patient is taught some relaxation techniques, but it takes a bit of practice to use them whenever relaxation is needed (see Chapter 7). Simply telling him to relax or to stop worrying is not helpful; he is using almost every muscle in his body to struggle for breath or is extremely tense in anticipation of breathlessness. Some patients become very agitated and talkative. You should display a calm attitude, stay with the patient, and encourage him to breathe, not talk.

Lung Cancer

Etiology

Lung cancer is the leading cause of cancer deaths worldwide. In the United States in 2013 there were about 228,190 new cases of lung cancer and 159,480 deaths ([American Cancer Society, 2014](#)). Lung cancer typically occurs in people 40 years of age or older. **Cigarette smoking is the primary cause (90%).** A person living with a smoker has twice the risk of lung cancer as someone not regularly exposed to smoke. Other risk factors are increasing air pollution, asbestos exposure, lung diseases such as TB and COPD, and radon exposure. About 15% of patients diagnosed with lung cancer survive more than 5 years. The percentage is low because often lung cancer is not detected until it is at an advanced stage.

Pathophysiology

Non-small cell lung cancer (NSCLC) includes adenocarcinoma, squamous cell, and large cell carcinoma and accounts for about 85% of all lung cancers. Small cell lung cancer (SCLC) makes up the other 15%. Small cell or “oat” cell tumors grow rapidly and are often located near a major bronchus in the central part of the lung. Non-small cell tumors are usually found in the lung periphery and have undifferentiated cells that have slow growth and tend to metastasize.

Chronic irritation of the epithelial tissue in the lung causes changes in cell structure. This makes the tissue more vulnerable to the carcinogens and irritants inhaled when smoking or breathing air with particulate matter. Dysplasia develops, and the tumor grows. Common sites of metastases for cancer of the lung are the brain, bone, and liver.

Signs and Symptoms

At first there are few symptoms, usually only a cough and some wheezing. As the tumor grows larger, the patient may have some pain or discomfort in the chest, exertional dyspnea, and expectoration of blood-streaked sputum. More specific symptoms depend on the location and size of the malignant tumor and the areas to which it has metastasized. If, for example, the malignancy has involved the esophagus, there will be ulceration, bleeding, and dysphagia. Tumors pressing against the trachea can produce hoarseness and paralysis of the vocal cords. Fatigue, anorexia, and weight loss are common, because lung cancer is usually advanced when discovered.

Diagnosis

Multiple tests are used to diagnose and stage lung cancer. These include chest radiograph; sputum cytology; low-dose computed tomography (CT); magnetic resonance imaging (MRI); cytology of specimens obtained by mediastinoscopy, bronchoscopy, or thoracentesis; fine-needle biopsy of the tumor; and video-assisted thoracoscopic surgery (VATS).

Treatment

Treatment is based on the type of cancer—small cell or non-small cell—and its stage. It may be possible to remove the affected area of the lung by surgery if the malignancy is in its earliest stages and is localized. Surgical procedures include wedge resection, in which a small area of the lung is removed; segmental resection, which includes removal of lung tissue and surrounding blood vessels and bronchioles; lobectomy, with removal of an entire lobe of the lung; and **pneumonectomy**, in which an entire lung is removed. Lobectomy is the most common procedure used for small cell lung cancer. Radiation may be used before and after surgery; however, some types of lung cancers are radiation resistant. Small cell tumors respond dramatically to chemotherapy, but if the disease is extensive, the malignancy tends to recur because of metastasis that occurred before diagnosis. Five drugs are used in various combinations to treat small cell tumors: irinotecan, carboplatin, cisplatin, doxorubicin, and etoposide. A drug once used to treat rheumatoid arthritis shows promise for some types of lung cancer. The drug aurothiomalate (ATM) is a targeted therapy that prevents normal cells from turning into cancerous tumor cells. Phase II trials are under way ([American Lung Association, 2014](#)).

NSCLC is very aggressive and difficult to treat; unless caught in the very early stages, the prognosis for this cancer is not good. The treatment for stage I and II lesions is surgical resection. For higher stages, combinations of one or two chemotherapy drugs, biotherapy agents, radiotherapy, and photodynamic therapy (PDT) are used, depending on the stage of the cancer and the symptoms of the patient. For PDT, the patient is given a drug that is taken up by the tumor cells,

making them very sensitive to light and/or heat. The tumor is then exposed to a laser beam that destroys the malignant cells. The laser is introduced into the bronchi via a bronchoscope. Tumors in the main bronchi are particular targets for this type of therapy. Several drugs have been released over the past 10 years for treatment of NSCLC. None have shown improvements in mortality. Current research is focusing on the genetic characteristics of individual tumors and tailoring chemotherapy to target the specific tumor. One clinical trial found that patients with metastatic NSCLC who were placed in the palliative care limb of the protocol had a better quality and length of life than did those in the standard oncology care group ([Tan, 2014](#)).

Nursing Management

Care of a patient undergoing thoracotomy for cancer of the lung is discussed later in the chapter. See [Chapter 8](#) for nursing care of patients with cancer. You must educate the patient about tests and treatments; this may help to reduce the patient's and family's anxiety.

Pulmonary Vascular Disorders

Pulmonary Embolism

Etiology and Pathophysiology

Pulmonary embolism (PE) occurs when a pulmonary vessel is plugged with a mass or clot. Emboli can occur in solid, liquid, or gas forms and can occur from fracture of a long bone (fat embolus), from amniotic fluid during childbirth, from air introduced through a central line, or from clots formed elsewhere in the body (such as from a deep venous thrombosis or thrombi that form in the heart when the patient has dysrhythmias). Regardless of the origin of the embolus, there is interference with blood flow in the lung distal to the point where the embolus lodges. The obstruction causes shunting, and blood flows past the alveoli without receiving oxygen or without giving up carbon dioxide. The consequences of pulmonary embolism can be minor or life-threatening.

Older adults are especially prone to developing deep venous thrombosis (DVT) when they are immobilized from surgery or for a major illness. Long airplane flights and sitting for long periods with the legs crossed are other potential causes of DVT. All hospitalized patients are screened for their DVT risk and appropriately anticoagulated as part of The Joint Commission's Core Measures. Most pulmonary emboli are a result of thrombus formation that then becomes mobile and travels to the lungs.

Signs and Symptoms

Symptoms depend on the size and location of the clot in the lung and whether it is one clot or multiple small clots. The general symptoms are respiratory distress with dyspnea, chest pain, cough, hemoptysis, and anxiety. Hypotension, tachycardia, or confusion may occur. A sudden onset of dyspnea and a drop in SpO₂ in a patient at risk of thrombus formation is very suggestive of PE.

Diagnosis

Diagnosis is made by ruling out other problems, such as heart failure, and by tests to support a diagnosis of PE. The [Institute for Clinical Symptoms Improvement \(ICSI\) \(2013\)](#) offers guidelines. First, a clinical pretest probability score should be determined, based on presence of symptoms and risk factors. Plasma D-dimer testing is recommended when a PE is initially suspected (see [Chapter 12, Table 12-1](#)). Computed tomographic pulmonary angiography (CTA) is ordered (unless contraindicated—in which case a ventilation/perfusion scan is performed). The CTA will help with the diagnosis of PE or identify another cause for the symptoms. Other tests include a chest radiograph, an echocardiogram, arterial blood gases (ABGs), and an electrocardiogram (ECG). These tests look for other causes of symptoms and do not diagnose a PE.

Treatment

Oxygen therapy is initiated to decrease hypoxia. Treatment depends on the size and location of the embolus. Intravenous heparin is usually begun and continued for 5 to 10 days or until the warfarin levels are therapeutic (international normalized ratio [INR] **of at least** 2.0). Warfarin (Coumadin) is initiated several days before discharge and is continued at home for up to 1 year. Rivaroxaban (Xarelto) may be initiated for patients not admitted and are being treated as outpatients.

Thrombolytic (dissolves thrombi) therapy using alteplase or reteplase is reserved for large emboli that cause hemodynamic instability. Pulmonary embolectomy may be beneficial to patients with severe right ventricular dysfunction and cardiogenic shock ([McFadden, 2010](#)). An inferior vena cava (IVC) filter may be placed to prevent future clots from traveling to the lungs from the lower extremities. Recent reports of complications related to the filters have made placement of the device controversial.

Nursing Management

Initial care for a patient who might be experiencing a PE is to remain calm, stay with the patient, raise the head of the bed to a high Fowler position, begin low-flow O₂ therapy, assess vital signs,

notify the provider of the patient's symptoms, start a peripheral IV, and administer heparin when it is ordered. Prepare the patient for the diagnostic tests and for probable treatment. Prevention is the best intervention, and DVT prophylaxis is implemented for all inpatients. Early identification and notification of the provider for any change in condition indicating possible PE is an important nursing responsibility. The patient is kept on bed rest in the semi-Fowler position initially, but turning, deep breathing, and coughing are important to prevent atelectasis.

Primary Pulmonary Hypertension

Pulmonary arterial hypertension (PAH) is elevated pressure in the pulmonary artery. It is caused by a variety of mechanisms. Older terminology delineated primary and secondary PAH, but current labeling is done by groupings based on pathophysiology, clinical symptoms, and treatment options. The classic symptoms are dyspnea and fatigue. Other symptoms are chest pain with exertion, dizziness, and syncope. The disorder eventually causes right-sided heart enlargement (cor pulmonale), followed by heart failure.

There is no cure for PAH, but treatment can improve or relieve symptoms and increase the quality and length of life. Treatment of an underlying cause can help improve symptoms. Drug therapies are concentrated on lowering pulmonary pressures by vasodilating the vessels. Calcium channel blockers and the prostacyclin epoprostenol (Flolan) promote pulmonary vasodilation. Calcium channel blockers are administered orally, but epoprostenol must be continuously administered through a central IV line. Other medications include oral phosphodiesterase type 5 inhibitors, endothelin-receptor antagonists, and soluble guanylate stimulators. Anticoagulants, diuretics, digoxin, and supplemental oxygen may be used according to guidelines. Lung transplantation is reserved for patients with pulmonary hypertension who do not respond to epoprostenol and who progress to severe right-sided heart failure.

Lung Transplantation

Lung transplantation is a viable option for a variety of end-stage lung diseases. Options include single lung, bilateral lung, and heart-lung transplantation. Patients must undergo extensive evaluation and psychological counseling and meet stringent criteria. There must be no history of malignancy within 2 years, no presence of HIV, no substance addiction (e.g., alcohol, tobacco) for 6 months, and no renal or liver impairment. The average wait for a suitable organ is longer than 1 year. The most common cause of death after lung transplantation is infection, which often occurs within 4 to 6 weeks. Immunosuppressive therapy is lifelong to prevent organ rejection. After transplantation and stabilization, patients enter a rehabilitation program to improve physical endurance.

Chest Injuries

The major complications of chest trauma involve either the lungs and air passages or the heart and major blood vessels, and the patient can rapidly deteriorate. Major concerns in the care of patients with chest injuries are:

- Maintenance of an airway
 - Ensuring adequate ventilation
 - Treatment of circulatory problems to ensure circulation of oxygenated blood
- (See [Chapter 44](#) for additional information about chest trauma.)

Pneumothorax and Hemothorax

Pneumothorax and **hemothorax** often occur as a result of a blunt (nonpenetrating) or penetrating injury to the chest wall. These conditions can cause partial or total collapse of one or both lungs. The space within the pleural membranes is an airtight compartment with **negative pressure**. This negative pressure allows for the tidal movement of air in and out of the lungs. If, however, there is a break in the airtight compartment—either along the surface of the lung or from outside the pleural sac—air rushes in and collapses the lung. **Pneumothorax is a threat in chest injury, and usually present in the period after thoracic surgery.** The condition also can occur spontaneously when there is a rupture of the alveoli. This is called *spontaneous pneumothorax*. Tall, thin people and smokers are more prone to spontaneous pneumothorax. Cases have occurred after scuba diving, flying, or mountain climbing.

A pneumothorax may require nothing more than rest and the administration of oxygen to relieve discomfort. If the amount of air in the pleural space is minimal, a large-bore needle may be used to aspirate it. For greater amounts of air or fluid, a thoracostomy tube (chest tube) may be inserted and connected to water-seal drainage to remove the air and allow re-expansion of the lung ([Figure 14-4](#)).

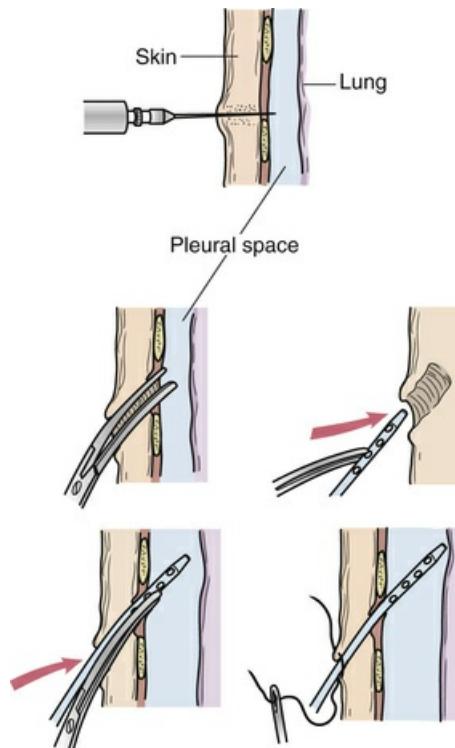


FIGURE 14-4 Insertion of a thoracostomy tube (chest tube).

Hemothorax is the presence of blood within the pleural cavity caused by laceration of the lung, heart, or blood vessels within the thorax. The accumulation of blood in the pleural cavity can cause

partial or total collapse of the lung. There also is the possibility of mediastinal shift in hemothorax and the likelihood of impaired venous return to the heart. The blood is removed with a thoracostomy tube and chest drainage.

For a patient with pneumothorax, hemothorax, or a combination of the two—hemopneumothorax (Figure 14-5)—assess for a history of acute or chronic respiratory disease, accidental injury to the chest, or chest surgery. The patient may complain of sudden chest pain or a feeling of tightness in the chest. There is an increase in both pulse rate and rate of respirations, a drop in blood pressure, and the absence of normal chest movements and absent or diminished breath sounds on the affected side.

Think Critically

You come upon an automobile accident and stop to assist. You have your stethoscope in your car. Name three assessment criteria that would lead you to believe that the driver of the vehicle has suffered a pneumothorax.

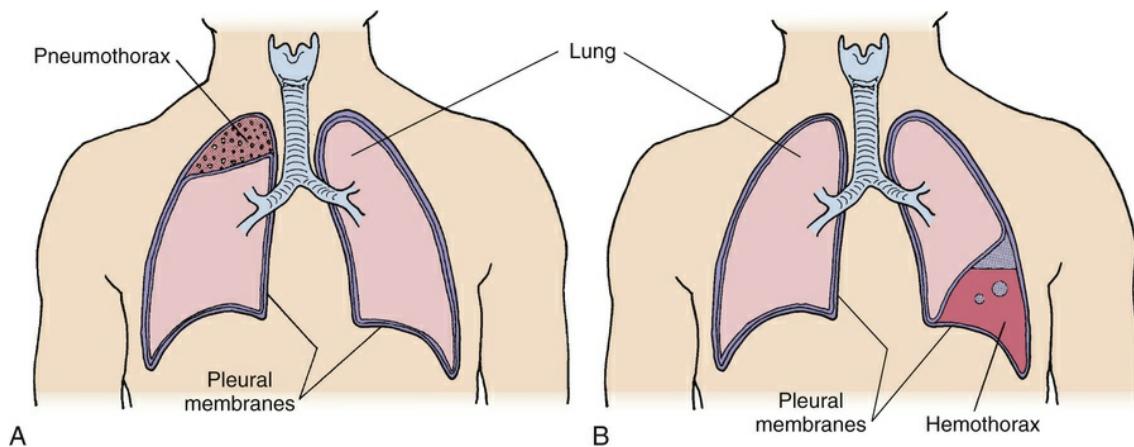


FIGURE 14-5 A, Pneumothorax. B, Hemothorax.

Lung Disorders

Pulmonary Edema

Pulmonary edema is an abnormal collection of fluid in the interstitial spaces of the lung and inside the alveoli. Acute pulmonary edema is a medical emergency. Pulmonary edema is classified as cardiogenic or noncardiogenic depending on the cause. Left ventricular heart failure is a common cause. See [Chapter 19](#) for assessment and treatment of heart failure. Noncardiogenic causes include neurogenic pulmonary edema, drowning, acute glomerulonephritis, inhalation injury, allergic reaction, and acute respiratory distress syndrome (ARDS).

Nursing care involves placing the patient in high Fowler position. Oxygen is started immediately, and continuous positive airway pressure (CPAP) or intubation may be necessary. Furosemide is given for fluid diuresis, and morphine reduces anxiety and the workload on the heart. Drugs for the underlying heart disorder or other condition also are administered. The nurse must closely monitor intake and output and perform continuous respiratory and cardiac assessment to evaluate the effectiveness of treatment.

Acute Respiratory Distress Syndrome

Etiology and Pathophysiology

Acute respiratory distress syndrome (ARDS) is a form of acute lung injury (ALI) that results from pulmonary changes that occur with sepsis, major trauma, major surgery, or any critical illness. When the alveolar capillary membrane is injured, it becomes more permeable to intravascular fluid. Alveoli fill with fluid, and oxygen and carbon dioxide cannot cross the membrane into and out of the capillaries. Pulmonary edema and lung stiffness occur, resulting in severe hypoxemia. ARDS is particularly dangerous when a patient has multisystem disorders; the mortality rate in these patients is 25% to 40%. Improvements in treating the underlying cause as well as interventions for ARDS have improved survival rates.

Signs, Symptoms, and Diagnosis

Dyspnea, tachypnea, tachycardia, and hypoxemia occur. Auscultation may reveal fine, scattered crackles. There is increasing hypoxemia and respiratory alkalosis from the tachypnea. As ARDS progresses, symptoms worsen because of increased fluid accumulation and decreased lung compliance. The onset may be as soon as 12 to 48 hours after the initiating event.

Diagnosis is by physical presentation, history of a disorder or event known to cause ARDS, ABG determination, and chest radiograph. The chest radiograph will show bilateral infiltrates, sometimes called *whiteout*, in the absence of heart failure. The sudden onset and hypoxemia despite supplemental oxygen completes the diagnosis. The PaO_2 is divided by the fraction of inspired oxygen (FiO_2); if the result is 200 or less, the diagnosis is ARDS. Results of less than 300 constitute a diagnosis of ALI.

Treatment and Nursing Management

Treatment for ARDS is ventilatory support with low tidal volumes to prevent additional pressure-related lung injury, positive end-expiratory pressure (PEEP) or CPAP, treatment of the underlying disorder, careful fluid and electrolyte management, and total care for basic needs. Drug therapies have not been shown to be an effective intervention for ARDS. Because infection and sepsis are often the cause of ARDS, early administration of appropriate antibiotics is essential to halt the infectious process.

Nutritional support is essential in prevention of complications and modulation of the stress response. Enteral nutrition is the preferred route of administration. Prone positioning has been shown to improve oxygenation but not overall survival. Patients with ARDS will be on mechanical ventilation in an intensive care setting.

Respiratory Failure

Respiratory failure is the result of insufficient oxygen or excessive carbon dioxide.

Hypoxemic respiratory failure (type I) occurs when PaO_2 is lower than 60 mm Hg and a normal or low PCO_2 is present. This is a result of insufficient oxygen passing from the alveoli to the capillaries. For example, in pneumonia or with a massive pulmonary embolism, fluid fills the alveoli and interferes with gas exchange at the alveoli-capillary interface.

Hypercapnia (also called *hyperventilation*) is the result of hypoventilation, during which the usual amount of carbon dioxide is not eliminated by exhalation. In hypercapnic respiratory failure (type II) the PCO_2 is greater than 50 mm Hg. It is common for hypoxemia to be present in type II respiratory failure. Carbon dioxide is a respiratory stimulant, and the normal response to excessive levels of carbon dioxide is an increase in respiratory rate. If, however, the respiratory centers in the brain are continuously exposed to higher-than-normal levels of carbon dioxide, as in COPD, they become less reactive, and a drop in the respiratory rate occurs. Chronic lung disease may result in a chronic state of respiratory failure. Many patients live in a constant hypoxic state and are always short of breath. Abruptness of onset and severity of symptoms identify the acuteness of the condition. Signs and symptoms of respiratory failure include restlessness, agitation, or confusion. An increase in respiratory rate, pulse, and blood pressure signals a physiologic attempt to compensate for inadequate oxygenation. The patient may sit upright and bend forward and be unable to speak without pausing for breath. Diaphoresis and retraction of accessory respiratory muscles occur as the work of breathing increases. Cyanosis is a late sign of hypoxemia. The final outcome can be cardiac arrest from respiratory acidosis.

Safety Alert

Recognition and Response to Changes in Patient Condition

An essential National Patient Safety Goal is to improve the recognition and response to changes in patient condition. Particularly for patients who are at risk for retaining carbon dioxide, do not assume that lethargy and drowsiness are secondary to the patient's having a "restless, sleepless night." Assess breathing patterns and respiratory rate and carefully compare the current mental status to baseline. Check pulse oximetry and PtCO_2 readings. Notify the provider if you suspect respiratory failure, and obtain an order for ABGs.

Respiratory failure is treated with oxygen and respiratory therapy, including mechanical ventilation, measures to reduce and remove secretions, drugs to reduce bronchospasm and airway inflammation, and correction of acidosis. Treatment of the underlying cause is also necessary. Acute respiratory failure will be managed in an intensive care unit setting because mechanical ventilation is usually required. Extracorporeal membrane oxygenation (ECMO) may be used in some patients.

By vigilant observation and assessment of patients with respiratory problems and close attention to turning, deep breathing, and coughing, you can often prevent respiratory failure. Nursing measures are incorporated to relieve anxiety and agitation. Monitoring fluid balance is particularly important when there is concurrent heart or multiorgan failure.

Common Therapeutic Measures

Intrathoracic Surgery

Intrathoracic surgery, such as resection of lung tissue and other pulmonary structures, requires opening the chest wall and entering the pleural cavity. An intrathoracic approach is also necessary to repair the heart and great vessels or defects of the esophagus.

VATS is replacing the standard **thoracotomy** (incision with entry into the thorax) for many procedures. About 70% of thoracic procedures can be performed in this manner, including pulmonary resections, biopsy or resection of mediastinal tumors or masses, and drainage of pleural effusions. As with laparoscopic procedures performed in the abdominal cavity, several incisions are made to introduce the scope, camera, and necessary instruments. At any time a VATS procedure can be converted to an open thoracotomy if needed.

Preoperative Care

Assessment of the patient's respiratory status before thoracic surgery depends on whether the surgery is elective or emergent. If there is time, a health history as well as subjective and objective assessment data should be obtained before the surgery (see [Chapter 12](#)).

Preoperatively, efforts are made to improve the respiratory status of the patient as much as possible. Special exercises may be prescribed to strengthen the chest, shoulder, and accessory muscles of respiration and to remove accumulated secretions from the air passages.

When standard thoracotomy is to be performed, arm and leg exercises are taught preoperatively to prevent thrombophlebitis and problems with movement. Movement of the arm may be very painful because of positioning during surgery or the surgical involvement of muscles that control the arm. "Frozen" (immobile) shoulder can occur if the arm is not exercised. With VATS, this complication is less likely to occur.

Preoperative patient education focuses on teaching information to improve lung ventilation and to prepare for postoperative equipment such as chest tubes, suctioning, mechanical ventilation, and use of an incentive spirometer.

Postoperative Care

During the immediate postoperative period, nursing assessment and intervention focus on routine positioning, turning, coughing, and deep breathing; procedure-specific observations; and attention to chest tubes and the closed drainage system. A patient who has had thoracic surgery should be ambulatory as soon as possible. An advantage of VATS is that the patient is out of bed and into a chair within 4 to 6 hours of surgery; pain is less. The standard thoracotomy patient has a 4- to 6-week recovery, whereas the VATS patient resumes activities of daily living in 3 to 4 days and can even return to work within 1 week. To promote early mobility, pain management is essential. Surgical pain causes the patient to take shallow breaths and limit movement that causes pain. Adequate pain management will facilitate deep breathing and mobility, both of which are essential in preventing complications.

Special observations include watching for signs of pneumothorax, hemothorax, or both; observing for symptoms of respiratory distress; and auscultation and palpation of the upper chest and neck for swelling caused by **subcutaneous emphysema** (an accumulation of air or gas under the skin, which feels like bubble wrap on palpation). Subcutaneous emphysema is also called **crepitus** and can occur when air leaks into the tissues around chest tubes. It could be a sign of malfunctioning of the drainage system and should be reported. Inspecting the drainage system for air leakage is essential. Assessing for signs of infection, both respiratory and incisional, is also a nursing responsibility.

Gastric distention and paralytic ileus are possible complications of standard thoracic surgery. **Distention of the stomach and intestines is particularly hazardous for the post-thoracotomy patient, because distention can cause these organs to push up on the diaphragm and impair ventilation, which is already compromised by the surgery.**

Positioning for comfort, optimal ventilation, and adequate drainage of the operative site is important during post-thoracotomy care. In most cases the patient is allowed to lie on his back and operative side. Many surgeons do not permit lying on the unaffected side, because this position

diminishes the expansion of the good lung. When the patient has a tube inserted for drainage from the operative site, lying on the operative side facilitates the flow of drainage. Care must be taken when positioning the patient to prevent kinking the chest tubes.

An understanding of the surgical procedure performed and a careful adherence to mobility orders are essential for safe movement of thoracotomy patients. A pneumonectomy patient has had an entire lung removed. Over time the body will accommodate for the space previously occupied by the lung; however, in the immediate postoperative period certain positions may put tension on the bronchial stump. Surgeon preference will dictate acceptable patient positioning for any thoracic surgery.

Care of patients with chest tubes and closed drainage.

Regular and frequent monitoring of patients with chest tubes with an understanding of why the tube has been placed will help with early identification of problems requiring intervention. It will also allow for assessment of effectiveness of the therapy (Figure 14-6). There are three major areas of assessment:

1. The respiratory status of the patient
2. The site at which the tube is inserted into the chest and the length of the tube (for kinks or clots)
3. The amount and character of the drainage in the collection chamber

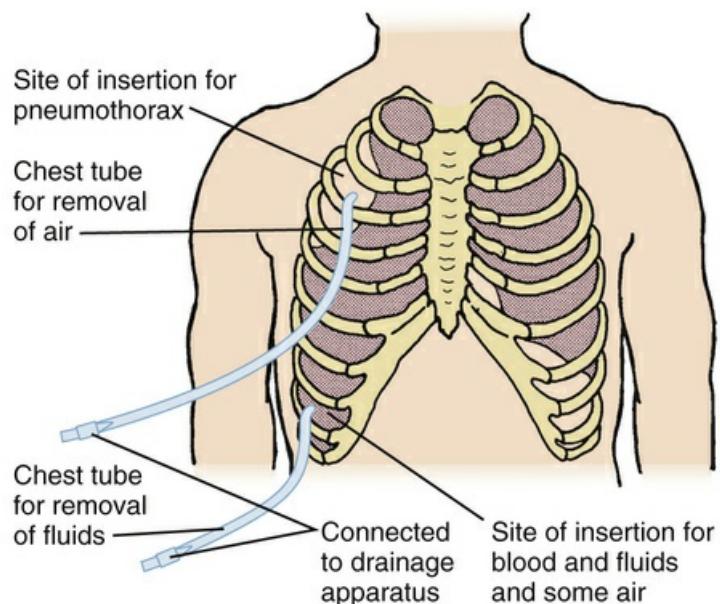


FIGURE 14-6 Location of sites for insertion of chest tubes for drainage of air and fluids.

The patient is assessed for ease of breathing, pain or discomfort, level of consciousness and orientation, and anxiety and restlessness. The rate and character of respirations are noted, as are breath sounds. The entry site is assessed for unusual drainage, infection, integrity of sutures, and the presence of subcutaneous emphysema. The chest tube will be attached to a drainage system. Commercial disposable plastic water-seal drainage systems are the most common. The drainage system should (1) provide for drainage of air and blood from within the pleural cavity and (2) allow for gradual re-expansion of the lung by isolating the intrathoracic pressure from atmospheric pressure. Figure 14-7 shows a disposable system. Note that the water in the left-hand chamber serves as a suction control chamber. When the unit is attached to wall suction there will be bubbling in the compartment. The level of fluid determines the amount of suction applied to the chest. Increasing the wall suction will increase the bubbling but does not change the degree of suction. Slow gentle suction is adequate. The middle chamber is the water-seal chamber that prevents air from entering the chest cavity. Tidaling (movement with breathing) should occur in this chamber. If

air is being removed from the chest, then bubbles might be observed in this chamber. The collection chamber—located on the far right of the device—is calibrated for accurate measurement of drainage from the chest. When caring for a patient with a closed drainage system, the following precautions should be kept in mind:

- Remember that the pleural cavity is an airtight compartment. The apparatus and all connections must remain airtight at all times; all connections should be taped.
- Do not allow the tubing to become kinked or obstructed by the weight of the patient.
- Never pin the tubing to the bedclothes.
- Do not empty chest tube drainage containers. The system must remain closed. Replace the unit when the drainage chamber is full.
- The system operates by gravity and must remain below the patient's chest level at all times.
- The amount of drainage expected will vary according to why the tube was inserted. Find out from the surgeon how much drainage is expected and when to call.
- If the chest tube becomes unattached, do not clamp the tube; place the end of the tubing in a container of sterile water. This creates a “water seal” and can prevent tension pneumothorax. Temporary clamping may be performed by the surgeon to assess lung function or occasionally by the RN to check for the source of air leaks.
- Persistent bubbling in the water seal chamber indicates an air leak. Fluid in the chamber **should** fluctuate with inhalation and exhalation. Occasional bubbles may appear with breathing, sneezing, or coughing. If a pneumothorax is present, bubbling will occur with inspiration, as air is forced out of the area of the pneumothorax.
- A “puffed-up” appearance of the patient's chest or neck could be subcutaneous emphysema.
- Dressings may be reinforced but are not changed except by order of the surgeon. Dressings must be occlusive and not allow air in around the chest tube.

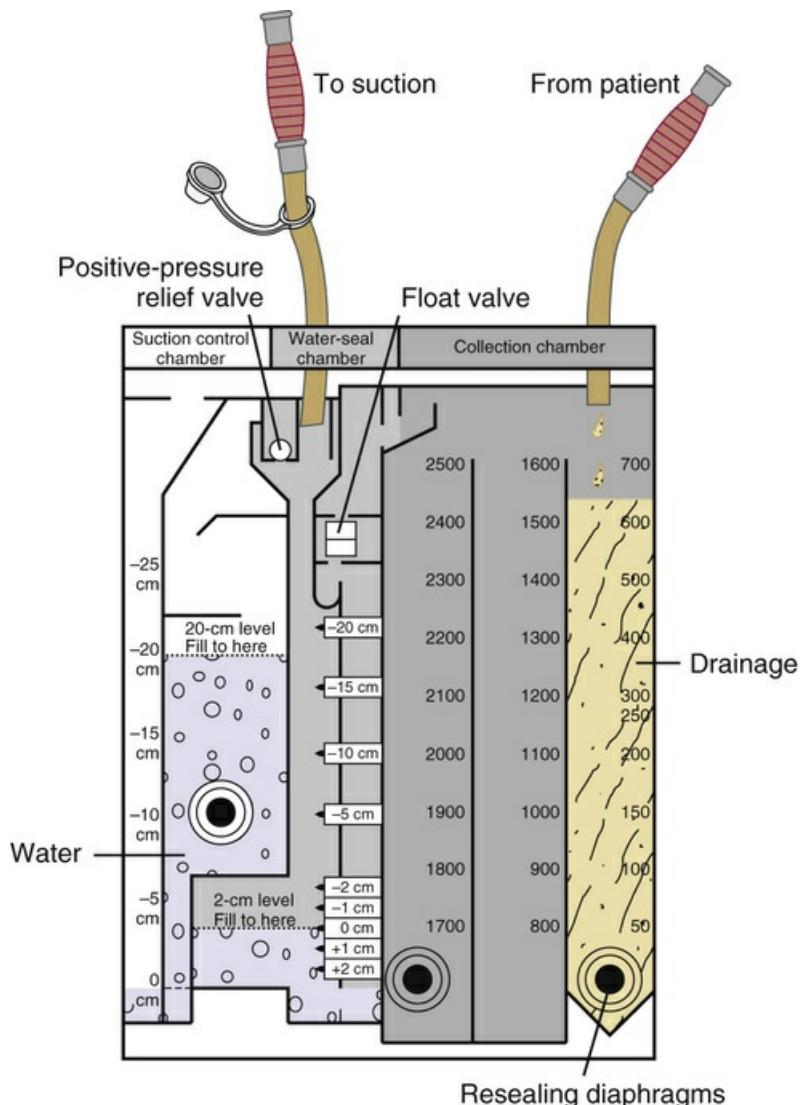


FIGURE 14-7 Disposable water-seal drainage system; note the three chambers. (From Harkreader H, Hogan MA: *Fundamentals of nursing: Caring and clinical judgment*, ed. 2, Philadelphia, 2004, Saunders.)

Other devices such as a flutter valve, or Heimlich valve, may be substituted for chest drainage systems. This valve permits the flow of air and fluid from the pleural space into a collection area but prevents the return flow of air or fluid; the Heimlich valve is inserted between the chest tube and the drainage collection apparatus or may be used without a collection device if only air is being evacuated.

Ambulatory patients may be using a small portable chest drainage system that has only one chamber with a dry seal and does not contain water. The system is used for certain patients who have less than 500 mL of drainage daily. The collection chamber must be emptied when full. Two other devices, the Pneumostat and the Pleurx pleural catheter, are available for chest drainage for home care patients. Each comes with specific care directions.

A dry-suction system is sometimes used in place of water-seal suction. It provides more consistent flow because the suction adjusts automatically to changes in the patient's pleural pressure or to fluctuations in wall suction pressure. The regulator within the unit is preset to $-20\text{ cm H}_2\text{O}$ but can be changed to range from -10 to $-40\text{ cm H}_2\text{O}$.

Specialized chest drainage systems are used to collect the patient's blood from the chest after surgery so that it can be reinfused in an autologous transfusion.

Think Critically

Your patient is 1 day postoperative. What would you do if the fluid in the drainage chamber of the

closed-chest drainage system had not increased over the past 4 hours?

The patient should be medicated 30 to 60 minutes before the removal of a chest tube. When the surgeon removes the chest tubes, the incision is covered with a dressing containing sterile petroleum jelly to close off the opening so that air does not enter the pleural space. This type of dressing is also applied if a chest tube is accidentally pulled out. Auscultate the lungs after chest tube removal to verify that a pneumothorax has not occurred. Eventually the incision will seal itself. A sample plan with interventions for a patient having thoracic surgery is shown in [Nursing Care Plan 14-1](#).

Think Critically

What would you do if you went to assess your first-day postoperative standard thoracotomy patient and the water in the closed drainage system waterseal chamber was not fluctuating with the patient's breathing?

Nursing Care Plan 14-1

Care of a Patient With Lung Cancer

Scenario

A 62-year-old female smoker with a diagnosis of early lung cancer is scheduled for a right thoracotomy and lobectomy. She has no other medical problems except mild arthritis, for which she occasionally takes aspirin.

Preoperative Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge related to postoperative care for thoracotomy.*

Supporting Assessment Data

Subjective: "I've never had surgery before."

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize understanding of postoperative routine of frequent monitoring of vital signs, chest tube care, and respiratory treatments.	Explain purpose and show tubes, drainage apparatus, and oxygen equipment. Explain need for early ambulation. Describe methods of pain control.	Being familiar with equipment and what to expect after surgery decreases fear of the unknown.	Verbalizes understanding of what equipment is for. Says will try to ambulate this afternoon. States understanding of PCA pump for pain control. Outcomes met.
Patient will demonstrate use of spirometer and coughing and deep-breathing exercises.	Teach deep breathing, coughing, use of incentive spirometer. Obtain return demonstration.	Learning the techniques before surgery facilitates postoperative performance.	Uses spirometer correctly and is able to demonstrate coughing and deep breathing.
Patient will be mobile and active after the surgery to prevent postoperative complications before discharge.	Teach leg exercises; flex and extend ankles and knees, circular rotation of ankles, and gluteal tightening. Ambulate to determine preoperative abilities.	Teaching before surgery empowers patient and provides time to practice techniques and ask questions. Ambulating before surgery gives baseline information.	Is practicing leg exercises enthusiastically. "Hope I can keep this up after surgery." Ambulates independently with steady gait. Easily walks full length of pre-op teaching unit without distress.

Postoperative Problem Statement/Nursing Diagnosis

Altered gas exchange/*Risk for impaired gas exchange related to surgical removal of portion of lung and possible complications.*

Supporting Assessment Data

Objective: Thoracotomy and lobectomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will display normal respiratory rate and normal oxygenation before discharge.	Position on back or operative side; turn, cough, deep breathe, and use incentive spirometer q2h; splint incision with small pillow to minimize pain.	Position allows good lung to fully expand. Incentive spirometer use opens alveoli, promoting better gas exchange and prevent atelectasis.	Assisted to turn q2h; using spirometer and coughing q2h. Splints incision when coughing.
	Administer oxygen as ordered.	Oxygen saturation should be maintained at ordered parameter.	Receiving oxygen at 3 L via nasal cannula.
	Monitor vital signs and respiratory effort, and auscultate lung fields q4h; pulse oximetry readings q1h, monitor blood gas levels.	Respiratory rate, lung sounds, blood gas levels, and pulse oximetry readings provide data regarding respiratory status and can indicate decline or improvement.	BP 134/82, P 85, RR 28/min. Left lung with normal breath sounds; right lung with diminished sounds in bases and absent over middle lobe area. SaO ₂ 95% average.
	Encourage use of PCA to promote better cooperation with respiratory therapy, coughing, and deep breathing, but avoid oversedation and respiratory depression.	If pain is minimized, patient is able to more fully expand the lungs and to perform coughing and deep-breathing exercises.	Using PCA appropriately; pain at 4 on a scale of 1-10.
	Maintain intact, functioning closed-chest water-seal	Intact system prevents air from entering pleural	Chest drainage system intact with 150 mL drainage.

	drainage system. Observe for signs of subcutaneous emphysema.	space and collapsing lung.	No subcutaneous emphysema; no signs of respiratory distress (i.e., labored, uneven respirations; no subjective SOB).
	Monitor abdomen for signs of distention or ileus.	Distention can cause pressure on diaphragm and decrease lung expansion.	Abdomen soft and nondistended.

Postoperative Problem Statement/Nursing Diagnosis

Potential for infection/*Risk for infection related to surgical incision and chest tubes.*

Supporting Assessment Data

Objective: Thoracotomy and lobectomy; chest tube in place.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
No signs of infection as evidenced by clean incision, temperature in normal range, normal WBC count, and clear breath sounds during hospitalization.	Use aseptic technique for dressing changes and care of chest tube.	Prevents introduction of pathogenic organisms.	Very small amount of pink-tinted drainage on old dressing. Dressing changed, as ordered, with aseptic technique. Incision intact.
	Assess temperature trends q24h; monitor WBC count.	Provides data that might indicate beginning infection.	Temp 99.4° F (37.4° C) CBC results pending.
	Observe wound for signs of infection.	Early detection and reporting results in early intervention.	No redness, swelling, or pain to surrounding tissues. Dressing dry and intact.
	Protect from people with infections.	Helps prevent exposure to respiratory infection.	Note placed on door advising visitors, who may have infection, to check with nurses before entering.
	Maintain adequate nutrition and fluid intake.	Adequate fluid and nutrition are required for healing.	Taking clear liquids. IV line patent at 125 mL/hr.
	Auscultate lungs each shift and as needed for changes in respiratory status.	Auscultating at the beginning of the shift establishes baseline for comparison.	Breath sounds clear but diminished in bases and absent over right middle lobe.
	Administer antibiotics as ordered.	Antibiotics may be ordered prophylactically because of weakened immune system.	Antibiotics are en route from the pharmacy, will be administered as soon as available. Continue plan.

Problem Statement/Nursing Diagnosis

Anxiety/*Anxiety related to diagnosis of cancer of the lung, treatment, and prognosis.*

Supporting Assessment Data

Subjective: "I'm scared. I don't want to die of cancer. Will I have to have chemotherapy? Will there be a lot of pain?"

Objective: Anxious look on face.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will be less anxious about treatment and disease process by discharge.	Establish trusting relationship; use active listening. Encourage verbalization of fears and concerns; answer questions honestly.	A trusting relationship promotes sharing of feelings and fears.	Using active listening, but patient is not verbalizing details.
	Engender hope; discuss what patient can do to optimize chances of survival: quit smoking, exercise program, diet, relaxation techniques, stress reduction.	Hope allows patient to focus on the future. Active participation in her own survival is empowering and increases feelings of control over the disease.	Reminded that many people have lived for many years after having lung cancer. Discussed aids for quitting smoking. Not willing to try relaxation exercise yet.
	Advise that oncologist will discuss modes of treatment when pathology report is completed. Type of tumor, growth, and aggressiveness dictate treatment.	Giving correct information and explaining why more information is not immediately available helps to decrease anxiety.	Advised that oncologist would be in tomorrow morning to talk about options. States that she would like to have her family present for that discussion.
	Assure that pain control is possible.	Fear of pain and uncertainty about ability to withstand pain is a major source of anxiety.	Visibly relieved when reassured about pain management. Continue plan.

BP, Blood pressure; *CBC*, complete blood count; *IV*, intravenous; *P*, pulse; *PCA*, patient-controlled analgesia; *RR*, respiratory rate; *Sao₂*, oxygen saturation; *SOB*, shortness of breath; *WBC*, white blood cell.

Critical Thinking Questions

- Why should this patient not be positioned on the nonoperative side after surgery?
- What would you do if you noticed that the suction control chamber on the disposable water-seal chest drainage system was not bubbling?

Medication Administration

Bronchodilators are drugs that directly act on and relax the smooth muscle of the bronchi and thereby relieve bronchospasms. Box 14-1 lists general nursing implications for these drugs. Liquefying agents help to thin the bronchial secretions, making them less tenacious. Anti-infective agents used for respiratory infections include the tetracyclines, penicillins, cephalosporins, macrolides (clarithromycin [Biaxin]), fluoroquinolones (ciprofloxacin [Cipro]), and the sulfa drugs.

Box 14-1

General Nursing Implications for the Administration of Bronchodilators

When giving a bronchodilator drug, you should:

- Follow the standard procedures for checking identification of the patient, using the “Six Rights,” verifying allergies, and monitoring for side effects and drug interactions.
- Auscultate the lungs to ascertain the types of lung sounds present.
- Take the pulse and count respirations to establish ranges before drug administration.
- Use these drugs cautiously in patients with cardiac disease, because they affect heart action.
- Consult the provider before administering a bronchodilator to a patient who has a current cardiac dysrhythmia.
- Give each dose of the drug as close to the ordered time as possible to maintain a steady blood level of the drug.
- When the patient is taking theophylline, check drug serum levels; the therapeutic range is 10 to 20 mcg/mL. If the level is above 20 mcg/mL, withhold the drug and notify the provider.
- Warn older adult patients that bronchodilators may cause dizziness and to take precautions when changing positions.
- Monitor the patient for effectiveness of the drug by performing a respiratory assessment.

Regarding possible side effects or adverse effects of the drug, you should:

- Warn the patient about the possibility of paradoxical bronchospasm and advise him to consult the provider if this happens before administering another dose.
- Tell the patient to chew sugarless gum or suck on hard candy to relieve dry mouth.
- Monitor the patient for specific side effects of each drug; general side effects of bronchodilators are dry mouth, insomnia, nervousness, dizziness, palpitations, gastrointestinal upset, and changes in blood pressure.

You should teach the patient taking a bronchodilator drug to:

- Take the drug with a full glass of water; if it causes gastrointestinal upset, take the drug with a meal.
- Take the drug 15 to 60 minutes before exercising (check specific time for individual drug because time depends on form of the drug [i.e., inhalant or oral tablet]).
- Follow correct procedure for inhaling the drug: shake the inhaler gently before using, clear the nose and throat, take a deep breath, relax, and completely exhale before inhaling drug.

Adapted from Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 8, St. Louis, 2011, Mosby.

Corticosteroids are a major part of inhalation therapy for patients with COPD. Inhaled steroids at doses used routinely for COPD and asthma are not significantly absorbed systemically and do not produce the same side effects as oral steroids. Acute respiratory problems are sometimes treated with oral corticosteroids. When corticosteroids are prescribed, the patient must be aware that steroids may blunt the inflammatory response normally seen in early infection. Long-term steroids should not be abruptly discontinued; these drugs must be slowly tapered over several days. Oral

steroids contribute to potassium loss, and replacement may be necessary. Blood glucose is closely monitored for elevation. Gastrointestinal prophylaxis is recommended to counter gastric irritation.

Antihistamines are used to treat respiratory symptoms of an allergic disorder. They reduce the secretions and swelling of the nasal and bronchial mucosa. Decongestants are prescribed for symptoms of the common cold and sinusitis. **Leukotriene** inhibitors are the newest addition to the treatment for asthma. They help control symptoms by blocking the activity of substances that mediate inflammation.

Aerosols are fine suspensions of very small particles of a liquid or solid that constitute a gas. Several delivery systems provide aerosolized medications. MDIs are used to deliver a variety of drugs to respiratory patients. The patient should be taught² to use an MDI properly. MDIs deliver liquid medication, and dry powder inhalers (DPIs) deliver the dose in powder form. Bronchodilators, liquefying agents, and some anti-infective agents may be administered directly onto the mucous membranes of the respiratory tract by a **nebulizer** (device producing a fine spray) and mechanical ventilator.

A nebulizer can provide aerosolized medications via mouthpiece, face mask, face tent, or tracheostomy collar. Nebulizers are available for use at home. In the hospital, the nebulizer is attached to oxygen so that hypoxemia can be treated as medication is being administered. Nebulizer treatments are usually 20 to 30 minutes long and are given two, three, or four times a day.

The patient is taught to breathe through the mouth during the treatment. He should sit in a comfortable chair. Halfway through the treatment and after the treatment, deep breathing and coughing are performed to raise loose mucus.

Humidification

Without adequate water and humidity, mucous secretions become extremely thick and tenacious, and the mucous membranes become dry, crusted, irritated, and more susceptible to invasion by pathogenic microorganisms. For oxygen delivery of 4 L per minute or less, humidification is not necessary. Room air is not artificially humidified. At low flow rates, the largest volume of inhaled gas is room air, and the normal physiologic mechanisms function to humidify the inhaled oxygen and room air. With tracheostomies and high-flow oxygen delivery, humidification is needed. Highest humidification is achieved with warmed fluids, although room temperature fluid can be used.

Pulmonary Hygiene

Patients with chronic pulmonary disease can benefit from a program of pulmonary hygiene that is designed to remove secretions and to enable more efficient exchange of oxygen and carbon dioxide. Pulmonary hygiene programs include administering prescribed drugs; humidifying inhaled air; medication therapy via nebulizer, DPI, or MDI; chest physiotherapy; and breathing exercises. Several devices are available to help clear mucus and open airways and can be used at home.

Chest physiotherapy includes postural drainage (when possible) and percussion and vibration. **Postural drainage** involves positioning the patient so that the forces of gravity can help remove secretions deep in the bronchi and lungs ([Figure 14-8](#)). Tapping, clapping, and vibrating techniques are used primarily for cystic fibrosis for the purpose of dislodging mucous plugs so that they can be coughed up more easily. The provider or physical therapist will give specific directions, and therapy must be provided by someone who has been instructed in the proper technique. Family members can be taught the procedures, if needed, for home care.

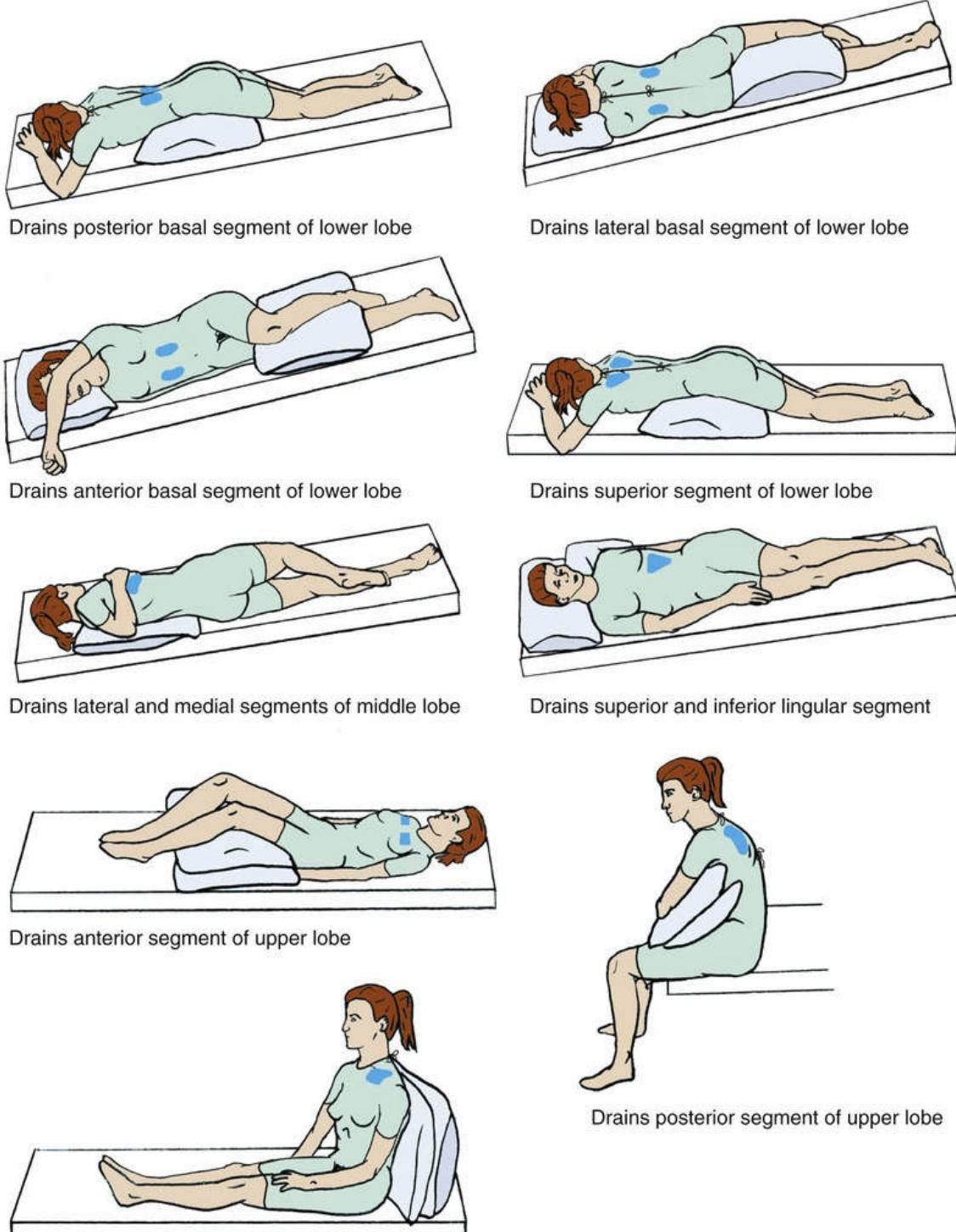


FIGURE 14-8 Positions for postural drainage. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2013, Saunders.)

Because there is likely to be some gagging during coughing episodes that take place during postural drainage, it is best to carry out the procedure before meals, when the stomach is relatively empty and vomiting is less likely. If the patient is to have postural drainage only once a day, drainage should be done in the morning to remove secretions that have accumulated during the night. After postural drainage is completed, good mouth care—including brushing the teeth and using a refreshing mouthwash—should be performed.

Older Adult Care Points

Older adult patients with osteoporosis are at risk for fractures of the vertebrae and ribs. Clapping should not be used on these patients; vibrating techniques are more appropriate.

Patient Teaching

Pursed-Lip Breathing

- Sit up tall and move the back away from the chair; place the feet about shoulder-width apart. Lean forward slightly with hands or elbows on the knees.
- Close the mouth, and breathe in through the nose.
- Purse the lips as though to gently whistle or blow out a candle; keep the lips and cheeks relaxed.
- Blow through relaxed pursed lips, exhale slowly, and do **not** force the air out of the lungs (this can bring about the collapse of the airway structures).
- Breathe out slowly without puffing out the cheeks; control the flow of exhaled air as if you wanted to cause a candle to flicker but not extinguish.
- Take twice as much time to let the breath out as it did to take it in.
- Tense the abdominal muscles to force as much air from the lungs as possible.
- Use pursed-lip breathing during any physical activity.
- Refrain from holding your breath when lifting objects or performing other physical activities.

The purpose of performing breathing exercises is to strengthen the abdominal muscles so that they can push upward against the diaphragm and assist in the expiration of air from the lungs. These exercises also help overcome rigidity of the thorax so that the lungs can inflate and deflate more easily. Patients who follow the exercises prescribed for them often find that they can lead more active and useful lives than formerly possible because their exertional dyspnea is less severe ([Cecily and Alotaibi, 2013](#)). The muscles of their body are stronger; thus there is less risk for complications that accompany immobility. The exercises also help patients to cough up secretions that would otherwise remain in the lower bronchi and serve as a growth medium for bacteria or a cause of atelectasis.

Patient Teaching

Abdominal (Belly) or Diaphragmatic Breathing

- Initially practice lying down.
- Lie on the back with the knees bent. Take a deep breath through the nose with the abdomen relaxed and, with the palm of one hand, feel the abdomen rise. Exhale slowly to a count of four.
- Exhale slowly through pursed lips, tightening the abdominal muscles that push the diaphragm up, forcing more air out of the lungs.
- Once comfortable with the abdominal breathing technique, use it when standing or sitting. This type of controlled breathing will provide more endurance during physical activity.

Oxygen Therapy

Oxygen is a drug, and it must be prescribed and administered in specific doses to avoid O₂ toxicity.

The dosage of O₂ is stated in terms of *concentration* and *rate of flow*. High concentrations (above 50%) may be prescribed to treat acute conditions in which the patient can benefit from prompt treatment of hypoxia, as in myocardial infarction and pulmonary edema. The rate of flow may be as high as 12 L/min. Methods of administration are divided into high-flow and low-flow systems (Figure 14-9 and Table 14-5).

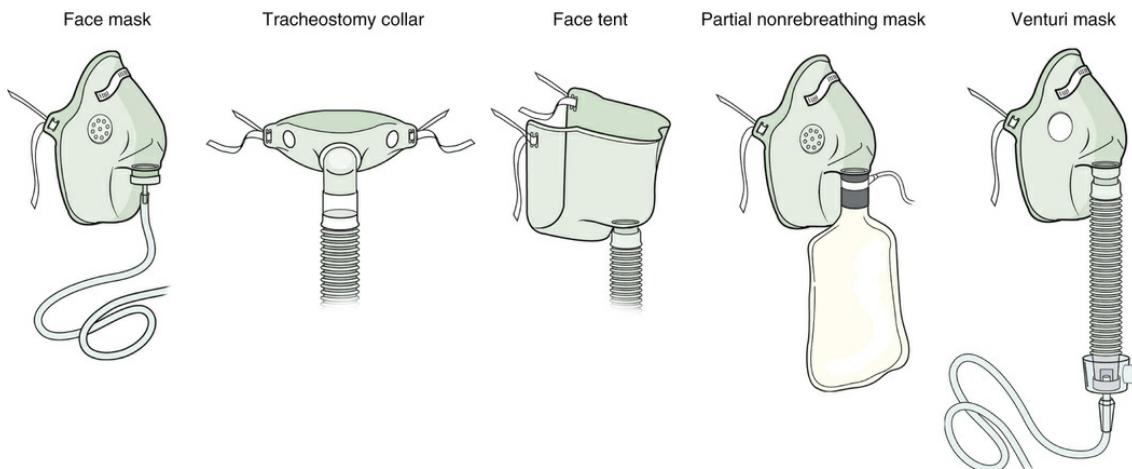


FIGURE 14-9 Various oxygen delivery devices. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2013, Saunders.)

Table 14-5
Advantages and Disadvantages of Common Oxygen Delivery Devices

Method	O ₂ Delivery	Advantages	Disadvantages	Nursing Implications
Nasal cannula (nasal prongs)	Low concentrations; dependent on rate and depth of breathing <i>Flows:</i> 1 L = 24% O ₂ 2 L = 28% O ₂ 3 L = 32% O ₂ 4 L = 36% O ₂ 5 L = 40% O ₂ 6 L = 44% O ₂	Patient can move about, eat, and talk while receiving oxygen. Most COPD patients can tolerate 2 L/min flow.	Restless patients can easily dislodge the prongs. Risk of skin irritation at nares, ears, and cheeks. Flow rate 3 L and above requires humidification to prevent drying and irritation of nasal mucosa.	Prongs should be facing down toward mouth when inserted in nose; check frequently because patients tend to replace the prongs incorrectly. Make sure prongs are patent.
Simple face mask	Low to medium concentrations; 35%-50% can be achieved with flow rate of 6-12 L/min.	Mask provides adequate humidification; delivers oxygen quickly for short-term therapy.	Discomfort and risk of pressure necrosis caused by tight seal between face and mask. Device must be removed for patient to eat, drink, or take medications. Muffles voice when talking. Requires at least 5-L flow to prevent accumulation of CO ₂ in mask.	Wash and dry under mask and wipe out mask q1-2h. Mask must fit snugly. May need to pad straps at ears to prevent skin irritation and possibly necrosis.
Partial non-rebreather mask	Higher concentrations; 40%-60% at flow rates of 6-10 L/min.	Mask is lightweight; reservoir contains 100% oxygen for breathing. One tab on the mask prevents limitation on the amount of exhaled CO ₂ that is "rebreathed" by the patient.	Risk of pressure necrosis with long-term use. Cannot be used with high humidity.	Flow of O ₂ should be high enough that the bag does not deflate during inspiration. Check skin under straps frequently.
Nonrebreather mask	Highest concentrations; 60%-90% can be achieved.	Delivers high concentration of oxygen. One-way tabs on the mask prevent the patient from rebreathing exhaled CO ₂ .	Cannot be used with high humidity. Flow rate must be sufficient to prevent bag from deflating during inspiration.	Mask should fit snugly; check skin contact areas for pressure necrosis.
Venturi mask	Delivers consistent FiO ₂ regardless of breathing pattern. Concentration and liter flow marked on mask apparatus; available for 24%, 28%, 31%, 35%, 40%, and 50% O ₂ .	Mask can provide good humidification; good for delivering low, constant O ₂ concentrations to patient with COPD.	Discomfort and risk of skin irritation. Must be removed for eating, drinking, and taking oral medications. Talking is muffled.	Air ports must not be occluded. Check skin contact areas frequently.
Transtracheal catheter	Delivers oxygen efficiently.	Flow requirement is reduced 60%-80%, increasing time oxygen is available from portable source. Catheter is less visible. Less nasal irritation occurs.	Catheter replacement is an invasive procedure. Not appropriate for someone with excessive mucus production.	Patient and family teaching about catheter replacement.
Tracheostomy collar	Delivers O ₂ and humidification via tracheostomy; must be connected to a nebulizer with FiO ₂ set at 24%-100%.	Adds humidity to help liquefy secretions. Lose some of O ₂ flow because collar is not tight fitting and sits loosely over the tracheostomy.	Must drain condensation in tubing often. Risk of respiratory infection.	Drain condensation from tubing into receptacle; being careful not to allow fluid to go into tracheostomy. Remove and clean collar device and check skin under straps at least q4h.
T-bar (Briggs adapter)	Delivers O ₂ and humidification to tracheostomy or endotracheal tube; must be connected to a humidifier FiO ₂ set at 24%-100%.	Attaches directly to the tracheostomy. Adds humidity to liquefy secretions.	Must drain condensation in tubing often. Risk of respiratory infection.	Drain condensation from tubing into receptacle; be careful not to get fluid into tracheostomy. Remove and clean T-bar device q4h.

COPD, Chronic obstructive pulmonary disease; FiO₂, fraction of inspired oxygen.

Moderate concentrations of oxygen are prescribed when increased metabolic rate raises the consumption of oxygen or when there is poor distribution of oxygen because of heart failure. The

concentrations of O₂ given in a moderate dosage are about 28% to 30% at a rate of flow of 4 to 7 L/min.

Low concentrations of O₂ of about 24% to 28% delivered at a rate of 1 to 3 L/min are indicated when the patient needs oxygen over an extended period. These percentages and rates of flow are approximate amounts. The exact dosage delivered depends on the method of administration and the patient's individual breathing pattern. Although oxygen is essential to life, excessive amounts are toxic. High concentrations of inhaled oxygen can cause lung injury much like that in ARDS. Short-term O₂ therapy, which is the administration of O₂ to treat hypoxemia, is indicated when:

- There is an inadequate intake of oxygen because of obstruction or restriction of airflow through the air passages.
- Oxygen is not distributed throughout the body because of circulatory failure.
- There is an inadequate supply of hemoglobin to transport the oxygen.
- Carbon dioxide or other gases displace the oxygen in the blood.

Objective criteria for oxygen needs include maintaining the SaO₂ greater than 92% and the PaO₂ greater than 60 mm Hg (for disorders such as COPD).

Outward signs of hypoxia vary among patients, but dyspnea, restlessness, and confusion are the most common signs. Blood gas analysis is the most reliable indicator. For bedside assessment pulse oximetry is quick and noninvasive and gives a snapshot of oxygen saturation.

Long-term O₂ therapy for patients with asthma or COPD is used to:

- Relieve hypoxemia
- Reverse tissue hypoxia and its signs and symptoms
- Allow the patient to function better mentally and physically, thereby increasing self-reliance

Oxygen orders for long-term management are prescribed in liters per minute or a specific FiO₂. For acute situations orders are given to maintain an oxygen saturation at or above a certain level. You or respiratory therapist titrates the oxygen delivery to achieve the intended outcome.

Nursing Management

Check the O₂ delivery system at the beginning of the shift and then periodically to verify that the flow is set according to the provider's order or that the target Spo₂ is being maintained. Check the tubing to see that it is not kinked and that it is connected to the oxygen source. Make sure that the patient is wearing the delivery device. Oxygen is not explosive; however, oxygen does support combustion, which means that a spark or flame can cause a major fire. Smoking is not allowed when oxygen is used. The tubing should be kept off the floor, and the connections should be handled aseptically to prevent contamination of the system. Most health care facilities are smoke-free institutions, but patients and families need to be taught safety principles if oxygen is to be used at home. Open flames for cooking are also a risk.

When oxygen therapy is discontinued after long-term use, it is usually done gradually. The patient is "weaned" from dependence on oxygen by gradually reducing the dosage, until room air is tolerated.

Think Critically

Can you describe the assessment points you would cover at the beginning of the shift for a patient who is receiving oxygen therapy? Consider both the patient and the oxygen setup system.

Mechanical Ventilation

Mechanical ventilation is needed when the patient cannot maintain adequate ventilation because of respiratory, neurologic, or neuromuscular problems or trauma. In the acute care setting the most commonly used method is positive-pressure ventilation.

The pressure delivered is greater than that within the airway and alveoli; therefore gas flows into the lungs, either assisting or controlling inhalation. When the pressure is released, exhalation is passive without effort by the machine or the patient. Ventilators are classified by how the inspiratory cycle is terminated. An endotracheal tube or tracheostomy tube must be in place for use

of most mechanical ventilators (see [Chapter 13](#)).

Pressure-cycled ventilators deliver air into the lungs up to a preset pressure. The Babybird and the Siemens Servo are examples of this type. These are mainly used for infants and children.

Volume-cycled ventilators deliver a preset volume of gas with preset pressure limits. Adequate tidal volumes will be delivered even when airway resistance is great (e.g., in patients suffering from severe obstructive lung disease). If the ventilator meets too much pressure, an alarm sounds to indicate that the correct tidal volume is not being delivered. This is commonly caused by excessive secretions in the lungs, and suctioning is needed.

High-frequency jet ventilation provides good ventilation with the use of relatively small tidal volumes at very high respiratory rates. The oxygenation and ventilation are accomplished by gas diffusion and convection rather than a high flow of gas. Because the intrathoracic pressures needed for this type of ventilation are much lower, there are fewer complications (e.g., barotrauma, hypotension, and pneumothorax) than with other types of ventilation.

Modes of Ventilation

In **controlled-mode** ventilation, the machine is set to deliver a fixed number of breaths per minute, at a set volume. The machine does not allow for spontaneous respirations. Controlled-mode ventilation is used during periods of central nervous system depression, such as during anesthesia, sedation, and drug overdose.

Assist-mode ventilation decreases the work of breathing for the patient. When the patient takes a breath, the machine delivers a set tidal volume. Assist-mode ventilation is combined with the control function to provide an assist-control mode. If the patient's respiratory rate falls, the machine will deliver a set number of breaths per minute; if the patient initiates a breath, the machine finishes it at the set tidal volume. The patient can breathe above the rate set on the ventilator. **Intermittent mandatory ventilation (IMV)** and **synchronized intermittent mandatory ventilation (SIMV)** are the most common modes of ventilation found in critical care settings. These allow the patient to breathe spontaneously and yet provide a preset number of ventilator breaths at a preset tidal volume, to ensure adequate ventilation without respiratory muscle fatigue. SIMV is triggered by the patient's inspiratory effort to initiate the machine breath. During mechanical ventilation, it is possible for a patient's respiratory muscles to weaken from lack of use. One of the advantages of SIMV mode is that the patient's respiratory muscles are at work during spontaneous breathing, keeping the muscles toned, and this makes it easier to wean the patient from the ventilator.

In PEEP, the pressure in the airways never falls below a certain level (usually between 5 and 15 cm H₂O). This holds the smaller air passages open, thus limiting atelectasis. It also expands alveoli so that there is more time for gas to diffuse across the membrane and correct hypoxemia. PEEP is used for ARDS and respiratory failure. PEEP increases intrathoracic pressures, which can diminish venous return to the heart, thereby decreasing cardiac output and blood pressure.

Pressure support ventilation.

In pressure support ventilation (PSV), the patient breathes spontaneously, but PSV decreases the work of drawing gases through the ventilator tubing, thus decreasing patient fatigue. PSV is used as an adjunct to standard ventilator modes. PSV has proven very beneficial during weaning from IMV.

Continuous positive airway pressure.

CPAP and bilevel positive airway pressure (BiPAP) can be used for patients who are breathing spontaneously but are showing signs of hypoxemia. It is used for infants with mild respiratory distress syndrome (RDS) and for adults in the early stages of respiratory failure. The therapy can be delivered via the ventilator in an intubated patient, usually for weaning purposes. CPAP and BiPAP not delivered through an artificial airway is considered *noninvasive positive pressure ventilation (NPPV)*.

Noninvasive positive pressure ventilation.

NPPV is used in the hospital and in the home to provide ventilation assistance for patients who need help with oxygenation or air movement. NPPV may be used to improve oxygenation and ventilation so that endotracheal intubation is not needed. It is only used in spontaneously breathing patients who can maintain their own airway. Carefully monitor carbon dioxide levels, oxygen

saturation, hemodynamic stability, level of consciousness, ability to clear secretions, and ability to tolerate the mask or prongs. If treatment outcomes are not met, intubation with mechanical ventilation may be necessary. In the home setting, NPPV is used in the form of CPAP or BiPAP primarily for sleep apnea. The delivery devices use room air and not oxygen for gas delivery. The primary function is to keep positive pressure in the airway to prevent it from closing during sleep. Delivery of supplemental oxygen is not a goal of the therapy ([Figure 14-10](#)).



FIGURE 14-10 Management of sleep apnea often involves sleeping with a nasal mask in place. The pressure supplied by air coming from the compressor opens the oropharynx and nasopharynx. (From Lewis S, Dirksen S, Heitkemper L, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 8, St. Louis, 2011, Mosby.)

Nursing Management

Care for a patient who is receiving mechanical ventilation requires extensive training and supervised practice. The patient will require protection from infection, continuous monitoring of vital signs, observation for hypoventilation and hyperventilation, measurement of intake and output, and prevention of disabilities from inactivity. When caring for a patient on mechanical ventilation, you should:

- Check the provider's order each shift and then check the ventilator for the proper settings: mode, FiO_2 (the oxygen concentration that is delivered), respiratory rate, tidal volume, peak inspiratory pressure, and PEEP.
- Check alarms to see that they are turned on. Alarms should not be turned off when disconnecting the patient to suction, because the alarms may not be reactivated.
- Keep tubing clear of pooled water; empty the water into an appropriate receptacle as needed.
- Check for tension or stretching of the ventilator tubing every time a patient is repositioned.

The patient is observed for signs of complications, such as gastric distention, pneumothorax, and impaired cardiac output from decreased venous return, and the need for increasingly higher pressures to deliver the set tidal volume—which can indicate stiffening of the lungs (decreased compliance). Prevention of ventilator-associated pneumonia includes multiple nursing interventions. Auscultate the lung fields to be certain that both lungs are being ventilated. Monitor ABG levels to determine the effectiveness of ventilation treatment.

Safety Alert

Preventing Ventilator-Acquired Pneumonia

Use of a “ventilator bundle” helps prevent ventilator-acquired pneumonia. The Agency for

Healthcare Research and Quality recommends: (1) elevation of the head of the bed to 30 to 45 degrees, (2) continuous removal of subglottic secretions, (3) change of ventilator circuit no more often than every 48 hours, and (4) hand hygiene before and after contact with every patient. In addition, facility bundle policy may include checking the residual volume in the nasogastric tube, providing oral care with chlorhexidine, deep vein thrombosis prophylaxis, and peptic ulcer prophylaxis (AHRQ, 2011).

For ventilation to be effective, the lungs must be kept clear of secretions. Many patients can cough up secretions and do not need to be suctioned; others may need suctioning as frequently as every 15 minutes. Endotracheal and tracheal suctioning must be done with strict aseptic technique because of the high risk of respiratory infection. In intubated patients an inline suction catheter is used for secretion removal.

An intubated patient on a ventilator cannot talk, so alternative means of communication such as a dry erase board, VitalVoice communication device, electronic device, or paper and pencil are offered. In the acute phase of mechanical ventilation, patients may be sedated. Nurses and other staff need to communicate with the patient assuming they can hear what is being said and explain all procedures and activities.

Additional calorie intake is needed just to maintain weight when a ventilator is used. Continuous enteral feeding is the method most often used to prevent malnutrition in these patients. You should monitor nutritional parameters.

If a ventilator alarm sounds and the problem cannot be located quickly, the patient should be disconnected from the machine and ventilated with a manual resuscitator bag and oxygen until the problem is solved. **Table 14-6** summarizes the dangers of mechanical ventilation.

Think Critically

You have just assisted another nurse in turning a patient who is being mechanically ventilated. The patient has been positioned on the left side and the ventilator is on the right side of the bed. What would you check before you leave the bedside?

Table 14-6
Dangers of Mechanical Ventilation

Danger	Manifestations
Barotrauma	Sudden increase in peak inspiratory pressure; absent breath sounds over one area of lung; pneumomediastinum; pneumothorax; subcutaneous emphysema; high-pressure alarm goes off frequently.
Oxygen toxicity	Parenchymal damage and absorption atelectasis; alveolar membrane damage; nonproductive cough; decreasing vital capacity; decreased compliance; increased peak inspiratory pressure.
Impaired cardiac output	Decreased blood pressure; poor peripheral perfusion; decreased level of consciousness.
Infection	Change in sputum color, quantity, and consistency; crackles and rhonchi; increased white blood cell count; fever; infiltrate on chest radiograph.
Fluid retention	Increasing body weight; fluid intake more than output; peripheral edema; crackles in lungs or diminished breath sounds.
Gastric distention	Increasing abdominal girth; complaint of distention; tender to palpation.
Gastrointestinal bleeding	Positive stool guaiac; "coffee-grounds" aspirate from gastric suction; dropping hemoglobin; black or bloody stool.

Community Care

Home care nurses may be the first to notice that a patient needs home oxygen therapy; also chronic respiratory patients must be monitored for early signs of complications, such as heart failure. Most patients diagnosed with sleep apnea are using BiPAP or CPAP machines in the home, and home health nurses monitor and teach about use of the machine. Outpatient clinic nurses may be the first to notice that respiratory patients are having an increased number of sick days with an increased severity with each episode. Careful history and screening should be conducted to determine whether there is an occupational exposure to an irritant or if the patient is developing hypersensitivity. The nurse can advocate for spirometry, because it is a good test for detecting nonmalignant occupational lung diseases. Community nurses participate in infection control by identifying and referring potential and active cases of tuberculosis within the community.

Working with patients to promote compliance with their exercise and medication regimen is a primary function of the nurse in the community. Teaching use of the peak airflow meter and the MDI can save health care dollars by decreasing serious episodes of acute respiratory dysfunction.

Rehabilitation (see [Chapter 9](#)) of chronic respiratory patients is directed at:

- Improving breathing
- Improving activity tolerance
- Decreasing infection
- Preventing acute episodes

Get Ready for the NCLEX® Examination!

Key Points

- Symptoms of influenza are headache, fever, chills, and muscle aches, followed by hacking cough, runny nose and nasal congestion, and sensitivity to light.
- Hospital-acquired pneumonia can often be prevented by use of aseptic technique and good respiratory care. Older adults are at special risk for pneumonia.
- Symptoms of bacterial pneumonia are high fever, chills, cough with rusty sputum, chest pain, diaphoresis, malaise, and aching muscles. There will be diminished or abnormal breath sounds.
- Fluids (unless contraindicated) should be increased for patients with respiratory infections.
- Treatment of tuberculosis requires multiple medications for a period of 6 to 9 months (see [Table 14-1](#)).
- Restrictive lung disorders include pleurisy, pleural effusion, pulmonary fibrosis, kyphosis, severe scoliosis, and arthritis of the chest wall.
- Chronic obstructive lung disorders include emphysema and chronic bronchitis. Smoking cessation is one of the most important measures in the treatment of obstructive lung disease.
- Emphysema causes destruction of the terminal respiratory units and narrowed, stiff airways with loss of lung elasticity; it causes air trapping and CO₂ retention.
- Chronic bronchitis causes inflammation, excess secretion of mucus, chronic cough, increasing resistance to airflow, and hypoxia. In asthma, bronchospasm and excessive secretion of mucus with bronchoconstriction cause decreased airflow and hypoxia. A severe asthma attack can kill, if not relieved.
- COPD patients are taught diaphragmatic breathing and pursed-lip breathing techniques to assist aeration of the lungs.
- The primary cause of lung cancer is cigarette smoking. Symptoms of lung cancer include cough, wheezing, chest discomfort, exertional dyspnea, and expectoration of blood-streaked sputum. Treatment includes surgery, radiation, chemotherapy, and biotherapy agents.
- Signs and symptoms of pulmonary embolus are dyspnea, chest pain, cough, hemoptysis, and anxiety. Anticoagulant therapy is used for prevention or treatment of pulmonary embolus.
- Pneumothorax and hemothorax decrease lung capacity; treatment includes chest tubes and a closed drainage system.
- Pulmonary edema is a medical emergency. Symptoms include severe dyspnea; orthopnea; noisy respirations; pink frothy sputum; pale, cold, clammy skin; anxiety; restlessness; and possibly confusion.
- ARDS is life threatening and is treated with ventilatory support with PEEP.
- Respiratory failure occurs as type I hypoxic failure and type II hypercapnic failure.
- Frequent respiratory assessment is essential for a patient with chest tubes. Nursing care includes positioning on the back or on the operative side or according to provider orders; checking tubing for kinks; and reporting abnormal chest drainage.
- O₂ is a medication used to treat hypoxemia and can be toxic. High concentrations of O₂ are not used for COPD patients because it can diminish their drive to breathe; use only low-flow oxygen of 1 to 3 L/min.
- Mechanical ventilation is necessary after chest surgery and for respiratory failure, ARDS, flail chest (see [Chapter 44](#)), and neuromuscular disorders that interfere with the respiratory muscles. Nursing care includes carefully checking ventilator settings each shift, ensuring that alarms are on, auscultating the lungs to be sure both lungs are being ventilated, suctioning as needed, administering nutritional therapy, and observing for complications.

Additional Learning Resources

-  Go to your Study Guide for additional learning activities to help you master this chapter content.
 Online Resources

- American Lung Association, www.lungusa.org
- Centers for Disease Control and Prevention, www.cdc.gov
- Tuberculosis treatments and drugs,
www.mayoclinic.com/health/tuberculosis/DS00372/DSECTION=treatments-and-drugs
- National Heart Lung and Blood Institute, www.nhlbi.nih.gov

Review Questions for the NCLEX® Examination

1. A nurse is caring for a patient with signs and symptoms of influenza. What home care for this respiratory condition would be appropriate?

1. Schedule adequate periods of exercise and activity.
2. Provide warming measures.
3. Restrict fluid intake.
4. Consider analgesics and antipyretics.

NCLEX Client Need: Pharmacological Therapies

2. A 58-year-old man is admitted with bacterial pneumonia. He has high fever accompanied by chills, a cough productive of rust-colored sputum, and a general feeling of malaise. The medical diagnosis is confirmed by:

1. blood cultures.
2. chest radiographs.
3. white blood cell count.
4. bronchoscopy.

NCLEX Client Need: Reduction of Risk Potential

3. Which patient is at greatest risk for developing a pulmonary embolism? The patient who:

1. has a central line that was started 2 days ago
2. is 3 months pregnant with her first child
3. has been immobile for 1 week and is mildly dehydrated
4. is ambulating 2 days after abdominal surgery

NCLEX Client Need: Reduction of Risk Potential

4. A frail 40-year-old woman is admitted with complaints of fever, fatigue, coughing, difficulty breathing, and weight loss. Place the following nursing interventions in priority order.

1. Auscultate lung sounds.
2. Assess work of breathing and oxygen saturation.
3. Review the physician orders and implement.
4. Weigh the patient.

NCLEX Client Need: Reduction of Risk Potential

5. Which person should be advised not to have the tuberculosis (TB) skin test? The person who:

1. is symptomatic after a short exposure to someone with TB.
2. had a bacille Calmette-Guérin (BCG) vaccine 2 years ago.
3. works with children at a large day care center.
4. works as a waitress in a small local restaurant.

NCLEX Client Need: Health Promotion and Maintenance

6. A nursing student is reviewing signs and symptoms with a group of people who are at risk for lung cancer. The nurse would intervene if the student says:

1. "Weight loss and fatigue are the first symptoms to manifest."
2. "An occasional cough or wheezing would be the first signs."
3. "Hoarseness could occur if a tumor presses against the vocal cords."
4. "Deep bone pain could occur because the cancer may spread to the bones."

NCLEX Client Need: Health Promotion and Maintenance

7. Which action is appropriate in the care of a patient who is on mechanical ventilation?

1. Instruct the respiratory therapist to check the ventilator settings and alarms.

2. Auscultate the lungs bilaterally to ensure that both lungs are being ventilated.
3. Disconnect the alarms before suctioning or before turning the patient.
4. Perform endotracheal suctioning every 15 minutes, using sterile technique.

NCLEX Client Need: Reduction of Risk Potential

8. A 55-year-old man was admitted for complaints of a recurring irritating "smoker's" cough with small amounts of sputum and was diagnosed with chronic bronchitis. What is the most likely clinical finding?

1. Nonproductive cough
2. Decreased white blood cells
3. Dry mucous membranes
4. Elevated hemoglobin and hematocrit

NCLEX Client Need: Reduction of Risk Potential

9. A patient is immobilized and has been lying in bed for an extended period. What nursing intervention(s) should be done to prevent hypostatic pneumonia? (*Select all that apply.*)

1. Avoid immunizations because of weakened state.
2. Assist the patient to turn at least every 2 hours.
3. Instruct the patient to cough and deep breathe.
4. Allow nothing by mouth to prevent aspiration.
5. Practice scrupulous hand hygiene.

NCLEX Client Need: Reduction of Risk Potential

10. The nurse admits a patient who was diagnosed with active pulmonary tuberculosis. What nursing intervention(s) would help control the spread of the disease? (*Select all that apply.*)

1. Implementing airborne isolation.

2. Assigning the patient to a positive-pressure isolation room.
3. Wearing a HEPA respirator mask when providing direct patient care.
4. Explaining the importance of covering the mouth when smiling.
5. Practicing good hand hygiene.

NCLEX Client Need: Safety and Infection Control

Critical Thinking Questions

Scenario A

You are assigned to take care of Janet Blair, a 26-year-old married mother of two small children who has pneumococcal pneumonia. She is receiving oxygen by nasal cannula at 3 L/min and has "activity as tolerated." ordered. IV antibiotics are being administered and she is receiving nebulization treatments from respiratory therapy. She is very weak, has a temperature of 104.6° F (40.3° C) and sometimes experiences delirium.

1. What would be an appropriate plan of care for Janet?
2. How would you evaluate the effectiveness of the nursing interventions listed on the plan of care?
3. What psychosocial problems might Janet have? How would you help her with these?

Scenario B

Mrs. Wester is 62 years old. She has had emphysema for several years but has not sought help in coping with the problems associated with the chronic lung disease. While in the hospital with an acute respiratory infection, she becomes very depressed and says she will never be able to take care of herself again because of her breathlessness. She has not been taught any techniques for pulmonary hygiene. She is not willing to give up smoking.

1. What do you think might be the attitude of some health care professionals in regard to Mrs. Wester's problems? What is your personal response to Mrs. Wester's situation?
2. Devise a teaching plan to help her with her problem of fatigue and breathlessness.
3. List interventions that would be appropriate in helping with her nutritional and hydration needs.

Scenario C

Mr. Cohen is admitted to the hospital for a lobectomy. His diagnosis is early lung cancer. He is 56 years old and has worked in a cotton mill since he was 16. He is slightly underweight but is physically strong and has an optimistic outlook about his surgery and chances for recovery.

1. What special preoperative instruction would you expect Mr. Cohen to need?
2. What nursing interventions would you expect to be on his postoperative nursing care plan?
3. How would you help Mr. Cohen deal with the diagnosis of cancer, treatment, and prognosis?

Scenario D

Mr. Azale has recently been diagnosed with asthma. He is coming to the clinic for ongoing management of the condition. He wants to understand the disease and be an active participant in

his own health care.

1. Prepare a teaching plan to help him understand his condition and self-care.
2. Describe what you would tell Mr. Azale about the possibility of having a severe, acute asthma attack.

UNIT V

Hematologic System

OUTLINE

Chapter 15 The Hematologic System

Chapter 16 Care of Patients With Hematologic Disorders

CHAPTER 15

The Hematologic System

Objectives

Theory

1. Review the structures and functions of the hematologic system.
2. Differentiate between the various types of blood cells and their functions.
3. Examine factors that may alter the function of the hematologic system.
4. Explain ways in which the nurse might help prevent blood disorders.
5. Relate at least five different kinds of information that can be obtained from a complete blood count (CBC).
6. Illustrate ways to accomplish hemostasis.
7. Apply the nursing process to patients with hematologic system disorders.

Clinical Practice

8. Explain the procedure and care for a patient receiving bone marrow aspiration.
9. Perform a focused assessment on a patient with a problem of the hematologic system.
10. Plan appropriate nursing interventions for patients with hematologic system disorders.

KEY TERMS

- agranulocytosis** (ăh-grăñ-ū-lō-sī-TŌ-sīs, p. 331)
aplastic anemia (ă-plăs-tĭk ă-NĒ-mē-ă, p. 331)
dyscrasias (dīs-KRĀ-zhē-ăz, p. 330)
erythropoiesis (ĕ-rīth-rō-pō-Ē-sīs, p. 328)
hemarthrosis (hē-măr-THRŌ-sīs, p. 336)
hematocrit (hē-MĀT-ō-krit, p. 332)
hemolysis (hē-MŌL-ī-sīs, p. 330)
iatrogenic (ī-ă-trō-JĒN-ik, p. 330)
jaundice (JĀWN-dīs, p. 336)
leukopenia (lū-kō-PĒ-nē-ă, p. 331)
melena (MĒL-ĕh-nă, p. 336)
petechiae (pě-TĒ-kē-ă, p. 336)
phagocytosis (făg-ō-sī-TŌ-sīs, p. 329)
polycythemia (pōl-ē-sī-THĒ-mē-ă, p. 336)
thrombocytopenia (thrōm-bō-sīt-ō-PĒ-nē-ă, p. 331)

Overview of Anatomy and Physiology of the Hematologic System

Functions of Blood

- Transportation of water, oxygen, nutrients, hormones, enzymes, and medications to the cells
- Transportation of carbon dioxide and other waste products away from the cells
- Regulation of fluid volume and electrolyte distribution
- Regulation of pH and acid-base balance with its buffering ability
- Regulation of body temperature
- Providing clotting factors for hemostasis

Components of Blood

- Blood is composed of formed elements and plasma (Figure 15-1).

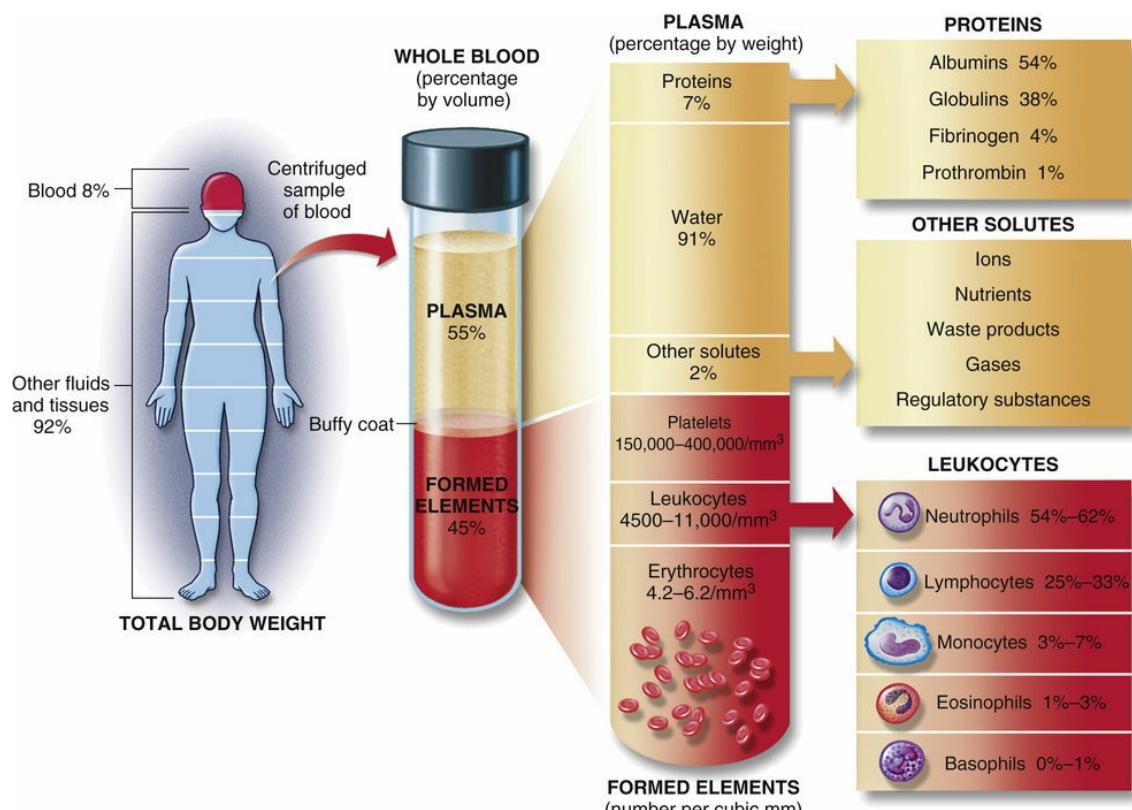


FIGURE 15-1 Components of blood. (From Patton KT, Thibodeau GA: *The human body in health and disease*, ed. 6, St. Louis, 2014, Mosby.)

- The formed elements are erythrocytes, neutrophils, lymphocytes, monocytes, eosinophils, basophils, and platelets.
- Plasma contains proteins, water, salts, dissolved gases (such as CO_2), bicarbonate (HCO_3^-), hormones, glucose, and wastes.
- The plasma proteins are albumin, globulins, and fibrinogen.

Functions of the Plasma Proteins

- Albumin raises osmotic pressure at the capillary membrane, preventing fluid from leaking out

into the tissue spaces. (Osmotic pressure is covered in [Chapter 3](#).)

- The alpha and beta globulins work as carriers for drugs and lipids by combining with them and transporting them throughout the body; gamma globulins act as antibodies.
- Fibrinogen is essential to the formation of blood clots.

Production of Blood Cells

- Blood cells develop from stem cells located in the bone marrow through [erythropoiesis](#) ([Figure 15-2](#)).

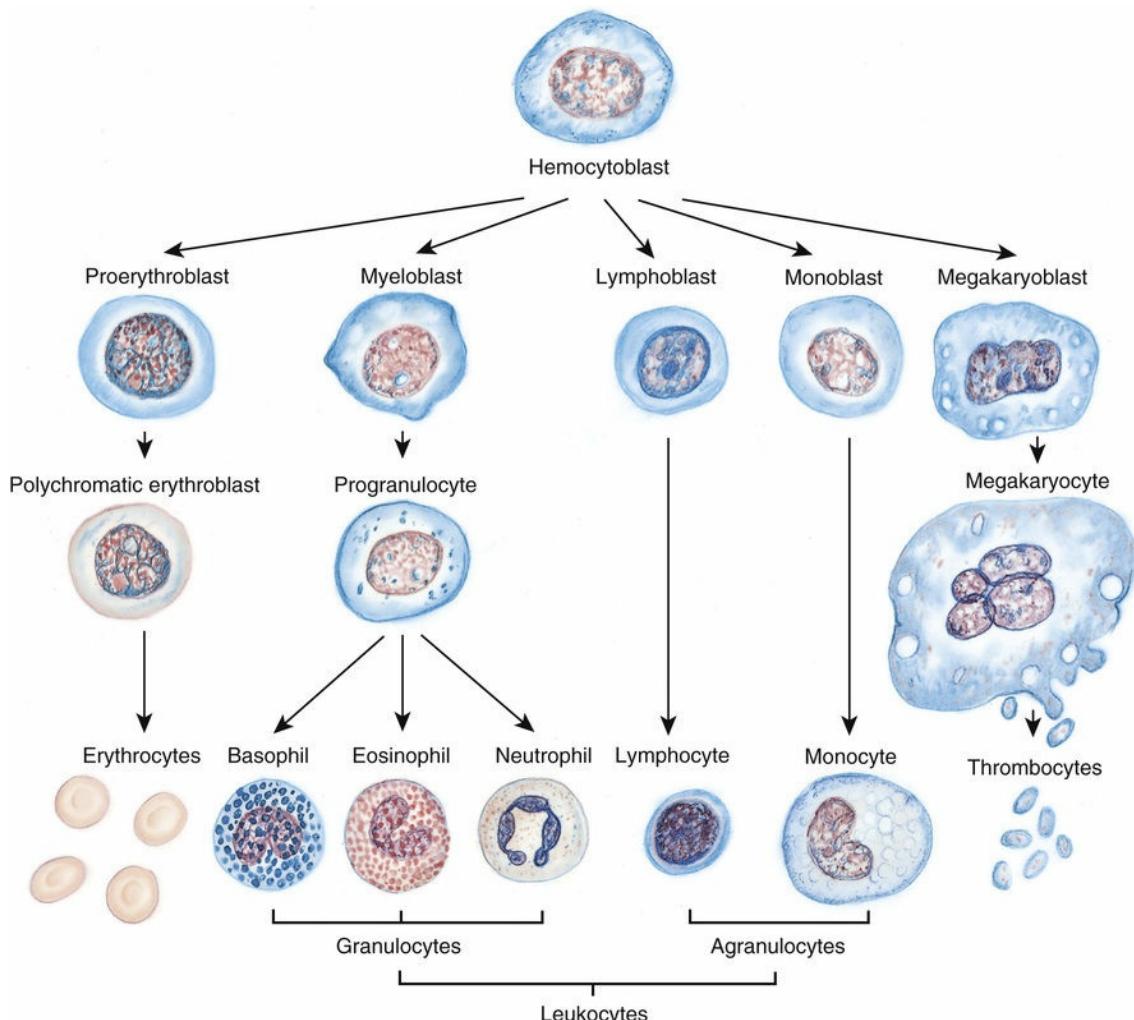


FIGURE 15-2 Erythrocytes (RBCs), leukocytes (WBCs), and thrombocytes (platelets) are the end products of erythropoiesis. (From Applegate E: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2010, Saunders.)

- The kidney makes most of the body's erythropoietin stimulating factor, which then prompts the liver to release erythropoietin for erythrocyte production.
- Erythropoiesis requires iron, vitamins B₁₂, C, and E, folic acid, and amino acids—all of which are obtained from proteins.

Functions of the Red Blood Cells

- Red blood cells (RBCs, or erythrocytes, the most numerous of the blood cells) contain hemoglobin, which carries oxygen to the cells and a portion of carbon dioxide away from the cells.
- Each person has a hereditary blood type based on the antigens on the RBCs. This can be A, B, AB,

or O.

- The normal laboratory range of RBCs for adults is 4.2 to 6.2 million/mm³ and varies by gender.
- The normal laboratory range for hemoglobin in adults is 12 to 18 g/dL and varies by gender.
- Decreased numbers of RBCs or decreased hemoglobin results in a reduction in the amount of oxygen that can be carried to the cells of the body.
- RBCs live for approximately 120 days.
- The spleen and the liver remove old, damaged red cells.

Functions of the White Blood Cells

- White blood cells (WBCs, or leukocytes) provide the first line of defense against microbial agents.
- The normal adult laboratory range for total leukocytes (WBCs) is 4500 to 11,000/mm³; they have a life span of about 13 to 20 days.
- Leukocytes migrate from the bone marrow cells out into the tissues and are carried by the bloodstream to locations where they are needed.
- Leukocytes are divided into granulocytes (meaning “with granules”) and agranulocytes (meaning “without granules”) in the cell nucleus (see [Figure 15-2](#)).
- Granulocytes are divided into neutrophils, eosinophils, and basophils and are produced in the red bone marrow.
- Neutrophils make up 54% to 62% of the WBC count and work by engulfing and destroying bacteria by the process of **phagocytosis**, which means “to consume or swallow up other cells or particles.”
- An infection in the body stimulates increased production of neutrophils, resulting in a higher-than-normal WBC count, or leukocytosis.
- Eosinophils, which make up 1% to 3% of the total WBCs, help detoxify foreign proteins; eosinophils increase in number during allergic reactions and in response to parasitic infections.
- Basophils, which compose up to 1% of the total WBC count, release histamine in response to allergens and help prevent clotting in the small blood vessels.
- Agranulocytes consist of lymphocytes and monocytes. They are produced in the red bone marrow and in lymphatic tissue.
- Lymphocytes, which account for 25% to 33% of WBCs, are produced in the red bone marrow and the lymphatic tissue. Lymphocytes occur as B cells and T cells. B lymphocytes change into plasma cells that produce immunoglobulins responsible for the humoral immune response.
- Some T cells are killer cells that fight antigens and provide cell-mediated immune response (see [Chapter 10](#)).
- Monocytes compose 3% to 7% of the WBCs and become macrophages (large mononuclear monocytes) that migrate out into the tissues, where they become phagocytes, fighting infection and ridding the body of foreign substances. They engulf bacteria and foreign substances and eliminate them from the body.
- A differential blood cell count gives information about the numbers of different types of leukocytes present in the blood and about the type of inflammatory process that is occurring.

Platelets and Their Function

- Platelets, also called *thrombocytes*, are fragments of megakaryocytes that are produced by the bone marrow.
- Platelets provide the first line of protection, after vasospasm (contraction of a vessel), to prevent bleeding by promoting clotting when the wall of a blood vessel has been damaged.
- Platelets are involved in maintaining hemostasis by a complex process that balances the production of the clotting and dissolving factors.
- Fibrin strands derived from the plasma protein fibrinogen attach to aggregated platelets to help form a clot.
- Platelets are small, formed elements of the blood active in the clotting process. Platelets tend to

adhere to damaged or uneven surfaces and to clump together.

- The normal laboratory platelet count range for adults is 150,000 to 400,000/mm³; the life span of a platelet is about 10 days.
- Although the body can withstand a substantial drop in the number of platelets, when the platelet count is low, there is risk of spontaneous bleeding into the skin, kidney, brain, and other internal organs.

Interaction of the Lymphatic System With the Vascular System

The lymphatic system consists of lymph nodes, lymph channels, the spleen, and the thymus gland (see [Chapter 10](#)). The spleen, located in the upper left abdominal cavity below the diaphragm and behind the stomach, filters the blood, removing pathogens, old blood cells, and debris, and produces lymphocytes (see [Figure 10-2](#)). It is a reservoir for extra blood; in response to hemorrhage, it contracts, and by contraction, the spleen releases some of its stored blood into the cardiovascular system. If the spleen is removed, its functions are taken over by other lymph tissue and by the liver.

Lymph vessels collect excess fluid and protein from the interstitial spaces and return it to the bloodstream. Lymph nodes (bundles of lymphatic tissue) filter out leukocytes and cell debris from inflammations and infections before the lymph is returned to the bloodstream.

Changes of the Hematologic System That Occur With Aging

Plasma volume decreases after age 60 years; older individuals have less blood volume. This means less blood reserve in case of blood loss. In addition, bone marrow activity decreases by about 50% as years advance; the marrow becomes infiltrated with fat and fibrotic tissue. Reduced bone marrow inhibits full production of blood cells, so the immune response is decreased, making the older person more susceptible to infection. There is less antibody response to foreign proteins, a decreased secretion of intrinsic factor from the stomach, and decreased absorption of vitamin B₁₂, leading to pernicious anemia from B₁₂ deficiency.

In older adults, new cells are produced at a slower rate, and correction of anemia becomes a longer process. Antibody response to vaccines is also decreased. There is now a super-strength flu vaccination for patients age 65 years and older that is intended to compensate for this decreased response.

When blood loss occurs, an older adult patient is at greater risk for hypovolemia and shock. Blood is more prone to coagulate, because platelets tend to aggregate more with advancing age, and there are alterations in clotting activity. The increased incidence of thrombosis in coronary and cerebral arteries may be related to changes in clotting activity. Daily low-dose aspirin sometimes is prescribed to counteract this phenomenon.

Pigment loss and yellowish cast to the skin are common changes associated with aging; these routine skin changes make pallor and jaundice more difficult to discern in older adults.

Causes of Hematologic Disorders

Hematology is the study of blood, blood components, and blood-forming tissues. The lymphatic system, which drains the fluid from the spaces around each cell and channels it into the circulatory system, is discussed in [Chapter 10](#). Anemias, blood loss and hemorrhage, and hemolysis are all types of hematologic disorders you may encounter during patient care. Several disorders that interfere with normal function of the blood are inherited. Hemophilia, sickle cell disease, and thalassemia types of anemias are examples. Accidental tearing or cutting of the vessels of the cardiovascular system and surgery causes bleeding and loss of blood. Blunt trauma to the spleen, such as might occur in an automobile accident, may cause tearing and massive internal hemorrhage. Chemicals and transfusions of the wrong blood type can cause **hemolysis** (destruction of red blood cells).

Cultural Considerations

Genetic Hematologic Tendencies

- African Americans have the highest incidence of sickle cell disease.
- Pernicious anemia is more prevalent among those of Scandinavian descent and among African Americans.
- People of Middle-Eastern origin may have a genetic predisposition to thalassemia.

Some blood disorders are **iatrogenic**; that is, they are brought on by medical treatment. For example, blood **dyscrasias** (imbalance in numbers of types of cells) or other pathologic conditions of the blood can be induced through at least four kinds of actions:

- Bone marrow suppression, which interferes with the production of blood cells
- Interference with normal cell function
- Destruction of the blood cells by cytotoxic drugs[®]
- Destruction of cells by a transfusion reaction of mismatched blood

Some antineoplastic drugs, for instance, act to depress the bone marrow, which inevitably causes a reduced supply of blood cells. Other drugs, such as phenytoin (Dilantin), primidone (Mysoline), and oral contraceptives, can produce anemia by interfering with the absorption and utilization of folic acid, a substance needed to produce RBCs. Diuretics such as furosemide (Lasix) and hydrochlorothiazide (HydroDIURIL) sometimes cause **leukopenia** (decreased numbers of white cells), **aplastic anemia** (deficient cell production resulting from a bone marrow disorder), and abnormally low counts of platelets and granulocytes. Procainamide hydrochloride (Pronestyl) and quinidine, which are used to correct dysrhythmias of the heart, also can cause **thrombocytopenia** (too few platelets), **agranulocytosis** (decrease in granulocyte production), and aplastic anemia. Most drugs are powerful chemicals that are capable of producing undesirable side effects, even though the drugs can be of great value.

Clinical Cues

If a patient is showing signs of a blood disorder, review the medications that are being taken, and note their side effects.

Nutritional deficiencies, such as low protein or lack of vitamin C, can interfere with erythropoiesis and normally functioning blood cells. Abnormal red cells are more prone to rapid destruction, which can result in anemia. Bone marrow damage from toxic substances may also interfere with the production of blood cells. Malignant conditions such as leukemia cause growth

of abnormal blood cells and interfere with the production of normal cells. **Box 15-1** presents factors that alter hematologic system function.

Box 15-1

Factors That May Alter Function of the Hematologic System

Genetic Disorders

- Hemophilia
- Sickle cell disease
- Agranulocytosis
- Fanconi syndrome

Hemorrhage (Anemia)

- Surgical blood loss
- Blood loss from childbirth or spontaneous abortion
- Traumatic blood loss

Anemia

- Iron deficiency
- Folic acid deficiency
- Pernicious anemia
- Chronic slow blood loss
- Aplastic anemia

Hemolysis

- Blood transfusion reaction
- Genetic types of anemia

Bone Marrow Suppression

- Antineoplastic agents used in treatment of cancer
- Radiation treatment used for cancer
- Excessive exposure to ionizing radiation
- Exposure to toxic chemicals that damage bone marrow
- Drugs that suppress the bone marrow

Bone Marrow Proliferation or Abnormality

- Leukemia

■ Nutrition Considerations

Nutrients Needed for Building Red Blood Cells (Erythropoiesis)

NUTRIENT	ROLE IN ERYTHROPOEISIS	FOOD SOURCES
Cobalamin (vitamin B ₁₂)	RBC maturation	Red meats, especially liver
Folic acid	RBC maturation	Green leafy vegetables, liver, meat, fish, legumes, whole grains
Iron	Hemoglobin synthesis	Liver and muscle meats, eggs, dried fruits, legumes, dark green leafy vegetables, whole-grain and enriched bread and cereals, potatoes
Vitamin B ₆	Hemoglobin synthesis	Meats (especially pork and liver), wheat germ, legumes, potatoes, cornmeal, bananas
Amino acids	Synthesis of nucleoprotein	Eggs, meat, milk and milk products (cheese, ice cream), poultry, fish, legumes, nuts
Vitamin C	Conversion of folic acid to its active forms; aids in iron absorption	Citrus fruits, leafy green vegetables, strawberries, cantaloupe

RBC, Red blood cell.

Prevention of Hematologic Disorders

When considerable blood is lost through hemorrhage, the patient becomes anemic. Sometimes excessive blood loss can occur during menstruation. Prevent hemorrhage after surgery or childbirth by vigilantly assessing the amount of blood loss and by instituting measures to stop the loss if it is excessive.

Clinical Cues

The average amount of blood loss from menstruation is less than 80 mL per cycle. A better way to estimate that blood loss is to count the number of saturated pads or tampons. Each saturated pad is equal to about 50 mL of blood loss.

Nurses can help prevent anemia by promoting proper nutrition and by educating the public about the possibility of nutritional anemia. Nutritional anemia is a particular concern for individuals who subsist mostly on “fast food.”

Older Adult Care Points

An older adult, especially one who lives alone, is at high risk of poor nutrition. Problems with arthritis, vision, and chronic diseases make it more difficult for older adults to shop for food and to prepare food. As a result, an older adult may substitute cookies, toast, or cereal for a well-balanced meal. It is important to obtain a food intake history.

Secretion of intrinsic factor from the stomach and absorption of vitamin B₁₂ is decreased in older adults. The lack of these substances can lead to pernicious anemia from B₁₂ deficiency (see [Chapter 16](#)).

Monitoring patients for drug side effects and alerting the provider should blood-related side effects occur can prevent a serious blood disorder from developing. Carefully monitoring blood transfusions and promptly reporting any untoward reaction may decrease the incidence of hemolysis from a reaction.

Health Promotion

Preventing Blood Disorders

- Caution the public about the dangers of exposure to ionizing radiation and harmful chemicals to help decrease the incidence of blood disorders related to harmful substances.
- Suggest genetic counseling (for the possibility of transmitting a genetic blood disorder to offspring) to those adults who have such a genetic disorder.
- Inform patients about medications they are taking that can cause blood disorders; remind patients to be alert for signs of excessive bruising or easy bleeding. Suggest that CBCs be checked periodically, for monitoring purposes.

Diagnostic Tests and Procedures

A surprising amount of information can be obtained from a stained blood film using only a 5-mL sample of uncoagulated blood. Each of the formed elements can be studied for shape, maturity, and number. Other kinds of studies include those done to measure the rate at which RBCs settle out from plasma (called the *sedimentation rate*) and to separate and classify various kinds of proteins, including antibodies, in the plasma. Explain the venipuncture procedure and the purpose of the test to the patient. Many patients have a great fear of needles. Others are concerned about having what seems like a lot of blood withdrawn. A few words of assurance and explanation can do much to relieve anxiety about a needle stick and to promote cooperation. Use Standard Precautions and aseptic technique for the venipuncture and the correct tubes for each sample. Wear latex or impermeable gloves any time a venipuncture is performed, and dispose of phlebotomy equipment according to Standard Precautions (see Appendix B).

Think Critically

The CBC of your patient shows the following values:

- RBCs: 4.8 million/mm³
- WBCs: 6.7 million/mm³
- Hemoglobin: 10.2 g/dL
- Platelets: 250,000/mm³

What abnormalities, if any, do these results indicate?

Leukocyte counts provide information about infection and possible immune disorders (see Chapter 10). Data about the number of platelets are valuable in diagnosing a variety of diseases affecting—or affected by—the clotting of blood. There are at least 12 different types of hemoglobin in human blood. The types are designated by letters—for example, hemoglobin A is normal adult hemoglobin, hemoglobin F is normal fetal hemoglobin, and hemoglobin S is found in sickle cell disease. A **hematocrit** is a test that measures the volume of blood cells in relation to the volume of plasma. When there has been a loss of body fluids but no loss of cells (as in dehydration), the cell volume is high in proportion to the amount of liquid (plasma) in the bloodstream (i.e., the hematocrit rises). When either hemorrhage or anemia has depleted the supply of cells, the blood is “thinned” and the cell volume is low. Table 15-1 presents the most common diagnostic tests and related nursing care for the hematologic and lymphatic systems.

Clinical Cues

- Increased numbers of eosinophils often indicate allergy.
- A viral infection prompts the production of additional lymphocytes.
- Bacterial infection stimulates the production of neutrophils, and segmented neutrophils (segs) increase.
- Ongoing bacterial infections cause immature neutrophils to appear in the blood as **bands** (immature forms of segmented granulocytes). This is referred to as a “shift to the left.”
- A “shift to the right” occurs when there are more mature neutrophils than usual; this occurs with anemia from vitamin B₁₂ or folic acid deficiency.

Table 15-1

Diagnostic Tests for Disorders of the Hematologic System

TEST AND NORMAL RANGE	PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
Complete blood count (CBC)	Determine whether abnormalities are present in the numbers of blood cells or types of blood cells; assess the amount of hemoglobin present. Useful to diagnose anemia.	Fill a lavender-top tube containing EDTA with a venous sample of blood. Use a site where there is little chance of dilution from intravenous solution. Mix the blood and the EDTA by gently rotating the tube.	Warn the patient that a "stick" is about to occur, but that the pain will be short-lived. Apply pressure directly to the puncture site after withdrawing the needle; at the antecubital space, do <i>not</i> have the patient flex the arm, because this tends to cause a hematoma.
Erythrocytes			
Hemoglobin: females: 12.0-16.7 g/dL; males: 13.0-18.0 g/dL			
Red blood cell (RBC) count: females: 4.2-5.4 million/mm ³ ; males: 4.6-6.2 million/mm ³			
Hematocrit: females: 37%-47%; males: 40%-54%			
Leukocytes			
White blood cell (WBC) count: 4500-11,000/mm ³			
Differential Count			
Granulocytes			
Neutrophils: 54%-62% of WBCs			
Eosinophils: 1%-3% of WBCs			
Basophils: 0%-1% of WBCs			
Agranulocytes			
Lymphocytes: 25%-33% of WBCs			
Monocytes: 3%-7% of WBCs			
Thrombocytes (platelets): 150,000-400,000/mm ³ of blood			
Mean corpuscular hemoglobin (Hb) (MCH): 26-34 pg/cell			
Mean corpuscular Hb concentration (MCHC): 32-36 g/dL			
Mean corpuscular volume (MCV): 80-96 µm ³			
Erythrocyte Sedimentation Rate (ESR)			
Winrobe: Males: 0.5 mm/hr Females: 0- 15 mm/hr	To detect inflammation and infection.	Fill a blue-top tube with venous blood. The laboratory determines the rate at which the RBCs settle.	Explain that this test helps diagnose an inflammatory process but is nonspecific
Westergren: Males: 0- 15 mm/hr Females: 0- 20 mm/hr			
Hemoglobin Electrophoresis			
Hemoglobin A _{1c} : 3%-5% Hemoglobin A ₂ : 1.5%-3% Hemoglobin F: <1% of total	Useful in diagnosing various types of anemia. Useful for diagnosis and monitoring of diabetes mellitus.	Performed on venous sample using lavender-top tube with EDTA.	Same as for CBC.
Blood Typing			
ABO Rh testing	Used to determine blood type. Useful for detecting unexpected antibodies.	Performed on venous sample using red-top tube. Some specific types of ABO/Rh tests use lavender-top tube with EDTA	Same as for CBC.
Tests for Anemia			
Ferritin, serum: 20-200 ng/mL Total iron-binding capacity: 250-410 mcg/dL Saturation: 20%-55%	Detect reason for anemia.	Obtain a venous blood sample of 5-7 mL in a red-top tube.	Same as for CBC.
Reticulocyte count: 0.5%-2%, or 30,000-130,000 per microliter.	Helps distinguish between different types of anemia. Monitors bone marrow function.	Same as for CBC.	Same as for CBC.
Coagulation Tests			
Prothrombin time (PT): 12-14 sec Activated partial thromboplastin time (APTT): 20-25 sec Bleeding time, iv: 2.75-8.0 min	Determine abnormalities of clotting time.	Performed on a venous blood sample; use a blue-top tube	Same as for a CBC; pressure may need to be applied longer than usual if the patient has an abnormal clotting time or is on heparin or warfarin therapy.
International normalized ratio (INR) Normal: 1-2 Prevention and treatment of VTE, PE, VHD: 2-3 Other: 3-4.5	Standardized blood clotting test for tests run at different laboratories.		
D-Dimer			
Negative: <0.5 µg/mL	Provides assay of fibrin degradation to assess thrombin and plasmin activity. Useful for diagnosing pulmonary embolism and disseminated intravascular coagulation (DIC).	Collect blood sample in a blue-top tube.	No fasting is required.
Sickledex			
0	Tests for the presence of hemoglobin S.	Performed on a venous blood sample; use a lavender-top tube.	Client may be anxious about the result; be sensitive to patient emotions. Positive result indicates need for genetic counseling.
Bence-Jones Protein Test			
Presence of Bence-Jones proteins in the urine is abnormal.	Assists in the diagnosis of multiple myeloma.	Obtain a 10-mL fresh morning specimen of urine in a clean container. Must be refrigerated or tested immediately.	Explain the procedure to the patient.
Schilling Test			
≥7% excreted within 24 hr	Determines ability to absorb vitamin B ₁₂ used to diagnose pernicious anemia.	Radioactive B ₁₂ is given orally, followed in 2 hr by an intramuscular injection of B ₁₂ . A 24-hr urine specimen is collected.	Assess kidney function. Requires an 8- to 12-hr fast. No B vitamins for 3 days prior; no laxatives for 24 hr. Subnormal levels of B ₁₂ in the urine indicate the lack of intrinsic factor, which facilitates absorption of vitamin B ₁₂ .
Bone Marrow Aspiration and Biopsy			
Normal cell counts	Helps diagnose blood disorders. Assists in identifying certain anemias, leukemia, and thrombocytopenia.	Cells are withdrawn by needle from the sternum or iliac crest. Leukocytes, platelets, and erythrocytes are examined in the various stages of	Explain that the aspiration is done at the bedside. Seek an order for prebiopsy medication to decrease the discomfort. Explain that there is a feeling of pressure when the needle is

		development to determine abnormalities.	inserted and sharp, brief pain when the marrow is aspirated. The area of aspiration is surgically prepped. The patient must hold perfectly still. Pressure is applied to the site afterward to prevent hematoma formation. Post-test, observe for swelling and tenderness, indicating continued bleeding or infection.
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EDTA, Ethylenediaminetetraacetic acid, an agent used to reduce blood clotting; *PE*, pulmonary embolism; *VHD*, valvular heart disease; *VTE*, venous thromboembolism.

Note: Normal values differ among laboratories.

Nursing Management

Assessment (Data Collection)

History

Assess patients for signs and symptoms that indicate abnormalities in the blood. Abnormal symptoms result from too little circulating blood or too little hemoglobin, too few platelets, deficiency of normal neutrophils or lymphocytes, and too many abnormal blood cells. **When there is insufficient hemoglobin to carry oxygen to the cells, signs of oxygen deficit occur.** Perform a focused assessment to obtain an appropriate history. Inquire about renal disease, which may be a cause of anemia.

Focused Assessment

Data Collection for the Hematologic System

History Taking

Ask the patient the following questions:

- Do you or does anyone in your family have a genetic blood disorder (hemophilia, thalassemia, sickle cell trait or disease, aplastic anemia, agranulocytosis, or thrombocytopenic purpura)?
- What is your occupation?
- Have you ever been told you had anemia?
- Do you become easily fatigued?
- Do you have frequent sore throats or other infections?
- Do you frequently feel as though you have a fever?
- Do you ever have night sweats?
- Are your joints painful? Do they swell?
- Do you bruise easily or develop pinpoint blood spots?
- Do you suffer from itching?
- Do you have any swollen lymph nodes in the groin or armpits?
- Do you ever have tingling or numbness in the extremities?
- Do you have frequent headaches? Palpitations?
- Have you become more irritable than usual?
- Do you get dizzy frequently? Do you suffer fainting spells?
- Do you get short of breath when you walk a short distance or when you climb stairs?

- Do your gums bleed when you brush your teeth? Does your tongue get sore? Do you have frequent mouth sores?
- Do you have any difficulty eating?
- How much alcohol do you drink in a day?
- Do colds or infections seem to last a long time for you?
- Do you often feel fatigued even when not doing much?
- Have you been exposed to chemicals, such as pesticides, cleaning agents, or industrial chemicals of any kind?
- Have you ever noticed that you have black, tarry-looking stool? Smoky or brown urine?
- Do you have stomach pain or indigestion or ever had an ulcer?
- Are your menstrual periods unusually heavy?
- What do you usually eat for each meal?
- Are you often cold when others are not?
- Are there cultural factors you would like considered?
- What are your expectations of treatment?

Physical Assessment

Head and Neck

- Color of conjunctiva and sclera of eye
- Condition of gums, oral mucous membranes, and tongue
- Presence of enlarged cervical lymph nodes

Skin

- Color (pale) (check conjunctivae, palms of hands, and roof of the mouth in people with dark skin)
- Condition of fingernails (brittle, spoon-shaped)
- Presence of ecchymoses or petechiae
- Jaundice
- Nasal or gingival bleeding
- Hair (dry, brittle, thinning)

Chest and Abdomen

- Presence of swollen lymph nodes in armpits or groin
- Rapid respirations; shortness of breath on exertion
- Rapid pulse rate at rest
- Widened pulse pressure (greater distance between systolic and diastolic pressure)

- Epigastric tenderness
- Abdominal distention

Extremities

- Presence of swollen or painful joints
- Different lengths of fingers and toes

Urine and Stool

- Signs of blood

Physical Assessment

Skin. Although pallor may be a sign of anemia, it is not the most reliable sign. Many other factors can affect a person's complexion and skin color, including thickness of the skin, amount of skin pigment, and number and distribution of blood vessels near the surface of the skin. Pale mucous membranes or pale conjunctiva of the eye are better indicators of anemia. A very ruddy complexion with a red, florid appearance is typical of an excessive number of red blood cells (**polycythemia**).

Jaundice, or a yellowing discoloration of the skin and sclera of the eyes, can occur as a result of excessive destruction of red blood cells (hemolysis). When red blood cells are ruptured, bilirubin is released. The pigment eventually finds its way into the bloodstream, where it causes jaundice. If hemolysis is occurring, the urine will often contain bilirubin, giving urine a brown tea color.

Bruises; purplish patches; and small, red, pinpoint lesions (**petechiae**) are typical of thrombocytopenic purpura, a hemorrhagic disease sometimes associated with a decrease in the number of circulating platelets. For dark-skinned people, check the palms of the hands and soles of the feet for petechiae. Bleeding under the skin and formation of bruises in response to the slightest trauma are common in anemias, leukemias, and diseases affecting the bone marrow and spleen. These appear as darker areas on brown-skinned people.

Older Adult Care Points

- Older adults bruise more easily because of thinner skin and greater fragility of blood vessel walls.
- Aspirin, omega-3 fatty acids, vitamin E, ginkgo biloba, and some prescription drugs also may make older adults more prone to bruising.
- Bruising is not necessarily an unusual sign in this age group.

Cyanosis, or a bluish tint to the skin, can indicate hypoxia resulting from inadequate numbers of circulating erythrocytes. The gums or the roof of the mouth are the best places to check for a bluish color in dark-skinned people.

Mucous membranes. Nutritional deficiencies contributing to anemia and resultant hypoxia may cause sore and painful gums and tongue. The patient may have difficulty chewing and eating. The tongue may be smooth and beefy red. Bleeding of the gums may occur with toothbrushing when the platelet count is low.

Abdomen. Stomach pain or nausea can be caused by bleeding ulcers (a common cause of chronic blood loss). Black, tarry stools or coffee-ground emesis indicates gastrointestinal (GI) bleeding. Hiatal hernia also can cause a chronic blood loss.

Assignment Considerations

Observing for Blood

If a nursing assistant will be assisting the patient with toileting, remind that person to check the stool for signs of **melena** (dark stool containing blood pigments) and the urine for a smoky color

(indicating blood).

Clinical Cues

For hospitalized patients with thrombocytopenia, abdominal girth should be measured daily to detect internal bleeding. Mark the lateral aspects of the abdomen where the measuring tape is placed and measure at the umbilicus. Put the measuring tape in the same place each day.

Swollen and painful joints. Bleeding into the joints (**hemarthrosis**) is not uncommon in certain kinds of anemia or in hemophilia. This might be evidenced by swelling and slight redness in the area of the joints, or the patient may move more slowly and with obvious discomfort.

Lymph tissue involvement. Enlarged lymph nodes occur in a number of different blood disorders, as well as in infections and immune disorders. The nodes most often inspected and palpated are those under the arm, in the neck, and in the inguinal (groin) region. Lymph node enlargement is often found while bathing a patient or helping her with activities of daily living (ADLs).

Assignment Considerations

Changes to Report

When assigning tasks to a CNA or UAP, ask the person to report any swellings he notices when assisting the patient with bathing. State that the patient may bruise easily and ask for a report of any new bruised areas or patient complaints of bleeding of gums or elsewhere.

Enlargement of the spleen, which also accompanies polycythemia and several other blood disorders, might be described by the patient as a feeling of fullness on the left side of the upper abdomen. Palpate the abdomen gently in a patient with a suspected blood disorder. Do not palpate deeply if there is tenderness in the area of the spleen, because this could cause rupture of the spleen.

Mental state. Irritability and mental depression are often found in patients with blood disorders. Irritability, dizziness, difficulty in concentrating, and headache may be caused by a decreased supply of oxygen to the brain. Depression often accompanies the chronic lack of energy, difficulty in eating and enjoying food, and the many other problems from which patients with blood disorders often suffer.

Older Adult Care Points

An older adult who has developed pernicious anemia may present with confusion and a loss of mental faculties. This state may be initially believed to be Alzheimer disease. A blood count is important to establish the correct diagnosis.

Activity intolerance. Physical activity increases the demand for oxygen, but if there are not enough circulating RBCs to carry the necessary oxygen, the patient becomes physically weak and unable to engage in physical activity without severe fatigue. Note whether the patient is able to do things for herself or needs help to complete specific ADLs.

Think Critically

- Can you name four signs or symptoms that you might encounter when taking a patient's history that could indicate your patient may be anemic?
- How can the conjunctiva and the sclera of the eye provide information about anemia or jaundice?
- What signs and symptoms might indicate that the patient is suffering a chronic blood loss?

Nursing Diagnosis

Problem statements/nursing diagnoses for hematologic and lymphatic disorders are based on the problems the disorders cause for the patient. Problem statements/nursing diagnoses commonly associated with hematologic disorders are listed in **Table 15-2**. They must be individualized for each patient. Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Table 15-2

Common Problem Statements/Nursing Diagnoses, Expected Outcomes, and Interventions for Patients With Blood Disorders

Problem Statement/Nursing Diagnosis	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Altered nutrition/Imbalanced nutrition related to iron deficiency blood loss, or vitamin B ₁₂ deficiency	Protein levels will be within normal limits within 6 wk. Hemoglobin levels will be within normal range within 3 mo. CBC will show increasing RBCs and Hb within 3 wk. The patient will administer her own B ₁₂ injections on a regular schedule.	Teach the patient about foods that meet required needs. Obtain dietary consultation as needed. Administer iron preparation; if liquid, give through straw. Give iron with juice or food containing vitamin C. Warn that stool may be greenish black. Monitor CBC count for evidence of increase in RBCs and Hg. Administer vitamin B ₁₂ as ordered; advise that lifetime therapy is needed.
Altered tissue integrity/Impaired tissue integrity related to inflammation of mucous membranes	The patient will perform mouth care diligently on schedule. Patient will display normal-appearing mucous membranes.	Give gentle mouth care before meals and q2h. Provide bland, easily chewed foods.
Altered activity tolerance/Activity intolerance related to decreased RBCs or Hb	Patient will use oxygen as ordered. Patient will alternate activities with rest. Patient will seek assistance with ambulation when dizzy.	Administer oxygen by nasal cannula at 3-6 L/min as ordered for patient with sickle cell crisis. Space activities, allowing rest periods for patient with fatigue. Assist with ADLs to prevent fatigue. If dizzy, caution to change position slowly; call for assistance with ambulation.
Pain/Pain related to ischemia and swollen joints	Patient will verbalize that pain is controlled by analgesics. Patient will verbalize that pain has decreased within 48 hr.	Elevate swollen joints and apply hot or cold packs. Teach to avoid strenuous exercise. Use bed cradle to support bed covers. Administer analgesics as ordered PRN.
Potential for injury due to low platelet count	Platelet count will be within safe limits after platelet administration. Patient will have no new hematoma formation or other evidence of bleeding.	Assess for signs of internal bleeding (bruises, blood in urine or stool); measure abdominal girth daily. Minimize trauma; handle gently. Apply ice packs and gentle pressure if hematoma seems to be forming. Monitor administration of platelets PRN. Use small-gauge needle for injections; rotate sites. Avoid injections, if possible. Apply pressure to puncture site or any invasive procedure for 10 min. No rectal meds. Use toothettes/no toothbrush.
Potential for infection due decreased leukocytes	Patient will have no evidence of infection.	Observe for early signs of infection and report. Take temperature q4h. Use strict aseptic technique for wound care and invasive procedures. Use protective isolation as needed. Teach patient good personal hygiene. Avoid sick people, crowds. Maintain integrity of skin and mucosa. Administer anti-infective drugs precisely as ordered.
Insufficient knowledge due to substances that damage bone marrow	Patient will verbalize knowledge of drugs and chemicals that are harmful to the bone marrow within 1 wk.	Assess for exposure to substances that could have damaged the bone marrow. Teach about drugs and chemicals that are harmful to bone marrow and how to prevent damage. Seek feedback to validate understanding of content taught.
Anxiety due to unknown outcome of diagnostic tests and knowledge of disease, treatment, and prognosis	Patient will verbalize purpose and expected experience for each diagnostic test ordered. Patient will verbalize fears regarding disease, treatment, and prognosis.	Provide teaching regarding each diagnostic test. Encourage verbalization of fears. Offer emotional support to patient and family.
Decreased self-esteem due to inability to perform usual activities	Patient will define ways to cope with physical limitations. Patient will verbalize strengths. Patient will discuss possibility of seeking counseling.	Assist to cope with limitations of the illness. Help plan ways to maintain appropriate activity. Help to focus on the things she can still do. Obtain counseling referral if psychological disturbance indicates need.
Altered family coping due to expenses of treatment and possible death of patient	Patient and family will seek assistance from community resources as needed. Patient and family will verbalize understanding of disease, treatment modalities, and their implications.	Refer leukemia patient and family to community resources, such as the American Cancer Society, for assistance. Assist family and patient to understand the disease, treatment modalities, and their implications. Encourage attendance for all family members in a support group. Obtain referral to social worker for further assistance. Encourage open communication within family.

ADLs, Activities of daily living; CBC, complete blood count; Hb, hemoglobin; PRN, as needed; RBCs, red blood cells.

■ Planning

Plan nursing care to provide rest periods for the patient. For patients with anemia, plan dietary teaching or consultation with the dietitian. **Patients with a blood abnormality are at higher risk for infection, so it is extremely important to use aseptic technique.** Patients with a blood abnormality should not be exposed to people who are ill with contagious diseases, such as colds or influenza. Nursing goals include:

- Prevent infection.
- Conserve the patient's energy and prevent undue fatigue.
- Correct nutritional deficiencies.
- Provide treatment to halt or slow the disease process.
- Control pain or discomfort.

Specific expected outcomes are written for individualized problem statements/nursing diagnoses.

■ Implementation

Handle patients with blood dyscrasias gently to prevent bruising and hematomas. Take care to apply pressure for 5 to 10 minutes after injections or venipuncture. Good skin care is essential, because the skin acts as a protective barrier against infection. Teach about nutrition and medication administration, prevention of infection, and measures to prevent bleeding. Pain control is important for patients with sickle cell anemia in crisis, patients with hemophilia with hemarthrosis, and patients with advanced leukemia.

■ Assignment Considerations

Report Oozing of Blood

Although you are responsible for checking patients for signs of bleeding, when a patient with a blood disorder has had blood drawn or an invasive procedure, ask the CNA or UAP to report any oozing noticed at the site or on bandages when he is providing basic care such as feeding or toileting.

■ Think Critically

When caring for a patient who has been in an automobile accident and has sustained trauma to the trunk of the body, what laboratory values should you check daily?

See [Table 15-2](#) for specific interventions for patients experiencing blood disorders. Other interventions are included in the discussion of the various disorders in [Chapter 16](#).

■ Evaluation

The evaluation process provides data to determine whether the specific outcome criteria are being met for each patient. Monitor laboratory values for blood counts and determine whether counts are improving to determine whether treatment and nursing actions are meeting the patient's needs. Assess for side effects and evaluate how the patient is tolerating the medication or other treatment for the underlying disorder.

■ Home Care Considerations

Evaluating Treatment

It is important that each home care nurse evaluate how closely the patient is following the prescribed treatment plan. Determine whether the treatment is effective, and if it is not effective, consult the provider about changing the plan.

■ Clinical Cues

When a patient with leukemia is undergoing chemotherapy, evaluate the blood count results to confirm that safe levels of leukocytes and platelets are present before administering another dose of a drug that inhibits their production.

Common Problems Related to Disorders of the Hematologic System

Excessive Bleeding

When injury has occurred, or spontaneous bleeding happens, you should immediately apply pressure to stop the bleeding (Figure 15-3). Severe bleeding can lead to irreversible hypovolemic shock and circulatory collapse from loss of intravascular fluid. Blood loss from an artery is bright red and will gush forth in spurts at regular intervals as the heart contracts. Blood from a severed or punctured vein leaks slowly and steadily and is dark red. Box 15-2 presents methods of controlling bleeding. If bleeding occurs in a patient who does not have sufficient clotting factors, a transfusion of that factor or of platelets will be ordered. See Chapter 16 for information on transfusions.

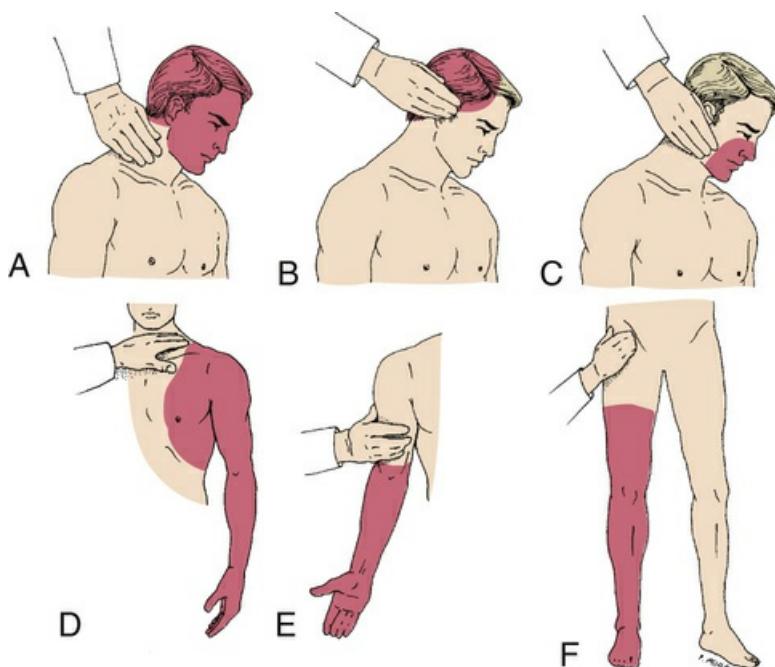


FIGURE 15-3 Locations of commonly used digital pressure points to stop hemorrhage. The screened areas are those within which hemorrhage may be controlled by pressure on a specific artery. **A**, Carotid artery. **B**, Temporal artery. **C**, External maxillary artery. **D**, Subclavian artery. **E**, Brachial artery. **F**, Femoral artery.

Box 15-2

Techniques to Control Bleeding*

- Position the body part that is bleeding over a firm surface and immobilize the part.
- Place a sterile dressing or clean cloth over the wound.
- With the flat palm of the hand or several fingers, apply direct pressure on the wound continuously for 5 minutes.
- Check whether bleeding has stopped after 5 minutes; if bleeding is still occurring, apply pressure continuously for another 10 minutes.
- When bleeding has stopped, gently remove hand pressure and apply a pressure dressing over the cloth or dressing by folding another dressing or piece of cloth several times and tying it firmly

over the wound.

- Check circulation distal to the wound to be certain that the pressure dressing is not so tight that circulation below the wound is cut off.
- Reinforce the dressing as needed by applying yet another layer of dressing as blood soaks through; do not remove previously applied dressings.
- If direct pressure will not stop the bleeding, and bleeding is considerable, apply pressure over the artery leading to the wound. (**Cut off arterial flow only as a last resort.**)
- Check for adequate pressure over the artery by determining a lack of pulse distal to the wound and patient report of a sensation of tingling and numbness in the wound area.

*Severe bleeding can lead to irreversible hypovolemic shock from loss of intravascular fluid and to circulatory collapse.

Excessive Clotting

Patients with certain disorders, such as polycythemia vera, and patients with high platelet counts are at risk for increased bleeding. Watch for symptoms of phlebitis (see [Box 15-1](#)).

Clinical Cues

Blood loss in the GI tract from an ulcer, tumor, or hiatal hernia can be in small amounts or in a large enough amount to make stool appear black (melena). Loss of 50 to 75 mL of blood from the upper GI tract is required before melena will appear.

Fatigue

Help decrease fatigue by spacing activities throughout the day, with frequent rest periods. Assure the patient that her stamina will improve as her red cell count and hemoglobin rise. Work with the patient and family to decrease chores and expectations while fatigue is being experienced. Fatigue is common with anemia, and it affects all aspects of the patient's life.

Anorexia

Serve small, frequent meals high in protein, vitamin C, and iron, unless contraindicated. Provide mouth care before each meal. Offer foods that are appealing to the patient. Keep the eating environment pleasant and free of odors. Ask family to sit with the patient, to offer socialization and encouragement during meals.

Pain

If the patient is experiencing pain, all comfort measures should be employed. Assess pain level at least every 4 hours and medicate as ordered. Teach relaxation and imagery and assist the patient to perform these techniques (see [Chapter 7](#)). Pain may escalate quickly for a patient with sickle cell anemia who is in crisis, so assess pain level at least every 2 hours.

Infection

When a patient is moderately to severely anemic, the oxygen-carrying capacity of the blood is considerably decreased. Less than optimal tissue perfusion and tissue hypoxia make it easier for pathogens to invade and cause infection. When WBCs are decreased or abnormal, there are fewer cells to fight infection. Patients with abnormalities of the blood need to be taught how to protect themselves from infection. Good hand hygiene is essential. Staying away from crowds and individuals with infections is necessary. Getting enough sleep and eating a well-balanced diet help keep the immune system as healthy as possible under the circumstances. Prophylactic antibiotics

may be given in certain situations. Precautions for patients who are prone to infection because of neutropenia are discussed in [Chapters 8 and 10](#).

If the patient develops an infection, close monitoring of therapy and symptoms is needed. Rest, plenty of fluids, and sufficient protein and vitamin C are required to help the patient heal.

Bone Marrow Failure

Bone marrow failure occurs from abnormal cells overcrowding the normal cells or from inadequate production of normal cells. Leukemia causes overproliferation of abnormal cells in the bone marrow. Chemotherapy and radiation, thrombocytopenic purpura, and chemical toxicity can be factors in bone marrow failure. Predisposition to anemia, thrombocytopenia, and decreased WBCs occur. Sometimes bone marrow recovery occurs if the toxic agent is avoided, but usually a bone marrow transplant or stem cell transplant is necessary.

Get Ready for the NCLEX® Examination!

Key Points

- When the number of RBCs or hemoglobin is decreased, the amount of oxygen that reaches the cells is reduced.
- Leukocytes are the first line of defense against microbial agents.
- Neutrophils perform phagocytosis.
- Lymphocytes such as B cells and T cells destroy foreign proteins.
- Platelets are the first line of cell protection to prevent bleeding when trauma has occurred.
- When the platelet count is low, spontaneous bleeding may occur.
- Bone marrow activity decreases by 50% in older adults.
- Blood in older adults coagulates more easily because of platelet **aggregation** (sticking together).
- Hemophilia, sickle cell disease, and certain types of anemias that cause blood disorders are inherited.
- Blood dyscrasias may be caused by drugs, radiation, or toxic substances (see [Box 15-1](#)).
- Nutritional deficiencies can cause anemia.
- A CBC with a differential count (count of the different types of white cells) can help diagnose many blood disorders (see [Table 15-1](#)).
- Bone marrow aspiration is used to diagnose a variety of blood disorders.
- A history is gathered and a focused physical assessment is performed for patients with a suspected blood disorder.
- There are common problem statements appropriate for patients with a blood disorder (see [Table 15-2](#)).
- Preventing infection, conserving energy, controlling pain, and correcting the underlying cause are the goals of care for patients with a blood disorder.
- Patients with blood disorders must be handled gently.
- Checking serial CBCs is part of the evaluation process.
- Methods to stop bleeding should be taught to patients and families.
- Self-care measures are taught to each patient to prevent infection.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• **Online Resources**

- The American Society of Hematology, <http://www.hematology.org>
- Association of Pediatric Hematology/Oncology Nurses, <http://www.aphon.org/>

Review Questions for the NCLEX® Examination

1. For a patient with the clinical finding of leukocytosis, the nurse should:

1. initiate transmission-based isolation precautions.
2. inspect for signs of active bleeding.
3. anticipate a possible provider order for antibiotic coverage.
4. schedule periods of rest and activity.

NCLEX Client Need: Physiological Integrity

2. For an older adult patient admitted for recent falls, which clinical finding(s) relative to the hematologic system would be associated with the aging process? (*Select all that apply.*)

1. Decreased hematocrit and red blood cells
2. Decreased antibody buildup from flu immunization
3. Prolonged prothrombin time and sedimentation rate
4. Increased neutrophils to fight infection
5. Increased coagulability, which predisposes to clots

NCLEX Client Need: Safe and Effective Care Environment

3. A patient works in a chemical plant. When answering an assessment question, he tells the nurse he wears protective clothing, mask, and equipment when handling any chemicals and he avoids coming into contact with radiation. This is an example of:

1. Unreasonable environmental fear.
2. Decreased risk for blood disorders.
3. Decreased risk for idiopathic thrombocytopenic purpura.
4. Protection against pernicious anemia.

NCLEX Client Need: Health Promotion and Maintenance

4. A patient is told that her hematocrit is very low. What symptoms would you expect the patient to experience?

1. Increased energy because of the increased percentage of red blood cells
2. Fatigue related to reduced oxygen transport
3. Reduced mobility caused by decreased lubrication of the joints
4. Increased thirst from salt retention

NCLEX Client Need: Physiological Integrity

5. A patient displays characteristic purple spots and patches. This assessment finding is called _____ and is often caused by _____.

1. ecchymosis; vitamin B₁₂ deficiency
2. thrombocytopenic purpura; platelet deficiency
3. angioedema; iron deficiency anemia
4. petechiae; bruising of the skin

NCLEX Client Need: Physiological Integrity

6. A nurse formulates the following expected outcome for a patient admitted with hemarthrosis: "The patient will have no new hematomas or other evidence of bleeding." The most appropriate nursing intervention would be to:

1. suggest the patient use a soft toothbrush.
2. handle the patient very gently, protecting joints.
3. keep the skin well lubricated.
4. place the patient on a mechanical soft diet.

NCLEX Client Need: Health Promotion and Maintenance

7. A nurse taking care of an older adult woman with pernicious anemia demonstrates understanding of the functional implications by:

1. promoting adequate rest.
2. actively listening to the patient's concerns.
3. monitoring for bleeding.
4. administering antibiotics.

NCLEX Client Need: Physiological Integrity

8. After removing a peripheral vascular access device, the nurse notes bleeding at the site. Put the following nursing actions in order of priority:

1. Tape a sterile dressing over the site.
2. Check for other areas of bleeding.

3. Apply direct pressure.
4. Elevate the extremity.

NCLEX Client Need: Safe and Effective Care Environment

9. A nurse initiates neutropenic precautions for a patient who has undergone chemotherapy. Which nursing action(s) would be considered appropriate? (*Select all that apply.*)

1. Use clean technique for wound care and invasive procedures.
2. Use transmission-based isolation precautions as needed.
3. Allow all visitors as desired.
4. Maintain integrity of skin and mucosa.
5. Provide analgesics, as needed.

NCLEX Client Need: Safe and Effective Care Environment

10. To confirm the diagnosis of pernicious anemia, the patient undergoes a Schilling test. This test involves a(n):

1. oral dose of vitamin B₁₂ followed by collection of a 24-hour urine specimen.
2. oral dose of a multivitamin containing B₁₂, followed by an injection of B₁₂.
3. B₁₂ injection followed by collection of a 24-hour urine specimen.
4. dose of radioactive vitamin B₁₂ followed by an injection of B₁₂ and collection of a 24-hour urine specimen.

NCLEX Client Need: Physiological Integrity

Critical Thinking Questions

Scenario A

You come upon an automobile accident and stop to help.

1. The first victim has a gash in his thigh and blood is spurting at regular intervals from the wound. What method would you use to stop the bleeding?
2. The second victim has a bleeding wound on the forehead. What method would you use to stop

the bleeding?

Scenario B

Mr. Jones has a disorder that has caused leukopenia. He lives alone. To prepare him for discharge home, you need to provide teaching for him.

1. What would you teach him about preventing infection?
2. What would you suggest regarding visitors who wish to see him?
3. What would you tell him about performing necessary errands?

Scenario C

Your 38-year-old male patient has a history of seizures and takes phenytoin. He has developed mild hypertension and takes hydrochlorothiazide to control his blood pressure.

1. What would you teach him about measures to prevent blood disorders?
2. What would you recommend to him for monitoring possible problems?

CHAPTER 16

Care of Patients With Hematologic Disorders

Objectives

Theory

1. Examine the causes of the various types of anemias.
2. Develop a plan of care for a patient with an anemia.
3. Explain the pathophysiology and care of sickle cell disease.
4. Compare cell abnormalities of polycythemia vera with those of leukemia.
5. Formulate a teaching plan for a patient with leukemia.
6. Illustrate why multiple myeloma is a disease affecting older people.
7. Discover the problems and treatments a patient with hemophilia faces.

Clinical Practice

8. Considering the goals of care, write expected outcomes for each of the appropriate problem statements for a patient with a blood disorder.
9. Prepare to provide preprocedure and postprocedure care for the patient undergoing a bone marrow aspiration.
10. Perform an assessment on a patient with a suspected hematologic disorder.
11. Assist with the development of a plan of care for an adult with leukemia.
12. Assess for signs and symptoms of disseminated intravascular coagulation.

KEY TERMS

- allogeneic** (ăl-ō-JĚN-ik, p. 363)
- anemia** (ă-NĒ-mē-ă, p. 343)
- autologous** (ăw-TÖL-ō-güs, p. 360)
- disseminated intravascular coagulation (DIC)** (dī-SĒM-ĕ-năt-ĕd īn-tră-VĀS-cū-lär kō-ăg-ū-LĀ-shün, p. 359)
- ecchymoses** (ĕk-ĕ-MŌ-sĕz, p. 357)
- erythropoiesis** (ĕr-thrō-pō-Ē-sĭs, p. 344)
- hemarthrosis** (hē-măr-THRŌ-sĭs, p. 358)
- hemolysis** (hē-MŌL-ĕ-sĭs, p. 344)
- hypovolemia** (hī-pō-vō-LĒ-mē-ă, p. 343)
- leukapheresis** (lū-kă-fĕ-RĒ-sĭs, p. 354)
- purpura** (PŪR-pū-ră, p. 357)
- splenomegaly** (splē-nō-MĒG-ă-lē, p. 351)

stomatitis (stō-mă-TĪ-tīs, p. 356)

thrombocytopenia (thrōm-bō-sīt-ō-PĒ-nē-ă, p. 357)

Disorders of the Hematologic System

Anemia

In the human body, healthy red blood cells (RBCs) carry oxygen to tissues. A balance is maintained between the production of new RBCs and the disposal of old “worn-out” RBCs. Anemia occurs when something interferes with this balance or interferes with the maturation of cells. **Anemia** is a state in which there are insufficient numbers of functioning RBCs, or a lack of hemoglobin, to meet the demands of the tissues for oxygen.

Etiology

There are three major classifications of anemia, according to cause:

- Anemia resulting from blood loss
- Anemia resulting from a failure in blood cell production
- Anemia associated with an excessive destruction of red cells

Rapid, severe bleeding leads to anemia from blood loss, **hypovolemia** (decreased volume of circulating blood), and, potentially, shock. A blood loss that leads to anemia may result from severe trauma to the blood vessels and massive hemorrhage, or the blood loss may be more gradual, as from a small, bleeding peptic ulcer that causes a chronic blood loss.

The amount of blood loss that leads to hypovolemic shock varies, depending on the ability of the patient's body to compensate for the lost fluid volume. A blood loss of even 500 mL in an adult who had normal circulating volume may cause hypovolemic shock. See [Chapter 44](#) for the treatment of shock. [Table 16-1](#) correlates amount of blood loss and consequent clinical manifestations.

Clinical Cues

The classic signs and symptoms of hypovolemic shock are falling blood pressure; rapid, weak pulse; cool, damp skin; thirst; decreased urine output; and restlessness progressing to decreased consciousness.

Table 16-1
Clinical Manifestations of Acute Blood Loss

VOLUME LOST	CLINICAL MANIFESTATIONS
10%	None
20%	At rest, no signs or symptoms; slight postural hypotension when standing; tachycardia with exercise
30%	Blood pressure and pulse normal when supine; postural hypotension and tachycardia with exercise
40%	Below-normal blood pressure, central venous pressure, and cardiac output at rest; rapid, thready pulse and cold, clammy skin
50%	Shock and potential death

Adapted from Lewis SL, Dirksen SR, Heitkemper MM, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.

Anemia caused by a failure in cell production is the result of either a deficiency of certain substances necessary for the formation of RBCs or abnormal functioning of bone marrow. Examples of this type of anemia are:

- Nutritional anemia, in which there is an inadequate intake of foods containing proteins, folic acid, and iron
- Anemia resulting from bone marrow suppression caused by toxic substances
- Pernicious anemia, in which there is faulty absorption of specific nutrients, such as vitamin B₁₂

Iron or folic acid may not be well absorbed in people who have an intestinal malabsorption syndrome.

Hemolytic anemias, in which red cells are destroyed prematurely in the body, have many causes. Hemolytic anemia can be a result of genetic defects that affect cell structure, causing the cells to disintegrate quickly. Some of the hemolytic anemias, such as **thalassemia**, are inherited, whereas others are acquired when erythrocytes are exposed to poisonous agents, such as chemicals or certain bacterial toxins.

Immune reactions can cause blood cell **hemolysis** (destruction of red cells). The presence of

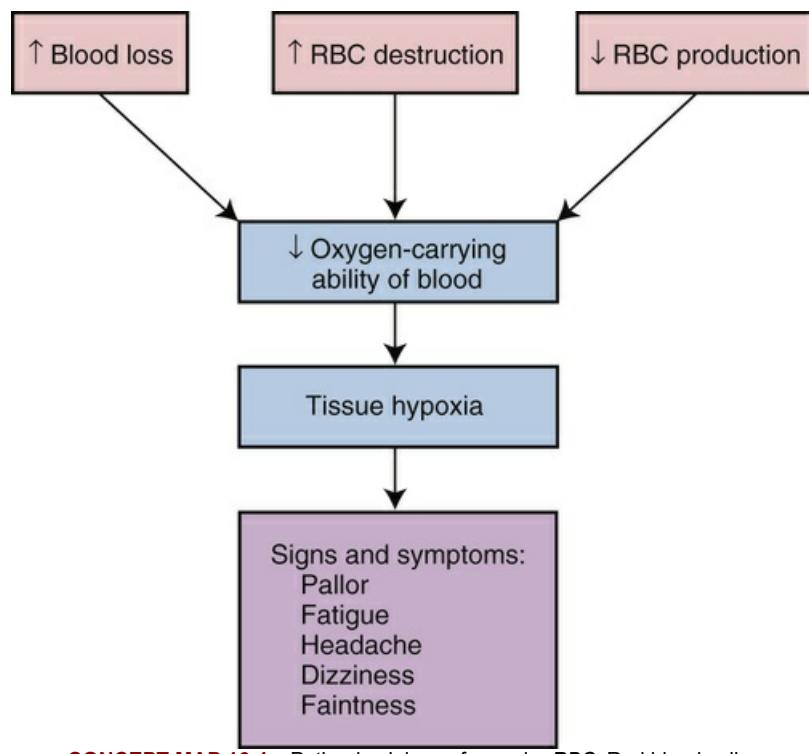
Toxins in the blood, infections such as malaria, transfusion reactions, and changes in blood chemistry may cause red cell hemolysis. Blood incompatibility in the newborn (**erythroblastosis fetalis**) is another cause.

Older Adult Care Points

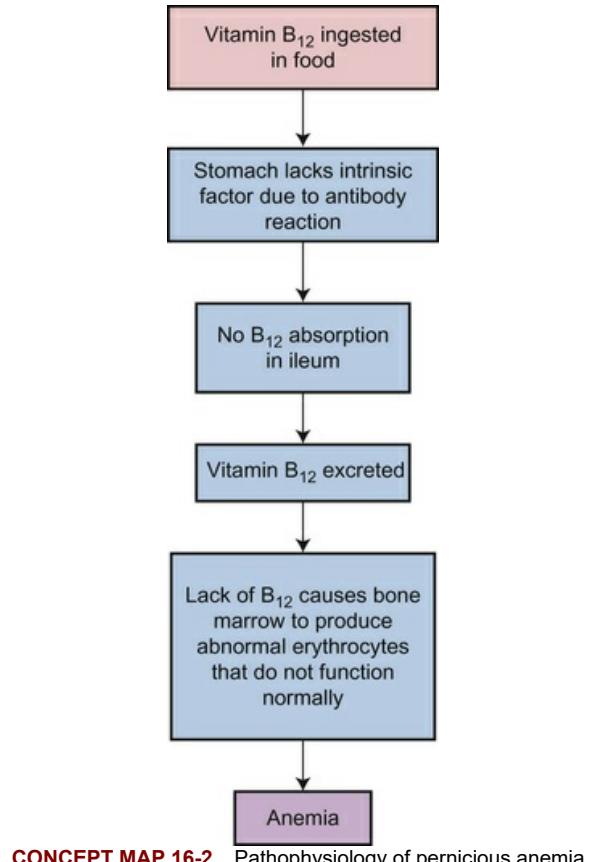
There is about a 20% incidence of anemia among older adults, most often because of poor nutrition. Shock may develop with smaller blood loss in this group because of decreased vascular tone and impaired cardiac function.

Pathophysiology

Iron deficiency anemia occurs when total body iron is insufficient and **erythropoiesis** (the production of red blood cells, as from the bone marrow) is diminished. The lack of iron impedes the formation of hemoglobin (Hb) ([Concept Map 16-1](#)). In **pernicious anemia**, an autoimmune disease, the intrinsic factor is missing from the gastric juices, and vitamin B₁₂ is not absorbed without it. Vitamin B₁₂ acts as a coenzyme in conjunction with folate metabolism and is important in the utilization of iron and protein for the manufacture of RBCs. The result of the missing intrinsic factor is that the red cell production is decreased, and those red cells that are produced are abnormal in their structure and function ([Concept Map 16-2](#)). To correct this condition, the provider will order the administration of vitamin B₁₂. A folic acid deficiency also contributes to anemia ([McCarron, 2013](#)).



CONCEPT MAP 16-1 Pathophysiology of anemia. *RBC*, Red blood cells.



CONCEPT MAP 16-2 Pathophysiology of pernicious anemia.

Hemolytic anemias associated with excessive destruction of RBCs are quite rare. When red cells are not normal, they break up easily or are destroyed by the body more quickly than are normal red cells. This RBC destruction causes the anemia.

Anemia occurs during end-stage renal disease when there is a deficiency of production of **erythropoietin**, a substance necessary to stimulate the creation of RBCs in the bone marrow. This problem is usually corrected by the administration of erythropoiesis-stimulating agents (ESAs), including epoetin alfa (Epogen) and darbepoetin alfa (Aranesp) (Poinier, 2013). These drugs can have severe side effects, including death, so they are used only until the hemoglobin level is high enough to prevent the need for a red blood cell transfusion. At this time, results are pending from two trials of these drugs, which are expected to provide guidelines for their administration. **Oxygen transport depends on the number and condition of the red cells and the amount of hemoglobin they contain.**

Clinical Cues

When a patient has had gastric bypass surgery or a gastrectomy, there is a risk of pernicious anemia from the resultant decrease of available intrinsic factor. Observe for signs of pernicious anemia in these patients.

Patients who take medications over a long period that suppress gastric acid secretion (histamine-2 inhibitors, proton pump inhibitors) must be watched for signs of pernicious anemia. Supplementation with vitamin B₁₂ injections or sublingual vitamin B₁₂ may help prevent this problem.

Signs and Symptoms

Signs and symptoms of anemias from causes other than rapid bleeding depend on whether the anemia is mild, moderate, or severe. Signs and symptoms of mild anemia (Hb 9.5 to 13 g/dL) are mild headache, palpitations, and dyspnea on exertion. Moderate anemia (Hb 6 to 10 g/dL) may include brittle nails, sore tongue, pallor, chronic fatigue, headache, and dizziness or faintness. Table 16-2 presents the many signs and symptoms of severe anemia. Tachypnea and tachycardia may

develop with severe anemia because of the decreased ability of the blood to transport sufficient oxygen to the tissues.

Table 16-2
Signs and Symptoms of Severe Anemia

BODY SYSTEM	SIGNS AND SYMPTOMS
General	Sensitivity to cold, lethargy, weight loss
Eyes	Blurred vision, blue sclera, yellowing of or pale conjunctiva, retinal hemorrhage
Skin	Pallor of face and palms, pruritus, jaundice, pale nail beds, pale mucous membranes, stomatitis, brittle nails, cheilitis
Cardiovascular	Palpitations, tachycardia, angina, systolic murmur, widened pulse pressure, intermittent claudication, CHF, possible MI
Respiratory	Tachypnea, orthopnea, dyspnea at rest
Gastrointestinal	Anorexia, difficulty swallowing, glossitis, enlarged liver, enlarged spleen, smooth tongue
Musculoskeletal	Bone pain
Neurologic	Headache, dizziness, impaired thinking, irritability, depression, fatigue

CHF, Congestive heart failure; MI, myocardial infarction.

Diagnosis

The microscopic appearance of the red cells in a film of blood that has been spread over a slide (a peripheral smear) gives information about abnormalities in size, shape, and color of erythrocytes circulating in the patient's bloodstream. The complete blood count (CBC) and differential cell count results are used to diagnose the presence of anemia. Measuring the quantity of hemoglobin determines whether the cells have sufficient amounts of hemoglobin to carry adequate oxygen to the body.

The prefix *normo-* refers to "normal"; the suffix *-cyte* refers to "cells"; the suffix *-chrom* refers to "color"; and the suffix *-ic* means "having the quality of" or "characterized by." Thus a normocytic, normochromic anemia is characterized by cells that are normal in size and color, but that have a deficiency in the number of RBCs and a low hematocrit. **This type of anemia usually occurs as a result of sudden blood loss.**

A hypochromic, microcytic anemia is characterized by decreased levels of hemoglobin (not enough color) and small (micro) cells. **This type of anemia is typical of an iron deficiency anemia.**

■ Common Foods High in Iron and Folic Acid

Foods High in Iron

- Beef liver
- Blackstrap molasses
- Chicken liver
- Cooked oatmeal
- Cooked prunes
- Cooked shrimp
- Dried apricots
- Egg yolks
- Kidney beans
- Lean beef
- Lima beans
- Whole grains
- Prune juice

- Raisins
- Spinach and green leafy vegetables
- Turkey

Adding raw spinach to dinner salads and snacking on raisins or dried apricots can quickly improve iron intake. Iron-enriched cereals and breads also can be added to the diet.

Foods High in Folic Acid

- Asparagus
- Beef
- Fish
- Cabbage
- Brussels sprouts
- Broccoli
- Legumes (kidney beans, etc.)
- Liver
- Eggs
- Whole grains

Note: Many of the foods high in iron also are high in folic acid.

Treatment

Correcting the underlying problem and then building up replacement blood cells treats anemia from chronic, slow blood loss. Anemia caused by inadequate iron, folic acid, or protein intake is managed with oral iron supplements, vitamins, and diet adjustment. If the anemia is serious, blood transfusions may be given, or iron supplementation may be administered intravenously (IV) with iron dextran (Imferon), sodium ferrous gluconate, or iron sucrose.

Pernicious anemia is treated by regular injections of vitamin B₁₂, or by weekly use of an intranasal form of cyanocobalamin (Nascobal), because the deficiency of intrinsic factor prevents adequate absorption of this vitamin from food. There must be sufficient folic acid in the diet or by supplement. [Table 16-3](#) presents the medications most commonly prescribed for hematologic disorders.

 **Table 16-3**

Drugs Commonly Used to Treat Disorders of the Hematologic System*

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Mineral			
Ferrous sulfate (Feosol, Fer-In-Sol) Ferrous gluconate (Fergon) Ferrous fumarate (Feostat, Ircon) Iron dextran (Imferon) IM or IV Iron sucrose IV (Venofer) Sodium ferric gluconate IV	Increases elemental iron as a component in the formation of hemoglobin. Used to treat iron deficiency anemia.	May cause GI upset: nausea, diarrhea, or constipation; monitor for constipation. Tell patient that oral form will turn stool black. Do not give with milk, which reduces absorption. Dilute elixir in juice and give through a straw to prevent staining of the teeth. Do not crush enteric-coated or sustained-release tablets or capsules. For IM form, give with at least a 3-inch, 19- to 20-gauge needle and use Z-track technique to prevent staining of the skin. Change needles after drawing up the solution. When given IV, monitor closely for anaphylactic reaction. Give with epinephrine; have Solu-Medrol on hand. Flush line with 10 mL saline after infusion.	Take oral form with orange juice or other vitamin C-rich food. Avoid taking iron with milk products. Keep out of reach of children, because it is toxic. Have Hb checked according to provider's schedule to check response to medication. Eat foods high in iron. Increase fluids and roughage if constipation occurs.
Vitamins			
Folic acid (Folvite)	Promotes normal erythropoiesis; used in certain types of anemia.	May interfere with anticonvulsant blood levels. Chloramphenicol interferes with absorption. Increase foods high in folic acid.	Have blood count monitored according to provider's schedule to determine effectiveness of therapy.
Vitamin B ₁₂ Cyanocobalamin (Rubramin, Anacobin);	Acts as coenzyme for cell replication and hematopoiesis. Used in pernicious anemia, other GI	Give SC or IM daily for 5-10 days and then once monthly for maintenance. Can cause anaphylactic reaction when given IV. Deficiency more common in strict vegetarians.	Teach importance of maintaining monthly injections for life to prevent further episodes of pernicious anemia. Encourage increased intake of vitamin

methylcobalamin	disorders that decrease vitamin B ₁₂ absorption, and cases of dietary deficiency.		B ₁₂ in diet if deficiency is diet related.
Antimetabolite			
Hydroxyurea (Hydrea)	Inhibits DNA synthesis. Used to reduce episodes of sickling in sickle cell anemia. Used to eradicate abnormal cells in leukemia, myeloma, polycythemia vera, and some solid tumors.	Discontinue if WBC count is <2500/mm ³ or platelet count is >100,000/mm ³ . Capsule granules may be mixed with water if taken immediately. May cause GI problems: stomach upset, stomatitis, vomiting, diarrhea.	Use cautiously in presence of renal dysfunction. Radiation therapy increases toxicity. Monitor intake and output. Monitor for infection. Monitor blood counts for neutropenia, thrombocytopenia, and bone marrow suppression. Caution to avoid exposure to infection and to report signs or symptoms of infection promptly. Increase fluid intake to maintain adequate hydration. Give mouth care q4h to prevent stomatitis. Report bleeding to the provider.
Biologic Response Modifiers			
Epoetin alfa; erythropoietin (Epogen, Procrit)	A natural hormone produced by recombinant DNA techniques that controls rate of red cell production. Stimulates the bone marrow, functioning as a growth factor. Used to combat reduced production of erythropoietin in end-stage renal disease. Used as adjunct therapy in HIV-infected patients with anemia secondary to drug therapy.	Also used for patients with anemia secondary to chemotherapy and in rheumatoid arthritis patients who experience anemia from therapy. May be used to increase RBCs in anticipation of autologous blood transfusion before surgery.	May cause seizures. Monitor blood count closely; dosage may need to be reduced if hematocrit rises too rapidly. Monitor blood pressure closely; may cause rise. May cause pain in limbs and pelvis. Explain the purpose of the injections. Remind that the drug must be refrigerated; discard after 6 hr at room temperature.
Filgrastim (Neupogen)	Stimulates production, maturation, and activation of neutrophils.	CBC with differential before beginning therapy and twice weekly thereafter. Monitor BP; may cause transient increase.	Teach to inform provider if fever, chills, severe bone pain, chest pain, or palpitations occur.
Pegfilgrastim (Neulasta)	Regulates production of neutrophils within bone marrow. Increases phagocytic activity.	CBC and differential before therapy and routinely thereafter. Monitor for allergic reaction (i.e., peripheral edema). Assess muscle strength. Observe mouth for stomatitis, mucositis.	Inform of possible side effects and how to watch for allergic reaction. Remind that regular blood counts are important.

*Chemotherapy drugs are discussed in Chapter 8.

BP, Blood pressure; CBC, complete blood count; GI, gastrointestinal; Hb, hemoglobin; HIV, human immunodeficiency virus; IM, intramuscularly; IV, intravenously; RBCs, red blood cells; SC, subcutaneously; WBC, white blood cell.

For **hemolytic** anemia, the underlying cause is found and corrected (if possible) and then the blood volume is rebuilt with added iron and appropriate diet. If the anemia is severe, blood transfusion may be indicated.

Think Critically

Your patient who has suffered a blood loss and is now anemic complains that he is short of breath. Can you explain how blood loss might affect respiration?

Nursing Management

Assessment (Data Collection)

Whenever a patient complains of fatigue, headaches, or shortness of breath, anemia should always be considered. A CBC and data regarding physical signs and symptoms are collected.

Focused Assessment

Data Collection When Anemia Is Suspected

Health History

Ask the patient the following questions:

- Have you had any recent blood loss or trauma?
- Do you have chronic liver, endocrine, gastrointestinal, or renal disease?
- What medications, vitamins, supplements, or herbal products do you take?
- What surgeries have you had and when?
- Have you ever had radiation treatments or chemotherapy?
- Is there a history of genetic blood disorders in your family?
- Has your appetite or weight changed?

- Have you noticed any changes in your urine or stool?
- Are you experiencing shortness of breath, weakness, or fatigue?
- Have you noticed any heart palpitations?
- Do you get frequent headaches?
- Have you noticed any changes in vision or dizziness?
- Do you have pain or itching anywhere?
- Do you become cold when others are not?

Physical Assessment

Check for the following:

- *Skin:* Pale skin and mucous membranes; pale conjunctiva, yellowing of sclera; cracks in lips; brittle, spoon-shaped fingernails ([Figure 16-1](#)); jaundice; petechiae; ecchymoses; dry, brittle, thinning hair



FIGURE 16-1 Thin, concave (spoon-shaped) nails with raised edges may be seen on people with iron deficiency anemia.

- *Respiratory:* Tachypnea, orthopnea, dyspnea on exertion or at rest
- *Cardiac:* Tachycardia, systolic murmur, angina, ankle edema
- *Gastrointestinal:* Sore mouth, stomatitis, beefy red tongue, abdominal distention, enlarged liver or spleen
- *Neurologic:* Headache, dizziness, confusion, irritability, ataxia (unsteady gait), paresthesia

Pertinent Laboratory Values

- CBC, serum iron, ferritin, folate, cobalamin (vitamin B₁₂), stool for guaiac, urinalysis, serum erythropoietin

Nursing Diagnosis

Problem statements/nursing diagnoses are based on the clinical findings. Common problem statements include:

- Altered activity tolerance due to weakness and fatigue
- Altered gas exchange due to decreased hemoglobin
- Altered nutrition due to poor diet and anorexia
- Insufficient knowledge regarding nutrition and medication regimen

Specific nursing diagnoses can be chosen from the NANDA-I list (see inside the back cover).

■ Planning

Expected outcomes are written for the specific individual problem statements chosen to resolve the patient's problems. For the problem statements listed, outcomes might include:

- Within 1 month patient will be able to perform hygiene, dressing, and grooming activities without needing to rest between activities.
- Within 2 months patient will be able to carry out usual daily activities without shortness of breath or fatigue.
- Patient will eat three nutritious meals per day, containing sufficient iron, folic acid, vitamin C, and protein, daily.
- Patient will verbalize understanding of dietary and medication regimen within 1 week.

■ Implementation

Intervention is based on an understanding of the particular kind of anemia affecting the patient. Anemia from blood loss presents problems quite different from those related to chronic—and possibly incurable—aplastic or hemolytic anemia. For patients with anemia that interferes with clotting and that tends to cause bleeding episodes, nursing actions are directed toward preventing the episodes. For any patient with anemia severe enough to cause fatigue, assist with daily living activities and provide planned rest periods.

Nursing functions include administering blood, iron, vitamin B₁₂, and folic acid and monitoring for desired effects. Patients are educated about needed dietary adjustments. Patients should be taught that iron is absorbed more readily if vitamin C is simultaneously present in the gastrointestinal (GI) system. Taking iron medication with orange juice provides the necessary vitamin C.

Analgesia for headache or joint pain is given as ordered, and the patient is monitored for adverse side effects. More problem statements commonly associated with hematologic problems, including anemia, and lists of appropriate interventions are included in [Table 15-2](#).

▣ Older Adult Care Points

- Iron supplements should be taken 1 hour before or 2 hours after a meal, as long as they do not cause GI distress.
- Many older adults have chronic conditions that require daily medication. Antacids and many other drugs interfere with iron absorption.
- Check all drugs a patient is receiving to determine whether drug interactions might interfere with iron absorption.

■ Evaluation

Evaluation data are gathered to determine whether expected outcomes are being met. Laboratory values are particularly important when evaluating the care of a patient with anemia. However, equally important are data showing that the problems caused by the anemia are resolving.

Aplastic Anemia

Aplastic anemia (a rare disorder) may develop after a viral infection, as a reaction to a drug, or because of an inherited tendency. The disease is characterized by bone marrow depression and is believed to probably be an immune-mediated disease. Red cells, white cells, and platelet levels are decreased. The toxic effects of certain substances can be responsible for aplastic anemia. Some of these agents include benzene; insecticides; drugs, such as chloramphenicol (Chloromyctin), phenylbutazone (Butazolidin), and sulfonamides; some anticonvulsants; gold compounds used to treat rheumatoid arthritis; and alkylating agents or antimetabolites used in chemotherapy. Many other drugs can cause aplastic anemia, but this adverse effect is rare. Radiation exposure is another factor in the development of the disorder.

Safety Alert

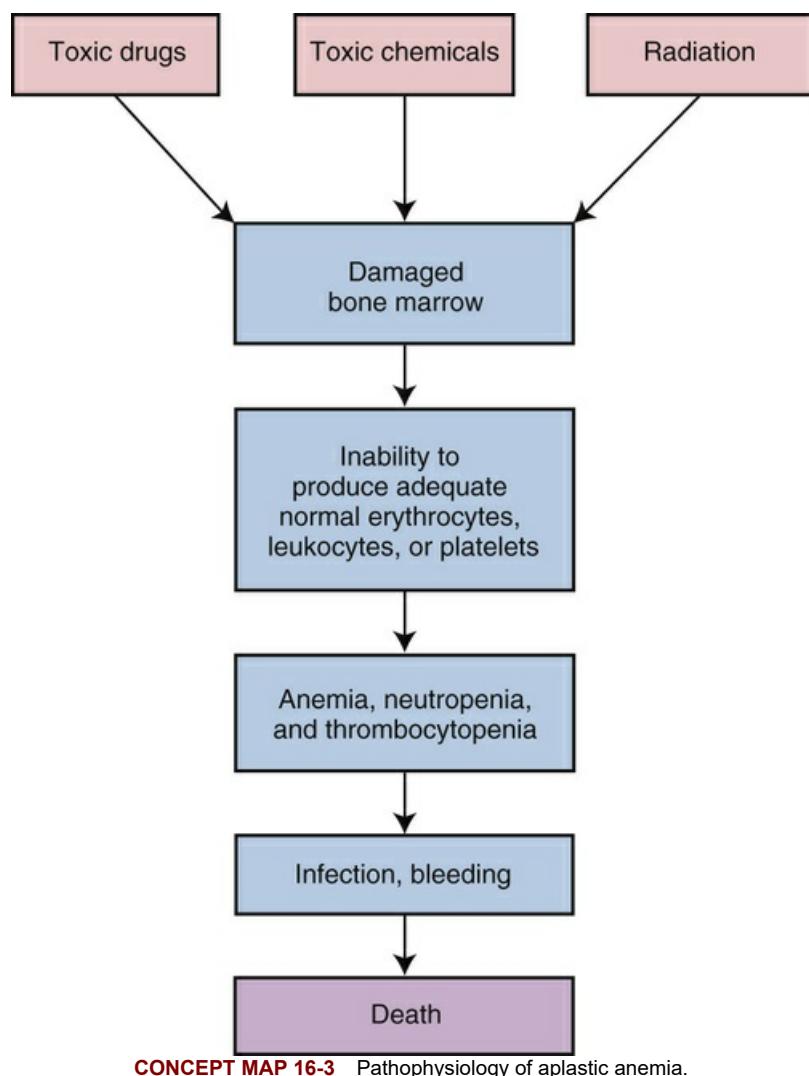
Monitor Drug Side Effects

It is your responsibility to monitor blood studies carefully for all patients who are receiving any drug that is potentially damaging to the bone marrow.

Think Critically

What chemical products in your home or garage are capable of causing bone marrow depression?

Impairment or failure of bone marrow function leading to the loss of stem cells is the cause of aplastic anemia (Concept Map 16-3). With aplastic anemia, the bone marrow has decreased cells and increased fatty tissue. In addition to the signs and symptoms of iron deficiency anemia, ecchymosis, petechiae, and hemorrhage[®] related to low platelet count also occur. Infection is common and may not cause an inflammatory response because of the very low leukocyte count. There is often frequent bleeding in the mouth.



Diagnosis is by blood count with differential, bone marrow biopsy, and ruling out other disorders. **Aplastic anemia causes an emergency situation.** Treatment must eliminate any identifiable underlying cause. Packed red cells and platelets are administered. Antibiotics are given

for identified infection; oxygen is sometimes administered to patients with low erythrocyte counts. Bone marrow transplantation (BMT) is the treatment of choice for patients younger than 45 years with severe bone marrow depression, but there must be an identical human leukocyte antigen (HLA) match. Immunosuppressive therapy with antithymocyte globulin (ATG) and cyclosporine is showing promise at improving outcomes. ATG contains polyclonal antibodies against human T cells. The 5-year survival rate for young survivors is about 70%.

Prevention of hemorrhage and infection is a top priority. Psychological support of the patient and family is important when they are faced with this life-threatening condition. Safety measures are priorities. Actions for problems of weakness and fatigue are the same as those presented for anemia earlier in the chapter. Other common nursing interventions are included in [Table 15-2](#). See [Chapter 8](#) and the Evolve website for precautions and actions for patients with disseminated intravascular coagulopathy and neutropenia and for safety measures when thrombocytopenia is present.⁸

Health Promotion

Dangers of Toxic Agents

All nurses should promote public education about the dangers of toxic agents. It is vitally important that people read and follow the label instructions on all cleaning agents, insecticides, and chemical compounds.

Sickle Cell Disease

Etiology

Sickle cell disease is a genetic disorder in which the gene is inherited⁸ from both parents (homozygous gene) ([Table 16-4](#)). Sickle cell disease is characterized by erythrocytes that contain more hemoglobin S than hemoglobin A. Sickle cell disease is found in less than 1% of African American newborns but also affects some people whose ancestors are from the Mediterranean region, the Middle East, and India. Approximately 8% of African Americans carry the gene.

Table 16-4
Comparison of Four Types of Anemia

CHARACTERISTIC RBC	ETIOLOGY	ADDITIONAL EFFECTS
Iron Deficiency Anemia		
Microcytic, hypochromic Decreased hemoglobin production	Decreased dietary intake, malabsorption, blood loss	Only effects of anemia
Pernicious Anemia		
Megaloblasts, immature nucleated cells	Deficit of intrinsic factor due to immune reaction	Neurologic damage Achlorhydria
Aplastic Anemia		
Often normal cells Pancytopenia	Bone marrow damage or failure	Excessive bleeding and multiple infections
Sickle Cell Anemia		
RBC elongates and hardens in "sickle" shape when O ₂ levels are low—short life span	Recessive inheritance	Painful crises with multiple infarctions Hyperbilirubinemia

RBC, Red blood cell.

From Gould BE, Dyer RM: *Pathophysiology for the health professions*, ed. 4, Philadelphia, 2011, Saunders.

Sickle cell trait, in which only about 50% of an individual's total hemoglobin is affected, is present in about 10% of the African American population of the United States. The trait is heterozygous, meaning that the person has an inherited gene for the trait from one parent only. People with the heterozygous trait for sickle cell are carriers; they can transmit the gene to their children even when they themselves do not show signs of the disease. Therefore genetic counseling and adequate screening for early detection of the disease are considered extremely important to control sickle cell anemia. In the United States many patients with sickle cell anemia live into their mid-40s. The most common cause of death is acute chest syndrome, in which damage occurs to the lungs.

Pathophysiology

When a patient with sickle cell disease experiences lower oxygenation than normal, the defective S

hemoglobin forms clumps in the red cells, causing them to assume a sickle shape, blocking blood vessels, breaking apart, and forming thrombi that cause organ damage. Sickle cells are destroyed by the body very quickly, causing anemia.

Sickle cell trait occurs in people who have only one gene, rather than a pair of genes, for sickle cell anemia. They usually do not have problems with cells assuming a sickle shape unless they experience severe oxygen deficiency.

Signs and Symptoms

The signs and symptoms of sickle cell disease are those that indicate lack of oxygen and blood flow, such as pallor, lethargy, and pain. The problems from interrupted normal blood flow affect many organs (Figure 16-2). Painful swelling of the hands and feet related to bone infarction from the sickled cells (hand-foot syndrome) may occur. After sickle cell crisis, signs typical of anemia occur because the abnormally shaped cells are very fragile, break easily, and are destroyed. The RBC and hemoglobin counts can drop very quickly during a crisis.

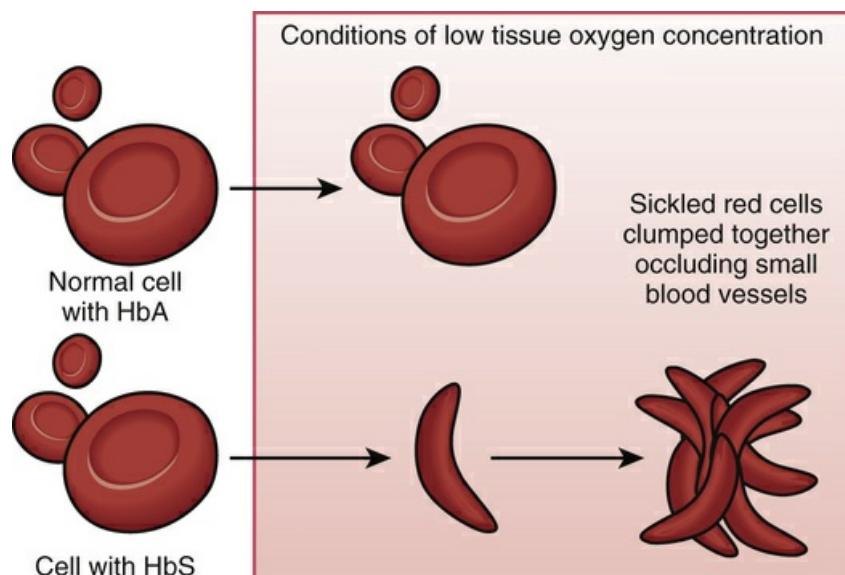


FIGURE 16-2 Sickling of red cells occurs when tissue oxygen is low. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2012, Elsevier Saunders.)

Diagnosis

A peripheral blood smear can show sickled cells. The sickling test, which exposes RBCs to a deoxygenating agent, is diagnostic. Hemoglobin electrophoresis identifies the presence of abnormal hemoglobin. During crisis, there will be elevations of serum bilirubin because of the hemolysis of the abnormal red cells. Skeletal x-rays reveal bone and joint abnormalities.

Treatment

There is no cure or specific treatment for sickle cell anemia; treatment is primarily symptomatic and preventive. Patients should be taking folic acid regularly and eating a diet with sufficient protein to help build red cells. Infection is to be prevented, and the patient should receive all recommended immunizations against influenza, hepatitis A and B, pneumonia, tetanus, and other diseases.

Adequate intake of fluid on a daily basis is important to keep the blood as fluid as possible. Alcohol and recreational drugs are to be avoided, because they can cause complications. Quick attention for illness should be sought.

The drug hydroxyurea (Hydrea) has been found to reduce the frequency of sickling episodes. Patients taking this drug have shown a 50% decrease in the number of hospitalizations for crisis (SCD, 2015). If a crisis occurs, the patient may be treated at home with bed rest, adequate fluid intake, and analgesics. Pain control is important during a crisis. Narcotic analgesia with morphine is administered on a continuous basis, usually by patient-controlled analgesia pump. If the patient's

hemoglobin drops considerably or his condition suddenly deteriorates, he is hospitalized, given oxygen, and transfused with packed red cells and IV fluids are given. An attempt is made to mobilize the sickled cells and to prevent damage to major organs. Infection is treated with appropriate antibiotics.

There are many complications of sickle cell disease, including cholecystitis, stroke, congestive heart failure, and damage to all major organs (Figure 16-3). One of the most common problems is leg ulcers from impaired circulation to the legs and feet. Protecting the feet and lower legs from injury is important, because small wounds tend to develop into difficult-to-heal ulcers.

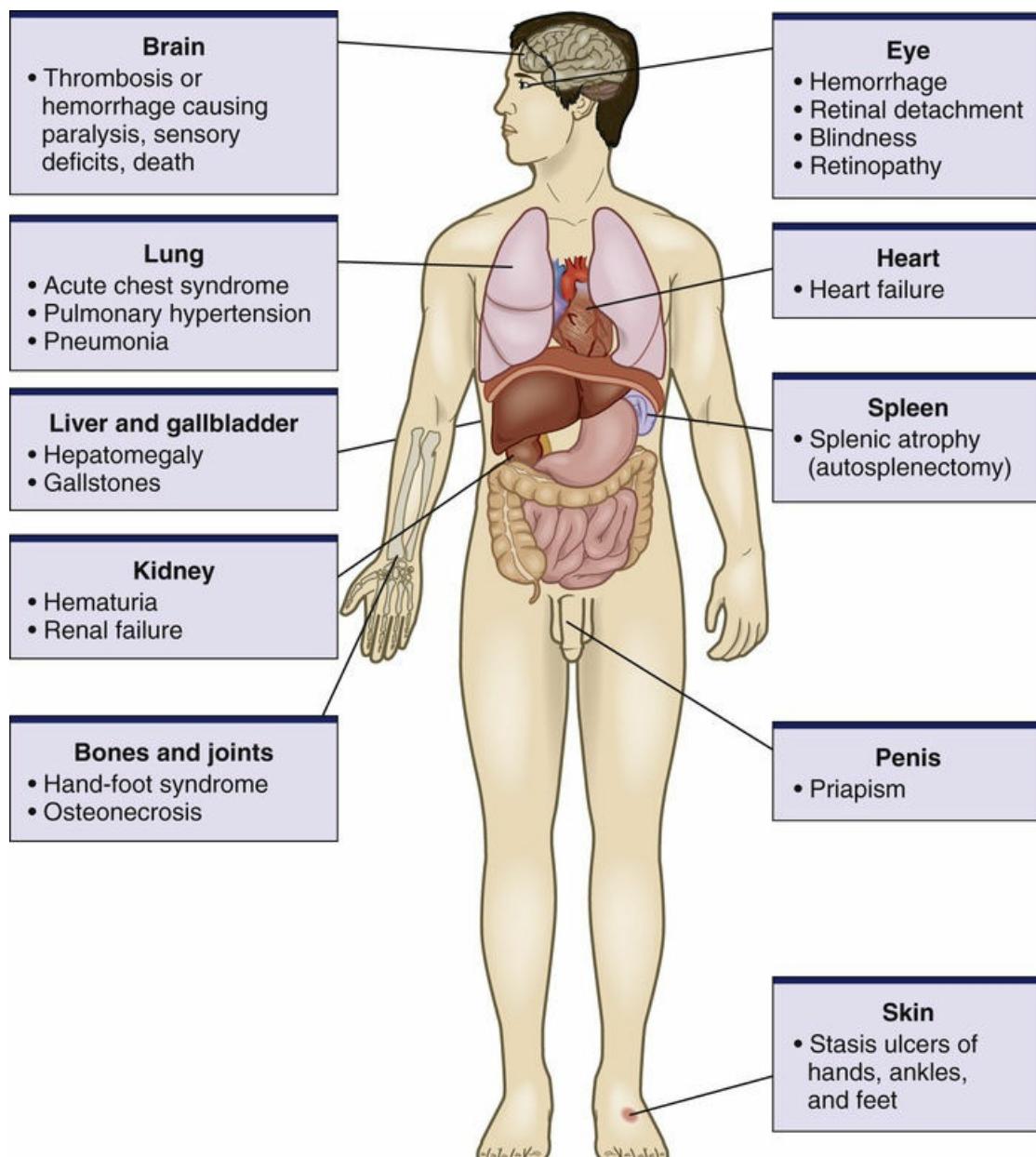


FIGURE 16-3 Clinical manifestations and complications of sickle cell disease. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Elsevier Saunders.)

BMT is currently the only available treatment that can cure some patients. The scarcity of donors, the cost, and the risks involved greatly limit the use of this option. Gene therapy is offering hope for future treatment of sickle cell disease. Researchers at UCLA have discovered a technique to use hematopoietic (blood-producing) stem cells (HSC), which have had an antisickling gene introduced, from the bone marrow of patients with sickle cell disease. In early 2014, trials of this groundbreaking technique began with the hope for promising results.

Nursing Management

Nursing care is aimed at relieving the symptoms from complications of the disease and minimizing organ damage. Patients are taught to avoid high altitudes, vigorous exercise, and iced liquids. Patients are to maintain adequate fluid intake, refrain from smoking, and obtain treatment for infections promptly. Adequate rest is important, because patients with sickle cell anemia experience fatigue. **Assessment for adequate pain relief is a top priority** (Myers and Eckes, 2012). Intake and output will be monitored to prevent overloading the patient with fluid. Oxygen therapy is instituted if the patient is hypoxic (oxygen therapy helps prevent further cellular damage).

Polycythemia Vera

Excessive production of RBCs results in polycythemia vera. White cell numbers sometimes also increase, but not to the degree that they do in leukemia. The cause of polycythemia vera is unknown, but the disease is considered a neoplastic disorder. The blood becomes thick from the increased numbers of cells, blood vessels become distended, and blood flow is sluggish. Because of the sluggish flow, there is a tendency to develop blood clots. Blood pressure is elevated and the heart hypertrophies. Hemorrhage is common in areas of distended blood vessels. Signs and symptoms of polycythemia vera include a reddish face with deep-red purplish lips, fatigue, weakness, dizziness, headache, enlarged spleen (**splenomegaly**), and congested liver. Minor injury may result in excessive bleeding.

Diagnosis includes a genetic test for the JAK2V617F mutation. This mutation is positive in 95% of cases of polycythemia vera.

Treatment is aimed at reducing the number of blood cells. Phlebotomy, antineoplastic agents, and radiation therapy are all used. In phlebotomy, a blood vessel is pierced, and blood is drawn off. As much as 500 mL of blood at a time may be withdrawn every 2 to 3 months. **Increased fluid intake is essential to decrease blood viscosity, and aspirin is used to decrease platelet clumping and clot formation.**

A secondary polycythemia may develop in response to prolonged hypoxia and increased erythropoietin secretion. Secondary polycythemia does not have the same effects as primary polycythemia. In addition, 20% of patients develop acute myelogenous leukemia (AML).

Leukemia

The word *leukemia*, translated literally, means “white blood.” Actually, the white blood cells (WBCs) would have to number 1,000,000/mm³ before the blood would have a milky white appearance, and, although leukemia is characterized by an increase in the number of leukocytes, their number rarely rises above 500,000/mm³. In addition to the increase in number, however, the leukocytes of patients with leukemia are abnormal cells that do not function as normal white cells do.

Etiology

Leukemia is a cancer, and as with other types of cancers, the exact cause of leukemia is not known. There are factors considered to be closely linked with the development of leukemia. **Exposure to ionizing radiation in relatively large doses is one such factor. Another is exposure to certain chemicals, such as benzene, that are toxic to bone marrow.** Benzene is an ingredient in lead-free gasoline, and the incidence of leukemia has risen since lead-free gasoline has been in use. The amount of exposure to benzene and other chemicals that causes bone marrow suppression is unknown, and this amount possibly varies among individuals. **It is prudent to be careful about breathing gasoline fumes and using household chemicals and pesticides.** The third factor is the retrovirus known as *human T-lymphotropic virus 1 (HTLV-1)*, which causes human T-cell leukemia. People with an abnormal number of chromosomes and chromosomal translocations are at a greater risk for developing acute lymphocytic leukemia. About 90% of patients with chronic myelogenous leukemia have the Philadelphia chromosome.

Malignant production of WBCs is the actual cause of the disease. DNA becomes damaged. **Table 16-5** shows the clinical manifestations of leukemia and the factors linked to their development.

Table 16-5
Causes of Clinical Signs of Leukemia

MANIFESTATIONS	CAUSES
Severe infections	Immature and abnormally functioning leukocytes, even though there is an increased number of them.
Symptoms of anemia	Rapidly proliferating white cells apparently "crowd out" developing red cells and platelets.
Enlarged spleen, liver, and lymph nodes	Excess white cells accumulate within organs, causing distention of tissues.
Weakness, pallor, and weight loss caused by elevated metabolic rate	Increased production of white cells requires large amounts of amino acids and vitamins. Increased destruction of cells leads to more metabolic wastes that must be disposed of by the body.
Renal pain, urinary stones and obstruction to flow of urine, and urinary tract infection	Large amounts of uric acid are released when white cells are destroyed by antileukemic drugs.
Headache, disorientation, and other central nervous system symptoms	Abnormal white cells infiltrate the central nervous system.

Pathophysiology

An acute leukemia is one in which there are a large number of primitive cells, called *blasts*. In chronic leukemia, the predominant cells are more developed than blasts. Leukemias are also classified by the origin of the abnormal cells. Myeloid leukemia arises from the bone marrow, whereas lymphoid leukemia has its origin in the lymphatic system. There are four main types of leukemia: acute myelogenous leukemia (AML), chronic myelogenous leukemia (CML), acute lymphocytic leukemia (ALL), and chronic lymphocytic leukemia (CLL).

About 54,270 people will develop leukemia in 2015, and 24,450 people in the United States will die of it ([American Cancer Society, 2015](#)). In acute leukemia there is a sudden, rapid growth of immature blast or stem cells, rapid progression of the disease, and a short survival if the disease is not treated. Most leukemia occurs in adults older than 60 years.

Chronic forms of leukemia have a more gradual onset, slower disease progression, and a relatively longer survival time. CLL is common in men older than 50 years and accounts for one third of the new cases of leukemia annually. CML is most common in young and middle-aged adults. Over time CML progresses to the acute form, and eventual death is common.

Leukemia has three major effects:

1. Increased numbers of abnormal, immature leukocytes
2. Accumulations of these cells within the lymph nodes, spleen, and other organs
3. Eventual infiltration of the malignant cells throughout the organs of the body

Signs, Symptoms, and Diagnosis

Patients with chronic leukemias are often asymptomatic, and the disease is detected during a regular physical examination and routine CBC. Other signs and symptoms of leukemias include fever, malaise, frequent or persistent infections (sore throat, flu, etc.), swollen lymph nodes, enlarged spleen, bone pain, weight loss, and easy bleeding or thrombosis. Diagnosis is made by using the history, physical examination, CBC with differential, and bone marrow studies to rule out other disorders.

Treatment

Treatment is aimed at:

- Slowing down the growth of the malignant blood cells
- Maintaining a normal level of red cells, hemoglobin, and platelets
- Managing the symptoms and meeting the special needs of each patient

Acute leukemia treatment consists primarily of chemotherapy with a combination of antineoplastic agents targeted at different phases of the cell cycle. The drug therapy is divided into three phases: induction, consolidation, and maintenance. **Remission induction** therapy is initiated at the time of diagnosis and consists of an intensive combination chemotherapy aimed at achieving a complete remission of symptoms. **Consolidation** therapy is another course of the same agents, or others, at a different dosage level, and the goal is to achieve cure. **Maintenance** therapy is usually oral chemotherapy at lesser doses taken for 2 to 5 years to maintain remission.

Older Adult Care Points

Patients older than 65 years require reduced dosages of chemotherapeutic drugs (to prevent toxicity) because they have decreased kidney and liver function and the drugs are not metabolized as quickly in older adults as they are in a younger person.

Before chemotherapy is started, the patient should be well hydrated and given a drug orally to prevent hyperuricemia and kidney stones. Radiation therapy is used as a supplement to increase the success of treatment and to decrease discomfort from enlarged organs (spleen, liver). Cure is sometimes possible, as has been evidenced in children with ALL. Results in adults have not been as good. BMT is a possibility for patients who have had an initial remission with chemotherapy. Eventually it is hoped that stem cell treatment, or monoclonal antibody treatment combined with BMT, will provide lasting remission. If an enlarged spleen does not respond to radiation, splenectomy may be performed. **Chronic lymphocytic leukemia**—the most common leukemia seen in older adults—is not treated until the patient experiences symptoms. At that time a combination of chemotherapy agents is used.

Chronic myelogenous leukemia is currently treated with imatinib (Gleevec) or a combination of imatinib with other agents. Recombinant human alpha interferon has been shown to reduce the growth and division of leukemic cells in 55% to 60% of patients ([Navigating Cancer, 2015](#)). Hydroxyurea (Hydrea) may be used as a single chemotherapeutic agent. **Leukapheresis** (separation of white cells) may be done to reduce the massive number of circulating leukocytes that clog organs and cause damage. Blood is drawn, the unwanted white cells are separated out, and the remainder is returned to the patient. A small percentage of patients with CML are likely candidates for BMT.

Transfusions of blood components are prescribed for leukemia patients to maintain a near-normal blood picture. Platelet transfusion during or after chemotherapy often is necessary. Antibiotics may be given prophylactically during chemotherapy and are started immediately on signs of infection, because the body's defense mechanisms are seriously compromised. **Box 16-1** lists the chemotherapy agents used to treat the various types of leukemia.

Box 16-1

Chemotherapeutic Agents Used to Specifically Treat Leukemia

Chronic Lymphocytic Leukemia

- Chlorambucil
- Fludarabine
- Cyclophosphamide
- Vincristine
- Prednisone
- Rituximab
- Alemtuzumab
- Pentostatin
- Cladribine

Chronic Myelogenous Leukemia

- Imatinib
- Dasatinib
- Busulfan
- Hydroxyurea
- Interferon alpha

Acute Myelogenous Leukemia

- Cytosine arabinoside
- Anthracycline
- Daunorubicin
- Doxorubicin
- Anthracenedione
- Arabinosyl cytosine

Acute Lymphocytic Leukemia/Acute Lymphoblastic Leukemia

- Daunorubicin
- Vincristine
- Prednisone
- L-Asparaginase
- Cyclophosphamide
- Cytarabine
- 6-Mercaptopurine
- Methotrexate
- Cytosine arabinoside
- Clofarabine
- Doxorubicin
- Fludarabine
- Pentostatin
- Rituximab

Nursing Management

A thorough health assessment is performed, and specific problems are identified. Problem statements for a patient with leukemia include those appropriate for anemia, leukopenia, and thrombocytopenia. Patient problems to be addressed are:

- Potential for infection
- Abnormal bleeding
- Anemia
- Nutritional alteration with severe anorexia and weight loss
- Increased levels of uric acid in the urine and blood (resulting from chemotherapy)
- Psychosocial problems related to the effects of the disease, as well as the prescribed treatment

Collaboration with the dietitian and the pharmacist is a key point in nursing care of a patient with leukemia. [Nursing Care Plan 16-1](#) presents care for common problems of patients with leukemia.

Nursing Care Plan 16-1

Care of the Patient With Leukemia

Scenario

James Cathcart, a 42-year-old man, has acute myelogenous leukemia (AML). He is undergoing outpatient chemotherapy and is being followed at home by a home care agency nurse.

Problem Statement/Nursing Diagnosis

Potential for infection/*Risk for Infection related to low WBCs.*

Supporting Assessment Data

Objective: WBCs 2000/mm³.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will remain free of infection.	Monitor temperature daily. Report elevation >100.4° F (>38° C) that lasts for more than 4 hr.	Temperature elevation may indicate beginning infection.	Temp remains at 99.2° F (37.3° C).
	Teach patient and family to perform hand hygiene frequently.	Hand hygiene helps prevent infection.	Hand hygiene used consistently.
	Use meticulous hand hygiene when caring for patient.	Helps prevent transmission of microorganisms.	
	Have patient deep breathe q2h while awake.	Respiratory exercises help prevent respiratory infection from pooled secretions.	Using incentive spirometer regularly.
	Administer transfusion of granulocytes as needed.	Granulocyte transfusion provides WBCs to help fight infection.	Transfusion not ordered yet. Continue plan.
	Caution to eat only cooked fruits and vegetables.	Raw foods often carry bacteria that could cause infection.	States understands need to only eat cooked foods.

Problem Statement/Nursing Diagnosis

Fatigue/*Fatigue related to chemotherapy side effects.*

Supporting Assessment Data

Subjective: States has no energy; frequently falls asleep.

Objective: RBCs 3.2 million/mm³, Hct 33 mL/dL.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will be able to bathe and dress self without assistance.	Provide bathing assistance daily.	Conserves patient's energy.	Bathing assistance given daily.
	Encourage resting between care activities.	Prevents undue fatigue.	Is resting between activities.
	Encourage to perform ADLs in small segments.	Preserves energy.	Is combing hair and brushing teeth.

Problem Statement/Nursing Diagnosis

Altered family coping/*Disabled Family Coping related to loss of patient's income.*

Supporting Assessment Data

Subjective: Patient too weak to work; wife seeking full-time employment.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient's wife will cope effectively as primary wage earner.	Assist wife with defining alternatives for employment.	Helps focus direction for employment.	Wife is considering possible alternatives.
	Arrange consultation with social worker to coordinate patient's care when wife returns to work.	Social worker can arrange in-home assistance.	Social services appointment made.
	Suggest community resources that might help wife find employment.		Wife given list of community resources for employment. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for Injury related to decreased platelets.*

Supporting Assessment Data

Objective: Platelets 106,000/mm³.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience episodes of bleeding.	Monitor CBC and platelet counts.	Will detect further decrease in platelets.	CBC remaining stable, but platelets down to 104,000/mm ³ .
	Instruct to report oozing of blood from the gums.	Alerts to potential for impending bleeding episode.	No oozing of blood.

	Instruct to observe stool and urine for signs of bleeding.	
	Administer stool softener to prevent constipation.	Soft stool will not injure rectal mucosa, causing bleeding.
	Instruct to use soft toothbrush or toothettes to clean teeth.	Helps prevent small breaks in mucosa or skin that might cause bleeding.
	Instruct to use an electric razor to shave.	Using soft toothbrush and electric razor. Continue plan.

Critical Thinking Questions

- What measures are necessary for a patient who is immunosuppressed from chemotherapy and is susceptible to infections?
- How could you help boost Mr. Cathcart's self-esteem now that he has to give up his role as the family wage earner?

Infections from bacteria, viruses, and fungi are the most common cause of death in people with leukemia. Infection is a threat either because of abnormal function of bone marrow that is characteristic of the disease or because of suppression of bone marrow function as a result of therapy. Nursing measures to prevent infection are essential, as is vigilant assessment for early signs (see [Chapter 8](#) for information about risk for infection from the effects of chemotherapy or radiation).

Abnormal bleeding as a result of a very low platelet count is the second most common and dangerous complication of leukemia. Observation of the patient, awareness of the patient's current platelet count, and prevention of trauma to body tissues and blood vessels as a result of low platelets are primary concerns in nursing management.

Safety Alert

Prevent Bleeding

For a patient with a low platelet count, whenever venipuncture is performed, an injection is administered, or an intravenous catheter or needle is discontinued, pressure over the site must be maintained for 10 minutes to prevent continuous oozing.

Older Adult Care Points

- Older adult patients already have decreased immune system function. When leukemia develops, or is treated, these patients are at very high risk for infection.
- Older adult patients cannot tolerate hemorrhage, and so hemorrhage must be carefully guarded against.
- Other conditions may affect appetite. Emphasis on an appropriate diet, supplements, good nutritional status, and excellent mouth care can make a marked difference in the quality of life of an older adult with leukemia.

Anemia and its associated problems of fatigue, hypoxia, GI upsets, and cardiovascular complications affect patients with leukemia. The anemia can result from the disease itself, from excessive bleeding, or from the therapy administered. Nursing measures previously described for a patient with anemia are appropriate to the care of a patient with leukemia. Colony-stimulating factor drugs sometimes are used to counteract the anemia and neutropenia caused by treatment for leukemia. However, these drugs may stimulate the growth of abnormal cells, making the patient's condition worse, and so are used with caution.

Nutritional problems arise from any of a number of conditions. **Extreme weight loss and cachexia are nearly always seen in patients with advanced cancer.** Failure to eat sufficient amounts of nutritious foods is not the only reason this is so. As explained in [Chapter 8](#), metabolic changes that occur with the proliferation of malignant cells in the body also are responsible for weight loss and emaciation. If nursing measures to alleviate or minimize **stomatitis** (inflammation of the mouth), nausea, and vomiting are not effective, parenteral nutrition may be necessary, but

using total parenteral nutrition as a standard precaution for high-risk patients is not effective (Kim and Kim et al, 2012).

The increased level of uric acid that results from rapid cell destruction during chemotherapy often causes the uric acid crystals to settle out in the kidney structures, causing impaired renal function. Maintaining adequate hydration and administering drugs to decrease the production of uric acid are important nursing measures, as is close observation of fluid intake and urinary output. The emotional effect of a diagnosis of cancer and the psychosocial needs of the cancer patient and his family are discussed in [Chapter 8](#).

Think Critically

Why is it common for a leukemia patient to have frequent infections? What causes this problem? When caring for a leukemia patient, what parameters would you need to assess to detect early signs of infection?

Thrombocytopenia

Thrombocytopenia occurs when the platelet count drops to less than $150,000/\text{mm}^3$ and can be a life-threatening condition. Causes include bone marrow depression from chemotherapy or radiation, autoimmune diseases, bacterial and viral infections, disseminated intravascular coagulation (DIC), and overfunction[®] of the spleen. Certain drugs, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and thiazides, also can result in platelet deficiency.

Immune thrombocytopenic purpura (ITP) is the most common acquired thrombocytopenia. It is an autoimmune disease in which there is abnormal destruction of circulating platelets. In ITP the platelets are covered with antibodies. In the spleen, these platelets are recognized as foreign and are destroyed by macrophages. This disorder commonly occurs in women between 20 and 40 years of age. The chronic form of ITP has a gradual onset, with transient remissions. Heparin therapy sometimes causes a type of thrombocytopenia that can be life-threatening. Porcine-prepared heparin seems to cause less of this problem than other types of heparin.

Many patients with thrombocytopenia are asymptomatic. Signs and symptoms of thrombocytopenia include **purpura** (purple spots and patches and small areas of multiple petechiae in the skin and mucous membranes) or large bruised areas caused by hemorrhage that are called **echymoses** ([Figure 16-4](#)). Bleeding can occur in any part of the body. Hemorrhage is the major danger.



FIGURE 16-4 Ecchymoses of the hand from thrombocytopenia. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 7, St. Louis, 2007, Mosby.)

Some patients recover spontaneously. Otherwise, transfusion of platelets is used to control hemorrhage. Splenectomy is done when the cause of the thrombocytopenia is unknown and the

patient does not respond to other therapy, with the hope that this will remove the cause of platelet destruction. The drug eltrombopag (Promacta) has been approved by the Food and Drug Administration (FDA) to treat the disease. It carries with it a risk for hepatotoxicity. Close monitoring of liver function tests is required.

Nursing care is focused on prevention of bleeding by careful handling of the patient, close observation for signs of spontaneous bleeding, and quick intervention. Invasive procedures are used only when essential. Patients are taught to avoid activities that might induce bleeding (see Chapter 8).

Multiple Myeloma

Multiple myeloma is a disease in which neoplastic plasma cells infiltrate the bone marrow and destroy bone. It occurs in about 4 in 100,000 people. Men are affected twice as often as women, and the disease occurs in African Americans twice as often as whites. The disease usually occurs after age 40 years, with the average age at diagnosis being 65 years.

Etiology and Pathophysiology

The cause of multiple myeloma is unknown. Risk factors include a family tendency toward the disease; ionizing radiation; and exposure to herbicides, insecticides, and chemicals (particularly benzene). Genetic factors and viral infections may play a role.

In multiple myeloma, abnormal plasma cells multiply out of control in the bone marrow. These abnormal cells produce excessive amounts of abnormal immune globulin and cytokines. The accumulation of the abnormal cells (tumors) in the bone marrow disrupts normal RBC, leukocyte, and platelet production. The disruption of normal cell production leads to anemia, impaired immune response with susceptibility to infection, and bleeding tendencies. The tumors disrupt normal bone marrow function and weaken the bone, predisposing the patient to frequent fractures.

Signs, Symptoms, and Diagnosis

The onset of multiple myeloma is gradual, and symptoms appear when the skeletal system is heavily involved. The patient may experience backache, bone pain that is worse with movement, or pathologic fractures and severe pain. Multiple myeloma is diagnosed by x-ray studies, bone marrow biopsy, and blood and urine tests. The appearance of light chains from the abnormal immune globulins in the urine, or Bence-Jones proteins, is a diagnostic sign. Because the bone destruction during multiple myeloma releases calcium, a hypercalcemia occurs that may lead to kidney stone formation and renal impairment. The CBC will show anemia, leukopenia, and thrombocytopenia. Bone marrow studies show large numbers of immature plasma cells.

Treatment

Chemotherapy or palliative radiation is used to combat the disease. Pain control is a primary concern. Hypercalcemia and osteoporosis often develop, and patients must be monitored and treated for these complications. Measures must be taken to prevent pathologic fractures.

The most common chemotherapy regimen is melphalan and prednisone. It is given orally for 4 to 7 days and repeated at 4- to 6-week intervals. Bortezomib (Velcade) is another successful, targeted therapy for multiple myeloma. Thalidomide (Thalomid), an immune-modulating drug, has proven very successful alone or in combined treatment. Interferon alfa may be used to prolong a remission. Bisphosphonates such as etidronate (Didronel), pamidronate (Aredia), or zoledronic acid (Zometa) inhibit bone breakdown and thereby decrease skeletal pain and hypercalcemia. The drug is given IV once a month. Measures are instituted to reduce blood calcium levels. There is no cure for multiple myeloma, but stem cell transplantation can prolong life for some patients.

Nursing Management

Supportive care for the many complications of the disease and treatment is provided. Encouraging adequate hydration with an intake of 3 to 5 L of fluid a day to minimize problems from hypercalcemia is a priority. Pain assessment and management are crucial to the quality of life for the patient. Acetaminophen and NSAIDs are used along with narcotic analgesics. Care is taken when moving the patient because of the potential for fractures.

Assignment Considerations

Assisting Patients With Blood Disorders

When enlisting the aid of a nursing assistant to help with positioning, moving, or toileting the patient, remind the person that the patient is very prone to bruising, bleeding, or fractures (as the case may be). Do not assign ambulation of a patient with multiple myeloma to assistive personnel, because any slight bump or twist of the body may cause a fracture.

Psychosocial care is essential, because the disease has remissions and exacerbations and is eventually fatal. The nursing care for a patient with a neoplastic disorder is covered in [Chapter 8](#). The patient and family must be taught about the signs and symptoms of hypercalcemia and instructed to report these signs and symptoms immediately to the provider. Measures to prevent falls must be instituted, both in the hospital and in the home. Mental status is monitored closely, and measures to protect the patient are instituted if confusion arises.

Hemophilia

Etiology

Hemophilia is an inherited X-linked disorder in which there is a deficiency of specific clotting factors. Classic hemophilia, or hemophilia A with a factor VIII deficiency, affects 1 in 5000 male births in the United States. Hemophilia B, or Christmas disease, causes a deficiency of factor IX. Christmas disease affects 1 in 30,000 male births. Both types of hemophilia are characterized by a delayed blood coagulation time that produces a prolonged period of bleeding after injury or surgery. These types of hemophilia almost always occur in males and are genetically transmitted through the mother. Although the mother does not have the disease herself, she and all her female descendants can transmit classic hemophilia to their offspring. Acquired hemophilia can affect both men and women, but the disease is rare. Hemophilia can develop as a result of formation of antibody to the clotting factors in blood transfusions, in patients with collagen vascular disease, or after a drug reaction. Idiopathic occurrence may be seen in people older than 50 years of age.

Pathophysiology

The hallmark of hemophilia is bleeding into joints, causing loss of mobility and unequal extremity lengths. In all types of hemophilia, there is a decrease in the amount of activity of 1 of the 11 different clotting factors normally present in blood and essential to the formation of clots. The blood of a hemophiliac patient forms a clot immediately after injury, but the clot breaks down and does not effectively stop bleeding. In von Willebrand disease, another type of bleeding disorder, there is a decrease in the activity of factor VIII, even though the factor is present in normal amounts in the plasma.

There are varying degrees of severity in the types of hemophilia, depending on the amount of the factor present and the role of the factor in clot formation. For patients with mild cases (those who have 25% to 50% of the deficient factor present in the serum), symptoms may not appear at all until a severe injury or surgery is followed by prolonged bleeding, and the hemophilia is thus discovered. In very severe cases (those in which less than 1% of the factor is present) the affected individuals may bleed spontaneously without injury, and severe hemorrhage can develop very quickly whenever an injury does occur.

Signs and Symptoms

The most obvious symptom of hemophilia is bleeding. Bleeding most often occurs internally, with leakage of blood into the joints, into the intestinal wall or peritoneal cavity, and into the deeper tissues of the body. **Hemarthrosis**—bleeding into the joints—produces swelling, pain, warmth, and limitation of movement similar to that experienced by patients with rheumatoid arthritis ([Figure 16-5](#)). Hemarthrosis is the primary problem for most patients with hemophilia. If the bleeding occurs in the intracranial spaces and thereby increases intracranial pressure, the patient may experience convulsions and brain damage that can be fatal. Other serious complications from internal bleeding in a person with hemophilia include obstruction of the airway as a result of hemorrhage into the

neck or pharynx and intestinal obstruction resulting from bleeding into the intestinal wall or peritoneum.

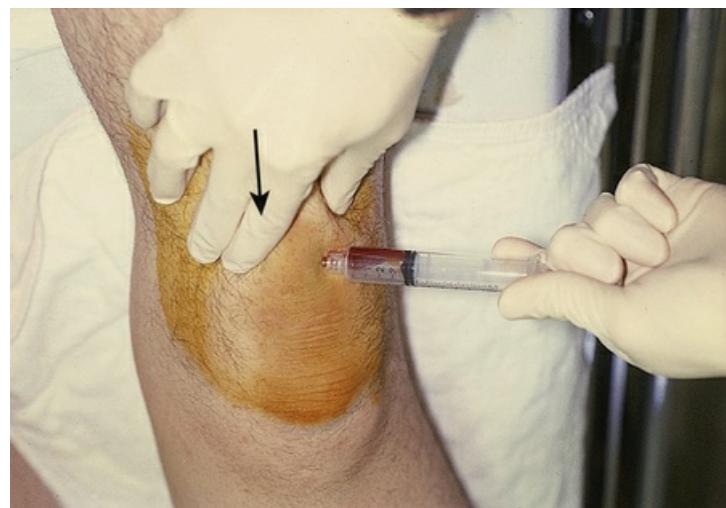


FIGURE 16-5 Aspiration of the knee to relieve the hemarthrosis common in hemophilia. (From Roberts JR, Hedges JS: *Clinical procedures in emergency medicine*, ed. 5, Philadelphia, 2009, Saunders.)

Diagnosis and Treatment

Diagnosis is by history, physical examination, CBC, and tests for the various clotting factors in the blood. In the more common types of hemophilia, transfusion of the missing blood factors prevents bleeding. Recombinant forms of factor VIII and factor IX are now available; both decrease the risk of transmitting undetected viruses and prions that can occur with donor blood.

For mild hemophilia A and for some subtypes of von Willebrand disease, desmopressin acetate (DDAVP), which is a synthetic form of vasopressin, may be given to stimulate an increase in factor VIII and von Willebrand factor. Tranexamic acid (Cyklokapron) and aminocaproic acid (Amicar) are administered to inhibit fibrinolysis by increasing clot stability.

Analgesic drugs and corticosteroids may be used to treat the joint inflammation and pain caused by hemarthrosis and by the common resultant arthritis. Safe analgesics include acetaminophen, oxycodone, propoxyphene, and pentazocine. Prophylactic factor treatment may be administered before dental procedures or in advance of other invasive diagnostic tests and unavoidable surgery.

Safety Alert

Avoid Taking Aspirin

Aspirin must never be taken by patients with hemophilia, because aspirin increases the bleeding problems. Patients must read the labels on every over-the-counter preparation to be certain that drug products do not contain aspirin or acetylsalicylic acid.

Many patients with hemophilia have been receiving blood products for a number of years. Unfortunately, many older patients have been infected with HIV or hepatitis C virus from contaminated plasma concentrates. The problem of contamination has created additional psychological stress for the patient with hemophilia. About 90% of older people with severe hemophilia are HIV positive. Death from AIDS has been common. Fortunately, adequate screening is in place now and the problem is resolving.

Nursing Management

In addition to administering the necessary clotting factors, interventions include elevating the injured body part, applying cold packs, controlling pain, observing for further bleeding, and

providing psychological support for the patient and family. You should also encourage genetic counseling for family members, if this counseling has not occurred previously.

Disseminated Intravascular Coagulation

Disseminated intravascular coagulation (DIC) is a complicated disorder that usually occurs in conjunction with tissue destruction. It accompanies serious problems, such as severe trauma, gram-negative sepsis, shock, respiratory distress syndrome, malignancy, transfusion reaction, amniotic embolus, and abruptio placentae (separation of the placenta from the uterine wall).

Damaged tissue liberates tissue thromboplastin, creating a state of excessive clotting in the microcirculation throughout the body. When excessive clotting depletes the body's clotting factors, hemorrhage follows, leading to hypotension or shock. DIC is always life-threatening.

The first signs of DIC are usually continued bleeding from an injection or IV site, extensive bruising in areas of injury, ecchymoses where there has been no trauma, and petechiae. There may be oral, vaginal, or rectal bleeding. Laboratory studies will reveal a decreased hemoglobin and low platelet count. The prothrombin and activated partial thromboplastin times will be increased. The fibrinogen level is reduced, and the fibrin degradation products level is increased. The D-dimer result is elevated.

Treatment consists of correcting the underlying problem (e.g., trauma, infection). Vascular volume is maintained with fluid replacement; vasopressor medications are given to decrease bleeding, and mechanical ventilation is needed for ventilatory support and tissue perfusion. Fresh frozen plasma—packed RBCs—and other blood coagulation factors are administered to restore blood volume and control clotting (Levi and Besa, 2012).

As a nursing priority, be alert to the possibility of the development of DIC whenever a patient has a condition that predisposes to it. Early detection of external bleeding and monitoring sensorium and vital signs for indications of internal bleeding are both extremely important.

Therapies Frequently Used in the Management of Hematologic Disorders

Transfusions

A blood transfusion involves the administration of a blood component. To minimize the risks of circulatory overload, HIV, hepatitis, transfusion reaction, and other problems related to the administration, blood usually is transfused only when there has been a large blood loss, when the patient has a deficiency of a blood component, or when there must be a total blood exchange in a newborn. **Table 16-6** shows some commonly used blood products, the usual amount given per transfusion, and reasons why each is used.

Table 16-6
Blood Products and Their Use

COMPONENT	VOLUME	INFUSION TIME	INDICATIONS
Packed red blood cells (PRBCs)	200-250 mL	2-4 hr	Anemia; hemoglobin <6 g/dL, depending on symptoms
Washed red blood cells (WBC-poor PRBCs)	200 mL	2-4 hr	History of allergic transfusion reactions Bone marrow transplantation patients
Platelets			
Pooled	About 300 mL	15-30 min	Thrombocytopenia, platelet count <20,000/mm ³ Patients who are actively bleeding with a platelet count <80,000/mm ³
Single donor	200 mL	30 min	History of febrile or allergic reactions
Fresh frozen plasma	200 mL	15-30 min	Deficiency in plasma coagulation factors Prothrombin or partial thromboplastin time 1.5 times normal
Cryoprecipitate	10-20 mL/unit	15-30 min	Hemophilia A or von Willebrand disease Fibrinogen levels <100 mg/dL
White blood cells (WBCs)	400 mL	1 hr	Sepsis; neutropenic infection not responding to antibiotic therapy

Adapted from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Elsevier Saunders.

Autologous (originating in one's self) blood transfusion is commonly used when the patient's own blood can be collected and reinfused. Blood is collected either during or after surgery (such as from chest drainage), or blood is donated by the patient during the weeks before surgery, for later use. Laboratory procedures that separate the various components by centrifuge or other means allow for the administration of only the particular element of blood needed by a particular patient.

Dextran—a plasma expander similar to human albumin—is often used to replenish volume quickly, until needed blood products are obtained from the blood bank. Several artificial substitutes for human blood that eliminate the need for cross-matching are being tested. So far, no artificial substitutes for human blood have been released for use by the FDA. Special precautions are always taken when any blood component is given. Blood banks have written procedures and policies for withdrawing and dispensing blood for transfusion.

Legal and Ethical Considerations

Consent for Blood Administration

The patient must have signed a consent form to receive a blood transfusion. If the patient is unable to sign, and the condition is life-threatening and no family member is reachable, the provider may make the decision to transfuse the patient.

Blood products are always checked by two nurses before administration (Figure 16-6). An LPN who is not qualified to transfuse blood may be asked to assist in checking the blood with the RN and to help monitor the patient during the infusion.

Legal and Ethical Considerations

Check the LPN/LVN Role

Some states have expanded their LPN practice act to include the administration of blood products.

Check your state's nurse practice act to see if that procedure is within legal practice in your state.



FIGURE 16-6 Two nurses must check the label on the blood product bag, the blood administration form of the blood bank, and the patient's armband and blood bracelet.

All blood bank and agency policies must be strictly followed to decrease the possibility of an adverse reaction or the administration of wrong blood to the wrong patient.

Nursing Management

Determine whether the patient has an IV site already established, and note what size catheter is in place. It is best to give blood through an 18-gauge or larger catheter. Best practices and safety require blood to be administered through a Y-type infusion set, with 250 mL of 0.9% saline on the other side of the Y. If a reaction to the blood occurs, the blood can be quickly shut off and the normal saline opened to maintain patency of the IV site. A special blood filter is included in the Y-type infusion set, and the drop factor is different from that of a regular IV tubing set. This infusion system is usually set up before the blood is obtained from the blood bank.

Older Adult Care Points

- Vessels in older adults are fragile. A 22-gauge cannula may be used for transfusion to older adults, rather than an 18-gauge cannula.
- Blood products should be transfused more slowly, to allow an older adult's body time to adjust to the added fluid.
- Careful assessment for fluid overload during and after the transfusion is essential. Signs of fluid overload are rapid bounding pulse, hypertension, and visibly swollen veins.

A lag period of 2 hours can be observed between each unit transfused to prevent fluid overload. The blood bag should be handled very gently to prevent damage to the cells. After obtaining the blood from the blood bank, immediately inform the nurse in charge of the patient that the blood is ready to be infused. The blood must be started within 30 minutes of arrival on the scene and should never be left at room temperature for more than 4 hours because blood is an excellent medium for bacterial growth; it takes between 1.5 and 4 hours for a unit of packed cells to infuse. ☎

Safety Alert

Blood Product Safety

Blood bags should never be heated in a microwave oven or placed in hot water. No other solution

or drug is ever administered through the same line or to the same site through which blood is infusing, because destruction of the cells might occur or a precipitate might be formed that could cause emboli.

Think Critically

If there has been carelessness in the proper identification method used to ensure that the right blood is given to the right patient, and the patient has a reaction, could the nurse be sued for negligence?

Transfusion Reaction

The word *reaction* means sensitivity to the blood itself, or sensitivity to the preservatives or other substances that have been added to a solution. Reactions to RBCs are the result of incompatibility between blood types. There are antigens on the surfaces of RBCs that can bring about a reaction when exposed to blood that is not the same type and is incompatible. The antigen-antibody reaction causes the cells to clump together and obstruct the flow of blood through the capillaries.

Safety Alert

Signs and Symptoms of a Transfusion Reaction

The symptoms of a transfusion reaction may be so mild that they go unnoticed, or so severe that death is the outcome (Table 16-7). In milder cases, the patient may develop a rash, hives, itching, or facial flushing. In more severe reactions, the patient may experience a variety of problems, including shock. A delayed reaction such as hepatitis, syphilis, malaria, or other infectious agents might not be evident until 4 to 6 weeks or longer after the blood has been given.

Table 16-7
Acute Transfusion Reactions

CAUSE	CLINICAL MANIFESTATIONS	MANAGEMENT	PREVENTION
Transfusion Reactions			
Infusion of ABO-incompatible whole blood, RBCs, or components containing 10 mL or more of RBCs	Chills, fever, low back pain, flushing, tachycardia, tachypnea, hypotension, vascular collapse, hemoglobinuria, acute jaundice, dark urine, bleeding, acute renal failure, shock, cardiac arrest, death	Treat shock if present. Initiate CPR, if indicated. Draw blood samples for serologic testing slowly to avoid hemolysis from the procedure. Send urine specimen to the laboratory. Maintain BP with IV colloid solutions. Give diuretics as prescribed to maintain urine flow. Give antipyretics, antihistamines as prescribed—avoid aspirin in thrombocytopenic patients. Insert indwelling urinary catheter or measure voided amounts to monitor hourly urine output. Dialysis may be required if renal failure occurs. Do not transfuse additional RBC-containing components until blood bank has provided newly cross-matched units.	Meticulously verify and document patient identification from sample collection to component infusion.
Circulatory Overload			
Fluid administered faster than the circulation can accommodate	Cough, dyspnea, pulmonary congestion, headache, hypertension, tachycardia, distended neck veins	Place patient upright with feet in dependent position. Administer prescribed diuretics, oxygen, and morphine. Phlebotomy may be indicated.	Adjust transfusion volume and flow rate based on patient size and clinical status. Have blood bank divide unit into smaller aliquots for better spacing of fluid input.
Sepsis			
Transfusion of bacterially infected blood components	Rapid onset of chills, high fever, vomiting, diarrhea, marked hypotension, or shock	Obtain culture of patient's blood and send bag with remaining blood and tubing to blood bank for further study. Treat septicemia as directed—antibiotics, IV fluids, vasoressors.	Collect, process, store, and transfuse blood products according to blood banking standards and infuse within 4 hr of starting time.

BP, Blood pressure; CPR, cardiopulmonary resuscitation; IgA, immune globulin A; IV, intravenous; RBC, red blood cell; WBCs, white blood cell.

Adapted from Lewis SL, Dirksen SR, Heitkemper MM, Bucher L: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.

Clinical Cues

If there is **any** sign of reaction, the blood transfusion is stopped immediately, saline is started, vital

signs are taken, and the provider and charge nurse are notified.

Diphenhydramine hydrochloride (Benadryl) may be ordered by injection if an allergic reaction is suspected. In severe anaphylactic reactions the treatment is the same as for anaphylaxis caused by any extreme hypersensitivity. Should the patient's temperature rise above 100.4° F (38.0° C), the infusion is stopped, the saline started, and the provider notified. Follow the policies of the facility if a reaction occurs. As long as there are no signs of adverse reaction, the patient is assessed and vital signs are taken every 30 to 60 minutes until the transfusion is completed, depending on agency policy.

Think Critically

Your patient is receiving a unit of packed RBCs. When you assess him after the first hour of the transfusion, his pulse rate has increased from 78 to 84, he is slightly restless, and he is complaining of discomfort in his back. His temperature has risen from 98.4° F to 99° F. He has no skin rash and denies nausea. What would you do?

Leukapheresis

Leukapheresis is a procedure performed to clear excessive WBCs from the blood. Leukapheresis may be performed directly on the patient, or the procedure may be performed on separated blood products. When performed directly, the patient is connected to a blood separator machine. Blood is drained a bit at a time from the patient, the WBCs are washed out of the blood, and the red cells and plasma are returned to the patient. This treatment is used to lower the WBC count in patients with CML and is sometimes used to treat certain immune disorders, such as myasthenia gravis.

Biologic Response Modifiers: Colony-Stimulating Factor Therapy

Research with DNA-recombinant techniques has developed drugs that stimulate the bone marrow to produce erythrocytes or neutrophils. Erythropoietin (Epogen) is given parenterally to patients who have decreased erythropoietin resulting from end-stage renal disease or who have suppressed bone marrow from the toxicity of chemotherapy given for malignancy, rheumatoid arthritis, or HIV.

Granulocyte colony-stimulating factor (G-CSF; Neupogen, Neulasta) is given parenterally to combat neutropenia. It is used for patients with bone marrow suppression from chemotherapy, particularly for those with non-blood-related malignancies. Granulocyte-macrophage colony-stimulating factor (GM-CSF; Leukine) accelerates the recovery of bone marrow after autologous BMT in patients with ALL, Hodgkin disease, or non-Hodgkin lymphoma who have undergone total destruction of the bone marrow during therapy.

Bone Marrow and Stem Cell Transplantation

BMT is aimed at providing healthy bone marrow when the patient's own bone marrow is faulty or has been destroyed by chemotherapy or irradiation during attempts to rid the body of leukemic or other cancer cells. The bone marrow used for transplantation can be **allogeneic** (from another person) or **autologous** (from the patient).

Peripheral stem cells or stem cells from umbilical cord blood can also be used for transplant, if there is a good match with the patient. If the transplant is to be autologous, cells are taken from the patient during a period of remission of disease—either by bone marrow aspiration or by pheresis (for peripheral stem cells). Allogeneic bone marrow is harvested from an HLA-matched person. The HLA match is determined by tissue typing. Finding a good HLA match is difficult; there is only a 25% chance of matching with the patient's own sibling.

Cultural Considerations

Bone Marrow Donations

Most people willing to donate bone marrow are white. There is a 30% to 40% chance of an HLA match for a white patient and donor marrow. Far fewer African Americans have signed up at the bone marrow registry, and the chance for an HLA match for an African American patient is less than 20%. Efforts are being made to encourage African Americans to become bone marrow donors.

Bone marrow harvest is done in the operating room, where multiple aspirations from the iliac crests are performed. About 500 to 1000 mL of marrow is harvested. The marrow is filtered and may be purged to rid autologous marrow of cancer cells or to rid the allogeneic marrow of T cells. Autologous marrow is then frozen ([National Cancer Institute, 2015](#)). Nursing care after harvest consists of monitoring the dressings for bleeding and medicating the donor for pain in the hip area. Nonaspirin analgesics often are sufficient to control pain.

The patient undergoes a conditioning regimen to rid the body of malignancy or to obliterate the diseased bone marrow. This usually takes 5 to 10 days. The process involves intensive high-dose chemotherapy, and often includes total body irradiation. The patient experiences all the side effects of these treatments: bone marrow suppression, diarrhea, stomatitis, severe nausea, and vomiting. The patient is at extreme risk for infection. Meticulous supportive and preventive nursing care is essential during and after this phase.

At least 2 days after the end of chemotherapy, the BMT infusion takes place, through a central line, over approximately 30 minutes. If the bone marrow or stem cells are from an allogeneic donor, the infusion takes place right after harvest. The process of engraftment begins as the cells find their way to the marrow-forming locations in the patient's bones and establish themselves there. Engraftment takes 2 to 5 weeks and is considered successful when the patient's erythrocyte, leukocyte, and platelet counts begin to rise. Until engraftment is complete, the patient is at dire risk of infection and hemorrhage. Other complications include failure of engraftment and graft-versus-host disease, in which the cells see the patient's tissues as foreign and mount an immune attack. Thrombosis and phlebitis in the liver also can occur; either will cause liver damage if not resolved.

Oxygen Therapy

Low concentrations of oxygen may be administered to relieve severe dyspnea and hypoxia during the acute phase of a blood disorder. The treatment is mostly symptomatic, but it does offer some relief if there is sufficient hemoglobin to carry the oxygen to the tissues. With sufficient hemoglobin transportation, oxygen administration may prevent a myocardial infarction. The care of a patient receiving oxygen therapy and the need for careful monitoring of blood gases are discussed in [Chapter 14](#).

Iron Therapy

Iron is one of the principal elements in the production and maturation of RBCs. When the body lacks iron, the amount of hemoglobin is decreased in the red cells, making them very small and pale in color. In simple iron deficiency anemia, the condition is relieved by administering iron salts. The iron preparations most often used are ferrous sulfate and ferrous gluconate. Ferrous sulfate is believed to be absorbed the best.

Although iron salts are absorbed better from an empty stomach, they are irritating to the GI tract. There will be fewer gastric upsets if this medication is given in divided doses and immediately after meals. The patient should be warned that taking iron salts by mouth produces greenish black stools and that there is no cause for alarm if this change in the color of stools occurs. Because iron salts may form deposits on the teeth and gums, causing a discoloration, the liquid forms of this medication should be given through a straw. After administration of each liquid dose, the teeth should be thoroughly cleansed and the mouth well rinsed.

Some patients suffer such severe gastric disturbances from the oral intake of iron salts that the medication must be given by another route. Patients who are anemic because of gastric or intestinal bleeding cannot take iron by mouth because the irritation aggravates their condition. The drug of choice in these cases is iron dextran ([Imferon](#)), an iron preparation that is given IV or is injected deep into the muscle. Such intramuscular (IM) injections must not exceed 2 mL at each site, and the sites of injection should be rotated to allow for proper absorption and to minimize the hazards of local inflammation. The Z-track technique for IM injection is recommended. Patients receiving an IV infusion of iron dextran must be watched closely for anaphylactic and other adverse reactions.

Vitamin C usually is given with iron, because it enhances iron's absorption. If a pharmaceutical preparation of vitamin C is not prescribed, the patient can take the iron salts with orange juice or another juice that is a good source of vitamin C.

❑ Think Critically

What would you teach a home care patient who is complaining that the iron medication is causing a mild nausea, stomach discomfort, and constipation?

Vitamin B₁₂ Therapy

Vitamin B₁₂ has two main functions in the body. First, vitamin B₁₂ is needed for RBCs to develop into mature, normally functioning cells; second, vitamin B₁₂ is necessary for nerve cells to function normally. Another B-group vitamin, folic acid, also is needed for RBC maturation, but it has no effect on the nervous system. Vitamin B₁₂ is used to treat pernicious anemia.

Injections of vitamin B₁₂ are given daily for the first few weeks and later may be spaced a week apart. As the patient improves, vitamin B₁₂ injections may be necessary only once a month, but injections must continue for the duration of life for patients with pernicious anemia.

In addition to taking supplemental iron and vitamins, patients with nutritional anemia should eat nutritionally balanced, high-protein meals.

❑ Nutrition Considerations

Hints for Adding Protein to the Diet

- Mix dry skim milk into the milk called for in recipes.
- Provide between-meal shakes made with commercial protein powder available at the grocery or health food store.
- Add dry skim milk to hot or cold cereal, scrambled eggs, soups, gravies, meat loaf or meatballs, casseroles, and desserts.
- Add diced or ground meat to soups and casseroles.
- Drink commercial canned high-protein drinks (available from pharmacies) between meals, or use instant breakfast drink mix.
- Add cream cheese or peanut butter to breakfast breads.
- Eat peanut butter on crackers, apples, celery, or toast for snacks.
- Mix cooked diced shrimp, tuna, crab, or ham with sliced boiled eggs in cream sauce and serve over cooked rice, pasta, biscuits, or toast.
- Eat desserts made with eggs.
- Eat commercial high-protein bars for snacks, available at grocery, health food, or sporting goods stores.

Splenectomy

Indications for surgical removal of the spleen include:

- Severe trauma to and rupture of the spleen
- Splenomegaly caused by rapid destruction of blood cells
- Splenomegaly from blood disorders, such as leukemia

If the spleen is removed, the other organs of the monocyte-macrophage system take over many of

its functions. Individuals who no longer have a functioning spleen are at a very high risk to develop life-threatening infections, especially those caused by pneumococci. It is recommended that these persons receive the Pneumovax vaccine. They are advised to consult a provider and take preventive antibiotics as prescribed when they experience even a seemingly trivial respiratory infection.

A patient with a ruptured or torn spleen is in immediate danger of hemorrhage and shock. Whenever an accidental blow, stab wound, or gunshot wound occurs in the vicinity of the spleen, the patient must be watched closely for signs of internal bleeding, such as an expanding abdomen and increased pain. After surgery, the patient is observed for early signs of infection, abdominal distention, and other more general complications of abdominal surgery.

Community Care

Patients with blood disorders are treated in many different places in the community. Patients undergoing chemotherapy may attend an outpatient clinic to receive the doses of the drugs they need. Support groups for patients with the various disorders may meet in hospitals, clinics, churches, schools, or other community locations. Patients with sickle cell disease or hemophilia may attend ambulatory clinics.

Patients with blood disorders are commonly treated as home care patients. An older adult patient with pernicious anemia who is home-bound may need a nurse to give vitamin B₁₂ injections and draw laboratory specimens for periodic blood counts. Patients with leukemia are commonly followed at home during chemotherapy and recovery periods. Patients with sickle cell problems are more likely to be treated in the home setting, after the initial crisis period is over. In some instances blood products are administered at home. Some types of chemotherapy agents are given in the home setting, and the patient must be monitored for all of the adverse effects that such therapy can cause.

Home care nurses must do considerable patient and family teaching about prevention of infection, prevention of and treatment for bleeding episodes, appropriate nutrition, and regulation of medication. The home care nurse manager will coordinate care for patients with their provider, pharmacist, home infusion company, home health aide, and family.

Get Ready for the NCLEX® Examination!

Key Points

- Anemia results in insufficient oxygen being carried to cells for the body's needs.
- Anemias result from blood loss, failure in blood cell production, or excessive destruction of red cells.
- Hypovolemia from blood loss may result in shock.
- Blood cell production requires protein, folic acid, and iron.
- Pernicious anemia results from lack of intrinsic factor and faulty absorption of vitamin B₁₂.
- There are a variety of causes of hemolytic anemia, some of which are genetic.
- A CBC and differential (peripheral smear) are used to diagnose blood disorders.
- Sickle cell disease is a genetic inherited disorder in which the affected gene is transmitted from both the father and the mother.
- The main method of sickle cell crisis prevention is hydration; the primary treatment is rehydration and pain control.
- Abnormal hemoglobin causes red cells to sickle when oxygen tension in the blood is lowered.
- There are many signs and symptoms and problems for those with sickle cell disease (see [Figure 16-3](#)).
- Nursing care for sickle cell disease and crisis is aimed at relieving the symptoms of complications and minimizing organ damage.
- Treatment of anemia is aimed at curing the underlying disorder and providing nutrients or supplements needed for building red blood cells.
- Aplastic anemia can be life-threatening and may require a bone marrow or stem cell transplant.
- Polycythemia vera causes blood to become too thick and predisposes to blood clots.
- Thrombocytopenia affects the platelets and causes bleeding that can be life-threatening.
- Nursing care for thrombocytopenia focuses on preventing bleeding.
- There are four major types of leukemia: chronic lymphocytic, chronic myelogenous, acute lymphocytic/lymphoblastic, and acute myelogenous.
- Agents that are toxic to the bone marrow are a key factor in the development of leukemia.
- Leukemia is acute or chronic, according to the phase of cell development present and the symptoms.
- A patient with leukemia may be asymptomatic or may have fever, malaise, and frequent infections.
- Treatment for leukemia is aimed at slowing the growth of malignant blood cells and maintaining normal levels of red cells, hemoglobin, and platelets.
- Bone marrow or stem cell transplantation is an option for certain types of leukemia.
- Infection and hemorrhage are two major complications of leukemia.
- Hemophilia is mostly an inherited disorder affecting the blood's ability to clot.
- Bleeding into the joints is the major problem of hemophilia.
- Blood factor replacement is the treatment for hemophilia.
- DIC occurs in conjunction with many disorders.
- There is clotting in the microcirculation and bleeding in DIC.
- Blood transfusions must be administered very carefully, because reactions can be serious or fatal.
- Patient consent is needed before blood component transfusion.
- There are many signs and symptoms of a blood transfusion reaction (see [Table 16-7](#)).
- If there is any sign of a transfusion reaction, the transfusion is stopped immediately.
- Bone marrow transplantation requires an HLA match and is a dangerous procedure.
- Iron, vitamin C, folic acid, and vitamin B₁₂ supplementation are used to treat anemias.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

Online Resources

- Acute lymphoblastic leukemia, <http://emedicine.medscape.com/article/207631-overview>
- Acute myelogenous leukemia, <http://emedicine.medscape.com/article/197802-overview>
- Aplastic anemia, <http://emedicine.medscape.com/article/198759-overview>
- Chronic myelogenous leukemia, <http://emedicine.medscape.com/article/197802-overview>
- Disseminated intravascular coagulation in emergency medicine, <http://emedicine.medscape.com/article/779097-overview>
- Hemophilia, www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001564
- Leukemia & Lymphoma Society, www.leukemia-lymphoma.org
- Multiple myeloma, <http://emedicine.medscape.com/article/204369-overview>
- Myeloproliferative neoplasms (MPN), <http://www.mpnresearchfoundation.org>
- National Cancer Institute, www.cancer.gov
- National Hemophilia Foundation, www.hemophilia.org
- Sickle Cell Disease Association of America, www.sicklecelldisease.org
- Sickle cell anemia, <http://emedicine.medscape.com/article/205926-overview>; www.scinfo.org; www.nhlbi.nih.gov/new/sicklecell.htm
- Stem cell transplant, www.mayoclinic.com/health/stem-cell-transplant/MY00089/METHOD=print

Review Questions for the NCLEX® Examination

1. While reviewing the laboratory results for a patient who had gastric bypass surgery last year, the nurse notes that the amount of red blood cells has remarkably decreased. The nurse suspects that the anemia is related to:

1. vitamin B₁₂ deficiency.
2. chronic renal failure.
3. iron deficiency.
4. bone marrow suppression.

NCLEX Client Need: Physiological Integrity

2. An emergency department patient has a suspected gunshot wound to the abdomen. The nurse who finds a profusely bleeding abdominal wound should anticipate which signs(s) and symptom(s) of profuse blood loss? (*Select all that apply.*)

1. Increased blood pressure
2. Rapid, weak pulse
3. Cold, clammy skin
4. Urine output >50 mL/hr

5. Decreased blood pressure

NCLEX Client Need: Physiological Integrity

3. The patient is prescribed Feosol oral medication for a mild anemia. Which patient statement indicates a need for further teaching about this medication?
1. "The medication is absorbed best on an empty stomach."
 2. "The medication is more effective if I drink orange juice as well."
 3. "I should take the medication with milk."
 4. "I should increase fluids and fiber to prevent constipation."

NCLEX Client Need: Health Promotion and Maintenance

4. You are assessing a new admission with leukemia. You have asked her about symptoms and she replies, among other things, that she is very tired. You are concerned that this may endanger her because (*select all that apply*):
1. she will not have the energy to socialize, and because most leukemia patients are children, this will interfere with her developmental stages.
 2. the fatigue will put her at risk for increased falling and because most people with leukemia are older than 60 years she is already at increased risk.
 3. the fatigue could put her at risk for falling asleep while driving.
 4. fatigue is a sign that the leukemia is most likely incurable.

NCLEX Client Need: Safety and Infection Control

5. A nurse starts a peripheral venous access site on a patient who had multiple traumatic injuries. The nurse notes blood in the urine and the feces. Suspecting DIC, the nurse expects which laboratory result?

1. Increased hematocrit
2. Elevated platelet count
3. Increased activated partial thromboplastin time

4. Decreased D-dimer

NCLEX Client Need: Physiological Integrity

6. Your patient has been diagnosed with multiple myeloma. What are some considerations while planning nursing care for this patient? (*Select all that apply.*)

1. Be very gentle while moving the patient.
2. Encourage vigorous mobility activities.
3. Delegate the care to a nursing assistant.
4. Know that the psychosocial care is essential.
5. Place the patient in protective isolation.
6. Medicate as ordered for bone pain.

NCLEX Client Need: Safe and Effective Care Environment

7. A patient with multiple myeloma may display which signs and symptoms on assessment?

1. Ruddy complexion and elevated RBCs
2. Joint pain and low platelet count
3. Leukocytosis and frequent sore throat
4. Bone pain and a positive Bence-Jones protein test

NCLEX Client Need: Physiological Integrity

8. Which measure(s) should a patient with leukopenia institute to prevent infection? (*Select all that apply.*)

1. Avoid eating salads, raw fruits, and raw vegetables.
2. Stay within the home.
3. Wash hands after handling the mail.
4. Do not get close to pets.
5. Stay away from crowds and crowded places.

6. Do not reuse dishes or eating utensils without washing them first.

NCLEX Client Need: Safety and Infection Control

9. After the first few minutes of transfusing packed RBCs, the patient has a temperature of 101.5° F (38.6° C), heart rate 120 beats/min, and blood pressure 90/50 mm Hg with complaints of back pain. The priority nursing action would be:

1. flush the line with normal saline.
2. stop the transfusion.
3. notify the provider.
4. administer diphenhydramine (Benadryl).

NCLEX Client Need: Physiological Integrity

10. A patient with cancer who has undergone bone marrow transplant, chemotherapy, and total body irradiation is under close observation. The nurse would continue with transmission-based precautions isolation for _____ until the patient begins to show signs of improvement when engraftment takes place. (*Fill in the blank.*)

NCLEX Client Need: Physiological Integrity

Critical Thinking Questions

Scenario A

Mrs. Hutton is a young mother who has three small children. She is admitted to the hospital with a severe anemia. Her hemoglobin is 7.5 g/dL, and her red cell count also is very low. Mrs. Hutton confides in you that she has never eaten as she should, especially when she was a teenager. With the added strain of having the children to care for at home, she doesn't take the time to cook the meals she knows they should have, because she is so tired all the time. Her husband makes a fairly good salary, but Mrs. Hutton is under the impression that an adequate diet would cost more than they can afford at present.

1. How can you teach the patient the value of nutritious food and help her with shopping practices that would provide her family with food items that are not expensive?
2. Which foods that are high in iron would you suggest she include in her diet?
3. What practical suggestions could you make to help Mrs. Hutton cope with fatigue?

Scenario B

Mr. Tate is a 24-year-old who has acute lymphocytic leukemia. He is receiving chemotherapy with cyclophosphamide, vincristine, prednisone, and daunorubicin. He is experiencing many of the problems associated with a blood disorder, as well as the problems caused by the side effects of the potent drugs he is receiving.

1. Describe the physiologic problems Mr. Tate is likely to experience as a result of the disease and the therapy.
2. Identify psychosocial concerns that Mr. Tate might have.

Scenario C

Mr. Harris, a 72-year-old white man, has just been diagnosed with chronic myeloid leukemia (CML). He has started chemotherapy with hydroxyurea and imatinib. If this is unsuccessful, he will begin treatment with interferon alfa.

1. What do you need to teach Mr. Harris about the drugs he is taking? Will he be on other drugs to control the side effects of this chemotherapy?
2. His wife asks whether he would be eligible for bone marrow transplantation. What should you answer?

Scenario D

Mrs. Solter, age 82, is to receive a transfusion of packed RBCs, because she is very anemic and not responding to oral medication. You are assigned to assist with the transfusion and to monitor the patient.

1. What are the priorities of care for this patient at this time?
2. Mrs. Solter asks what this transfusion will do for her. How would you respond?
3. What is the proper sequence of actions you would take if Mrs. Solter experienced a transfusion reaction while the blood product is infusing?

UNIT VI

Cardiovascular System

OUTLINE

Chapter 17 The Cardiovascular System

Chapter 18 Care of Patients With Hypertension and Peripheral Vascular Disease

Chapter 19 Care of Patients With Cardiac Disorders

Chapter 20 Care of Patients With Coronary Artery Disease and Cardiac Surgery

CHAPTER 17

The Cardiovascular System

Objectives

Theory

1. Review the normal anatomy and physiology of the cardiovascular system.
2. Examine the risk factors and incidence of cardiovascular disease.
3. Explain ways to modify risk factors for the development of cardiovascular disease.
4. Choose ways in which nurses can contribute to the prevention of cardiovascular disease.
5. Compare the diagnostic tests, specific techniques, and procedures for assessing the cardiovascular system.
6. Present three likely problem statements for patients who have common problems of cardiovascular disease and list the expected outcomes and appropriate nursing interventions for each.

Clinical Practice

7. Teach patients about the more common diagnostic tests and procedures to diagnose and evaluate cardiovascular diseases.
8. Assist patients to form plans to modify cardiovascular disease risk factors.
9. Assess for cardiovascular abnormalities in assigned patients.

KEY TERMS

- arteriosclerosis** (är-tē-rē-ō-sklē-RŌ-sīs, p. 373)
atherosclerosis (äth-ér-ō-sklē-RŌ-sīs, p. 371)
bruit (brū-Ē, p. 385)
cardiac output (p. 370)
cardiomyopathy (kär-dē-ō-mī-ÖP-ăth-ē, p. 382)
coarctation (kō-ärk-TĀ-shún, p. 373)
dysrhythmia (dīs-RĪTH-mē-ă, p. 372)
ejection fraction (p. 370)
endocarditis (ĚN-dō-kāhr-Dī-tīs, p. 373)
hypertension (hī-pěr-TĒN-shūn, p. 373)
infarct (p. 373)
intermittent claudication (in-těr-MĬT-ěnt klāw-dī-KĀ-shūn, p. 382)
ischemia (īs-KĒ-mē-ă, p. 373)
palpitations (păl-pi-TĀ-shūnz, p. 392)
pericarditis (pěr-ē-kāhr-Dī-tīs, p. 373)
rubor (RŪ-bōr, p. 386)

stroke volume (p. 370)
syncope (SĬN-kō-pē, p. 386)

Overview of Anatomy and Physiology of the Cardiovascular System

The Structures of the Heart and Their Functions

- The heart wall consists of three layers. The epicardium is the outer layer of tissue; the myocardium is the middle layer of muscle fibers that contract to pump blood; and the endocardium is the lining of the inner surface of the heart chambers.
- A membranous sac, the pericardium, surrounds the heart.
- The pericardium is a double-layered sac. The double layer helps provide a barrier to infection, prevents displacement of the heart, and contains pain and other receptors that elicit reflex changes in heart rate and blood pressure.
- The pericardial space contains a thin layer of fluid (30 to 50 mL).
- The four chambers of the heart make up two coordinated pumps: the right-side pump is a low-pressure system; the left-side pump is a high-pressure system.
- The right atrium and right ventricle receive deoxygenated blood from the vascular system and pump it through the lungs.
- The left atrium and left ventricle receive oxygenated blood from the lungs and pump it through the systemic circulation (Figure 17-1).

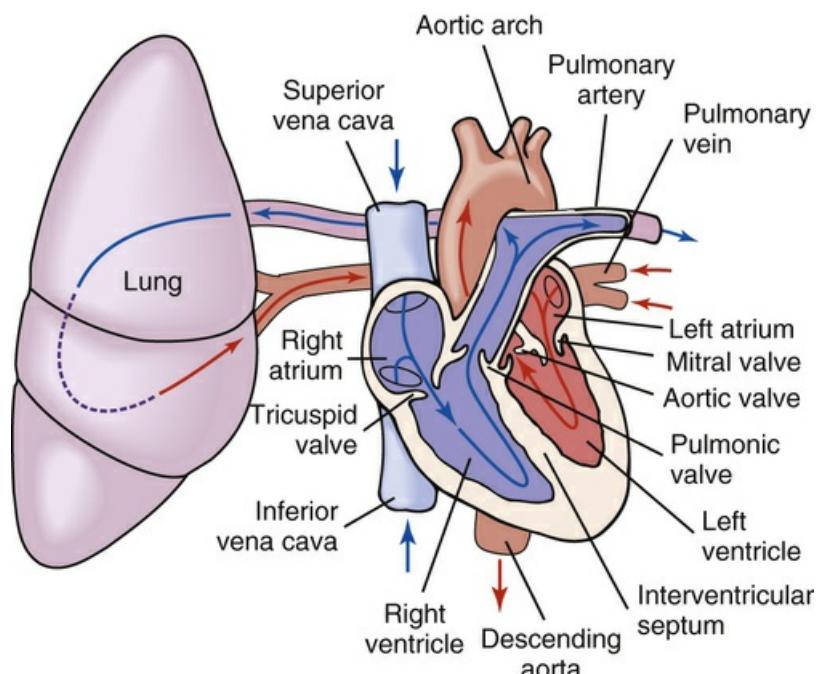


FIGURE 17-1 Heart structures and path of oxygenated blood flow out of the left ventricle and into the aorta. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 7, St. Louis, 2007, Mosby.)

- A septum separates the right and left sides of the heart.
- The cardiac valves direct the flow of blood through the heart chambers.
- Blood enters the right atrium via the superior and inferior vena cava and goes to the right ventricle through the tricuspid valve.
- Blood leaves the right ventricle through the pulmonic (or pulmonary) valve and goes into the pulmonary artery to circulate in the lungs, exchanging carbon dioxide for oxygen. The pulmonary artery carries blood away from the heart, so it meets the definition of *artery*, but it carries deoxygenated blood. The left atrium receives oxygenated blood from the pulmonary veins, and

the mitral valve controls the flow from the atrium into the left ventricle. Pulmonary veins carry blood toward the heart, but come from the lungs with oxygenated blood.

- The left ventricle ejects the blood through the aortic valve into the aorta and the systemic circulation.
- The coronary arteries branch from the aorta and supply the cardiac muscle with blood during diastole (Figure 17-2). Blood flow in the coronaries is restricted during systole because of muscle contraction.

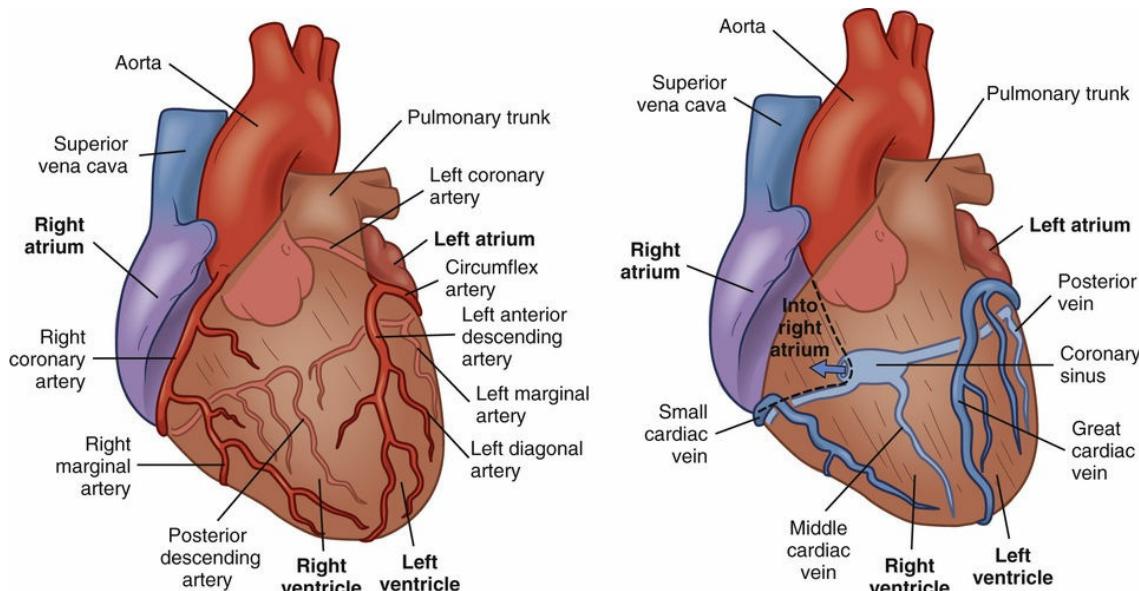


FIGURE 17-2 A view of the coronary arterial system. *Left*, Arteries. *Right*, Veins. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2015, Mosby.)

- The left coronary artery divides into the anterior descending and the circumflex arteries, providing blood for the left atrium and the left ventricle.
- The right coronary artery supplies the right atrium, right ventricle, and part of the posterior wall of the left ventricle, as well as the atrioventricular node of the cardiac conduction system (see Figure 17-2).
- The heart is located within the mediastinum and is tilted forward and to the left side of the chest.
- The point of maximal impulse (PMI) can normally be felt between the fifth and sixth ribs on a line dividing the left clavicle in half. Listen to the apical heart rate at this location.

Contraction of the Heart to Pump Blood

- The heart's pumping action is sparked by specialized pacemaker cells and conduction fibers that initiate spontaneous electrical activity, causing muscle contractions that result in a heartbeat.
- The conduction pathways are located in the myocardium and transmit the electrical impulse throughout the heart.
- The sinoatrial (SA) node is located in the right atrium and is called the "pacemaker" of the heart because it normally initiates the electrical impulses.
- The atrioventricular (AV) node (or junction) is located in the lower part of the right atrium. It relays the impulse from the SA node to the bundle of His and throughout the ventricles via the Purkinje fibers (Figure 17-3).

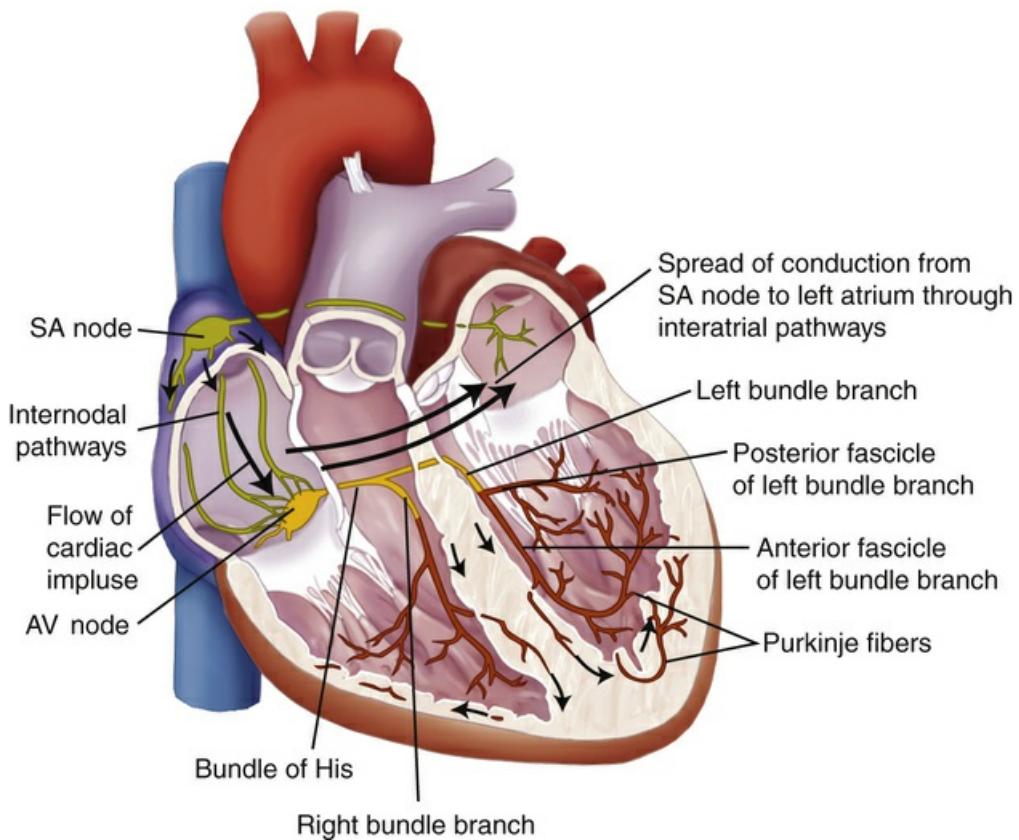


FIGURE 17-3 The cardiac conduction system. AV, Atrioventricular; SA, sinoatrial. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2015, Mosby.)

- The heart rate and rhythm are influenced by the autonomic nervous system; factors affecting the autonomic nervous system can speed up or slow down the heart rate.

The Cardiac Cycle

- The cardiac cycle consists of contraction of the muscle (systole) and relaxation of the muscle (diastole).
- The heart pumps out about 5 L of blood every minute.
- The amount of cardiac output depends on the heart rate, the amount of blood returning to the heart (venous return or preload), the strength of contraction, and the resistance to the ejection of the blood (afterload).
- Stroke volume** equals the amount of blood ejected by a ventricle during one contraction.
- Cardiac output** equals stroke volume multiplied by the heart rate.

The Ejection Fraction

- The **ejection fraction** is the percentage of blood that is ejected from the left ventricle during systole.
- A normal ejection fraction is 50% to 70%.
- As ejection fraction decreases with heart failure, tissue perfusion diminishes.
- A decreased ejection fraction causes backup of blood into the pulmonary vessels.
- Too much blood and the increased pressure in the pulmonary vessels can cause pulmonary edema.

Blood Flow Throughout the Body

- Three types of blood vessels make up the vascular system: arteries, veins, and capillaries; these

vessels conduct the blood from the body tissues to the heart –lung circulation and from the heart back to the tissues.

- Arteries carry oxygenated blood away from the heart (Figure 17-4). Veins carry oxygen-depleted blood back to the heart for reoxygenation by the lungs (Figure 17-5).

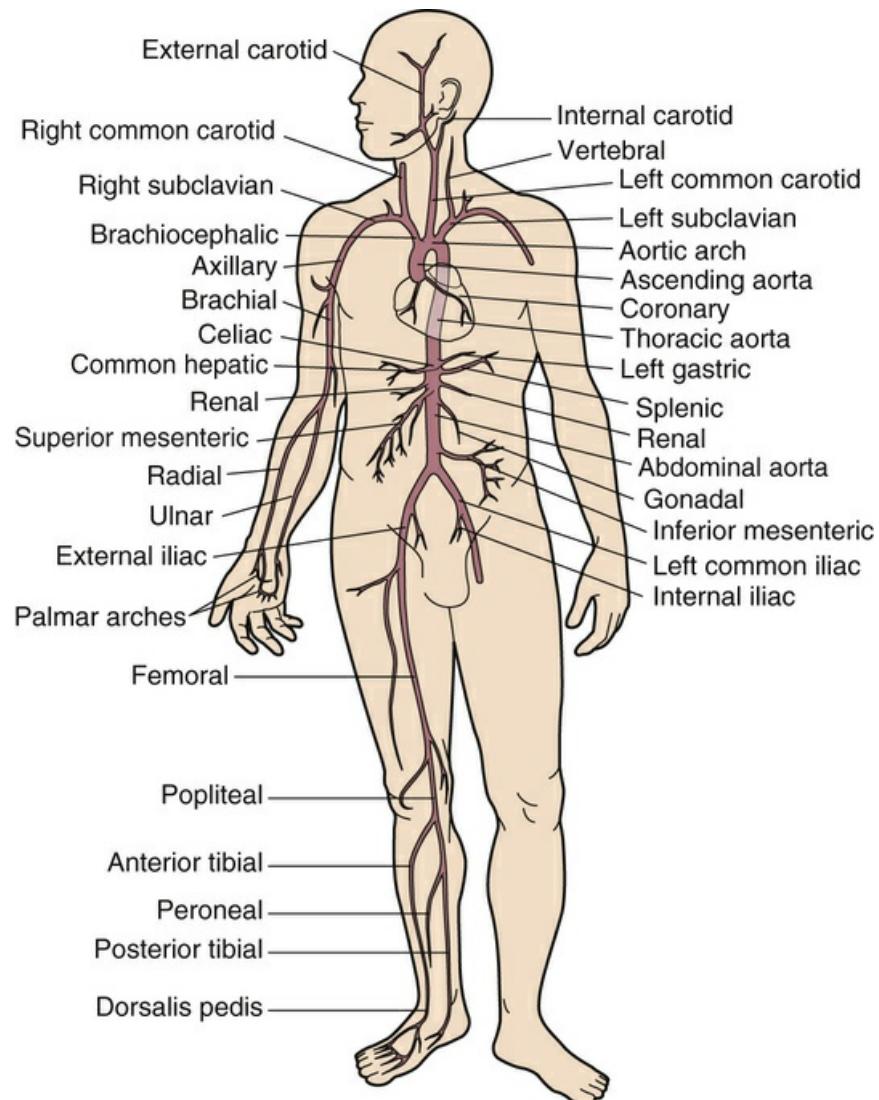


FIGURE 17-4 Major arteries in the body.

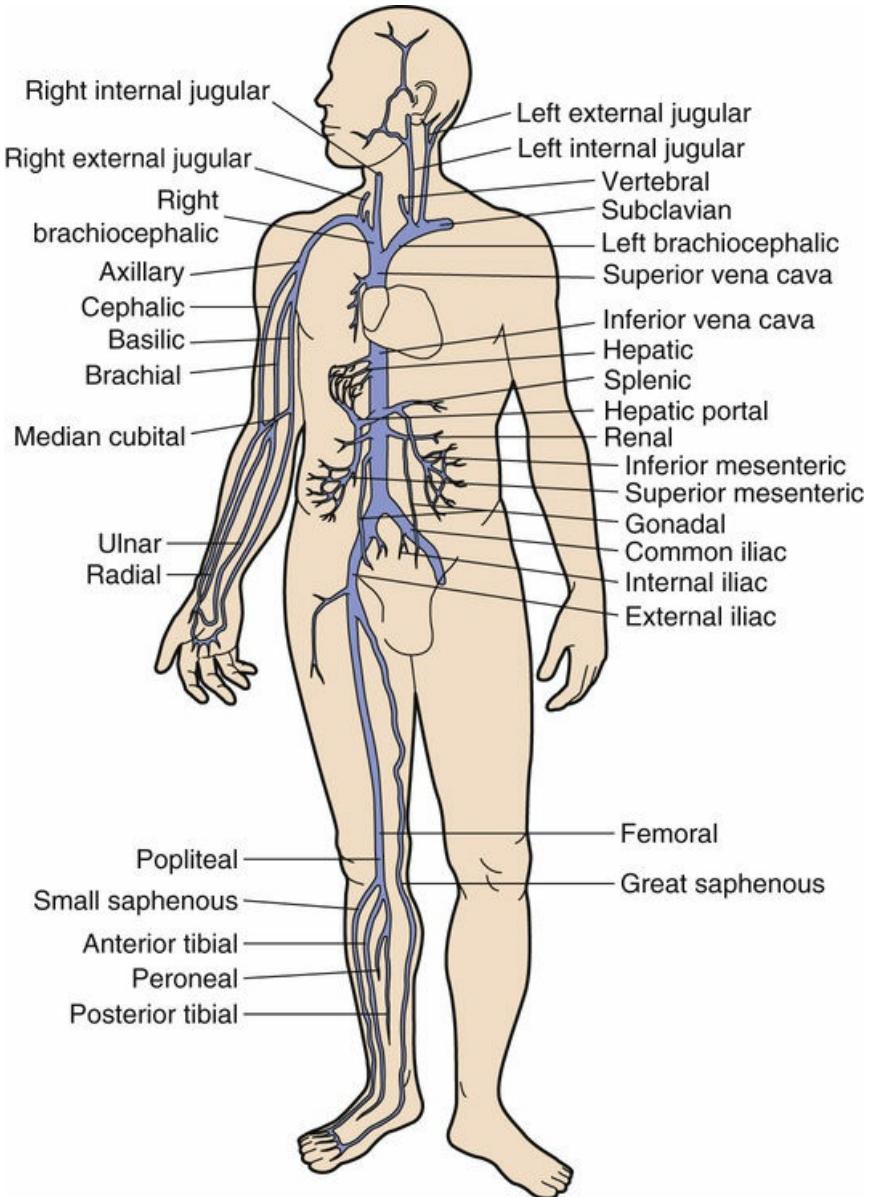


FIGURE 17-5 Major veins in the body.

- Small veins, **venules**, and small arteries, **arterioles**, are connected by the capillaries. It is in the capillaries that the oxygen is transported to cells and waste products are removed from them.
- The aorta is the largest artery in the body, and it receives blood from the left ventricle.
- The inferior and superior vena cava are the largest veins in the body and empty blood into the right atrium of the heart.
- Arteries are elastic and accommodate changes in blood flow by constricting or dilating.
- Three layers of tissue make up the artery wall: The outer layer (the **tunica adventitia**) is connective tissue; the middle layer (the **tunica media**) is smooth muscle; and the inner layer (the **tunica intima**) consists of endothelial cells.
- Veins have the same three layers but with less smooth muscle and connective tissue. The veins are thinner and less rigid and thus can hold more blood.
- The heart pumps blood through the arterial system with each contraction. Skeletal muscle contraction, respiratory movements that change pressures in the chest, and constriction of the veins propel blood back to the heart.
- Sets of valves in the medium and large veins open and close, keeping blood flowing toward the heart against gravity.

- For blood to circulate, the arteries must be unobstructed, and they must be able to dilate and constrict as necessary to regulate the blood flow. Veins also must be patent, their valves must function normally, and surrounding muscles must contract so that venous blood is continually being moved in the direction of the heart.

Blood Pressure

- Arterial blood pressure is the force that the blood exerts against the walls of the aorta and its branches.
- The blood pressure is greatest during ventricular contraction, or **systole**, when blood is ejected into the aorta.
- Diastolic pressure is the pressure when the ventricles are in the relaxation phase, or **diastole**, just before the next contraction of the ventricles.
- The difference between the systolic blood pressure and the diastolic blood pressure is called the *pulse pressure*.
- If the diameter of blood vessels becomes smaller because of atherosclerosis, blood pressure is increased with the effort of forcing the blood through the smaller opening. **Atherosclerosis** is the condition in which fibrous plaque with fatty deposits forms in the interior layers of the arteries, causing narrowing.
- If there is an increase in the volume of fluid in the blood vessels, the pressure within the vessels increases, and the heart must work harder to pump the increased volume of fluid through the vessels.
- If blood volume decreases, the kidneys secrete the enzyme renin in the blood ([Figure 17-6](#)).

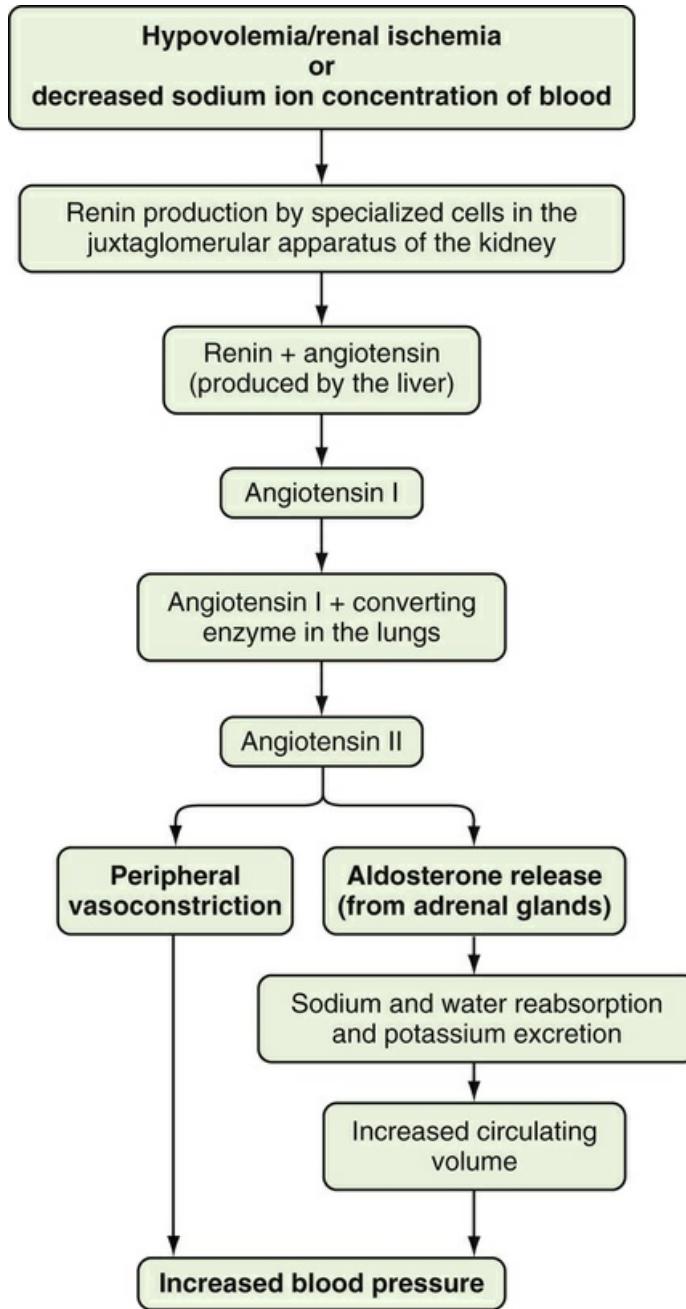


FIGURE 17-6 The renin-angiotensin-aldosterone system. (From Sole ML, Klein DG, Moseley MJ: *Introduction into critical care*, ed. 5, Philadelphia, 2009, Saunders Elsevier.)

- Renin acts on certain blood proteins to produce angiotensin I.
- Angiotensin I is converted to angiotensin II by angiotensin-converting enzyme from the lungs.
- Angiotensin II acts directly on the blood vessels, causing them to constrict, increasing resistance to blood flow in the peripheral vessels. Angiotensin II also stimulates the adrenal gland to release aldosterone, causing sodium and water retention by the renal tubules. The retained sodium and water increase the blood volume, causing blood pressure elevation and improved cardiac output.
- Blood flow is affected by the amount of resistance in the vessels and by the viscosity of the blood.
- Vascular resistance is controlled by the nervous system, hormones, blood pH, and ions that regulate the diameter of the vessels.
- **When the vessel diameter increases, resistance falls and blood flow increases. When vessel diameter decreases, resistance rises and blood flow decreases.**
- The sympathetic nervous system plays a major role in regulating vessel diameter because it prompts the release of the hormones norepinephrine and epinephrine that cause vasoconstriction.

- Blood viscosity is affected by the hydration status of the body. When dehydration occurs, blood viscosity increases; thicker blood causes an increase in blood pressure.

Cardiovascular System Changes Related to Aging

- The aging heart becomes stiffer and contractile ability decreases, resulting in decreased stroke volume.
- The coronary arteries become tortuous and dilated and have areas of calcification.
- The cardiac valves become thickened, particularly the mitral and aortic valves, which are subject to higher pressures. A systolic murmur is common in those older than age 80 years.
- The SA node loses about 40% of its pacemaker cells over time, predisposing to cardiac **dysrhythmia** (abnormal rhythm) or SA node failure.
- The aorta becomes stiffer, contributing to an increase in systolic blood pressure because the left ventricle must pump against greater resistance.
- The arterial walls thicken and lose elasticity, making them less able to adjust to changes in volume and to comply with sympathetic stimulation.
- Varicose veins develop as veins lose their elasticity, valve function decreases, and the leg muscles weaken and atrophy from decreased exercise.
- Platelet aggregation and increased coagulation potential lead to a greater incidence of thrombus formation, deep vein thrombosis, and thrombophlebitis.
- Chronic health problems and failing eyesight often lead to decreased activity, predisposing to vascular problems.

Cardiovascular Disease

Cardiovascular disease (CVD) affects one in four people in the United States, and more than 600,000 people die in the United States as a result of cardiovascular problems each year (Go et al., 2014). Cardiovascular disease is responsible for the largest portion of Medicare funds spent each year. Together with the heart, the vascular system provides the body with nutrients and oxygen needed for life. The vascular system also transports metabolic wastes that are excreted by the lungs and the kidneys. When a disorder of the cardiovascular system occurs, homeostasis is upset. Many of the disorders that afflict the cardiovascular system can be prevented or controlled.

Women and Heart Disease

Heart disease incidence in women is almost equal to that in men. More women than men die each year of heart disease. The risk factors are similar to those for men: high cholesterol, high blood pressure, and obesity. Other factors play a bigger role for women, such as diabetes, metabolic syndrome, smoking, and mental stress.

Health Promotion

Preventing Cardiovascular Disease in Women

- Participate in regular physical activity—at least 40 minutes three or four times a week.*
- Maintain cholesterol levels as indicated by risk stratification.
- Refrain from smoking.*
- Do not consume more than one alcoholic drink per day.
- Obtain and maintain a healthy weight to reduce the chance of type 2 diabetes.* Type 2 diabetes increases the risk of cardiovascular disease.
- Maintain a body mass index (BMI) below 25.
- Discontinue use of estrogen contraception/supplementation as soon as possible.
- Reduce the amount of *trans* fat in the diet.
- If diabetes is present, keep fasting blood sugar below 100 mg/dL.
- If hypertension is present, take medication regularly to keep blood pressure below 130/80 mm Hg (below 115/75 mm Hg is optimal).
- Incorporate stress reduction techniques into the daily lifestyle, because increased stress is a risk factor for cardiovascular disease.*

*These factors play an even larger role in prevention of heart disease in women than in men.

Think Critically

Can you think of two physiologic reasons why older adults are more at risk for hypertension?

Causes of Cardiovascular Disorders

Causes of cardiovascular disorders can be congenital or acquired. Narrowing of the aorta (**coarctation**), holes in the septum, or abnormal formation of a cardiac valve can occur congenitally.

Acquired defects include narrowing or hardening of the blood vessels from **arteriosclerosis** (thickening and loss of elasticity) or atherosclerosis (buildup of plaque) and aneurysms of the large vessels. Inflammation of the valve structure may cause narrowing (stenosis) or incomplete closure (insufficiency) of the valve. Alteration of the myocardial muscle tissue by extra growth with thickening (hypertrophy) or fibrosis may occur as a result of systemic **hypertension** (persistently elevated blood pressure), pulmonary hypertension, or valve problems. Lack of adequate blood supply (**ischemia**) or **infarct** (area of tissue that has died from lack of blood supply) may occur from coronary artery disease. Deterioration of the pacemaker cells and conduction fibers related to hypertrophy or inflammation of tissues may cause conduction disorders.

Several disorders involving either the heart or the vessels through which it pumps blood can eventually weaken and damage the heart muscle and lead to pump failure. This condition, called *heart failure*, is a complication of many cardiovascular diseases, as discussed in the following chapters.

Disturbances in any part of the heart's conduction system can result in an increase in heart rate (tachycardia), a slowing down of the heart rate (bradycardia), and disturbances in the rhythm of the heartbeat (dysrhythmias).

Infection and inflammation also can take their toll on the structure and function of the heart.

Endocarditis, inflammation within the lining and valves of the heart, and **pericarditis**, an inflammation of the sac surrounding the heart, can occur as primary diseases, but they are more often secondary to infection and inflammation elsewhere in the body. An example is rheumatic heart disease, which occurs after a streptococcal infection and damages heart valves.

Substances in the blood, such as excess carbon dioxide and certain drugs, can affect the rate and rhythm of the heart through their effect on the autonomic nervous system. The heart also responds to physiologic changes that indicate a need for more or less oxygen.

The arterial walls can be injured by several factors. Hypertension causes a mechanical injury by applying increased pressure continuously on the arterial walls. For each increment of 20/10 mm Hg above a pressure of 115/75, the risk of CVD doubles ([National Heart, Lung, and Blood Institute, 2012](#)). Elevated levels of total cholesterol and decreased levels of high-density lipoprotein cholesterol (HDL-c) lead to increased fatty deposits in the arterial walls, causing a narrowing of the vessels. Chemical toxins such as nicotine from tobacco and the toxins caused by renal failure cause injury to the arterial walls. Substance abuse with alcohol, stimulants, and recreational drugs are damaging to the cardiovascular system (see [Chapter 46](#)).

Physiologic disorders such as diabetes mellitus and metabolic syndrome directly cause physical changes in the vessel walls, leading to more rapid arteriosclerosis, an increased rate of atherosclerosis, and an earlier onset of hypertension.

Obesity, a sedentary lifestyle, and stress are all directly related to the increased incidence of atherosclerosis and hypertension. Smoking, and the changes it causes in the vessel walls, is directly related to arteriosclerosis of the peripheral vessels and decreased circulation in the lower extremities. Long-term hypertension causes arteriosclerosis and is a direct factor in the development of aortic aneurysm in many patients. Hypertension in some cases cannot be prevented, but it can be managed with diligent therapy and cooperation of the patient.

Prevention of Cardiovascular Disease

Cardiovascular diseases claimed 784,750 lives in 2010 in the United States ([Go et al, 2014](#)). Heart disease remains the major cause of death in the United States. Cardiovascular diseases also account for a large percentage of the chronic illnesses that disable, to some degree, a large portion of the U.S. population.

There are many kinds and degrees of heart disease. Advances in medical science have made it possible either to cure or successfully manage a large number of cardiovascular problems. Reasons for the decline in deaths from heart disease since the mid-1980s include improved emergency treatment of persons experiencing a coronary occlusion, or "heart attack," improved education of the public regarding ways to prevent cardiovascular disease, and teaching about the warning signs of a heart attack. Every nurse has a responsibility to assist with public education about heart disease.

Health Promotion

Know the Warning Signs of a Heart Attack

- **Chest discomfort:** A feeling of tightness, pressure, or a crushing or squeezing pain lasting more than a few minutes or returning after easing. In women, discomfort that radiates to the back or abdomen.
- **Pain or discomfort in other areas of the upper body:** Arms, shoulder, back, neck, jaw, or the top of the stomach. Women often have jaw or back pain.
- **Shortness of breath:** May occur with or without chest discomfort.
- **Breaking out in a cold sweat, nausea, or light-headedness** with or without chest discomfort.
- **Feeling of impending doom** that does not go away. Or unusual fatigue in women.
- **Chest pain** unrelieved by prescribed doses of nitroglycerin.

Call 911 or emergency number immediately—get help! Take an aspirin.

Nonmodifiable risk factors are those that cannot be prevented by an individual. However, control of diseases such as hypertension and diabetes mellitus and the reduction of high cholesterol are possible. Because hypertension and diabetes are factors in the development of atherosclerosis, controlling them can help prevent the early onset of heart disease. If a person with diabetes can keep the hemoglobin A_{1c} below 6% the risk of atherosclerosis is decreased ([Matsushita et al., 2010](#)).

Management of hypertension is one of the major factors for heart disease prevention.

[Table 17-1](#) presents the risk factors for cardiovascular disease. Metabolic syndrome is a strong indicator of cardiovascular risk and is diagnosed when three or more of the components in [Box 17-1](#) are present ([Wang, 2014](#)). More than 50 million Americans meet the criteria. Modifiable risk factors are the major focus for education to prevent heart disease. Cigarette smoking-related health problems are heavy contributors to heart disease, and smoking is a key factor in sudden cardiac death. The use of cocaine and methamphetamine has added to the problem of heart disease ([Figtree et al, 2012](#)). Cocaine causes vasoconstriction and is believed to speed up the atherosclerosis process. Also, cocaine has been known to cause sudden cardiac death, or stroke, in susceptible individuals. Research is finding that the ingestion of both alcohol and cocaine greatly increases the chance of cardiac death. Methamphetamine increases heart rate, causes vasoconstriction that can lead to hypertension, and speeds up electrical conduction, potentially causing dysrhythmias and myocardial infarction (MI).

Think Critically

Can you identify two risk factors you can modify to decrease your risk of heart disease?

Table 17-1
Risk Factors for Cardiovascular Disease

UNMODIFIABLE RISK FACTORS	SIGNIFICANCE
Heredity	Children of parents with cardiovascular disease are more likely to develop the same problem.
Race	African Americans experience high blood pressure two to three times more frequently than whites. Consequently the risk of heart disease in this group is higher.
Sex	Males experience more heart attacks than females earlier in life. After age 65 years, the death rate from heart disease increases in women.
Age	Four out of five people who die of a heart attack are age 65 years or older. Increasing age increases risk.
MODIFIABLE RISK FACTORS	MEANS OF MODIFICATION
Obesity	Keep weight within normal limits by diet and exercise. Reduce abdominal obesity.
High cholesterol	Implement a low-fat diet and exercise; take medication as prescribed. Target levels of cholesterol are individually set.
Hypertension	Keep blood pressure less than 120/80 mm Hg.
Diabetes	Maintain good glycemic control by keeping blood glucose within normal limits (<100 mg/dL).
Cigarette smoking	Quit smoking. Do not use smokeless tobacco; nicotine by any route affects blood vessels.
Sedentary lifestyle	Maintain an exercise program of 30-min sessions three to five times a week. Any level of increased activity is helpful.
Excessive stress	Use stress-reduction techniques regularly, such as exercise and relaxation techniques; reduce hostility; maintain a positive support system.
Excessive alcohol intake	Limit alcohol consumption to no more than recommended levels: men, 2 drinks/day; women, 1 drink/day.
Cocaine use	Do not use cocaine, methamphetamine, or other recreational drugs.

Box 17-1

Metabolic Syndrome Components

- Elevated waist circumference indicating abdominal obesity: *men*, greater than 40 inches (102 cm); *women*, greater than 35 inches (88 cm)
- Elevated triglyceride level: greater than 150 mg/dL
- Reduced high-density lipoprotein cholesterol level: *men*, less than 40 mg/dL; *women*, less than 50 mg/dL
- Elevated blood pressure: at or above 130/85 mm Hg
- Elevated fasting blood glucose level indicating insulin resistance: 100 mg/dL or greater

Although systolic blood pressure rises as a natural process of aging because arteries become less elastic, systolic hypertension should be treated in older adult patients. The *JAMA* 2014 guidelines for management of hypertension recommend implementing antihypertensive medications for individuals 60 years or older who have a systolic blood pressure at or above 150 mm Hg or diastolic blood pressure above >90 mm Hg. (James et al, 2014).

Hypertension in older adults is associated with an even higher risk of heart disease, stroke, and death from coronary thrombosis (Aronow et al, 2011). Hypertension has been associated with more rapid memory loss and loss of cognitive function in some research studies.

Nurses can play an important role in teaching others about hypertension, support patient efforts to prevent the disease and its long-term consequences, and contribute to reducing the incidence of the harmful effects of hypertension by participating in community screening programs and education. Nurses and other health care professionals have an obligation to serve as models for a healthy lifestyle.

Diagnostic Tests and Procedures

In addition to a routine physical examination and medical history, the provider has access to a number of procedures and tests to help diagnose cardiovascular disease (Figure 17-7). Noninvasive procedures usually are performed first and in general give less detailed information about cardiovascular structure and function. Specific cardiovascular diagnostic tests and their nursing implications are listed in Table 17-2.



FIGURE 17-7 Cardiac treadmill stress test.

Table 17-2**Common Diagnostic Tests for the Cardiovascular System**

TEST	PURPOSE	PROCEDURE	NURSING IMPLICATIONS
Electrocardiography (12-lead electrocardiogram [ECG])	Records electrical impulses of the heart to determine rate, rhythm of heart, site of pacemaker, and presence of injury at rest	Small electrodes are placed on the chest and extremities, to show conduction patterns in different directions of electrical flow. Signal-averaged ECG can be used for patients at high risk for serious ventricular arrhythmias. It takes longer than a standard ECG; monitoring takes approximately 10 min and signals are averaged.	Inform patient that there is no discomfort with this test. Maintain electrical safety. Normal finding: normal ECG.
Holter monitor (ambulatory ECG) Multiple devices in addition to the Holter monitor are available. All record the ECG over hours or days during regular activities of daily living.	Correlates normal daily activity with electrical function of the heart to determine whether activity causes abnormalities	Patient wears a small ECG recorder for 6, 12, or 24 hr while doing usual tasks. A diary is kept to show at what time the various activities were performed and any symptoms experienced. The record is analyzed to correlate any dysrhythmia with the activity at that time.	Remind patient that all activities must be recorded in the diary: brushing teeth, climbing stairs, sexual intercourse, bowel movements, sleeping, etc. Caution patient not to remove the electrodes and not to get the recorder or wires wet. Instruct patient to wear a loose shirt during test.
Loop recorder Implantable External	Continuously records ECG to determine if an arrhythmia is the cause of symptoms (e.g., syncope, palpitations, or dizziness)	A small device that records ECG activity for several months. The device can be implanted under the skin with local anesthesia or attached externally to the skin with long-term adhesive. The implanted device can be left in place for up to 3 yr.	The implanted device requires a small skin incision that will need assessment and care similar to any surgical incision.
Exercise ECG stress test (treadmill)	Records electrical activity of the heart during exercise Insufficient blood flow and oxygen show up as abnormal waveforms	Small electrodes are placed on the chest, and a tracing is made while the patient exercises on a treadmill, bicycle, or stairs. The degree of difficulty of the exercise is increased as the test continues to see how the heart reacts to increasing work demands. Vital signs are continuously recorded. May be combined with radionuclide imaging or echocardiograph. Provider is present.	Requires a signed consent form. Instruct patient to wear comfortable clothes and walking shoes. Light meal 2-3 hr prior, then NPO. Regular medications are given. Chest is shaved as needed for electrode placement. Inform patient that the test will be stopped if chest pain, severe fatigue, or dyspnea develops.
Chemical stress test with dipyridamole, adenosine, or dobutamine	Used for those who cannot exercise for an ECG stress test	Continuous 12-lead ECG monitoring is performed and the drug is administered. Blood pressure and pulse are taken and recorded q15min. The drug effect increases cardiac workload to identify whether cardiac ischemia results. The patient is NPO during the test.	Mild nausea or headache may occur. Explain that patient will lie on back for the test. If BP drops too low, phenylephrine is given.
Echocardiography	Useful in evaluating size, shape, and position of structures and movement within the heart Test of choice for valve problems	An ultrasound probe that emits sonar waves is guided over the chest wall while the patient is supine or turned on the left side. Test takes 30-60 min. May be done in combination with the exercise (stress) test.	Inform patient that there is no discomfort, although conduction jelly may feel cool. Normal finding: no abnormalities of size or location of heart structures; normal wall movement.
Stress echocardiogram	Detects differences in left ventricular wall motion before and after exercise	Resting echocardiogram images are obtained. The patient exercises; within 1 min, postexercise images are obtained. May be done in conjunction with a chemical stress test.	Explain the procedure and the importance of returning to the examining table immediately after exercising. Instruct patient not to consume heavy meal beforehand and to abstain from using tobacco or caffeine for 6-8 hr before test. Tell patient to wear walking shoes.
Venous ultrasound of the legs (lower extremity Doppler)	Assesses occlusion or thrombosis in a vein	A water-soluble gel is applied to bare skin in the area to be assessed. A Doppler transducer is passed over the area of the vessel. A gray-scale image of the vessel is obtained with color depicting the blood flow velocity.	Instruct patient to abstain from smoking for 30 min before the test.
Impedance plethysmography	Estimates blood flow in a limb based on electrical resistance present before and after inflating a pneumatic cuff placed around the limb Detects deep vein thrombosis	Measurements of electrical resistance are taken before and after a pneumatic cuff placed around the limb is inflated. Electrodes are placed on opposite sides of the limb.	Instruct patient to wear loose clothing. Explain that some discomfort may occur during inflation of the cuff. The patient is placed on an examination table and positioned supine in a relaxed, comfortable position. The limb is properly positioned, and electrodes and the pneumatic cuff are applied.
Nuclear imaging (myocardial perfusion scan, myocardial perfusion imaging, thallium scan, sestamibi cardiac scan, and nuclear stress test)	Evaluates blood flow in various parts of the heart Determines areas of infarction	A radioactive tracer is injected IV; radioactive uptake is counted over the heart by a gamma scintillation camera. May be done in conjunction with an exercise ECG stress test.	Explain that the radioactivity used is a very small amount and lasts only a few hours. Explain that a camera will be positioned over the heart. ECG electrodes are placed on the chest; scanning is done 10-15 min after injection; can be done as an outpatient procedure. May be done in two parts a few hours apart.
Multiple-gated acquisition (MUGA) scan (radionuclide angiography)	Determines area and extent of myocardial infarction (MI) Assesses left ventricular function	^{99m} Tc is injected IV and is taken up by areas of infarction, producing hot spots when scanned. Multiple serial images are obtained. Best results occur when done 1-6 days after a suspected MI.	Inform patient that radioisotopes will be given IV and that it will be necessary to lie still while the machine scans the heart. The patient's glucose level must be between 60 and 140 mg/dL. If scan is combined with exercise, patient will need to be NPO and must abstain from using tobacco and caffeine for 24 hr before the test.
Computed tomography (CT) scan CT angiography	Determines size and condition of aortic aneurysm Coronary vessels may be imaged	Noninvasive, unless dye contrast is used. Patient is positioned on scanning table and moved under the scanner.	Instruct patient in necessity of holding still during scan.
Magnetic resonance imaging (MRI) Magnetic resonance angiography (MRA)	Evaluates cardiac tissue integrity, detects aneurysms, determines ejection fraction and cardiac output, and determines patency of proximal coronary arteries	Noninvasive magnetic resonance is used to depict tissue images. IV gadolinium is injected as a contrast medium for the MRA.	Explain about the cylinder within which the patient will be positioned. Warn that there will be loud noises from the machine. Administer anti-anxiety medication if needed and ordered; provide ear protection.
Positron emission tomography	Evaluates myocardial perfusion	IV nitrogen-13-ammonia is injected and a scan performed to show myocardial metabolic function. Then fluoro-18-deoxyglucose is injected and a scan performed. In a normal heart, the scans will match; in an ischemic heart, the scans will differ.	Inform patient that radioisotopes will be given IV and that it will be necessary to lie still while the machine scans the heart. The patient's glucose level must be between 60 and 140 mg/dL. If scan is combined with exercise, patient will need to be NPO and must abstain from using tobacco and caffeine for 24 hr before the test.
Transesophageal echocardiogram (TEE)	Provides images of the heart, mitral valve, atrial septum, and thoracic aorta	Pharynx is anesthetized with topical agent. With patient in left side-lying position, an endoscopic transducer is placed in the esophagus and positioned behind the heart. Recordings of the images are made. Test takes about 20 min.	Patient must be NPO for 4-6 hr before test. Initiate IV access before test for sedation. Apply ECG leads for monitoring during test. Monitor pulse oximetry, end tidal CO ₂ , and BP. Observe patient after test until sedation has worn off.
Angiogram (venogram)	Identifies thrombi within the venous system	A tourniquet may be placed on the extremity, and dye is injected into the affected extremity. Radiographs are taken at timed intervals. Also used to identify venous stenosis.	Requires a signed consent form. Assess for allergies to radiopaque contrast. Hydrate patient before the procedure. Tell patient it takes 30-90 min, and that a warm flush may be felt when the dye is injected.

Arteriogram	Visualizes arterial anatomy and vascular disease in carotid, vertebral, aorta, renal, coronary, and peripheral arteries	A catheter is placed via the femoral artery into the desired artery. Radiopaque contrast is injected while x-ray (fluoroscopy) images are obtained. Digital subtraction techniques obliterate bony structures from the views. CO_2 gas may be used in place of dye if the patient is allergic to the dye. A balloon may be used during the procedure to open constricted areas. A stent may be placed in the vessel to keep it open.	Requires a signed consent form. Patient must be NPO for 2-8 hr before test. Mark peripheral pulses before procedure. Check renal function and coagulation studies before test and alert provider of abnormal values. Mucomyst may be administered a day before and after the test to prevent dye-induced nephropathy. Warn patient that dye acts as a diuretic and may cause some bladder distention during the test. Metformin must be discontinued before and after the test for several days to prevent renal damage.
Cardiac catheterization with coronary angiography; also called a <i>left heart catheterization (LHC)</i>	Assesses size and patency of coronary arteries and presence of collateral circulation Identifies pressure gradients for the aortic and mitral valves Assesses pumping action of the left side of the heart by measuring the ejection fraction of the left ventricle	Catheter is inserted into an artery. Femoral artery is commonly used, but may use radial or axillary arteries. With local anesthetic and procedural sedation, using fluoroscopy, the catheter is threaded up the aorta to the coronary arteries, which come off of the aorta just past the aortic valve. Contrast media is injected to visualize the size and shape of the coronary vessels. A separate catheter is used to pass through the aortic valve into the left ventricle. Contrast is injected into the chamber to visualize wall motion and calculate ejection fraction. Procedure is video recorded for later review.	Requires a signed consent form. Patient must be NPO for 6-8 hr before test. Assess patient for allergy to iodine, shellfish, or contrast dye. Have patient void before giving preoperative medication. Record baseline vital signs and mark location of pedal pulses. Inform patient that procedure involves being on a narrow table with a camera that rotates around to different angles, patient will have an IV, and must lie still during test. Procedural sedation is used. ECC leads, BP cuff, O_2 saturation monitor, CO_2 monitor will be in place during the test. Patient may be asked to cough or turn head during the procedure. Assess peripheral pulses with vital signs and question patient about numbness or tingling. Inspect insertion site for bleeding or sign of hematoma. If femoral insertion site was used, keep patient flat and leg extended for ordered time. If a closure device was used at the arterial puncture site, patient may be able to ambulate within 2 hr. Encourage fluids unless contraindicated to flush contrast from body.
During the procedure <i>intravascular ultrasound (IVUS)</i> may be performed.	Assesses degree of narrowing of coronary vessels and the type of material causing the narrowing (e.g., calcium, clot, or plaque)	An ultrasound catheter may be advanced into the coronary artery to image the lumen of the vessel. This is accomplished through the existing vascular access and through the catheters already in place. It is done as an adjunct procedure to the LHC.	Patient may be asked to cough or turn head during the procedure. Assess peripheral pulses with vital signs and question patient about numbness or tingling. Inspect insertion site for bleeding or sign of hematoma. If femoral insertion site was used, keep patient flat and leg extended for ordered time. If a closure device was used at the arterial puncture site, patient may be able to ambulate within 2 hr. Encourage fluids unless contraindicated to flush contrast from body.
Electrophysiology studies	Measures and records electrical activity from within the heart to determine the area of origin of the dysrhythmia and the effectiveness of the antidysrhythmic drug for the particular dysrhythmia	Three to six electrodes are placed in the heart through the venous system. Electrodes are attached to an oscilloscope that records the intracardiac and external ECG waveforms simultaneously. After baseline tracings are taken, the cardiologist tries to trigger the dysrhythmia that is to be studied by programmed electrical stimulation through the electrodes. Once the dysrhythmia is triggered, an antidysrhythmic drug is administered to determine its effectiveness in stopping the abnormal rhythm. Studies may take 1½ -4 hr; serial studies may be done on different days.	Provide psychological support for the patient, who is commonly fearful of having dysrhythmias induced. Antidysrhythmic drugs may be stopped 24 hr or more before the test to eliminate them from the patient's system. Assure the patient of constant monitoring and that emergency equipment and staff will be on hand. Keep patient NPO after midnight. Patent IV line is required. Electrodes are placed using fluoroscopy. Patient will be supine on an x-ray table. The femoral vein is most commonly used; the groin is shaved, and local anesthesia is used. Post-test care: much the same as for cardiac catheterization.
Hemodynamic monitoring via pulmonary artery (PA) (Swan-Ganz) catheter Placement of a PA catheter for diagnostic purposes is called a <i>right heart catheterization</i> .	Determines pressure, flow, and oxygenation within the right side of the heart and pulmonary vessels	A special catheter, infusion system, transducer, and a monitor are prepared, and the catheter is placed by the provider, usually under fluoroscopic guidance.	The system must be calibrated to perform properly. Readings are taken in the right atrium, right ventricle, and pulmonary artery, including pulmonary wedge pressures. Cardiac output may also be measured. Other data can then be calculated.
Laboratory Tests*			
B-type natriuretic peptide (BNP)	Determines degree of HF	Obtain 5-7 mL of venous blood; use an EDTA lavender-top tube.	No fasting is required.
C-reactive protein (CRP)	Assesses cardiac risk Level increased with inflammation	Obtain one tube of venous blood; use red-top tube.	Some laboratories require fasting; water is permitted. Low risk: <1 mg/dL High risk: >3 mg/dL
Serum lipids	Elevation of cholesterol is a risk factor for atherosclerotic heart disease	Use red-top serum separator tube (SST). Upon collection, the tube is inverted 6-12 times to accelerate the clotting process and separate the serum from the clot.	Patient is NPO except for noncaloric liquids for 12 hr. Normal ranges: Cholesterol: 150-200 mg/dL HDL: 30-80 mg/dL LDL: 60-180 mg/dL (with two or more risk factors, <73 mg/dL) Triglycerides: 40-150 mg/dL
Myoglobin	Is released by all damaged muscles, including the heart	Obtain 5 mL blood; use a red-top tube. Apply pressure to venipuncture site.	Explain procedure. No fasting is required. An elevated level can help confirm an MI. A nonelevated level rules out an MI. Normal value: <90 mcg/L
Troponin I (Tn I) Troponin T (Tn T)	Specific to heart muscle damage	Troponin I and T require different tubes for collection. Serial samples are usually drawn.	Levels may elevate within 4-6 hr after MI, peak within 10-24 hr, and return to normal within 10 days Normal values: Tn I: <0.3 mcg/L Tn T: <0.1 mcg/L
Creatine phosphokinase (CPK)	CPK is an enzyme found mainly in the heart, brain, and skeletal muscle	Serial samples are drawn over a 2-day period.	Elevated within 4-8 hr after heart attack (may also rise with injury to other muscles). Peaks within 12-24 hr; returns to normal levels within 3-4 days. Normal ranges: Men: 55-170 International Units/L Women: 30-135 International Units/L
CK-MB (creatinine kinase)	Isoenzyme of CPK that is primarily found in the heart	Serial samples may be evaluated.	Elevates within 2-6 hr after an MI, peaks within 12-24 hr, and returns to normal within 3 days. CK-MB is specific to myocardial injury. Normal value: <3 ng/mL
Homocysteine	An amino acid (a building block of protein) usually present in the blood as a result of eating meat	Obtain blood sample; use a blue- or purple-top tube.	10- to 12- hr fast is required. Normal ranges: Men: 5.2-12.9 $\mu\text{mol/L}$ Women: 3.7-10.4 $\mu\text{mol/L}$ Elevated level is considered an independent risk factor for ischemic heart disease. There are no current guidelines that recommend use of the test and most insurance will not cover the significant cost.
Myeloperoxidase (MPO)	Found in heme and is an antimicrobial enzyme biomarker for predicting risk for cardiovascular disease	Obtain 0.5-mL blood; use a yellow-top tube.	No fasting required. Normal value: <6 U/mL Detects or assists in ruling out microangiitis of the arteries.

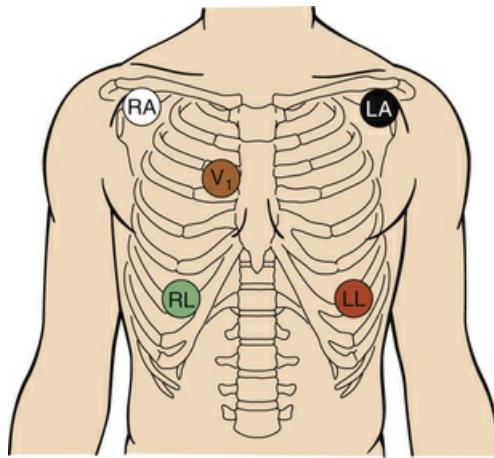
*Electrolyte values are listed in Table 3-3.

BP, Blood pressure; CO_2 , carbon dioxide; EDTA, ethylenediaminetetraacetic acid; HDL, high-density lipoprotein; HF, heart failure; IV, intravenously; LDL, low-density lipoprotein; MAP, mean arterial pressure; NPO, nothing by mouth; PADP, pulmonary artery diastolic pressure; PAWP, pulmonary artery wedge pressure; RAP, right atrial pressure; VLDL, very-low-density lipoprotein.

Cardiac Monitoring

Continuous monitoring of cardiac rate and rhythm often is done by **telemetry**. Disposable electrodes and wire leads are applied to the patient and are connected to a battery-operated transmitter unit. The wave pattern signals are sent to a monitor in a central station, where they are continually observed. This allows patients to walk around the nursing unit while being monitored. The wave pattern signals may also be displayed on a bedside monitor when continuous observation of the electrocardiogram (ECG) by the nurse is needed.

Cardiac monitors can detect specific **dysrhythmias** (abnormal variations of heart rhythm), automatically store the wave pattern, and alert the nurse to the abnormality with an alarm. Cardiac monitoring is used for patients experiencing an acute cardiac disorder, after cardiac surgery, after pacemaker insertion, and for patients with a potential for developing dysrhythmias. [Figure 17-8](#) shows proper placement for telemetry leads.



Five-electrode placement

FIGURE 17-8 Placement of the most commonly used telemetry leads. *RA*, Right arm; *LA*, left arm; *RL*, right leg; *LL*, left leg; *V1*, chest lead corresponding to the *V1* on a 12-lead electrocardiogram.

Specific Tests for Vascular Disorders

Diagnosing a vascular problem begins with a history and physical examination that includes a variety of tests for risk factors for vascular disorders. A complete blood count (CBC); urinalysis; blood lipid and cholesterol assessment (including high-density lipoprotein [HDL] and low-density lipoprotein [LDL]); or sequential multiple analyzer (SMA, also called a *metabolic panel*) panel that screens liver and kidney function, electrolytes, and blood glucose are ordered. If blood pressure is elevated, tests of thyroid, adrenal glands, kidneys, and renal arteries are done to rule out the possibility of another disease that might cause secondary hypertension. Hyperthyroidism, Cushing syndrome, pheochromocytoma, nephrosclerosis, and renal arterial stenosis all elevate blood pressure.

Doppler flow studies are performed to detect a venous thrombus when one is suspected and to assess the patency of the carotid arteries. Angiography may be performed to determine areas of narrowing in arteries or to detect a blockage. Nuclear medicine scans or CT angiography are performed to detect emboli in the lungs.

The ankle-brachial index (ABI) is an inexpensive, noninvasive bedside screening test to evaluate arterial status in the lower extremities ([Figure 17-9](#)). A regular blood pressure cuff is placed above the malleolus. Another blood pressure cuff is positioned over the brachial artery. A Doppler probe is used to check the systolic end point at the dorsalis pedis and the posterior tibial sites. The brachial blood pressure is measured. The ABI is calculated by dividing the systolic ankle pressure by the systolic brachial pressure. An ABI of 1 or more is considered normal. An abnormal ABI indicates arterial disease and can confirm a vascular cause for ischemic pain in the legs at rest and **intermittent claudication** (cramping pain in the muscles brought on by exercise and relieved by

rest). This pain is most common in the calves of the legs, but it also can affect the muscles of the thighs and buttocks. Chronic occlusive arterial disease commonly causes pain described as burning and tingling, with numbness of the toes. It is most noticeable at night when the patient is in bed.

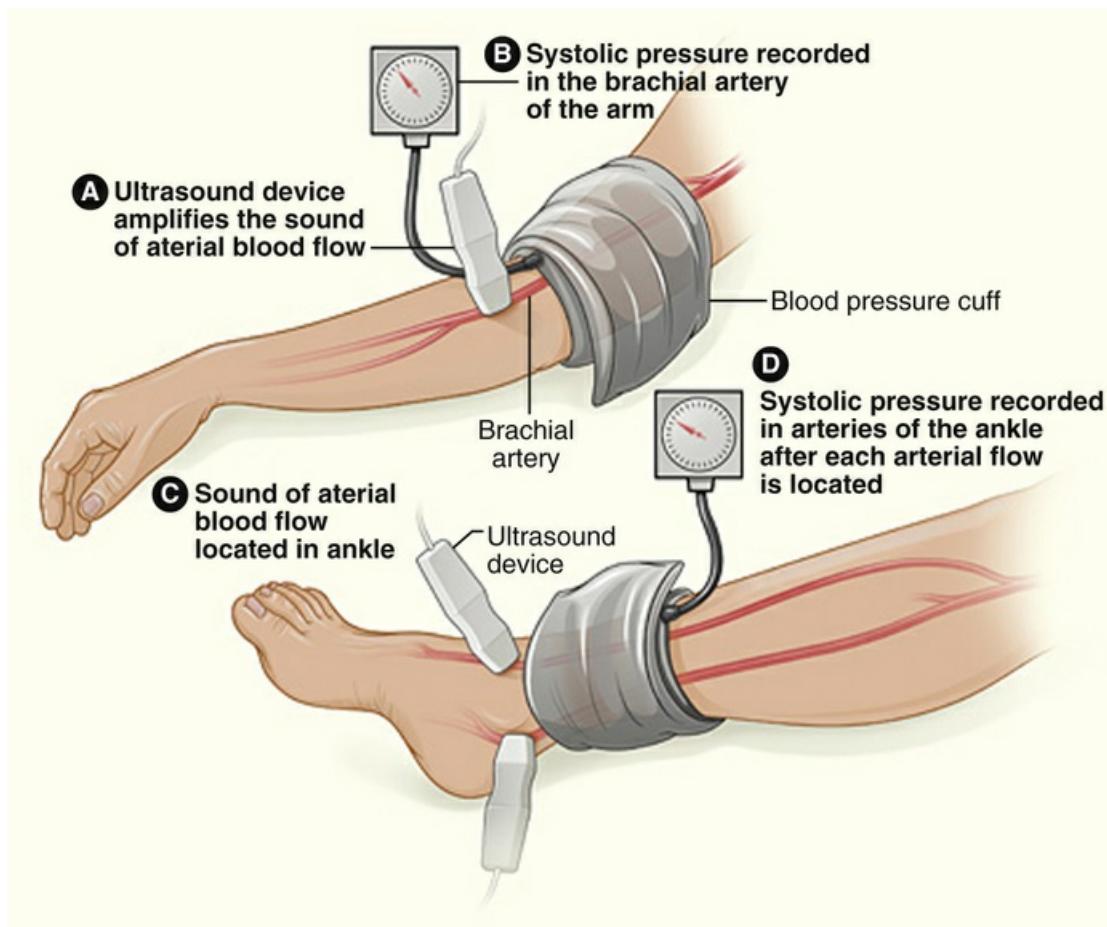


FIGURE 17-9 Ankle-brachial index. (From National Heart, Lung, and Blood Institute; National Institutes of Health; U.S. Department of Health and Human Services.)

See [Table 17-2](#) for diagnostic tests used to detect other problems in the vascular system. Serum cholesterol and lipids are also discussed in [Chapter 18](#).

Think Critically

Can you identify four teaching points to be covered for the patient who is to undergo an arteriogram?

Nursing Management

Assessment (Data Collection)

History Taking

It is important to determine whether the patient has risk factors for cardiovascular disease. Much of this information is obtained by the physician or nurse practitioner during history taking and by the admitting nurse during a complete nursing assessment. Some additional information, however, will be gathered in less formal interactions when the patient becomes more relaxed and comfortable with the nurses providing care.

Focused Assessment

Data Collection for the Cardiovascular System

History Taking

Ask the following questions:

- Do you ever have any chest discomfort or pain? What does it feel like? What, if anything, seems to bring it on? What makes it worse? How long does it last? Is it worse when you breathe in deeply? What gives relief? Does the pain radiate (spread) to other parts of the body, for example, down the arm or up into the neck or jaw, or to the upper abdomen? Is it localized, or does it cover a large area? On a scale of 1 to 10, with 10 being the worst and 1 being the least, how do you rate your pain? Do you have numbness, tingling, nausea, sweating, shortness of breath, anxiety, or dizziness when you have chest pain?
- Have you or any member of your family ever been told that you have diabetes mellitus; cardiovascular, thyroid, or renal disease; arteriosclerosis; hyperlipidemia; atherosclerosis; peripheral vascular disease; a blood disorder; gout; kidney disease; or an immune disorder such as lupus erythematosus?
- Do you become easily fatigued? Dizzy or light-headed?
- Do you become short of breath? When? Do you sleep on more than one pillow? Is your shortness of breath worse after physical activity? What kind of activity? When walking up steps? Does it occur when you are at rest? Does resting relieve it? Do you wake up at night short of breath or feeling like you are suffocating? Does sitting up on the side of the bed or getting up give you relief?
- Do you have a cough? What kind? Dry and hacking, or wet and productive? What does the sputum look like? Is there ever any blood in your sputum?
- Do you notice your heart beating very fast or pounding in your chest (palpitations)? Does it skip a beat?
- Have you ever fainted or felt like you were going to faint?
- Do you get up in the night to urinate? How many times do you get up each night?
- Have you noticed any sudden weight gain or swelling in the feet and legs?
- Do you experience pain in your legs when walking?
- Are your feet always cold?
- Have you ever had a bad injury to either leg?
- Have you ever had a deep vein thrombosis (DVT) or thrombophlebitis?
- What medications do you take that are prescribed by your provider? What over-the-counter medications do you take? Do you take herbals? Do you use recreational drugs?
- Do you smoke? Have you ever smoked? How much and for how long?
- Do you drink alcohol? What do you usually drink? How many drinks do you have? About how many times a week do you drink something alcoholic?
- What do you usually eat? Can you tell me what you generally eat for breakfast, lunch, and dinner? Do you have a midmorning, midafternoon, or evening snack? What do you eat for a snack? Do you eat fast food often? What type of fast food? What do you usually drink at meals? Do you drink liquids between meals?

- Do you regularly add salt to your food?
- Do you have leg pain at night?
- Have you ever had a sore on your foot or lower leg that was slow to heal?
- How would you rate your stress levels? What do you do to cope with or reduce stress?

Information concerning the patient's actual eating habits, such as snacking on "junk" food or daily consumption of several drinks containing caffeine, is more likely to be obtained during nursing care activities than during the initial assessment. Data concerning stressors in the patient's life and her response to them are more easily assessed while interacting over time.

An understanding of the patient's perception of her disorder and overall health is necessary to plan appropriate teaching. The effectiveness of your communication with the patient will determine the quality of subjective data obtained. Many over-the-counter (OTC) drugs can cause vasoconstriction and elevate blood pressure. Cold remedies, decongestants, and diet pills are particularly noted for having this effect. Patients sometimes do not consider OTC items as medications and do not report their use. Prescription medications also may affect the heart, including bronchodilators, anticoagulants, contraceptives, and psychotropic medications. Street drugs also alter blood pressure. A careful, specific diet history should be gathered. Fast-food intake is significant because it is often high in fat and sodium. **Excessive alcohol intake is a factor in the development of hypertension and cardiomyopathy.** Questions are asked to identify symptoms that might indicate that cardiovascular function has been impaired.

💡 Think Critically

How would you phrase questions about alcohol intake or drug use so that the patient would answer the questions honestly?

Physical Assessment

Significant findings include abnormal or extra heart sounds, crackles in the lungs, or pink frothy sputum indicating pulmonary edema.

🌐 Cultural Considerations

Dyspnea as the Major Symptom

African Americans often experience dyspnea as the most acute symptom during an MI. Dyspnea is more common than the more classic chest discomfort in this group. For this reason, they may delay seeking assistance.

Chest pain, if present, should be further assessed using the "PQRST" memory device ([Table 17-3](#)). Other significant findings might be a bluish cast to skin; pallor or diaphoresis (sweating); clubbing of the fingers; or pitting edema of the feet, ankles, or sacral area (see [Chapter 3, Figure 3-4](#)). There may be distended jugular veins, an abnormal rate or volume of pulses, or a pulse deficit. A pulse deficit is the difference between the apical and radial pulse rate when they are counted at the same time.

☒ Focused Assessment

Physical Examination of the Cardiovascular System

When assessing the cardiovascular system, check for:

- Skin color, temperature, and texture
- Facial expression: signs of pain or anxiety

- Vital signs
- Heart sounds: S_1 , S_2 , abnormal sounds, murmurs
- Apical pulse rate and rhythm; presence of pulse deficit
- Quality of peripheral pulses; compare them bilaterally
- Breath sounds: presence of crackles in lung bases
- Shape of fingers: presence of clubbing (see [Chapter 12, Figure 12-9](#))
- Appearance of neck veins: presence of venous jugular distention
- Abdomen: presence of distention; abdominal pulsation
- Ankles and feet: presence of edema and degree
- General body appearance: presence of edema
- Weight: gain of 2 lb or more over a few days
- Varicosities in lower extremities

Clinical Cues

Chest pain should be considered cardiac in origin until another cause can be ruled out. Many things can cause chest pain, but it is important to always think “cardiac first.”

Table 17-3
“PQRST” for Pain Assessment*

FACTOR	QUESTIONS TO ASK
Precipitating events	What events or factors precipitated or caused the pain or discomfort?
Quality of pain or discomfort	What does the pain or discomfort feel like? Is it aching, dull, sharp, tight, heavy pressure, etc.?
Radiation of pain	Where is the pain located? Does it radiate to the back, arms, jaw, teeth, shoulder, or elbow?
Severity of pain	On a scale of 0-10, with 10 being the most severe, how do you rate the pain?
Timing	When did the pain or discomfort begin? Has it changed since it started? Has this type of pain occurred before?

*This memory device is used to assist in obtaining information from any patient experiencing chest pain or discomfort.

An apical pulse rate should be taken for all patients on admission. Privacy should be provided before baring the chest, and the room should be warm. Heart sounds are auscultated at least every 8 hours on all patients who have a known dysrhythmia or a potential for dysrhythmia, a valve problem, or heart failure ([Figure 17-10](#)). The diaphragm of the stethoscope is placed over the bare skin at the mitral area to listen to the apical pulse. S_1 (lub) and S_2 (dub) should be distinguished. S_1 occurs with the closing of the AV valves during systole. S_2 is the closure of the pulmonic and semilunar (aortic) valves during diastole. Extra sounds or gallops may occur as S_3 sounds. Splitting of the S_2 sound may be normal in children and young adults, but may be abnormal in adults. S_4 is usually heard just before S_1 and can indicate various heart diseases.

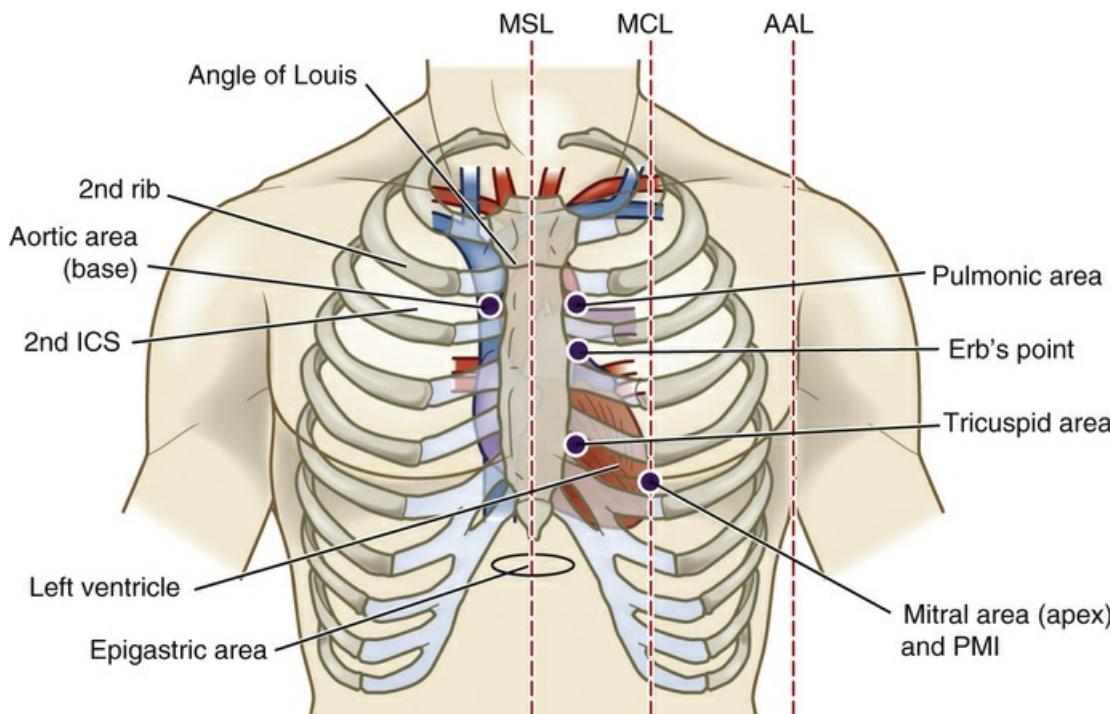


FIGURE 17-10 Sites for auscultation of heart sounds. S₁ is loudest at mitral and tricuspid areas. S₂ is loudest at aortic and pulmonic areas. Listen in the mitral area for S₃ and S₄ sounds. AAL, Anterior axillary line; MCL, midclavicular line; MSL, midsternal line; PMI, point of maximal impulse. (Modified from Price SA, Wilson LM: Pathophysiology: clinical concepts of disease processes, ed 6, St Louis, 2003, Mosby, and Kinney MR: Andreoli's comprehensive cardiac care, ed 8, St Louis, 1996, Mosby.)

The bell of the stethoscope is used to listen for heart murmurs. **It must be placed lightly on the skin for the sounds to be heard.** Murmurs usually have a “swooshing” sound from turbulent blood flow. Murmurs are commonly the result of damaged valves, causing abnormal blood flow in the heart. Because heart sounds typically are very soft, ask the patient to refrain from talking, and turn off the television or radio while listening. (Just remember to turn it back on.) Having the patient roll to the left side or lean forward may make the sounds louder and clearer.

Older Adult Care Points

The thickening of valve leaflets with age may cause a systolic murmur common in persons older than age 80 years.

Pulses. Check the arterial pulses and determine the pulse rate, rhythm, and character (force) of the pulse (Box 17-2). When performing a cardiovascular assessment, the radial pulse should be assessed and compared with the apical pulse. The apical pulse should be counted for a full minute. The carotid, femoral, popliteal, and pedal pulses should also be palpated and compared bilaterally, noting quality and character (Figure 17-11). The quality of pulses are graded as to their intensity. The character of the pulse is its regularity (see Box 17-2).

Box 17-2

Scale for Grading Pulse Quality

0 Absent

+1 Weak, thready

+2 Light volume

+3 Normal volume

+4 Full, bounding

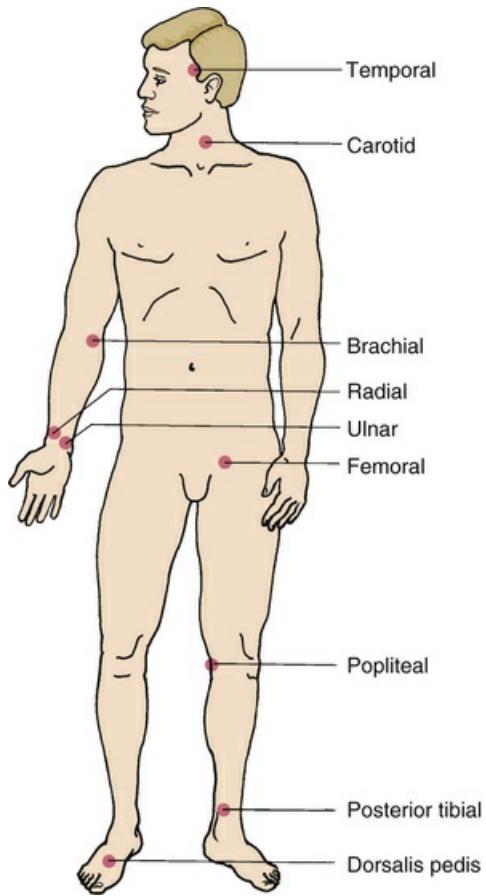


FIGURE 17-11 Palpation sites for arterial pulse.

If pulsations are weak or undetectable, use a Doppler device to check them. A Doppler measures the velocity of blood flow through a vessel with ultrasound waves. It can sense weak pulsations even in severely narrowed arteries. Dopplers may have a stethoscope or handheld probe attachment (Figure 17-12).

Think Critically

Can you recall the correct way to locate a dorsalis pedis and a posterior tibial pulse? Could you demonstrate the technique to a classmate?



FIGURE 17-12 The Doppler stethoscope is used to detect a faint pulse. (From Jarvis C: *Physical examination and health assessment*, ed. 5, Philadelphia, 2008, Saunders.)

Examine the abdomen with the patient lying supine to observe for a visual abdominal pulsation from the aorta. This sometimes indicates the presence of an aneurysm.

Bruits. A whooshing or purring sound (a **bruit**) is made when blood passes through a partially obstructed artery. To detect bruits, listen with the bell of the stethoscope applied lightly over the skin of the carotid arteries, abdominal aorta, and femoral arteries.

Blood pressure. For more accurate readings, be certain the patient has not had a cigarette or any caffeine for the past 30 minutes. Blood pressure should be carefully measured with the correct size cuff. The cuff should fit the upper arm with the lower edge 2.5 cm (1 inch) above the antecubital space. If the cuff is too narrow, the pressure will be falsely elevated. Cuffs are available in child, normal adult, and large adult sizes. The bladder must be centered over the brachial artery, and its length should cover at least 80% of the extremity's circumference when positioned correctly. The pressure should be taken lying supine, sitting, and standing for a thorough assessment. Standing blood pressure measurements also are important when a patient is started on a new medication, particularly an angiotensin-converting enzyme (ACE) inhibitor. Blood pressure should be measured on both arms. The arm on which the cuff is placed should be supported at heart level, and the feet should be supported or be on the floor. The patient should be resting quietly for 5 minutes before the measurement is taken. The equipment used should be calibrated, and the valve should open and close smoothly. The cuff should be deflated slowly and smoothly to obtain a correct diastolic reading. Automatic blood pressure machines must regularly be calibrated and checked for accuracy.

Orthostatic or postural hypotension occurs when the blood pressure drops when a person stands. Orthostatic or postural hypotension is a common cause of **syncope** (fainting) in older patients. A decrease of 20 mm Hg systolic pressure or a drop of 10 mm Hg diastolic pressure within 3 minutes of standing is orthostatic hypotension.

Older Adult Care Points

The blood pressure of older adult patients is usually lower right after a meal. For accurate readings, assess blood pressure between meals.

Skin. Tissues in light-skinned people who are receiving an adequate supply of oxygenated blood

appear pink and rosy, whereas tissues deprived of normal amounts of arterial blood appear pale and mottled. In dark-skinned people, the mucous membranes will be rosy and pink if oxygenation is adequate. However, the environment must be taken into account. Pale and mottled skin also can indicate that the patient is cold. Reddish-blue color can indicate venous insufficiency.

One way to assess arterial blood flow more accurately is by having the patient elevate her feet and legs above the level of the heart for 1 to 3 minutes until pallor occurs. Have the patient lower the legs to a dangling position while sitting. Compare both feet, noting the time necessary for pinkness to return (usually about 10 seconds). Note the time it takes for the veins of the feet and ankles to fill (usually about 15 seconds). For those with dark skin, inspect the soles of the feet for color change and use a light shining at an angle to visualize vein filling.

Return of color to the lowered feet is delayed in arterial insufficiency. If there is severe peripheral arterial disease, the dangling feet soon take on a dusky red color (**rubor**). The skin may be shiny and taut.

A cold environment and immobility will cause the extremities to feel cold to the touch. However, when a patient experiences persistent coldness of an extremity in a warm environment, peripheral arterial disease should be suspected. When observing a patient for signs of arterial disease, note differences in skin temperature in various areas of the same limb, as well as differences between limbs.

Skin that is chronically malnourished because of decreased blood supply has a characteristic appearance: the skin appears smooth, shiny, and thin, and there is little or no hair on its surface. The nails are thick with deposits of cornlike material under them.

If there is severe blood flow restriction of the tissues for several days, the tissues become necrotic. This causes the skin to assume a purple-black color. This is a deep cyanotic condition indicative of gangrene. Gangrene of the toes is a likely complication in the diabetic patient who has poor circulation in the feet.

Chronic venous insufficiency is accompanied by chronic edema. This in turn leads to inflammation of the tissues and eventually to the formation of ulcers. Edema is either present, absent, pitting, or nonpitting. Pitting means that a fingertip pressed into the area for 5 seconds leaves an indentation. Pitting is graded on a scale from 1+ to 4+ depending on how deep the skin can be depressed and how long the indentation remains. Review [Chapter 3](#) for assessment and staging of edema. Increased pigmentation of the skin, dryness and scaling, and excoriations are objective signs of venous insufficiency.

The capillary refill test has traditionally been used to check peripheral circulation. A fingernail or a toenail is squeezed over the bed of the nail sufficiently to cause blanching; the pressure is removed and an observation is made of how quickly the color returns. Normally the color returns immediately. Although it is a good gross assessment of circulation to the extremity, this test may be unreliable, because many factors can cause a decrease in time for color to return. This test is most useful for determining whether circulation is occluded by constriction or thrombosis above the area and has been shown to be a “red flag” warning in the assessment of children. A new device is available that squeezes the finger and uses optical sensors to identify color change, eliminating the subjectivity of human interpretation.

Nursing Diagnosis, Planning, Implementation

[Table 17-4](#) presents general problem statements/nursing diagnoses, expected outcomes, and nursing interventions for patients experiencing cardiovascular problems. Problem statements/nursing diagnoses may be added to the care plan for problems secondary to treatments, such as drug side effects or complications from surgery or preexisting diseases of other body systems. Specific NANDA-I diagnoses may be chosen from the NANDA-I list (see inside back cover).

Table 17-4
Common Problem Statements, Expected Outcomes, and Interventions for Patients With Heart Disorders

PROBLEM STATEMENT/NURSING DIAGNOSIS	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Cardiac Disorders		
Altered activity tolerance due to decreased perfusion	Patient will not experience undue fatigue performing activities with changes in vital signs.	Space activities of daily living and nursing procedures to prevent undue fatigue. Encourage use of oxygen as ordered. Implement actions to promote rest.
Potential for injury due to dysrhythmia or complications of myocardial infarction (MI) or heart failure (HF)	Patient will not experience serious dysrhythmia and will have a stable ECG. Patient will not experience complications from MI	Monitor ECG or telemetry tracings, observing for changes and life-threatening dysrhythmias. Assess for complications.

	or HF.	<p>Monitor lungs for crackles. Check for jugular venous distention. Auscultate for changes in heart sounds, extra sounds, changes in rhythm. Assess respirations for increasing dyspnea. Assess for signs of inflammation or infection; check temperature trend, white blood cell (WBC) level. Assess for chest pain on exertion or at rest. Monitor for central and peripheral edema. Assess trends in daily weight. Assess trends in 24-hr intake and output. Monitor vital signs.</p>
Potential for altered cardiac output due to dysrhythmia or ineffective cardiac muscle action	Patient will demonstrate adequate cardiac output with normal pulses, vital signs, skin color, and urine output.	<p>Assess apical pulse every shift. Administer antidysrhythmic and cardiotonic medications as ordered. Observe for side effects of medications. Assess for adequate perfusion: Check peripheral pulses. Assess color of extremities and around mouth. Assess mentation. Monitor urine output (related to perfusion of kidneys). Auscultate lungs for crackles every shift. Assess level of fatigue. Treat impaired oxygenation and fluid imbalance. Give stool softeners or laxatives, as ordered, to prevent straining at stool (Valsalva maneuver) and slowing of pulse or stopping of heart.</p>
Altered gas exchange due to cardiac failure	Patient will not experience impaired oxygenation; SpO ₂ within normal limits and PO ₂ between 80 and 100.	<p>Place in high Fowler position. Administer oxygen, as ordered. Feed frequent small meals to decrease oxygen demand. Administer diuretics as ordered. Monitor intake and output. Enforce fluid restrictions. Assist with activities of daily living (ADLs). Promote relief of anxiety. Give morphine, as ordered, to ease breathing and decrease anxiety. Monitor lung sounds, pulse oximetry, and blood gases. Assist to use incentive spirometer q2h as ordered.</p>
Altered self-care ability due to fatigue, weakness, or dyspnea	Patient will increase performance of own ADLs of 1-3 metabolic equivalents (METs) within 1 wk.	<p>Assist with all ADLs as needed. Plan nursing treatments to provide rest periods. Encourage to do small tasks of ADLs as condition improves. Assist to turn in bed q2h. Assess skin every shift and when turning. Provide mouth care before meals to stimulate appetite.</p>
Fear due to life-threatening illness	Patient will verbalize feelings and fears regarding life-threatening condition. Patient will identify own best coping mechanisms.	<p>Perform a spiritual assessment. Determine usual coping style. Support in coping mechanisms. Obtain clergy if patient desires contact. Provide privacy for prayer and devotions. Assist to express fears to reduce anxiety. Keep informed of what is being done for treatment and what to expect. Inform of positive gains toward wellness. Allow state of denial in acute stage; denial may be protective. Provide time with loved ones. Provide therapeutic touch if patient is accepting. Assess cultural meanings of events to patient. Actively listen to the patient's fears and concerns. Offer realistic reassurance as appropriate.</p>
Decreased ability for home maintenance due to fatigue, dyspnea, and activity intolerance	Appropriate home services will be in place before discharge.	<p>Refer for social services consultation. Consider home health care services. Offer information on homemaker aide services. Consult with family regarding ongoing care of patient at home. Collaborate with patient regarding plans for home care.</p>
Vascular Disorders		
Altered tissue perfusion due to vascular damage from elevated blood pressure	Patient's blood pressure will be within normal range within 3 mo.	<p>Assess blood pressure; determine effectiveness of therapy. Administer medications to lower blood pressure. Discourage intake of caffeine and excess sodium. Discourage smoking. Teach to arise slowly and stabilize before walking to counteract postural hypotension effect from medication. Teach anxiety- and tension-reduction techniques to decrease blood pressure. Encourage regular rest, relaxation, and exercise program.</p>
Potential for injury due to obstructed blood flow	Patient will not develop thrombosis or emboli. Thrombosis will resolve within 10-14 days.	<p>Assess for signs and symptoms of deep vein thrombosis and impaired blood flow. Maintain activity restrictions as ordered. Elevate affected extremity as ordered. Increase fluid intake to 3000 mL/day unless contraindicated. Administer anticoagulants as ordered; monitor for side effects. Teach to prevent future episodes by encouraging not to sit with legs crossed, not to sit for long periods, and not to put pressure on the back of the knees. Apply elastic stockings or sequential pneumatic devices to promote venous return.</p>
Potential for injury due to surgical revascularization	Patient will not develop bleeding or decreased perfusion.	<p>Check incisions for bleeding q1-2h × 24 hr, then q4h × 6, then every shift. Assess for internal hematoma by checking sensation below surgical area. Assess for adequate blood flow by checking pulses distal to incision on same schedule. Assess skin color and temperature above and below incision when checking for bleeding. Reinforce dressing as needed; change dressing per orders, using strict aseptic technique.</p>
Pain related to decreased blood flow and edema	Patient will verbalize adequate pain control attained from analgesics and comfort measures provided.	<p>Assess type and location of pain experienced. Handle gently and avoid jarring the bed. Use a bed cradle or footboard to prevent pressure from bed linens. Administer analgesics and anti-inflammatory agents as ordered. Apply heat as ordered; monitor closely to prevent burns. Teach relaxation techniques, imagery, or distraction to decrease pain. Elevate edematous extremity. Apply elastic stockings or sequential pneumatic devices to encourage venous return and decrease edema. Medicate for sleep as ordered if discomfort is interfering with rest.</p>
Altered activity tolerance related to pain in legs when walking	Patient will develop own activity program within 3 wk. Patient will exercise regularly according to devised program.	<p>Collaborate with physical therapist to encourage prescribed exercises. Assist to plan walking, swimming, or cycling program.</p>
Altered body image related to: Diagnosis of chronic illness Edema and dilated veins in the legs Loss of limb by amputation Inability to maintain former lifestyle	Patient will verbalize feelings regarding diagnosis, body changes, and needed lifestyle changes. Patient will identify personal strengths and coping mechanisms within 3 wk. Patient will become as independent as possible in tasks of daily living within 2 mo.	<p>Allow to express feelings about illness and disease process. Assist through the grief process. Assist to identify personal strengths. Reinforce coping mechanisms that have been helpful before. Be with patient for first dressing change. Clarify misconceptions about physical limitations after amputation. Involve patient in care of the wound after initial period of adjustment. Foster independence in tasks of daily living. Assist to explore lifestyle changes. Encourage significant others in their support of the patient. Teach ways to decrease risk of further amputation.</p>
Altered tissue integrity related to: Ulcer from decreased circulation Surgical wound (Risk for infection may be used here also.)	Patient will not develop a wound infection.	<p>Use strict aseptic technique for wound care. Treat and dress wound per provider's orders. Promote adequate nutrition to promote healing. Administer medication, as ordered, to prevent infection.</p>

		Position affected limb as ordered. Maintain correct body alignment.
Potential for altered tissue integrity related to bed rest and impaired circulation	Patient will not develop impaired tissue integrity.	Inspect pressure points q2h. Turn at least q2h. Maintain smooth linens on bed; provide appropriate padding to prevent pressure areas. Keep skin clean and dry. Refrain from raising the knee section of the bed. Encourage foot and ankle exercises every hour while patient is awake. Prevent shearing when patient is moving in bed by using a lift sheet and two people to turn the patient. Use mechanical lifts when indicated and special beds for complicated skin lesions. If skin breakdown occurs, notify provider immediately and provide appropriate wound care.
Insufficient knowledge due to inadequate information about disease process, medications, and self-care	Patient will verbalize knowledge of disease process and ways to prevent further damage. Patient will verbalize how to take medications and side effects to report. Patient will demonstrate self-care techniques.	Explain what is happening in the body to cause the decreased blood flow. Allow time for questions. Instruct in ways to decrease risk factors. Teach self-care methods, including exercises, skin care, foot care, dietary changes, and lifestyle changes. Teach about medications, including schedule of administration, action, side effects, and what to report to the provider. Encourage regular visits to the provider.
Absence of compliance due to refusal to follow treatment regimen	Patient will verbalize frustrations and problems in complying with treatment regimen and lifestyle changes. Patient will demonstrate compliance with treatment regimen.	Reinstruct about disease process. Explore problems with treatment regimen. Allow patient to express feelings about lifestyle changes. Explore ability to obtain and afford medications. Explore any difficulty in swallowing medications. Explain progression of disease and consequences of poor control; discuss complications and effect on lifestyle. Seek support system for compliance with treatment program. Give praise for each attempt at compliance. Respect the patient's right to make decisions about compliance.
Potential for injury due to: Embolus or bleeding from anticoagulant medication Circulatory occlusion from embolus	Coagulation times will remain within safe therapeutic range. Patient will have no signs of bleeding. Patient will have no signs of embolus.	Do not massage affected extremity. Encourage activity restrictions as ordered. Monitor laboratory values: international normalized ratio (INR) or activated partial thromboplastin time (APTT); notify provider when values are outside of accepted therapeutic limits. Assess urine and stool for signs of blood. Assess patient for excessive bruising, bleeding gums, nosebleeds, or bleeding at puncture sites. Check injectable anticoagulant dosages and IV admixtures with another nurse before administration to verify correct ordered dosage and rate of infusion. Assess for signs of embolus: chest pain, shortness of breath, change in level of consciousness, sudden headache, or other neurologic signs.

ECG, electrocardiogram; IV, intravenous.

A goal of community nursing is the promotion of healthful living to prevent cardiovascular disease. A concerted effort is being made to decrease childhood obesity as a method of decreasing risk for cardiovascular disease in adulthood. Blood sugar management in patients with diabetes and blood pressure control in those with hypertension are important for preventing vascular complications.

When planning care for cardiovascular patients, it is important to schedule nursing activities to conserve the strength of the patient and prevent excessive fatigue. Patients undergoing telemetry monitoring should not be disconnected from their monitor for any extended time. Check whether the patient may shower before disconnecting the telemetry device. **Reconnect the leads immediately afterward.**

Clinical Cues

Know what the patient's last blood pressure and pulse measurements were before going to the room with cardiovascular medications. Often you will need to take an apical pulse rate and blood pressure reading before administering certain medications. You need to know what those measurements were previously to properly evaluate the patient's status. Plan time to take these measurements and record them.

When a patient has a history of thrombosis, plan measures to prevent recurrence regardless of what patient problem is currently the focus of treatment. If the patient has peripheral arterial disease, be alert to prescribed medications that may cause further vasoconstriction. Understanding of the patient's overall condition allows for individualized care specific to the patient.

A large part of what the nurse does for a patient with a cardiovascular disorder is to monitor the condition and determine whether treatment is effective. Considerable time is spent on teaching patients about the disease, self-care, and medications. It is very important to monitor side effects or adverse effects of medication and teach the patient what effects to report.

Remember that any patient experiencing fatigue or weakness takes longer to accomplish the tasks of daily living. Space nursing actions appropriately. Watch the patient receiving cardiac drugs for postural hypotension; have her hold on to the bed rail and steady herself for a couple of minutes after arising before beginning to walk. This will help prevent falls. Specific nursing interventions are discussed with the various disorders in the following chapters.

Collaboration

Cardiovascular patients often are being treated by the physical therapist, dietitian, and respiratory therapist, as well as by the provider and nurse. It is important that the nurse consult with the other health professionals involved in the patient's care. Early collaboration with the discharge planner is important to provide continuity of care after discharge. Providing others on the health care team with information useful to them promotes a good working relationship and provides the patient with a team working toward the same goals.

■ Evaluation

Evaluation involves both subjective and objective data. Use good communication skills to ask the right questions to gather the required information from the patient. Ask the patient to describe any "different" feelings she has experienced. Inquire about changes in appetite and bowel movements that could indicate possible medication side effects. Check laboratory values for therapeutic drug levels before giving doses of medication, and note the latest blood levels of electrolytes. Assess for signs and symptoms of drug toxicity and for fluid or electrolyte imbalance. Ask yourself whether the patient is showing signs indicating that the medication you are giving is effective. The nursing care plan should be checked daily to evaluate whether each nursing action is effective. If an action is ineffective, it should be stopped and a new action should be devised to resolve the problem.

It is important to look at serial blood pressure readings to evaluate the effectiveness of treatment and of nursing interventions. Pressures that are consistently higher than normal between medication doses indicate a need to change either the dosage schedule or the medication. Trends in assessments give more information than isolated information.

Carefully evaluating pulses and comparing them bilaterally are important parts of nursing care for patients with problems of the cardiovascular system. Writing a good description of the quality and character of the pulses monitored in the nurse's notes will give coworkers an accurate assessment baseline on which to evaluate changes.

It is important to determine whether skin color and temperature have changed since the last assessment. Accurately measure and document areas of discoloration in the medical record. Monitor ulcerated areas closely and measure and photograph the areas to determine whether healing is occurring. Evaluate the color of the healing tissue and presence of exudate. If the wound is growing or not improving, the nursing actions or treatment must be changed.

Often the nurse must rely on subjective data from the patient to evaluate whether treatment and nursing actions are effective. Increases in peripheral circulation may be evident only by a decrease in pain or an ability to walk farther without pain.

Common Problems of Patients With Cardiovascular Disorders

Fatigue and Dyspnea

When the coronary arteries fail to supply adequate oxygen to the cells of the heart muscle, the heart is unable to perform as it should, especially when extra demands are placed on it. The result is a general hypoxia of the tissues throughout the body, which causes fatigue and dyspnea on exertion. In the early stages of heart disease, the patient may be only slightly aware of the inability to do as much physical work as she formerly could.

Activity may be restricted for MI and severe congestive heart failure (CHF). The patient may feed herself and assist with her sponge bath, with the nurse monitoring for shortness of breath or return of admitting symptoms. She should be cautioned against any strenuous activity, and response to activity should be monitored via telemetry units to watch for dysrhythmias or excessive heart rate changes. The amount of energy used in activity is expressed in **metabolic equivalents** (METs). [Box 20-4](#) shows the metabolic equivalents for various activities. The MET level and exercise tolerance are assessed, and targets are set for the rehabilitation process.

Criteria used to determine whether a cardiac patient is tolerating an activity include the following:

- The heart rate does not rise more than 20 beats per minute over the baseline rate.
- Systolic blood pressure does not drop.
- There is no complaint of chest pain, dyspnea, or severe fatigue.
- There is no abnormal heart rate or rhythm.

The progress of activity often is jointly supervised by a physical therapist and a nurse. More information on cardiac rehabilitation is presented in [Chapter 9](#).

Edema

Edema is an accumulation of fluid in the interstitial fluid compartment. It becomes a problem in heart disease when blood flow into or out of the heart is inhibited, causing a slowing down of the normal movement of body fluids between fluid compartments and their eventual excretion.

Continually assess the fluid balance of a patient with cardiac disease by looking for signs of abnormal collections of fluid in the body tissues. Daily weight change is considered the best indicator of fluid buildup. Check the feet and ankles of ambulatory patients for signs of dependent edema, and watch patients on bed rest for signs of swelling in the area of the sacrum, buttocks, and thighs. Observe for progressive signs of shortness of breath, and auscultate lung fields each shift to detect crackles—a sign of beginning pulmonary congestion. Observe the jugular veins for prominence when the patient is in an upright position; prominent veins may indicate fluid overload and CHF.

Clinical Cues

A weight gain of 3 lb or more in a 24-hour period indicates fluid retention.

Nursing responsibilities include recording the patient's weight daily before breakfast, supervising fluid restriction, accurately measuring intake and output, and assessing for signs of both fluid deficit and fluid overload. Older adult patients on fluid restriction and diuretics can easily become dehydrated.

Therapeutic measures to control edema include the administration of diuretics and restriction of sodium and, possibly, the restriction of fluid. You must observe for adverse effects of medication, such as electrolyte imbalance and postural hypotension. Potassium supplementation may be ordered for a patient who is experiencing hypokalemia or to prevent hypokalemia in patients taking non-potassium-sparing diuretics.

Safety Alert

Signs of Hypokalemia

Be alert for the following signs of hypokalemia: fatigue, muscle weakness, muscle cramps, drowsiness, confusion, new onset of bradycardia, or postural hypotension. Hypokalemia may cause life-threatening dysrhythmias.

Pain

Chest pain can be a symptom of a life-threatening heart event. Each episode of pain is carefully assessed by noting when it started; the location and radiation pattern; degree of pain on a scale; activity before onset; associated symptoms such as nausea, diaphoresis, or **palpitations**; and vital signs.

Severe pain is most often associated with heart disease of an acute nature (e.g., MI). Anginal pain caused by narrowed coronary arteries can interfere with the patient's lifestyle, as well as cause discomfort. Acute anginal pain is treated with nitroglycerin, oral nitrates, oxygen, reassurance, and careful monitoring for relief. Nitrates and other medications that dilate coronary arteries to promote better blood flow and decrease ischemia are used to control or prevent anginal pain.

Clinical Cues

If chest pain is not relieved after administering three nitroglycerin sublingual tablets (or spray) 5 minutes apart, notify the provider. Institute oxygen therapy according to agency protocol, monitor vital signs, and stay with the patient. The patient may be experiencing an MI. (Do check to make certain that the nitroglycerin causes tingling under the tongue. If not, the tablets may be too old and will not work. The tablets are very light sensitive.) Nitroglycerin can cause a significant decrease in blood pressure and mild to severe headache. Monitor for these side effects. At home, 911 should be called if the first nitroglycerin dose has not relieved the pain within 5 minutes.

If pain is not relieved, the analgesic drug used most often in an emergency situation is IV morphine sulfate. The goals of treatment are to restore oxygen supply to the heart and relieve the symptoms. Morphine, nitroglycerine, and oxygen are given as well as low dose aspirin—not to decrease pain but to decrease the stickiness of platelets to prevent further clot occlusion of coronary arteries (Zafari, 2015). For chronic chest pain not related to acute MI, oral pain medications may be used in addition to other interventions. The patient's pain may be increased because of nervousness and anxiety, and you can do much to help relieve pain by providing a restful environment, interacting therapeutically with "active listening," and balancing rest with prescribed physical activity.

Sleep deprivation and fatigue can increase the pain. Turning, administration of medications, visiting, exercise, and procedures should be coordinated so that the patient is not disturbed more than necessary.

Determining those factors that seem to trigger an attack can identify stressors that the patient may be able to avoid. Relaxation and other noninvasive techniques to manage pain are discussed in [Chapter 7](#).

Altered Tissue Perfusion

In **peripheral vascular disease**, **blood flow may be sluggish or altered by constriction of the vessels**. The smooth muscles of the arterial walls respond to temperature by constricting in the presence of cold and extreme heat and relaxing in the presence of warmth. Therefore the nurse's care plan should include (1) providing a warm environment for the patient; (2) covering the hospitalized patient with warm blankets or dressing her in warm clothing; and (3) instructing the patient to avoid extremes of cold and heat.

The constricting effect of extreme heat rules out the use of local applications of heat therapy. In addition to the danger of burning the patient because of decreased sensitivity to extremes of temperature, local heat increases metabolic activity in the tissues to which it is applied and

therefore further disrupts the balance of supply and demand for blood flow to all the tissues.

Think Critically

What would you recommend to an older adult home care patient to keep her lower extremities warm during the winter? The patient does not have the funds to keep the house heated above 68° F (20° C).

A second consideration is that of **pressure** against the walls of the blood vessels. Constricting clothing, elastic materials in underclothing, tight socks, and other form-fitting clothing is avoided. Frequent position changes are essential; position must be changed at least every 2 hours.

Patients with poor venous circulation can benefit from periodic elevation of the lower extremities above the level of the heart to facilitate venous return of blood to the heart. Well-distributed support of the vessels near the surface of the body will help improve venous return. To provide this kind of support, the provider may prescribe an elastic bandage or fitted elastic stockings. The stockings or elastic bandage should be applied early in the morning, before the legs are placed in a dependent position, because the blood vessels are less congested after a prolonged rest. Bandages and hose should be applied by beginning at the feet and working upward to avoid trapping blood in the lower leg. To stay in place the stockings have a band at the top. The skin under this area should be assessed to make sure the stockings are not constricting blood flow. The patient should have two pairs of elastic hose and should wash the hose after each day's wearing. Elastic hose should be replaced every 6 months, because they lose their elasticity. When stockings are removed, the heels should be checked for pressure areas. **Elastic stockings are not used for patients with arterial disorders.**

Exercise is especially beneficial to patients with decreased blood flow. Flexion of leg muscles helps "pump" venous blood back up to the heart against gravity. Walking is ideal exercise for ambulatory patients. Bedridden patients will need range-of-motion (ROM) exercises and the other kinds of muscular movements described in [Chapter 31](#). Use of a treadmill for patients who cannot exercise by walking outside is very beneficial. A stationary bicycle is another alternative.

In addition to mechanical factors, certain chemical factors affect the constriction of blood vessels. **Nicotine**, which is inhaled with tobacco smoke, has the effect of producing spasmodic narrowing of the peripheral arteries. Patients with arterial insufficiency are encouraged to stop smoking. Used in conjunction with a community smoking cessation support program, the booklet *You Can Quit Smoking*, available from the Agency for Health Care Research and Quality at <http://www.ahrq.gov/patients-consumers/prevention/lifestyle/index.html>, can be very helpful.

Alcohol is a mild vasodilator when taken in moderate amounts. Unless the patient has moral or religious convictions against its use, the provider may approve a daily intake of a specific, small amount of wine or liquor. It is important to find out whether alcohol will interfere with the action of medications being taken or cause problems for other coexisting diseases.

Health Promotion

Drink in Moderation

Promote proper use of alcohol for those who consume alcoholic beverages. Moderate alcohol intake for a man is two drinks in any 1 day. For a woman, the appropriate amount is one drink per day. One drink is $1\frac{1}{2}$ ounces of alcohol, 4 ounces of wine, or 12 ounces of beer.

Drugs that are helpful to relieve vasoconstriction and improve blood flow are prescribed. These drugs are of value only when the arteries are still capable of dilating. Severely sclerosed vessels respond very poorly to therapy of this kind.

Impaired Tissue Integrity

Tissues that have a diminished blood supply are subject to severe and permanent damage from the slightest injury, because the normal processes of healing and repair are impaired. Arterial and venous stasis often lead to chronic leg ulcers.

These ulcers are particularly distressing to patients, because they heal very slowly and many never completely heal. Patients must be taught to avoid conditions that contribute to injury of the extremities and to report any injury, no matter how minor.

Prevention of leg ulcers includes (1) wearing elastic bandages or support hose; (2) proper positioning and exercise; (3) preventing injury to the feet and legs; and (4) avoiding extremes of heat and cold and other mechanical and chemical factors that contribute to obstruction of blood flow. Information on care of a patient with a venous stasis ulcer is provided in [Chapter 18](#).

Get Ready for the NCLEX® Examination!

Key Points

- Cardiovascular disease is the leading cause of death in the United States.
- The heart and vessels become stiffer with age, and older adults have less cardiac reserve.
- Atherosclerosis and arteriosclerosis are major contributors to cardiovascular disease.
- Close to one third of the population in the United States has elevated blood pressure.
- Control of hypertension and obesity could lower the incidence of cardiovascular disease.
- Peripheral pulses should be compared bilaterally.
- Blood pressure should be taken—using correct technique—lying, sitting, and standing.
- Comprehensive nursing care plans should be holistic and may need to include problems secondary to the cardiovascular disease.
- Planning should include time management, because many heart medications need to be given as close to the prescribed time as possible to maintain a steady blood level of the drug.
- Collaboration with other health care team members assists in providing consistent, thorough care for patients with cardiovascular disorders. Evaluation involves ECG monitoring, checking blood levels of electrolytes, obtaining laboratory values for cardiac drugs to determine adequate dosing or toxicity, and monitoring blood counts for adequate red cells and hemoglobin to carry sufficient oxygen to the tissues of the body.
- Fatigue and dyspnea occur when the heart cannot pump sufficiently to carry adequate oxygen and nutrients to the tissues.
- Activity during cardiac rehabilitation is measured in metabolic equivalents; activity is started slowly and may progress according to the body's response.
- Heat therapy is applied cautiously to the extremities of patients with peripheral vascular disease.
- When blood volume is more than the heart can handle, there is a slowing of normal movement of body fluids and changes in concentration and pressure, causing edema.
- Daily weight change is the best indicator of fluid buildup.
- Watch patients who have fluid imbalances for accompanying electrolyte imbalances.
- Measures to reduce or prevent edema are often needed for patients with peripheral vascular disease.
- Pain from an MI may be acute or described as discomfort.
- Nitroglycerin, morphine, aspirin, and oxygen are the drugs of choice for myocardial pain.
- Anginal pain is treated with nitroglycerin and other drugs to promote arterial vasodilation.
- Decreasing anxiety and promoting rest may decrease anginal pain.
- It is very important to encourage patients with cardiovascular disease to quit smoking, because nicotine is a vasoconstrictor.
- Patients with peripheral vascular disease have difficulty healing lower leg and foot wounds.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

- Online Resources
- <http://www.practicalclinicalskills.com/heart-sounds-murmurs.aspx>

Review Questions for the NCLEX® Examination

1. Which statement(s) regarding drug use and the risk of cardiac disease is/are true? (Select all that apply.)

1. The vasodilation effects of cocaine hasten atherosclerosis.

2. Sudden cardiac death is associated with cocaine use.
3. Methamphetamine dilates blood vessels.
4. Cigarette smoking contributes heavily to heart disease.
5. Methamphetamine can cause myocardial infarction.

NCLEX Client Need: Health Promotion and Maintenance

2. The ankle-brachial index test is ordered for a patient experiencing signs of peripheral vascular disease. Which patient statement indicates that further teaching about the test needs to occur?

1. "I'll be lying down for this examination."
2. "The test is noninvasive."
3. "My brachial and pedal pulses will be checked and compared."
4. "My brachial and ankle blood pressure will be taken."

NCLEX Client Need: Reduction of Risk Potential

3. Morphine 6 mg is ordered for a man admitted with chest pain and a probable myocardial infarction. On hand is morphine 10 mg/mL. The nurse should give ____ mL to the patient. (*Fill in the blank.*)

NCLEX Client Need: Pharmacological Therapies

4. During initial assessment of an older adult, the nurse finds that the skin appears smooth, shiny, and thinned with little or no hair on the surface. Which nursing diagnosis should be on the care plan?

1. *Altered peripheral tissue perfusion.*
2. *Potential for infection.*
3. *Acute Pain related to decreased perfusion.*
4. *Fluid volume deficit.*

NCLEX Client Need: Physiological Adaptation

5. When providing care for a patient with cardiac disease, the nurse understands that the patient is at risk for alteration in cardiac output. Which of the following has the most potential to affect cardiac output?

1. Antihypertensive medications

2. Dysrhythmias

3. Chest pain

4. Atherosclerosis

NCLEX Client Need: Reduction of Risk Potential

6. The nurse weighs a patient with congestive heart failure and determines that there is a net weight gain of 3 lb within the last 24 hours. The patient states that she is short of breath. Place in priority order the nursing actions to take.

1. Listen to lung sounds.
2. Place nasal cannula O₂ starting at 2 L/min.
3. Raise the head of the bed.
4. Notify the provider.
5. Take vital signs, including pulse oximetry.

NCLEX Client Need: Physiological Adaptation

7. The nurse administered two consecutive sublingual nitroglycerin tablets to a patient complaining of moderate chest pain. If the patient's blood pressure is 148/88 mm Hg with continued chest pain, the next nursing action would be to:

1. administer morphine sulfate.
2. get an IV cannula inserted.
3. give another sublingual nitroglycerin.
4. provide emotional support.

NCLEX Client Need: Pharmacological Therapies

8. When interviewing a patient complaining of moderate chest pain, what question(s) should be asked? (*Select all that apply.*)

1. Who witnessed the pain?
2. What does the pain or discomfort feel like?

3. What relaxation strategies were implemented?
4. Where is the pain located?
5. To where does the pain radiate?

NCLEX Client Need: Physiological Adaptation

9. A nurse assesses an 83-year-old patient and finds a diastolic murmur on auscultation of the heart. The priority action for the nurse should be to:

1. stop the examination and call the provider.
2. document the finding in the chart.
3. inquire if other members of the family have a murmur.
4. realize that such a murmur is normal in this age group.

NCLEX Client Need: Physiological Adaptation

10. A patient is receiving a drug that may cause postural hypotension. For safety, the nurse should instruct the patient to do what? (*Select all that apply.*)

1. Increase fluid intake to prevent dehydration.
2. Arise slowly from a lying to a sitting position.
3. Sit on the side of the bed until not light-headed before standing.
4. Stand holding on to the bed rail to stabilize before walking.
5. Always ask for assistance when up and moving around.

NCLEX Client Need: Pharmacological Therapies

Critical Thinking Questions

Scenario A

Debra Johnson, a 20-year-old African American college student on your campus, comes to the health center complaining of frequent headaches. The assessment data show that she is 5'4" tall, weighs 170 lb (77 kg), temp 98.8° F (37° C), P 82, RR 14, and BP 154/90 mm Hg. She smokes about half a pack of cigarettes per day. She has a heavy academic schedule and rarely exercises. She eats a lot of "food on the run" at the local fast-food places. Her mother and uncle both have hypertension.

1. Which of her data is abnormal for her age?

2. What risk factors does she have for cardiovascular disease?

3. Which risk factors are modifiable?

Scenario B

Akio Sukura, a 64-year-old man, comes into the emergency department after experiencing chest pain and diaphoresis. His ECG is abnormal. He is scheduled for a cardiac catheterization.

1. Is a consent required for this procedure? If so, would he be able to sign it?
2. What questions would you need to ask him when preparing him for this diagnostic test?
3. What would be the priorities of care related to this diagnostic test after the procedure is finished?

Scenario C

Jackson Smith, a construction worker, comes into the clinic. The provider suspects that he has peripheral vascular disease.

1. What are the risk factors for this type of cardiovascular disease?
2. What diagnostic tests might be ordered for him?
3. Why would it be important to assess for signs of diabetes mellitus as well?

CHAPTER 18

Care of Patients With Hypertension and Peripheral Vascular Disease

Objectives

Theory

1. Explain the pathophysiology of hypertension.
2. Identify the complications that can occur as a consequence of hypertension.
3. Briefly describe the treatment program for mild, moderate, and severe hypertension.
4. Contrast the pathophysiology of arteriosclerosis with that of atherosclerosis.
5. List four factors that contribute to peripheral vascular disease.
6. Explain the signs, symptoms, and treatment of aneurysm.
7. Prepare a teaching plan for a patient with Raynaud syndrome.
8. Discuss the etiology and care for thrombophlebitis and deep vein thrombosis.
9. Summarize how venous insufficiency may lead to a venous stasis ulcer.
10. Compare venous stasis ulcer with arterial leg ulcer.
11. List types of surgery performed for problems of the peripheral vascular system.

Clinical Practice

12. Develop and implement a teaching plan for a patient who has hypertension.
13. Choose the points to be included in the teaching plan for a patient who has experienced thrombophlebitis.
14. Institute a teaching plan for a patient undergoing anticoagulant therapy.
15. Differentiate between venous and arterial insufficiency during a physical assessment.
16. Prepare a nursing care plan for a patient with arterial insufficiency.
17. Identify three likely problem statements for patients who have vascular disease and list the expected outcomes and appropriate nursing interventions for each.

KEY TERMS

bruit (brū-Ē, p. 411)

cellulitis (sēl-ū-LĒ-tēs, p. 406)

embolus (ĒM-bō-lüs, p. 405)

gangrene (găng-GRĒN, p. 412)
hypertension (hī-pĕr-TĒN-shūn, p. 396)
intermittent claudication (ĭn-tĕr-MĬT-ĕnt klăw-dĭ-KĀ-shūn, p. 406)
rubor (RŪ-bōr, p. 406)
scleropathy (sklér-ÖP-ā-thē, p. 419)
stent (stĕnt, p. 408)
thrombophlebitis (thrōm-bō-flĕ-BĪ-tīs, p. 406)
thrombus (THRÖM-būs, p. 408)
varicose veins (VÄR-ĕ-kōs VÄNZ, p. 418)

Hypertension

Hypertension is defined as persistently high blood pressure. This means a systolic pressure that is equal to or greater than 140 mm Hg and a diastolic pressure that is equal to or greater than 90 mm Hg when taken at least twice and averaged on two different occasions 2 weeks apart. The diastolic pressure is the main focus of treatment. It reflects the amount of pressure being exerted against the vessel walls while the heart is in its phase of relaxation and there is no added pressure from blood being forced out of the left ventricle and into the arteries. [Table 18-1](#) presents ranges for the classification of hypertension.

Table 18-1
Blood Pressure Classification

CLASSIFICATION	SYSTOLIC	DIASTOLIC	PATIENT ACTION
Normal	Less than 120	Less than 80	Monitor if risk factors are present.
Prehypertension	120-139	or 80-89	Modify diet, increase exercise, lose weight, stop smoking.
High			
Stage 1	140-159	or 90-99	Antihypertensives and diuretics may be prescribed.
Stage 2	160 or higher	or 100 or higher	Additional antihypertensive drug(s) may be prescribed. Continue lifestyle modifications.

Hypertensive individuals usually die of long-term damage to the end organs or target organs, that is, from damage to the brain, heart, and kidneys. More than half of the deaths associated with persistent and unrelieved hypertension are caused by myocardial infarction. Immediate causes of death related to high blood pressure include cerebral hemorrhage and heart failure.

Older Adult Care Points

Can you think of two physiologic reasons why older adults are at greater risk for hypertension?

Etiology

The etiology of hypertension is unknown, but it is believed to be related to alterations in the immune system ([Madhur, 2014](#)). Although the exact cause has not been identified, there are several known contributing factors. Secretion of excess sodium-retaining hormones and vasoconstriction substances, high sodium intake, obesity, diabetes mellitus, excessive alcohol intake, and sympathetic nervous system activity all contribute to elevated blood pressure.

There are two major types of hypertension: primary (idiopathic or essential) and secondary hypertension. Persons with a family history of hypertension are at risk for developing primary hypertension. Approximately 90% to 95% of all cases of hypertension are primary.

In 5% to 8% of patients, the hypertension is secondary to another disorder. Acute stress, excessive alcohol intake, sickle cell disease, arteriosclerosis, coarctation of the aorta, eclampsia of pregnancy, renal disorders, endocrine disorders, and neurologic disorders are examples of secondary causes. Amphetamine use, chronic nonsteroidal anti-inflammatory drug (NSAID) use, and tyramine-containing foods such as beer and wine taken with monoamine oxidase inhibitors (MAOIs) contribute to secondary hypertension. Female hormone therapy and nicotine use appear to be contributing factors in some people. If the underlying disorder can be detected and treated successfully, the problem of secondary hypertension is eliminated or more easily controlled. If no underlying disease can be identified as elevating the patient's blood pressure, the patient is considered to have primary hypertension.

[Table 18-2](#) presents the nonmodifiable and modifiable risk factors for hypertension. In many cases a loss of excess weight alone can return a slightly elevated blood pressure to normal. A moderate reduction of salt intake has been effective in lowering the blood pressure of some patients with mild or moderate hypertension. There is continuing research on the relation of race, gender, and ethnicity on the incidence and effects of hypertension.

Cultural Considerations

Hypertension and African Americans

African Americans tend to have a higher incidence of hypertension than do other minority groups and whites; African Americans also have higher noncompliance, complication, and mortality rates. Economic issues, access to health care, dietary practices, weight, and diabetes have been identified as possible reasons for the disparities ([American Heart Association, 2011](#)).

Table 18-2
Nonmodifiable and Modifiable Risk Factors for Primary Hypertension

Nonmodifiable Risk Factors	
Age	Systolic blood pressure (SBP) rises with age. After age 50 years, SBP >140 mm Hg is a cardiovascular risk factor.
Gender	Until age 55 years, hypertension is more prevalent in men; after age 55 years, it is more prevalent in women.
Ethnicity/race	Incidence is much higher in African Americans.
Family history	A close relative with hypertension increases a person's risk for developing it.
Modifiable Risk Factors	
Alcohol	Excessive alcohol intake is strongly associated with hypertension. Daily intake should be limited to 1 oz for those with hypertension.
Cigarette smoking, smokeless tobacco	Nicotine contributes to arteriosclerosis and thereby to hypertension. People with hypertension who smoke are at greater risk for cardiovascular disease.
Diabetes	Diabetes accelerates atherosclerosis and leads to damage of the large vessels. Hypertension is twice as prevalent in diabetics as nondiabetics.
Obesity	Central body obesity in particular is associated with the development of hypertension. When combined with other factors in metabolic syndrome, the risk of hypertension is increased even more.
Stress	Stress increases peripheral vascular resistance and stimulates sympathetic nervous system activity. If stress responses become excessive, they can contribute to the development of hypertension.
Elevated serum lipids	Elevated cholesterol and triglycerides are risk factors for atherosclerosis. Atherosclerosis contributes to hypertension in many individuals.
Excess dietary sodium	High sodium intake contributes to hypertension in some patients.
Decreased kidney function	Hypertension is more prevalent with an estimated glomerular filtration rate (GFR) less than 60 mL/min.

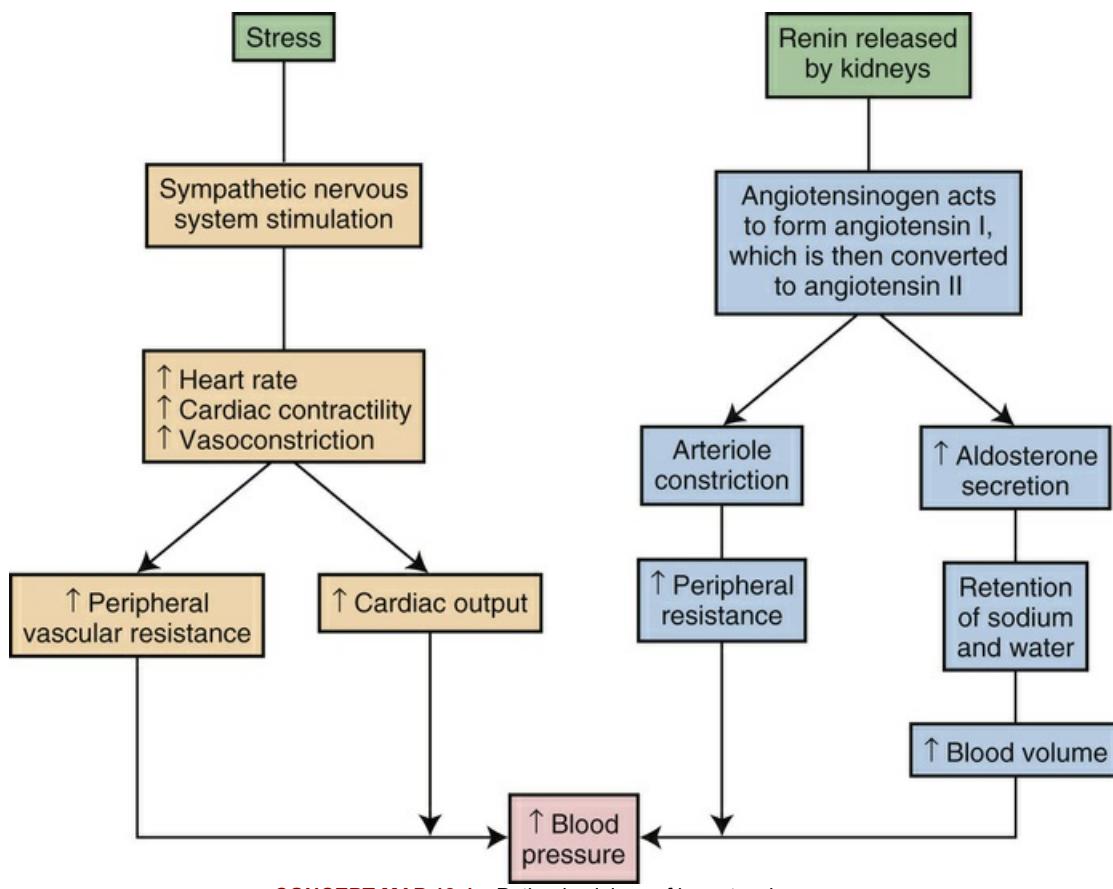
The rising incidence of childhood obesity has resulted in an increase in the incidence of hypertension. Health promotion activities targeting nutrition and exercise habits of children are increasing.

Pathophysiology

Blood pressure equals the amount of blood pumped out of the heart (cardiac output) multiplied by the systemic vascular resistance. If the diameter of blood vessels becomes smaller because of atherosclerosis or vasoconstriction, blood pressure increases with the effort to force the blood through the smaller opening. If there is an increase in the volume (amount) or viscosity (thickness or consistency) of fluid in the blood vessels, the pressure within the vessels increases and the heart must work harder to pump the fluid through the vessels. A pathologic response to stress can result in an elevation in blood pressure by stimulating the sympathetic nervous system and causing peripheral vasoconstriction and increased heart rate. Insulin, glucose, and lipoprotein abnormalities related to metabolic syndrome are common in primary hypertension. In some instances of hypertension, an excess of renin is secreted by the kidneys. Renin acts on a substance called *angiotensinogen*, converting it to angiotensin I. Angiotensin I is converted to angiotensin II by angiotensin-converting enzyme (ACE). Angiotensin II acts directly on the blood vessels, causing them to constrict, and stimulates the adrenal gland to release aldosterone. Angiotensin thereby increases resistance to blood flow in the peripheral vessels and causes retention of sodium and water by the renal tubules through the influence of aldosterone (see [Figure 17-6](#)). The retained sodium and water increase the blood volume, causing increased cardiac output and elevation of blood pressure. [Concept Map 18-1](#) shows the pathophysiology of hypertension.

Older Adult Care Points

The stiffening of arteries occurring with arteriosclerosis is a natural part of aging. The baroreceptors that normally help adjust blood pressure become less sensitive with age. The lack of elasticity of the vessels and the decreased sensitivity of the baroreceptors cause older adults to be at risk for orthostatic (postural) hypotension when changing position. An elevation of systolic pressure above normal should still be treated in this age group.



Signs, Symptoms, and Diagnosis

Hypertension has been called the “silent killer,” because in early stages it does not usually cause discomfort or any other subjective signs and symptoms to indicate its presence. About one third of those who have hypertension are not aware of it. Signs may appear only in the later stages when damage has been done to the target organs—that is, the kidney (renal ischemia and nephrosclerosis), brain (arteriosclerosis and microaneurysm), aorta (aortic aneurysm), eyes (retinal damage), and heart (left ventricular hypertrophy and reduced cardiac output). **Patients with symptoms may complain of headache, dizziness, blurred vision, blackouts, irritability, angina, dyspnea, or fatigue.**

Hypertensive patients develop coronary heart disease at a rate two to three times greater than that of persons with normal blood pressure. Examination of the blood vessels of the retina will reveal any damage to the retinal vessels. This retinal assessment gives an indication about how much damage the high blood pressure has done to vessels throughout the body. If retinal damage has occurred, it is an indication that the person's hypertension is moderate to severe.

Diagnosis is based on blood pressure readings on at least two occasions 2 weeks apart. An electrocardiogram (ECG), echocardiogram, and cardiac stress test may be ordered to determine whether any damage has been done to the heart muscle.

Treatment

The goals of treatment are (1) reduction of high blood pressure and (2) long-term control to decrease the risk of stroke, heart attack, loss of vision, and kidney disease. The target is to control blood pressure at or below 120/80 mm Hg. Treatment is individualized, using a stepped-care approach. For mild hypertension, smoking cessation, weight reduction, sodium restriction, alcohol restriction, exercise, a low-fat diet, and stress control are instituted. Sodium should be kept to less than 2400 mg/day with the DASH (Dietary Approaches to Stop Hypertension) eating plan. Alcohol intake should not exceed one serving of liquor, wine, or beer per day for women or two servings

per day for men. Aerobic exercise of 30 to 45 minutes most days of the week is recommended. If blood pressure is still high, a diuretic is added. If the blood pressure does not fall within normal limits, the second step is initiated, and an antihypertensive drug is prescribed.

Other drugs are added, if needed, to keep the blood pressure consistently within normal limits. Patients with more severe hypertension often require more than two drugs to attain control. The third step is to add additional drugs. The dose of each drug is increased as needed to achieve the desired blood pressure level unless side effects occur. In the event of side effects, another drug is substituted. Newer blood pressure medications are very expensive, and cost is a concern for many patients. Some drug companies have programs to help patients who cannot afford their medications. If a potassium-wasting diuretic is prescribed, the patient is taught to increase dietary potassium intake. A potassium supplement is added to treatment, and electrolyte levels are monitored regularly.

Patients should monitor their blood pressure at home and keep records of the readings. Periodic visits to the provider's office for regular examinations are necessary. The better the blood pressure is controlled and kept within normal limits, the less damage there will be to the target organs.

Safety Alert

Licorice that is found in herbal teas as well as black licorice candy, if consumed in large amounts, can increase blood pressure. If non-potassium-sparing diuretics are taken together with licorice, dangerously low potassium levels may result ([National Center for Complementary and Alternative Medicine, 2012](#)).

Antihypertensive Therapy

The drugs prescribed to reduce blood pressure work by decreasing blood volume, cardiac output, or peripheral resistance. [Table 18-3](#) and [Box 18-1](#) list examples of the drugs most commonly prescribed for hypertension and relevant nursing interventions.

 **Table 18-3**

Drug Classifications Used for Patients With Vascular Disorders

TYPE OF DRUG	ACTION
Diuretics	
Thiazides and Related Drugs	
Hydrochlorothiazide (Esidix, HydroDIURIL, Dyazide) Metolazone (Zaroxolyn) Indapamide (Lozol)	These drugs increase the excretion of water, sodium, potassium, and chloride by blocking the reabsorption of sodium and chloride.
Loop Diuretics	
Bumetanide (Bumex) Furosemide (Lasix) Torsemide (Demadex)	These drugs work in the loop of Henle to block reabsorption of sodium and chloride. This prevents passive reabsorption of water and promotes its excretion. These drugs produce the greatest amount of diuresis.
Potassium-Sparing Diuretics	
Amiloride hydrochloride (Midamar) Spironolactone (Aldactone) Triamterene (Dyrenium)	These drugs block the action of aldosterone in the distal nephron. This prevents the promotion of sodium uptake in exchange for potassium secretion usually caused by aldosterone, and potassium is "spared" (not secreted) and sodium is excreted. These drugs cause very little diuresis.
Antihypertensives	
Adrenergic Inhibitors	
Beta Blockers	
Atenolol (Tenormin) Propranolol (Inderal) Metoprolol (Lopressor, Toprol XL) Timolol (Apo-Timol) Bisoprolol (Zebeta) Carvedilol (Coreg)	It is not certain how these drugs work to reduce blood pressure. Blockade of the beta ₁ receptors lowers cardiac output by decreasing heart rate and contractility. Action on the beta ₁ receptors in the kidney decreases the release of renin, which is a factor in rising blood pressure.
Alpha Blockers	
Doxazosin (Cardura) Prazosin (Minipress) Terazosin (Hytrin)	These drugs block alpha ₁ stimulation on arterioles and veins, preventing sympathetic vasoconstriction. This action results in vasodilation, reducing peripheral vascular resistance and venous return to the heart.
Alpha-Beta Blocker	
Labetalol (Normodyne, Trandate)	This drug blocks both alpha ₁ and beta ₁ receptors, producing decreased heart rate, contractility, peripheral vascular resistance, and venous return.
Angiotensin-Converting Enzyme (ACE) Inhibitors	
Benazepril (Lotensin) Captopril (Capoten) Enalapril (Vasotec) Fosinopril (Monopril) Lisinopril (Prinivil) Quinapril (Accupril)	These agents lower blood pressure by inhibiting the conversion of angiotensin I into angiotensin II, thereby preventing vasoconstriction. They also restrict volume expansion mediated by aldosterone.
Angiotensin II Receptor Blockers	
Candesartan (Atacand) Eprosartan (Teveten) Irbesartan (Avapro) Losartan (Cozaar) Olmesartan (Benicar) Telmisartan (Micardis) Valsartan (Diovan)	These agents lower blood pressure by blocking the action of angiotensin II, thereby preventing vasoconstriction.

Calcium Channel Blockers	
Amlodipine besylate (Norvasc, Lotrel) Diltiazem (Cardizem) Nicardipine (Cardene) Nifedipine (Procardia) Verapamil (Calan, Isoptin)	These drugs reduce blood pressure by causing dilation of arterioles. Calcium channels are blocked, preventing the influx of calcium that promotes constriction.
Central-Acting Agents	
Clonidine (Catapres) Guanabenz (Wytensin) Methyldopa (Aldomet)	These agents act within the brainstem to suppress sympathetic impulses to the heart and blood vessels. This action decreases the release of norepinephrine by sympathetic nerves, reducing activation of peripheral adrenergic receptors, and promotes vasodilation. The agents also decrease heart rate and cardiac output.
Peripherally Acting Adrenergic Blockers	
Guanethidine (Ismelin) Reserpine (Serpaline)	These agents reduce blood pressure by blocking adrenergic receptors in the postganglionic sympathetic neurons and causing decreased sympathetic stimulation of the heart and blood vessels.
Direct-Acting Vasodilators	
Hydralazine (Apresoline) Minoxidil (Loniten)	These agents reduce blood pressure by promoting arteriole vasodilation.
Direct Renin Inhibitors	
A lisinopril (Tekturna)	This new class of drugs inhibits renin secretion from the kidney, reducing angiotensin I and angiotensin II, inhibiting vasoconstriction.

Box 18-1

General Nursing Interventions for the Administration of Diuretics and Antihypertensive Drugs

Diuretics

- Follow the “Six Rights” and “six rules” of medication administration to prevent errors and injury to the patient: **right** patient, **right** drug, **right** dose, **right** route, **right** time, **right** documentation; instruct the patient, take a drug history, assess for drug allergies, check for possible interactions, document after administration, and assess effectiveness.
- Check for sulfa allergy. Thiazide and thiazide-like diuretics are related to sulfonamides. Patients allergic to sulfas may have adverse reactions.
- Monitor intake and output to determine amount of diuresis and the drug's effectiveness.
- Track the patient's weight daily to determine the drug's effectiveness; evaluate for decreased edema.
- Check all drugs the patient is receiving for drug interactions with the diuretic drug to prevent toxicity or lack of absorption. Several diuretics are ototoxic, and this adverse effect may be potentiated by other ototoxic drugs.
- If possible, administer diuretic dose in the morning; if a second dose is required, give it mid-afternoon to avoid sleep interference by need to urinate.
- Provide assistance with urination in a timely manner (answer call bell quickly).
- Assess for signs of dehydration and hypotension; take blood pressure on a set schedule. Older adults are prone to excessive diuresis and can quickly become dehydrated.
- Monitor diabetic patients for increased blood glucose levels when taking loop or thiazide diuretics, because these drugs may cause hyperglycemia.

Regarding possible side effects or adverse effects of the drug, the nurse should:

- Monitor potassium levels frequently if the patient is taking a potassium-wasting diuretic; assess for signs of hypokalemia: weakness, tremor, muscle cramps, change in mental status, cardiac dysrhythmia.
- If the patient also is taking digoxin, consult the provider before administering the dose if the potassium level is below 3.5 mEq/L or if the patient exhibits signs of hypokalemia, because hypokalemia increases risk of fatal cardiac dysrhythmia in patients taking digoxin.
- If a patient is taking a potassium-sparing diuretic and potassium level is above 5 mEq/L, or if signs of hyperkalemia develop (abnormal cardiac rhythm), consult the provider before administering the dose.

- Monitor blood pressure. If blood pressure drops considerably, speak with the provider before giving another dose of the drug.
- Monitor the patient for signs of constipation, which is a possible side effect of diuresis.
- Monitor patients with a history of deep venous thrombosis (DVT) for recurrence, because diuretics reduce circulating fluid volume.
- Monitor and educate the patient for side effects or adverse effects of the particular drug taken. The most common general side effects are constipation, electrolyte disturbance, gastric upset, and hypotension. Adverse effects are dehydration, ototoxicity, hyperglycemia, and hyperuricemia.
- Monitor the patient for signs of allergic reaction, such as rash or itching.

Teach patients taking a diuretic to:

- Expect a frequent need to urinate, and an increased volume of urine.
- Report any new heartbeat irregularity.
- Report any signs of ringing of the ears, roaring sounds, a feeling of fullness in the ears, or decreased hearing.
- Eat foods high in potassium, such as bananas, orange juice, cereals, meats, tomatoes, potatoes, and raisins, daily, unless taking a potassium-sparing diuretic.
- If taking a potassium-sparing diuretic, restrict foods high in potassium.
- Take potassium supplement regularly if one is prescribed.
- Increase fiber in the diet if prone to constipation; consult provider if constipation occurs. Older adult patients who are inactive are more prone to constipation.
- Watch for signs of postural hypotension, such as dizziness or light-headedness, when changing position. Encourage patients to arise slowly from a supine position and to sit a minute before standing. (Older adults are particularly prone to this side effect.)
- Avoid the sun or take precautions; do not use a sunlamp when taking a loop or thiazide diuretic, because the medication may cause photosensitivity.
- Watch for signs of gout (tenderness or swelling of joints) when taking a loop or thiazide diuretic and notify the provider if these occur. Loop diuretics may cause an increase in uric acid levels.
- When taking spironolactone, menstrual irregularities or impotence may occur; report these occurrences to the provider.

Antihypertensive Drugs

- Establish that the patient is not hypotensive before giving a dose of an antihypertensive drug. If the patient's blood pressure is below normal levels, consult the provider before giving the dose.
- Monitor the heart rate for bradycardia or tachycardia. Follow specific parameters for administration of the specific drug; some drugs may cause bradycardia, and others may cause tachycardia.
- Follow the "Six Rights" and " six rules" of medication administration, and check the patient's identification by two methods before **each** dose.
- Inquire about any dizziness. If dizziness has been occurring, measure blood pressure standing and sitting to determine whether the patient is experiencing orthostatic hypotension; several antihypertensives may cause orthostatic hypotension.

- Note contraindications and precautions for each specific drug the patient is taking. Angiotensin-converting enzyme (ACE) inhibitors are contraindicated during pregnancy.
- Check all drugs the patient is receiving for drug interactions to prevent toxicity or increased severity of side effects. Many antihypertensive drugs have a depressant effect on the heart.
- Monitor blood pressure readings to evaluate effectiveness of the drug.

Regarding possible side effects or adverse effects of the drug, the nurse should:

- Monitor the patient for the side effects of each drug administered.
- Monitor serum glucose levels in patients with diabetes who are taking a beta-blocker drug, because the drug may mask hypoglycemia.
- Monitor lipid levels for changes in patients taking beta blockers, because these drugs interfere with lipid metabolism.
- Observe for hypersensitivity reactions such as rash; ACE inhibitors may cause hypersensitivity.
- Monitor patients for signs of congestive heart failure, such as edema; beta blockers, calcium channel blockers, and other drugs that decrease cardiac output may precipitate heart failure in patients with borderline cardiac function.
- Check the skin of patients using a clonidine patch for signs of irritation, a potential side effect of the patch. Be certain the old patch is removed when applying a new one.
- Give the first dose of an ACE inhibitor at bedtime, because it often causes hypotension.
- Monitor the potassium level of patients taking an ACE inhibitor. Because it suppresses the release of aldosterone, it increases potassium retention.
- Monitor liver function tests for patients taking centrally acting drugs, such as clonidine, because these drugs may cause liver damage in some patients.
- Monitor renal function tests in patients taking hydralazine, because this drug may cause renal impairment.

Teach the patient taking an antihypertensive to:

- Monitor blood pressure regularly and record the readings.
- Alter lifestyle factors that contribute to hypertension, such as smoking, excess weight, excessive stress, excessive alcohol ingestion, high-salt diet, and lack of exercise.
- Rise slowly from a lying position and stabilize before standing for a couple of minutes.
- Report alteration in sexual response, because some of the antihypertensive drugs may cause impotence.
- Report persistent side effects and any adverse effects of the drug.
- Monitor for weight gain from retention of sodium and water by weighing at least twice a week; report weight gain of more than 2 lb to the provider.
- Report signs of ankle edema, because several of the antihypertensive drugs can precipitate congestive heart failure.
- Be aware that methyldopa may cause dark urine for the first few weeks of therapy.
- Avoid abruptly discontinuing centrally acting antihypertensives, such as clonidine, because

rebound hypertension may occur.

- Check with the provider before taking over-the-counter drugs, because many are contraindicated in hypertension.
- Comply with medication therapy even when blood pressure is normal, because long-term compliance is the key to preventing the organ damage that hypertension can cause.
- Set own goals for lifestyle changes and medication therapy; a patient-directed program has a better chance of success.
- Notify the provider if a persistent dry cough develops after starting on an ACE inhibitor medication.

The blood pressure of older adult patients who are taking antihypertensive medications should be measured when they are sitting and when standing. Many of these medications can cause orthostatic hypotension; measuring blood pressure with the patient standing will reveal whether the medication is reducing the blood pressure too much. Assess patients receiving antihypertensives for dizziness, confusion, syncope, restlessness, and drowsiness, which may indicate hypotension.

Patient Teaching

Safety Measures to Prevent Falls for Patients With Orthostatic Hypotension

Teach patients who experience the side effect of orthostatic hypotension from medication to:

- Rise slowly from a lying to a sitting position; do not hold the breath while arising. Sit for 1 minute before standing; stand slowly holding on to a stable object. Stand for 1 minute before walking.
- While seated, flex and rotate the feet several times before attempting to stand; have feet firmly planted on the floor before standing.
- When walking, do not turn the head or body abruptly.
- When feeling unsteady while standing, call for assistance before walking.
- Report light-headedness or sudden dizziness.
- Use the bathroom before meals and try to avoid getting up for 30 to 60 minutes after meals.

Complications

Malignant hypertension is an older term for a hypertensive crisis that describes rapid onset of severe hypertension that causes symptoms. The term is no longer used except for billing and coding purposes.

Hypertensive Crisis

Hypertensive emergency is a life-threatening situation in which the blood pressure rises higher than 180/120 mm Hg and there is indication of target organ damage. Symptoms may include severe headache, blurred vision, seizures, nausea, and change in level of consciousness. It may occur if a patient has stopped taking antihypertensive medication, or it may be secondary to another disease process such as renal stenosis. The patient is placed in the intensive care unit and treated with intravenous (IV) emergency drugs, such as IV sodium nitroprusside (Nipride), nicardipine (Cardene IV), nitroglycerin, or labetalol (Normodyne), to lower the blood pressure. A reduction in blood pressure to 160/100 mm Hg is desired over the first 2 hours. Blood pressure is monitored every 5 to 15 minutes. Medication is adjusted to reduce the pressure slowly to prevent renal, cerebral, or coronary ischemia. **Hypertensive urgency** occurs when the blood pressure rises to

180/110 mm Hg but there are no signs or symptoms of target organ damage. This is a more common occurrence. The patient is observed in the emergency department and treated with oral medication. The patient is directed to follow up with the primary care provider.

Nursing Management

■ Assessment (Data Collection)

The patient should be assessed for indications of modifiable and nonmodifiable risk factors for cardiovascular disease. Physical assessment of the cardiac system should be performed. Assessment of blood pressure and documentation of levels and potential influences on values is an important aspect of nursing care. The patient's blood pressure should be taken lying supine, sitting, and standing for a thorough assessment. Standing blood pressure measurements also are important when a patient is started on a new medication, particularly an ACE inhibitor, because orthostatic hypotension may occur.

■ Older Adult Care Points

The blood pressure of older adult patients can be affected by other coexisting diseases. As people live longer, more chronic illnesses develop. Blood pressure management must take into consideration all medical conditions.

■ Nursing Diagnosis and Planning

Common problem statements for a patient with hypertension include:

- Potential for injury due to complications of hypertension.
- Insufficient knowledge (disease process, medications) due to new diagnosis of hypertension.
- Altered nutrition due to obesity, high-fat diet, or high sodium intake.
- Anxiety due to potential complications of disease process. Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected outcomes for a patient with hypertension may include:

- The patient will not experience retinopathy.
- The patient's blood pressure will return to normal limits.
- The patient will verbalize an understanding of teaching related to medications and disease process.
- The patient will lose 10% of body weight in a designated period.
- The patient will be able to choose low-fat and low-sodium items from a variety of menus.

■ Implementation

Nursing interventions consist of assisting the patient to make necessary lifestyle changes that will help control the blood pressure and slow further atherosclerosis. Diet changes are often the most difficult for the patient. It is best to work with the patient's current dietary likes and dislikes, modifying methods of food preparation to decrease sodium and fat content.

Sources of hidden sodium should be identified, and the patient should be taught how to read food labels. A dietitian referral or providing contact information to community groups that encourage healthful eating and promote exercise may be helpful.

■ Nutrition Considerations

Decreasing Sodium in the Diet

Instruct a patient who must reduce sodium in the diet to:

- Avoid "convenience" foods: ready-mixed sauces, frozen dinners, cured or smoked meats (including lunch meats), canned soups, and prepared salad dressings, unless the label truly indicates low sodium content.

- Be aware that regular canned vegetables often contain a large amount of sodium; in some instances rinsing will greatly decrease the sodium content. Use fresh or frozen vegetables or those canned without sodium when possible.
- Check soft drink labels for sodium content; avoid those that contain more than 140 mg of sodium.
- Check cereal box labels for sodium content; switch to a lower-sodium cereal, such as shredded wheat.
- Use one fourth to one half the amount of salt that a recipe calls for.
- Avoid adding salt to food after cooking.
- Make a salt-substitute seasoning of $\frac{1}{2}$ tsp garlic powder mixed with 1 tsp each of basil, black pepper, marjoram, onion powder, parsley, sage, savory, and thyme; or use a product such as Mrs. Dash or lemon pepper instead of salt.
- Fast-food and other restaurants are required to supply nutrition information, including sodium content. Make wise choices.
- Do not eat preserved or commercially prepared smoked meats, such as bacon, hot dogs, salami, pastrami, ham, smoked turkey, or sausage.
- Read all labels on food containers, looking for the words *salt* and *sodium*, and the letters *NaCl*.
- Check condiments for amount of sodium. Catsup, soy sauce, steak sauce, and others are high in sodium.

Cultural Considerations

Cultural Diet Variations

Working with patients from diverse cultures who have very different diets can be a challenge. Encouraging fat and sodium restriction in a cultural diet requires working with the patient to discover food preferences and food preparation patterns inherent in the family.

Patients who need to increase potassium intake are taught to include citrus fruits and juices, bananas, dried beans, tomatoes, and potatoes in their diet. The person who does the shopping and food preparation must be included in the diet instruction process. **Weight loss is the most important lifestyle change for obese patients.** The goal is a weight that is within 15% of ideal body weight.

If caffeine restriction is recommended, teach the patient to gradually decrease his caffeine consumption so that he will not experience withdrawal symptoms, such as headache and nervousness. Remind the patient that many types of soft drinks, as well as coffee, tea, and chocolate, contain caffeine. Most of these beverages are available in decaffeinated formulas. Because it produces vasoconstriction, nicotine has a major effect on blood vessels and blood pressure. Stopping smoking or use of smokeless tobacco products can be a difficult task for many patients. Core Measures call for counseling and an information packet on smoking cessation to be given to the patient. An exercise program that fits the patient's personality, ability, and preference should be designed. Walking to work from a parking lot a few blocks away, climbing stairs instead of using elevators, and a daily walk in the neighborhood often are sufficient. Other patients might prefer to use a stationary bicycle or treadmill. The object is to work on something that the patient will continue to do for the rest of his life.

Weight loss will begin to occur if the patient is faithful to the prescribed diet and exercise program. As his weight decreases, remind the patient of the direct effect these efforts have had on the blood pressure. Even a moderate weight loss of 7 to 12 lb (3 to 5 kg) can reduce blood pressure. Positive reinforcement should be given for even small amounts of weight loss.

Stress reduction requires an evaluation of lifestyle. Meditation, yoga, leisure activities, or just

saying no to extra obligations can all decrease stress. Help the patient determine where his stressors are and what can practically be done to manage them. Lifetime compliance with diet, exercise, stress reduction, and medication plans is difficult for most patients. Alternative therapy may help.

Complementary and Alternative Therapies

Grapeseed Extract for Hypertension

Grapeseed extract is an alternative medicine treatment for hypertension that also helps decrease cholesterol.

Many patients do not understand or accept that it is up to them to control their disease. They do well for several months or a few years, but then, because they feel well (while their blood pressure has been controlled), they stop taking their medication and gradually return to previous lifestyle patterns. By teaching them what high blood pressure does to the blood vessels and the heart, brain, eyes, and kidneys, you can do much to encourage patients to follow the treatment plan for life. Instruct patients on how to monitor their blood pressure at home to engage them in their care and track effectiveness of treatment. Each patient needs continuing encouragement for maintaining blood pressure control.

Patient Teaching

Complications of Uncontrolled Hypertension

The following information should be included in the teaching plan of a patient at risk for noncompliance with treatment of hypertension:

- Hypertension can cause damage to arteries, making them less elastic. This places an increased workload on the heart. This may cause MI, left ventricular hypertrophy, aortic aneurysm, and congestive heart failure.
- Small vessel damage to the brain disrupts circulation and may lead to dementia, transient ischemic attacks (TIAs) and ischemic stroke.
- Hypertension may cause an already weakened area in a blood vessel to rupture. This may cause an intracranial bleed known as a *hemorrhagic stroke*.
- Hypertension may cause damage to the small vessels of the kidney and may lead to kidney failure.
- Hypertension damages the arteries of the eye, causing the formation of clots or occurrence of hemorrhage that may lead to blurred vision or blindness.

There are many resources to help hypertensive patients manage their illness more effectively. The American Heart Association, Heart Center Online, the National Institutes of Health, and many others offer educational materials for patients with hypertension. *Healthy People 2020* goals and objectives have been written for hypertension. [\(e\)](#)

Health Promotion

Assessment for and Management of Hypertension

Blood pressure should be assessed every time there is contact with a health care provider. All adults should have their blood pressure assessed at least once a year, even if it has always been within normal limits. A patient with hypertension requires intense teaching to assist in achieving health management goals. Blood pressure should be monitored regularly at home with an

automatic blood pressure cuff that can be purchased at any pharmacy or most department stores. Ensure that the patient understands the needed lifestyle changes and how to accomplish behavior modification. The patient may be referred to a local support group as a resource in the management of his health.

■ Evaluation

Consistent maintenance of blood pressure within prescribed limits is a primary indicator of effectiveness of disease management. Evaluate the patient's knowledge of prescribed medications, including use, side effects, and administration. Knowledge of dietary management, exercise activities, stress management, and smoking cessation should be discussed at follow-up sessions. The patient's compliance with the management of hypertension is critical to preventing or minimizing complications of the disease process.

Arteriosclerosis and Atherosclerosis

Arteriosclerosis (hardening of the arteries) is a general term for a variety of arterial changes. Arteriosclerosis occurs with aging as degenerative changes occur in the small arteries and arterioles. The disorder is characterized by thickening of the artery walls that progresses to hardening as calcium deposits form. Vessel elasticity is lost. The thickening and calcification reduce the diameter of the vessels and cause slowing of blood flow. This may lead to ischemia and necrosis in various tissues. *Atherosclerosis* is another form of artery narrowing. Lipids are deposited within the vessel walls and combine with cells, fibrin, and cell debris to form plaques. The plaque grows and extends into the lumen of the artery, where inflammation or erosion causes the plaque to be exposed to the blood. This triggers clotting and subsequent blocking of the vessel by a clot (see [Figure 20-1](#)).

Atheromatous plaque with thrombi form primarily in the larger arteries, the carotid and coronary arteries. Diabetes mellitus, particularly when uncontrolled, speeds the development of arteriosclerosis and atherosclerosis. Hypertension is a major factor in arteriosclerosis. Any artery in the body can develop atherosclerosis. When vessels delivering blood to the extremities, heart, and brain narrow because of plaque formation, serious consequences can result.

Peripheral Vascular Disease

Peripheral vascular disease (PWD) involves narrowing or obstruction of peripheral blood vessels and loss of function. These vessels may be in the arms, neck, abdomen, or lower extremities (Figure 18-1). Peripheral blood vessels include all blood vessels except those in the heart and brain. Diabetes, particularly when uncontrolled, contributes to vascular disease.

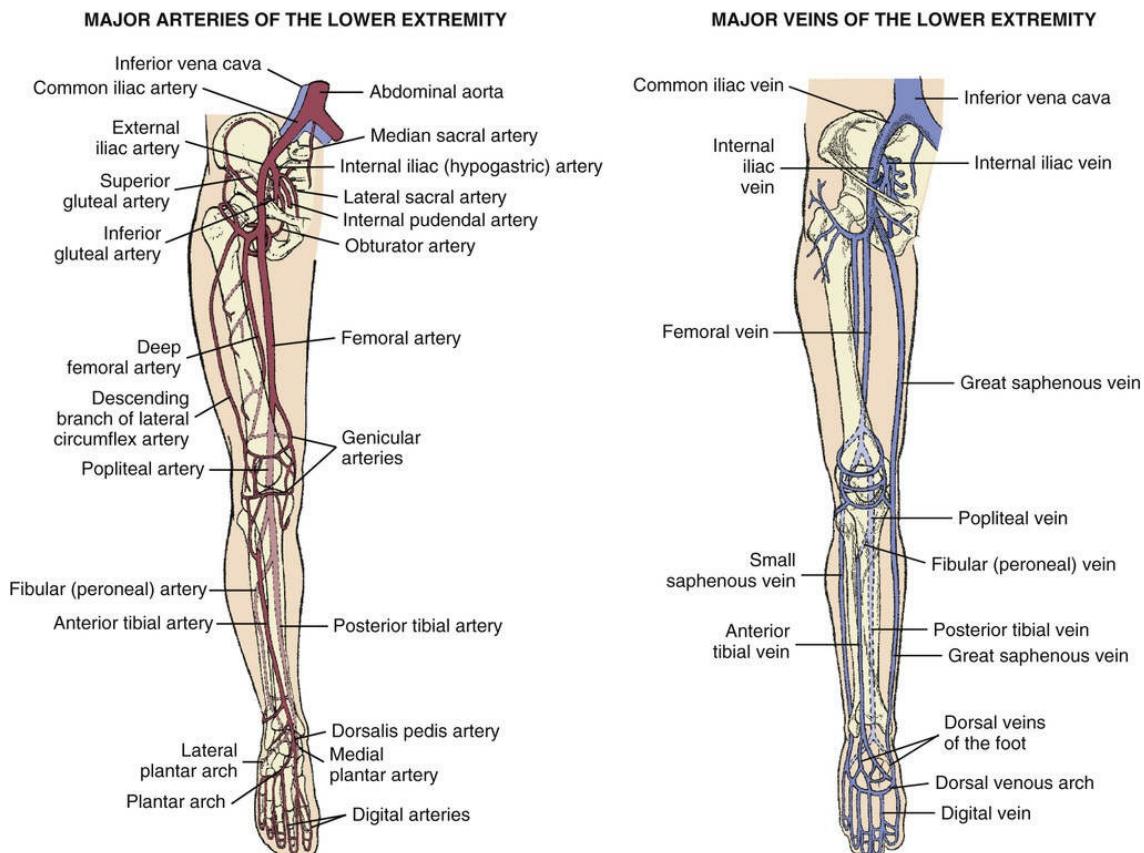


FIGURE 18-1 The peripheral vascular system: veins and arteries of the lower extremities. (From Mosby's dictionary of medicine, nursing, and health professions, ed. 8, St. Louis, 2009, Mosby.)

Other causes of peripheral vascular problems include spasm of the smooth muscles in the arterial walls (e.g., Raynaud disease), structural defects in the arteries (aneurysms), trauma, or **embolus** (blood clot or debris that travels and lodges in a blood vessel) that causes occlusion. Peripheral venous problems are caused by defective valvular function and formation of **venous thrombosis** (blood clots), which may be accompanied by **thrombophlebitis** (inflammation of a vein).

Prevention of PVD is focused on decreasing atherosclerosis and arteriosclerosis, controlling diabetes mellitus, controlling hypertension, and preventing smoking. Smoking cessation is important because nicotine causes vasoconstriction, resulting in elevation of blood pressure and decreased blood flow through the vessels.

Peripheral Arterial Disease (Arterial Insufficiency)

Etiology and Pathophysiology

The most common etiology of peripheral arterial disease (PAD) is atherosclerosis. The vessel walls become narrowed or the lumen obstructed, leading to loss of blood flow to the extremity. Restriction of arterial blood flow may cause arterial ulcers. Cessation of blood flow in the arteries leads to ischemia and tissue death (necrosis). PAD may be acute or chronic. Embolism is the most common cause of acute interruption of arterial blood flow. PAD may occur in any peripheral artery

and frequently occurs in the carotid arteries.

Signs, Symptoms, and Diagnosis

Obtain a complete history and physical examination of the patient. Table 18-4 compares the signs and symptoms of arterial and venous disorders to help identify which part of the vascular system is affected. Signs and symptoms of PAD of the lower extremities include **intermittent claudication** (pain when walking that diminishes at rest), pain at rest, tightening pressure in calves or buttocks, and ischemic changes. Blood pressure in the extremity affected by PAD is lower.

Table 18-4
Differences in Signs and Symptoms of Arterial and Venous Disease

CHARACTERISTIC	ARTERIAL DISEASE	VENOUS DISEASE
Pulses	Diminished, weak, or absent	Strong and symmetrical; may be difficult to palpate if edema is present
Skin	Pallor, dependent rubor; thin, dry, shiny, cool	Mottling with brown pigmentation at ankles; veins may be visible; legs or feet bluish when dependent; dermatitis; warm at ankle
Edema	Absent or mild	Present, particularly around ankle and in foot
Ulceration	On toes or at pressure points on feet	At bones of ankle
Necrosis and gangrene	Likely	Unlikely
Pain	Intermittent claudication when walking; sharp, stabbing, gnawing; lessens when at rest	Aching, cramping, particularly when dependent; may have nocturnal cramps
Nails	Thick, brittle (normal in older adults)	Normal
Hair	Hair loss distal to area of occlusion (hair loss normal in older adults)	Normal

Patients with PAD have pallor in the affected extremity when the leg is elevated and **ruber** (dark redness) when the leg is dependent. The skin may appear tight and shiny. Hair is usually absent on the affected extremity and the toenails are thickened. Pulses are diminished or absent. There also is a temperature change distal to the occlusion. Wounds on the lower leg are difficult to heal. The severity of these symptoms depends on the extent of the lesion, degree of occlusion, and amount of collateral circulation that has been established.

If severe ischemia occurs from occlusion of arterial blood flow, tissue distal to the occlusion blanches, becomes cold, hurts, and eventually becomes numb as necrosis occurs. Ischemic areas of the lower leg and foot may develop skin breakdown without injury. **Arterial ulcers** with a sharp edge and a pale base may form that are quite painful. These ulcers are very slow and difficult to heal (Figure 18-2). This is particularly true for diabetic patients. The affected part may develop **cellulitis** and edema and become gangrenous, necessitating amputation (Figures 18-3 and 18-4). The toes and foot are most often affected.



FIGURE 18-2 Patient with peripheral arterial disease who has arterial ulcers of the lateral malleolus and distal and lateral portion of the leg. Note the round, smooth shape. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)



FIGURE 18-3 Patient with cellulitis of the legs. (From *Mosby's dictionary of medicine, nursing, and health professions*, ed. 8, St. Louis, 2009, Mosby.)



FIGURE 18-4 Patient with gangrene of the toes. (Courtesy Cameron Bangs, M.D.)

An arterial thrombosis can occur as a vessel is narrowed by atherosclerosis. Atherosclerotic plaque ruptures, platelets aggregate at the roughened area, and a clot forms. If the clot breaks loose and travels, it becomes an arterial embolus and may cause acute occlusion of an artery. **Signs and symptoms of embolus occlusion of an extremity artery are the five Ps: pain, pulselessness, pallor, paresthesia, and paralysis.** Acute arterial occlusion may be treated with percutaneous intravascular procedures. The artery is accessed and the clot can be removed by special catheters, balloon angioplasty may be performed to open the lumen of the vessel, and stents may be placed to keep the vessel open. Many procedures that previously required surgery can now be done in a procedure room with fluoroscopy and the patient given procedural sedation rather than general anesthesia. Thrombolytic therapy may be given directly into the clot within the artery if it cannot be removed successfully.

Older Adult Care Points

Hair loss is a natural occurrence with aging, as is thickening of fingernails and toenails. These signs alone are not reliable indicators of vascular problems on the extremities in older adults.

Diagnosis of PAD is made using the ankle-brachial index (ABI) (see [Figure 17-9](#)). The normal value is 1 (i.e., the systolic pressure is the same at the ankle and brachial artery sites). Radiographic and ultrasound procedures also may be performed.

Treatment

The best treatment for arterial occlusive disease is regular exercise. A regular walking program results in substantial improvement. Patients are instructed to walk until the claudication pain starts and then rest until the pain goes away. This cycle is repeated until patients are able to walk 45 to 60 minutes daily. Smoking cessation is also a key factor in improvement of peripheral arterial occlusive disease (Rowe, 2014). Some dietary supplements have proven helpful in increasing circulation.

Complementary and Alternative Therapies

L-Carnitine

Several research studies have shown that L-carnitine, a natural substance found in muscle, heart, brain, and nerve cells, may be beneficial in improving the exercise capacity of individuals with peripheral artery disease. L-Carnitine, especially in the form of propionylcarnitine, improves muscle recovery after exercise. L-Carnitine can be found in many foods, with higher concentrations in red meat and dairy products. It is supplied as a dietary supplement in 50- to 500-mg tablets. Recommended dosage for individuals with PAD is 600 to 1200 mg three times per day or 750 mg twice daily. Side effects are few; however, these dosages in the upper range may cause diarrhea, hyperactivity, and insomnia.

Areas of ulceration are kept clean and free from pressure. Bed rest may be initially prescribed but walking has been shown to help circulation. Dry eschar is left in place. Debridement is performed only by a qualified health professional. Moist interactive dressings are used on the clean and granulating ulcer to promote healing. The goal of treatment of PAD is directed toward increasing blood flow through the peripheral arteries and decreasing the risk of clot formation in the vessels. Antiplatelet agents and platelet inhibitors may be used alone or in combination with other drugs. Aspirin is the most commonly used antiplatelet agent. It prevents the aggregation of platelets in the arteries. Platelet inhibitors, such as clopidogrel (Plavix), may be prescribed. Patients experiencing intermittent claudication may achieve relief of symptoms when prescribed pentoxifylline (Trental) or cilostazol (Pletal). These drugs increase blood flow by inhibiting clot formation in the vessel. Patients experiencing acute ischemia may receive thrombolytic therapy. Alteplase (t-PA, Activase) and tenecteplase (TNKase) are the drugs of choice for thrombolysis. Cholesterol-lowering drugs (e.g., atorvastatin [Lipitor], simvastatin [Zocor], ezetimibe [Zetia]) have been shown to be effective by decreasing low-density lipoprotein (LDL) and increasing high-density lipoprotein (HDL) levels, thus reducing plaque deposits in the arteries.

Clinical Cues

Medications to treat PAD or thrombosis may cause serious adverse reactions. The major adverse reaction is bleeding. Observe the patient for and report immediately evidence of excessive bruising or bleeding, prolonged clotting after a needle stick, hematuria, changes in vital signs, or changes in neurologic signs.

Percutaneous transluminal angioplasty (PTA) may be performed to open an artery to reduce claudication symptoms and improve extremity perfusion. A catheter is introduced into the artery, and when the proper spot is reached, a balloon is inflated multiple times to dilate the vessel, promoting better blood flow. A metal or mesh **stent** (tubular device to give support to a vessel interior) may be placed to prevent narrowing or closure of the artery (see [Figure 20-4](#) for a similar stent illustration). If the plaque has a significant calcium component, it may be difficult to dilate the vessel. Atherectomy with a Rotablator may be used to improve blood flow to a limb. It can scrape hardened plaque from the arterial wall.

Surgical treatment of PAD is a palliative measure only. It does not cure the disease or halt the atherosclerotic process. It can, however, relieve ischemic pain, help prevent amputation, and add years to a patient's life. The purpose of vascular surgery is to revascularize and nourish cells in the affected area.

An aortoiliac bypass or a femoropopliteal bypass is performed to correct arterial occlusion of the

leg to prevent the need for amputation. A synthetic graft is placed to divert blood around the obstructed area. [Figure 18-5](#) shows a schematic of a femoropopliteal bypass graft surgery. Postoperative care is the same as for other operative procedures but includes careful assessment of pulses distal to the graft to detect **thrombus** (clot) formation. As with any vascular surgery, extra attention is paid to assessment for signs of bleeding. An aortoiliac bypass requires both an abdominal and a groin incision. Blood pressure management is extremely important to maintain blood flow in the graft. Hypotension will cause slowing of the blood flow and potential thrombosis formation, whereas hypertension puts significant stress on the graft sutures, risking bleeding. Because of the condition of the patient's cardiovascular system, the very patients who need the grafting are the poorest surgical candidates. Percutaneous interventions are used more frequently for this patient population. A hyperbaric oxygen chamber is sometimes used for patients with severely compromised circulation to a lower extremity to increase tissue oxygen and prevent amputation.

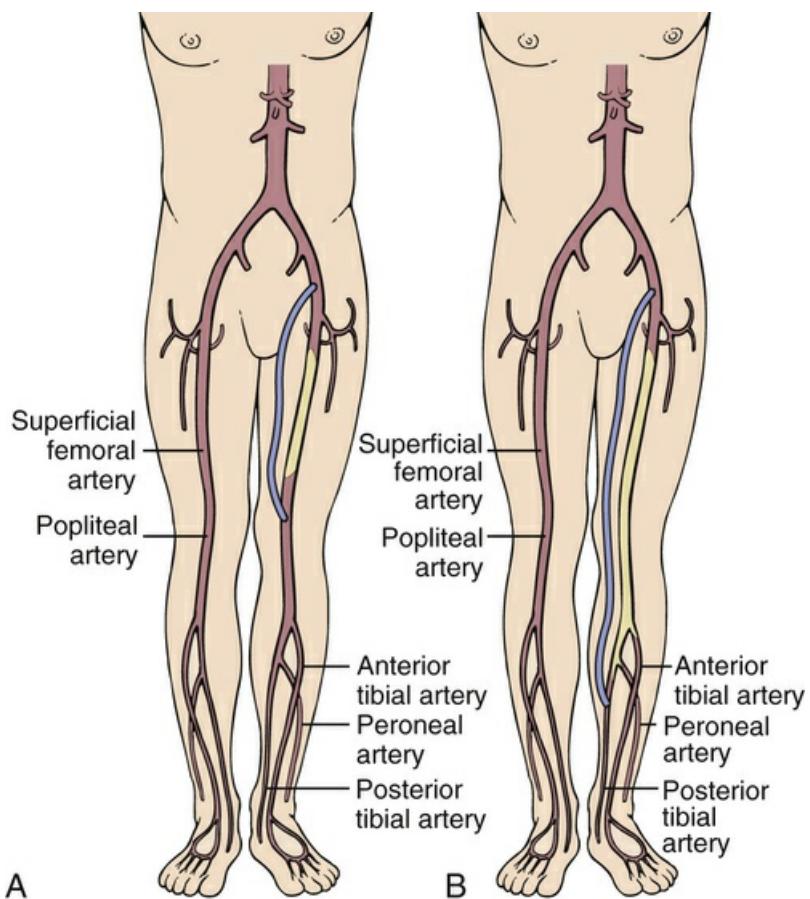


FIGURE 18-5 Femoropopliteal bypass graft. **A**, Femoropopliteal bypass graft around an occluded superficial femoral artery. **B**, Femoropopliteal bypass graft around occluded superficial femoropopliteal and proximal tibial arteries. (From Monahan FD, Neighbors M, Sands JK, et al: *Medical-surgical nursing: Health and illness perspective*, ed. 8, St. Louis, 2007, Mosby.)

❖Nursing Management

■ Assessment (Data Collection)

Perform a physical assessment of the patient's affected extremity at least every 4 hours or per facility protocol. Feet should be assessed for warmth, paresthesia, pain, and pulses. All findings must be documented, including any changes. If ulcers are present, assessment and documentation of skin integrity should be included. A major role of the nurse is early detection and prevention of complications. Acute changes in assessment of patients with arterial insufficiency are unlikely; however, maintain a record of the patient's condition in the event of complications.

■ Nursing Diagnosis and Planning

The major nursing care goals for patients with PAD are (1) maintaining arterial blood flow to the lower extremities; (2) protecting tissues from further injury from pressure and constriction of blood flow; and (3) preventing wound infection.

Problem statements for a patient with PAD may include:

- Altered peripheral tissue perfusion due to narrowed vessels.
- Altered skin integrity due to ulcers on lower extremities.
- Potential for injury due to loss of peripheral circulation.
- Acute pain due to ischemia to lower extremities. Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected outcomes may include:

- The patient will not experience loss of skin integrity.
- Peripheral pulses will remain palpable.
- The patient will report reduction in pain level in the lower extremities.

Rehabilitation of the patient requires instruction and guidance in special exercises to increase collateral circulation to the legs. See [Table 17-4](#) for other common problem statements and interventions appropriate for patients with peripheral arterial occlusive disease.

■ Implementation

Encourage blood flow by keeping the patient and the environment warm. Constricting clothing is to be avoided, and the bed should not be raised at the knees to prevent added pressure on the back of the knees and further occlusion of blood flow. Encourage the patient to change position frequently while awake. The lower extremities should be positioned below heart level to facilitate arterial blood flow. The legs are elevated only if edema is impeding circulation. See Evolve for a nursing care plan for a patient [with PAD](#).

▣ Clinical Cues

Assess the affected extremity; document and report significant changes in pain level, pulses, sensation, and skin temperature. Additional medical intervention may be needed to prevent complications that could result in amputation of all or part of an extremity.

Encouraging exercise is especially beneficial to patients with decreased blood flow. Walking regularly every day is best for the ambulatory patient. Swimming also is good because it applies light pressure to the surface of the legs and requires muscle action that encourages venous return. Patients on bed rest should be encouraged to do foot and leg exercises at least once each hour.

▣ Think Critically

Rhonda, a 63-year-old executive, is experiencing worsening intermittent claudication. Describe how you would interact with her to develop an exercise program that could lessen her symptoms.

Patients should dress in warm, nonrestrictive clothing and should avoid becoming cold. Blankets may be added for additional warmth. The room temperature should be maintained at the patient's comfort level.

▣ Older Adult Care Points

Older adults are less tolerant of cold temperatures because of decreased subcutaneous fat tissue as a result of the aging process. Room temperatures must be maintained at the patient's comfort level. Chilling can result in vasoconstriction and contribute to discomfort for patients with vascular disorders.

Tobacco use, especially smoking, contributes to PVD because of the vasoconstrictive effect of nicotine. There are other chemicals in cigarettes that directly damage blood vessels, accelerating the

development of atherosclerosis. If appropriate, patients should be referred to a smoking cessation program. Information concerning the effects of alcohol on vascular disorders, surgical interventions, patient teaching, and interventions to prevent leg ulcers can be reviewed in [Chapter 17](#).

Think Critically

Can you describe the specific actions you would take to help a patient recognize the need to establish a smoking cessation program?

Evaluation

Evaluation of the effectiveness of the plan of care involves assessing changes in peripheral pulses and skin integrity. Improvement or extension of vascular ulcers should be documented in writing and photographed periodically (e.g., weekly). Note changes in color, sensation, and temperature of the lower extremities. The patient's perception of pain level should be documented using a scale of 0 to 10. Evaluate the patient's level of compliance with establishing an exercise routine. Include type, frequency, and tolerance of exercise activities. Evaluate the patient's ability to meet established goals and revise the plan as needed.

Aneurysm

Etiology

Aneurysms—outpouching of the wall of an artery resulting from a structural defect in the layers of the arterial wall—occur in a weakened area of a blood vessel. Aneurysms usually are the result of plaque formation, genetic predisposition, or hypertension. Aneurysms may also occur in areas weakened by trauma or surgical procedures. Aortic aneurysms can occur in the area below the diaphragm (abdominal aneurysm) or on the ascending aorta in the chest (thoracic aneurysm). An abdominal aortic aneurysm is usually located below the kidneys. Long-term hypertension and smoking are risk factors, particularly in men.

Congenital malformations, diabetes mellitus, and hyperlipidemia predispose to various types of aneurysm. However, atherosclerosis and hypertension are believed to be the major factors in their development. Atherosclerotic plaque weakens the vessel wall, and hypertension puts extra pressure on the weakened walls. Cerebral aneurysm is covered in [Chapter 23](#).

Pathophysiology

An aneurysm can occur along any artery. Blood flow may become stagnant along the wall of the aneurysm, and clots can form. The clots can cause occlusion by thrombosis; alternatively, a clot may break away from the thrombosis to become an embolus that travels and lodges elsewhere. Once an aneurysm develops, it continues to grow larger. Aneurysms may eventually rupture if not repaired. **Aortic dissection** of the medial layer of the arterial wall can occur, causing bleeding between layers of the wall and increasing pressure on surrounding structures. As the dissection extends, blood flow through the arterial branches of the aorta become blocked. Blood flow slows to the organs those branches feed. Dissection occurs more frequently than aneurysm, particularly in men who are hypertensive.

Signs, Symptoms, and Diagnosis

Aneurysms often cause no obvious symptoms. Patients with an abdominal aortic aneurysm (AAA) may report back pain or a feeling of pressure and may have a visible pulsation of the abdomen. An aortic aneurysm in the thoracic area may cause substernal or tracheal pressure and difficulty with breathing. Diagnosis of aneurysms is difficult because of lack of symptoms during formation.

Physical examination and screening of patients with a family history may be the best means of early detection. The presence of an aneurysm can be verified by chest or abdominal radiograph, ultrasound, magnetic resonance imaging (MRI), or computed tomography (CT) scans. Men who have hypertension and a smoking history should undergo ultrasound screening for AAA. Many times abdominal or thoracic aneurysms are discovered when the patient has a scan or x-ray for some other reason.

Aortic dissection or rupture causes abrupt, excruciating pain. The pain radiates to the back, chest, abdomen, or extremities. Peripheral pulses are diminished. The patient may be in hypotensive shock because of blood loss. About 65% of patients with a ruptured AAA die before reaching the hospital (O'Conner, 2013). Emergent surgery to stop the hemorrhage and repair the aneurysm is indicated for patients who present to the emergency department.

Treatment

If an aortic aneurysm is detected early, it usually can be surgically repaired before it dissects or ruptures. The size and location of the aneurysm guides the need for surgical intervention. Thoracic and abdominal aneurysms do not warrant surgical intervention until the risk of rupture is higher than the risk of the surgery. The patient is evaluated every few months with ultrasound tracking of the size of the aneurysm. Surgery may be performed when AAAs are approximately 6 to 8 cm in diameter and thoracic aneurysms 5.5 to 6.5 cm. Patients may be prescribed antihypertensive drugs, such as beta blockers, to reduce the pressure on the arterial walls. If symptoms occur, surgical intervention may be necessary to prevent rupture of the aneurysm.

Surgery for aortic aneurysm involves replacing the area of the vessel wall that is weakened with a graft (open abdomen or chest surgery) or inserting a stent graft into the vessel (percutaneous intravascular insertion). The open surgery requires access to the aorta, where the aneurysm is opened and graft material placed, then the vessel is closed around the graft material. The use of a stent graft is a minimally invasive procedure and is used for patients who are not good candidates for open surgical repair of the aneurysm. A wire mesh stent covered with fabric is percutaneously placed in the area of the aneurysm. Small incisions in the groin are used to access the femoral artery. The stent grafts are positioned in the abdominal aorta and usually down the right and left femoral arteries. The graft provides support to the vessel wall and allows blood to flow through the stent, thus reducing pressure on the vessel wall. The aneurysm is then monitored frequently.

❖Nursing Management

■ Assessment (Data Collection)

Careful physical assessment is needed to detect the presence of an aneurysm. Immediately report findings of pulsations in the abdomen or other structures in which this is abnormal. Information concerning family history of aneurysm should be gathered during the patient history interview. Assessment of pain patterns—especially changes in intensity and location—is needed to identify progression of the patient's condition, which may be life-threatening.

■ Nursing Diagnosis and Planning

The main goal for a patient with an aneurysm is the prevention of rupture. Rupture of an aneurysm is a medical emergency and causes rapid hypovolemic shock, which can lead to death. Advise the patient to report any change in symptoms, such as pain intensity, apprehension, light-headedness, or any unusual sensation. Problem statements for a patient with an aneurysm may include:

- Potential for injury from possible rupture or dissection of aneurysm.
- Acute pain due to pressure of aneurysm on body structures and nerves.
- Insufficient knowledge due to management of medical condition.

Other problems will depend on the location of the aneurysm and whether there is leaking. Expected outcomes might be:

- The patient will not experience rupture or dissection of the aneurysm.
- The patient will report absence of pain.
- The patient will verbalize understanding of management of medical condition.

■ Implementation

Presurgical patient education is important. The patient must be taught signs and symptoms that should be reported to the health care provider immediately. Teaching concerning the medical and surgical treatment regimen should be included along with what to expect postoperatively.

?

Think Critically

You detect a pulsation in a patient's abdomen during physical examination. He states that it has been present for several years and the health care provider is "watching it." List signs and symptoms that could indicate a need for surgical intervention.

The surgical procedure and nursing care depend on the location of the aneurysm and the procedure performed. If aortic aneurysm is treated by thoracotomy or abdominal surgery, the care is similar to that of other types of thoracic and abdominal surgery. The main difference is that you must also carefully assess pulses and function distal to the repair site. Renal function must be watched closely, because blood flow to the kidneys is briefly cut off when the aorta is clamped for surgical repair.

Clinical Cues

Attentive postsurgical care is very important. Monitor urinary output at least every 30 minutes in the immediate postoperative period, then every 2 hours. The urinary output should be at least 30 mL/hr. Report falling urinary output immediately.

The patient may spend 24 to 48 hours in an intensive care unit postoperatively. Assist the patient to deep breathe and use an incentive spirometer every 1 to 2 hours if not intubated. Coughing is not encouraged, but should it occur the incision should be splinted with a pillow or folded bath blanket. Paralytic ileus may occur for a few days after abdominal surgery, and a nasogastric tube may be in place. Auscultate the abdomen every shift for the return of bowel sounds. Adequate pain medication is needed.

A patient undergoing thoracic aortic aneurysm repair will have chest surgery that uses a cardiopulmonary bypass machine. The care is the same as for other chest surgery patients. Chest tubes will be in place. These patients are especially at risk for atelectasis and pneumonia. Pain management is necessary to promote adequate respiratory effort. Cardiac dysrhythmias may be a problem, depending on the location of the repair.

A patient having an endovascular repair may be placed on a telemetry or medical-surgical unit. Observation for bleeding from the procedure site is the priority assessment.

■ Evaluation

Objective data—including vital signs, neurologic status, distal pulses, and respiratory status—should be assessed. Subjective data—including pain level and loss of sensation—should also be determined. Evaluation of the patient's understanding of teaching related to the disease process, potential complications, follow-up appointments, medications, and recommended lifestyle changes should be assessed and appropriate revisions made to the nursing care plan.

Carotid Artery Disease

When atherosclerosis has narrowed the carotid arteries leading to the brain, the signs and symptoms include carotid **bruit** (a purring sound heard with a stethoscope), confusion, transient vision loss, fainting, extremity weakness or paralysis, or other strokelike signs of decreased blood flow to the brain. The condition is treated by carotid endarterectomy or carotid artery angioplasty with stenting. Surgery is performed when the artery is 70% occluded (Singh, 2014). The goal of both procedures is to prevent the occurrence of stroke (see Chapter 23).

Specific postoperative care for endarterectomy includes assessing for signs of bleeding, for pressure from hematoma on the trachea (evidenced by increasing hoarseness), and for neurologic problems caused by thrombosis or embolus. Neurologic signs are monitored every 2 to 4 hours.

Clinical Cues

There is risk for cerebrovascular accident (stroke) after carotid endarterectomy. Assess the patient for signs of disorientation, hoarseness, impaired speech, impaired swallowing, hemiparesis, facial asymmetry, aphasia, and hypertension. These findings should be reported immediately to the surgeon. Because there may be swelling in the neck that may occlude the airway, observe for difficulty breathing.

If surgery is not indicated, the patient is taught to maintain adequate hydration and to comply with drug therapy for hypertension and diabetes, if applicable. Teaching is provided regarding prescribed antiplatelet or anticoagulant drugs. Signs and symptoms of further problems are reviewed, and the patient is advised to call 911 for emergency assistance if sensory or motor deficits appear.

Buerger Disease (Thromboangiitis Obliterans)

Etiology and Pathophysiology

Thromboangiitis obliterans, or Buerger disease, is not caused by atherosclerosis, but involves inflammation and thickening of small and medium-size arteries. Occlusion of the vessels in the hands and feet is usually noted first. The disease occurs more often in men than women and is commonly found in people from the Middle East, the Far East, India, and Southeast Asia. There is increasing incidence of the disease in women older than age 50 years. Moderate to heavy cigarette smoking is directly linked to the progression of the disease. It may be classified as an allergic response in some people in whom the body reacts to properties in nicotine.

Signs, Symptoms, Diagnosis, and Treatment

The signs and symptoms include numbness and tingling of the toes or fingers in cold weather, pain in the feet, and intermittent claudication that progressively becomes more severe. The pain is intense. Ulcerations and **gangrene** (death of tissue) may occur. Diagnosis is made through patient history and symptoms. **Cessation of smoking is the single most important treatment factor.** Cigarette smoking must be stopped immediately. Those who do not stop smoking are at great risk for gangrene and amputation of fingers or toes. Exercise may be used to increase circulation in the legs and feet.

❖Nursing Management

■ Assessment (Data Collection), Nursing Diagnosis, Planning, and Evaluation

The most important role of the nurse is patient teaching and reinforcement of the need for smoking cessation. Assessment of the extremities for skin impairment is essential. Nursing care and teaching is the same as for PAD.

Raynaud Disease and Raynaud Phenomenon

Etiology and Pathophysiology

The etiology of Raynaud disease is unknown. Raynaud disease is characterized by spasm of the arteries of the upper and lower extremities. The body has an exaggerated response to cold and stress, resulting in bilateral vasospasm. The disease occurs most commonly in young women. It mostly affects the fingers and toes. Raynaud disease can be a primary disorder or may occur secondary to another disease such as lupus erythematosus, rheumatoid arthritis, or scleroderma. In the latter instance it is known as Raynaud phenomenon and often occurs on only one side of the body.

Blood vessels normally constrict in cold environments; however, with Raynaud disease, this process is excessive. The affected body part changes color. When the spasm stops, there typically is burning pain and throbbing. In about 10% of those affected, the disease progresses to the point at which ischemia from arterial spasm is so severe that gangrene occurs and amputation is necessary.

Signs and Symptoms

Signs and symptoms of Raynaud disease include:

- Fingers and toes may display a series of color changes from white to blue to red; these changes are evident on the dorsal surface of the hands and feet ([Figure 18-6](#)).



FIGURE 18-6 Raynaud disease. (From Kamal A, Brockelhurst JC: *Color atlas of geriatric medicine*, ed. 2, St. Louis, 1991, Mosby.)

- The patient may experience numbness or a prickly sensation on warming and relief of stress.
- There may be decreased sensory perception.
- Edema may be present.
- Discomfort may occur in the extremity.

Diagnosis and Treatment

Diagnosis of Raynaud disease is usually made by evaluation of patient symptoms. The provider may order laboratory studies such as antinuclear antibody (ANA) test to determine the presence of autoimmune disorders. Medical therapy consists of stress control, avoidance of exposure to cold, and smoking cessation. Calcium channel blockers may be used to dilate capillaries in the hands and feet. The synthetic prostaglandin iloprost (Ventavis) dilates arterial beds throughout the body and extremities. Other drugs such as alpha blockers and vasodilators may be used to achieve vasodilation in the small blood vessels in the hands.

Nursing Management

The major nursing intervention for Raynaud disease is teaching the patient to protect extremities and prevent injury. The patient should be taught to dress warmly when in cold environments. Clothing should be layered and nonrestrictive. Hat, gloves, and warm socks should be worn. The patient should be taught to wear protective gloves when reaching into ovens and when handling extremely cold items. Teach the patient to avoid cold temperatures when possible, to manage stress, and to stop tobacco use. Caffeine intake should be limited. If appropriate, the patient should be referred to a smoking cessation program.

Health Promotion

Smoking Cessation

Encourage smokers with vascular disorders to seek smoking cessation programs in their communities. The American Lung Association's program "Freedom from Smoking" is offered free of charge online at the American Lung Association website (see Online Resources). Discuss other programs such as nicotine replacement therapy. Group programs are offered in many communities, hospitals, American Lung Association affiliates, and community-based health programs. A variety of products are available to decrease and prevent nicotine cravings during the cessation process. Assessment of progress with smoking cessation should occur at each visit with a health care provider.

Evaluate the progression of symptoms, including changes in skin color and sensation. Any changes in skin integrity should be noted. The patient's compliance with recommended lifestyle changes should be evaluated and the plan revised as needed to assist the patient to meet established goals.

Venous Disorders

Venous Thrombosis and Phlebitis

Superficial or deep veins can become inflamed, resulting in thrombosis. Superficial thrombophlebitis that occurs in a patient receiving IV therapy may be caused by chemical or mechanical irritation of the vessel. If not identified and treated, bacteremia may occur, resulting in *septic thrombophlebitis*. Decreasing hospital-acquired bloodstream infections is a Patient Safety Goal. Deep vein thrombosis (DVT) occurs most commonly in the iliac and femoral veins. DVT occurs in about 5% of all surgical patients. Because DVT can lead to embolization from the thrombus to the lungs. DVT prophylaxis is recommended for all hospitalized patients and is included in The Joint Commission's Patient Safety Goals.

Etiology and Pathophysiology

Three factors (Virchow's triad) that increase risk for venous thrombosis are (1) venous stasis, (2) damage of the inner lining of the vein (endothelium), and (3) hypercoagulability of the blood. Venous stasis occurs when the vein valves are damaged or when muscles of the extremities are inactive. People who are immobile for a long time are very susceptible to DVT. Prolonged surgeries, spinal cord damage and paralysis, and chronic heart failure all contribute to venous stasis. Immobility with the legs dependent in car or airplane travel for long periods also promote venous stasis. Trauma or external pressure or internal pressure from hypertension may damage the endothelium. Inflammation of the vessel leads to aggregation of blood components at the site of the inflammation. A clot forms at the inflammation site, leading to obstruction of blood flow. If not treated, the clot may become an embolus that may travel from the legs to the lungs, resulting in pulmonary embolus.

Smoking, female hormone replacement, estrogen-based contraceptives, corticosteroids, and various blood disorders are contributing factors to blood hypercoagulability. Obesity and dehydration also contribute to increased coagulability.

Older Adult Care Points

Older adult patients who have problems with mobility or stress incontinence tend to drink less fluid so that they do not have to visit the bathroom as often. This can lead to dehydration and more viscous blood, which in turn can predispose to thrombus formation in those susceptible to this disorder. Encourage adequate fluid intake to promote circulation, and provide a means for convenient toileting for these patients. The occurrence of DVT or thrombophlebitis increases with advanced age.

Patients particularly at risk for DVT are those having orthopedic surgery; those who smoke; and those who have diabetes, lung disease, blood disorders, PVD, sepsis, or cancer. If DVT is not resolved, the interaction of the clot with the vessel wall results in destruction of venous valves and development of venous insufficiency. **Embolism** may develop when a portion of a DVT in a leg breaks loose and travels to the lungs. The embolus lodges in small vessels, especially those in the pulmonary system. Blood flow is interrupted, and loss of oxygenation to the lung may occur. The condition can be life-threatening (see Chapter 14). When a pulmonary embolus is suspected, place the patient in a high Fowler position, provide oxygen and reassurance, notify the provider, and stay with the patient. Medication for pain and anxiety may be ordered; tests to determine whether a pulmonary embolus has occurred will be ordered.

Superficial Thrombophlebitis

Continuous IV therapy and contaminated IV drug needles are common causes of superficial thrombophlebitis. Phlebitis also occurs in patients with diseases associated with vasculitis. It can also occur spontaneously in the lower extremities or as a complication of a medical intervention.

Signs, Symptoms, and Diagnosis

Signs and symptoms of thrombophlebitis include swelling, redness, warmth, and considerable tenderness and pain on touching. Diagnosis is usually by ultrasound studies and rarely by venography. If venous imaging is needed, CT venography can be performed. Physical examination, patient history, and evaluation of signs and symptoms are important in diagnosing thrombophlebitis.

Treatment and Nursing Management

Treatment for thrombophlebitis includes discontinuing the source of irritation and modifying risk factors; applying warm, moist heat; elevating the extremity; and administering NSAIDs and antibiotics if infection is present. Patients are encouraged to stay off their feet and to elevate their legs. Support stockings are to be worn after the acute phase. If the IV is implicated as a cause, the IV catheter site will be changed to a new location.

Nursing management of a patient with thrombophlebitis includes assessment and documentation of the color, warmth, circumference, and pulses of the affected extremity. Explain the importance of adhering to the prescribed level of physical activity, and explain the potential complications of noncompliance. Make certain that the patient receives medications as prescribed. Warm, moist compresses to the affected extremity may be ordered. Emphasize the importance of this treatment. Develop a discharge teaching plan related to the disease process, medications, activity level, home care, and follow-up. Components of teaching may include:

- Avoidance of sitting for long periods with the legs down
- Avoidance of standing in one place for long periods
- Management with NSAIDs
- Application of compression stockings
- Activity limits
- Preventive measures

Think Critically

What teaching points would you cover for a 52-year-old female hair stylist who is being discharged after hospitalization for thrombophlebitis of the right leg?

Decreased redness, swelling, and pain indicate resolution of the thrombophlebitis. Evaluation of patient success in meeting goals would include compliance with medications and demonstrated evidence of understanding of discharge teaching. Often, subjective data from the patient must be relied on to evaluate whether treatment and nursing actions are effective.

Deep Vein Thrombosis

Signs, Symptoms, and Diagnosis

The main sign of a DVT is edema in one extremity ([Figure 18-7](#)). The area over the thrombosis may feel warm. Never rub or vigorously palpate the area, because this can dislodge the clot and send it into the circulation, which can cause severe damage or death.



FIGURE 18-7 Patient with deep vein thrombosis. (From Kamal A, Brockelhurst JC: *Color atlas of geriatric medicine*, ed. 2, St. Louis, 1991, Mosby.)

The most common method of diagnosing DVT is ultrasonography. Sound waves detect blood flow through the veins and identify areas of abnormality. If sonography is not clear, an MRI may be performed. Activated clotting time (ACT), activated partial thromboplastin time (aPTT), international normalized ratio (INR), hemoglobin (Hgb), hematocrit (Hct), and D-dimer laboratory tests are performed to detect blood dyscrasias or abnormal clotting times. A venogram sometimes is performed, but it requires injection of a dye to identify areas of obstruction, which may further irritate the vessel. Obtain the patient's allergy history before this procedure.

Clinical Cues

Whenever a patient has a known DVT, watch for signs of pulmonary embolus: dyspnea, hemoptysis, tachypnea, tachycardia, chest pain, decrease oxygen saturation, a feeling of impending doom, cyanosis, and possibly coughing and altered mental status. These signs indicate an emergency situation.

Treatment

Inpatient medical treatment for DVT usually consists of IV heparin. Low-molecular-weight heparin (LMWH), such as enoxaparin (Lovenox) by injection, may be used for inpatient management and is increasingly being used for outpatient treatment. Fondaparinux (Arixtra), a factor Xa inhibitor, may be used instead of enoxaparin. After initial IV or subcutaneous injection anticoagulation treatment, oral anticoagulation is started with warfarin sodium (Coumadin), rivaroxaban (Xarelto), edoxaban (Lixiana), dabigatran (Pradaxa), or apixaban (Eliquis). Anticoagulation is continued for 3 to 6 months for the first episode of DVT and a year for recurrent episodes (Patel, 2014). Anticoagulants will not dissolve the clot but may prevent new ones. The body dissolves the clot on its own over time.

Thrombolytic therapy may be used to dissolve the thrombus if vessel obstruction is severe; the agents used are the same as those listed for arterial thrombolysis. There is a high risk of bleeding with these drugs, and a compelling reason must be present for use, because in time the body will dissolve the clot without intervention. Sequential compression devices (SCDs) may be prescribed, or compression stockings may be fitted for daily use. Stockings must fit properly and be kept smooth. The compression forces blood from the superficial veins into the deep veins, decreasing venous stasis. Compression stockings are only removed for bathing and are changed and laundered daily. They must be replaced after 6 months, because the elastic quality decreases. Ambulation as soon as it is not prohibited by pain and swelling is recommended. There is no evidence that ambulation will dislodge a DVT and cause a pulmonary embolus as has been believed for many years (Patel, 2014).

If a patient is considered at risk for further embolus formation from DVT and is not a candidate for anticoagulation, a **vena cava filter** will be inserted. The device is placed in the inferior vena cava

(IVC) below the kidneys to prevent pulmonary emboli. With the use of a special catheter threaded into the vena cava, the device is positioned and deployed. The metal cage device catches the emboli and the body slowly dissolves and disposes of them. IVC filters come in different shapes and configurations but all do the same thing.

Post-thrombotic syndrome (PTS) is a potential complication for 50% of patients with DVT. While the body is dissolving the clot, there is continued inflammation at the site. This causes permanent damage in the vessel, called PTS. Some studies have shown that use of compression stockings relieves symptoms for some patients. A 2014 study reported in *The Lancet* found that use of elastic compression stockings after DVT did not prevent PTS ([Kahn et al, 2014](#)). Current research is focusing on more aggressive DVT treatment to remove the clot so it does not remain in contact with the vessel wall. Thrombolytic therapy delivered directly into the clot, percutaneous thrombectomy, angioplasty, and stenting are all being examined with the goal of preventing PTS.

Heparin-induced thrombocytopenia (HIT) may occur when unfractionated or low molecular weight heparin is used for several days to weeks. It is heralded by a sudden decrease in platelet count. If HIT occurs, heparin administration must be stopped.

❖Nursing Management

■ Assessment (Data Collection)

Assess patients at risk for DVT each shift for signs and symptoms. Assessment should include:

- Observation of the extremity for asymmetrical size
- Areas of warmth and redness over a vein
- Calf pain and/or tenderness
- Pitting edema of the affected extremity
- Measurement of calf circumference
- Body temperature greater than 100.4° F (38° C)

■ Nursing Diagnosis, Planning, and Implementation

Early ambulation postoperatively helps promote circulation and reduces the risk of clot formation. Encouraging patients on bed rest to change position and perform leg and ankle exercises each hour while awake can do much to decrease the incidence of DVT. Venous thrombosis occurs fairly commonly during long plane flights or car trips. Staying well hydrated, exercising the leg and calf muscles frequently during the trip, and walking every 1 to 2 hours help prevent clots from occurring. Wearing support hose while standing aids venous return and helps prevent thrombosis in those who have varicose veins ([Lew, 2013](#)).

Problem statements/nursing diagnoses, expected outcomes, and interventions are presented in [Nursing Care Plan 18-1](#).

✳ Nursing Care Plan 18-1

Care of a Patient With a Deep Vein Thrombosis

Scenario

Mrs. Hanson, age 72, fainted at the airport after returning from a cross-country plane trip of 6 hours. She was unconscious at the scene and woke up when medical personnel arrived. She had a heart rate of 20 when checked by the paramedics, and her heart rate returned to a normal range before she arrived at the hospital. She was admitted to a telemetry floor for observation.

She has now developed pain in her right calf, and her lower leg is swollen, with a hot, tender area in the midcalf region. She has been placed on a continuous heparin drip.

Problem Statement/Nursing Diagnosis

Insufficient tissue perfusion/*Ineffective tissue perfusion due to presence of clot in vein and inflammation.*

Supporting Assessment Data

Subjective: "My leg really hurts." Complains of pain in right calf.

Objective: Reddened, warm, tender area on midcalf. Temperature 101.2° F (38.4° C). Leg circumference increased compared with left leg.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Thrombus will resolve within 2 wk as evidenced by Doppler flow studies.	Encourage ambulation as tolerated; keep right lower leg elevated when in bed.	To prevent formation of further clot.	Up to the bathroom several times during the day. Right leg elevated when in bed.
Thrombosis will begin to resolve by discharge as evidenced by normal temperature and no calf tenderness, redness, or swelling.	Early ambulation. Administer analgesia for aching and tenderness. Warm packs to right leg; handle right leg gently. Auscultate lung sounds every shift; check pulse oximetry; be alert for signs of pulmonary emboli.	Maintain venous circulation. Promotes comfort. Provide comfort, decrease edema. Early detection of pulmonary emboli for immediate intervention.	Walking as much as tolerated. Analgesic administered x 2. States is more comfortable. Leg circumference decreased by 0.5 cm. Lung sounds clear to auscultation. Oxygen saturation 98%-100% on room air.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to heparin drip, thrombus formation, or embolus.*

Supporting Assessment Data

Objective: Heparin drip 50,000 U in 500 mL at 25 mL/hr. Deep venous thrombosis (DVT) in right leg.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience embolus or other DVT during hospitalization.	Maintain heparin drip on IV pump at ordered rate; assess IV site qhr for infiltration. Caution not to rub leg. Encourage increase in fluid intake. Apply compression stockings smoothly, removing only for bathing.	Prevent formation of additional thrombi. Rubbing may dislodge a clot and cause an embolus. Assists in reducing blood viscosity. Assists with venous return and prevents blood pooling.	Heparin drip continuous; IV site without redness or swelling. States understands not to rub the leg. Intake 2000 mL this shift. Compression stockings in place.
Patient will have no hemorrhage from heparin as evidenced by no sign of bleeding internally or externally.	Observe for bleeding of gums, excessive bruising, blood in urine or stool, nosebleeds, and abdominal pain with rigidity. Monitor Hgb and hematocrit to detect blood loss. Monitor ACT or aPTT and advise provider immediately if values rise above $2\frac{1}{2}$ times the control value or above therapeutic range.	Heparin can cause bleeding. May indicate need to change infusion rate or administer protamine sulfate if excessive blood loss occurs. Allows for adjustment of heparin dosage to keep it within therapeutic range.	Slight bleeding of gums. Bruising from previous needle sticks. No evidence of blood in urine or stool; bowel sounds present all four quadrants, abdomen soft. No change in Hgb and hematocrit. aPTT two times control value.
	Hold pressure over any needle stick for 5 min. Begin warfarin (Coumadin) or other drug therapy as ordered 3 days before heparin is stopped. Handle patient very gently.	Heparin extends bleeding time. Anticoagulant therapy will continue when discharged home. Prevents bruising.	No excessive bleeding with laboratory draws. Coumadin administered today. No new bruising.

ACT, Anticoagulant therapy; aPTT, activated partial thromboplastin time; Hgb, hemoglobin; IV, intravenous.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge due to precautions necessary when taking warfarin and about treatment regimen.*

Supporting Assessment Data

Objective: Will take warfarin at home for at least 6 to 12 months. Has never taken this medication.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize danger signs to report to provider, proper dosage of medications, and dietary considerations before discharge.	Teach the following: Avoid foods high in vitamin K (give list). Avoid over-the-counter medications and drugs that might extend clotting time or interfere with action of warfarin (e.g., aspirin, etc.). Move around carefully, trying not to hit head on anything or bump into things. Observe urine and stool for signs of bleeding.	Vitamin K counteracts the action of warfarin. Some over-the-counter drugs have anticoagulant actions that may increase risk of complications of drug therapy. Injury could cause bruising and hematoma formation. May indicate international normalized ratio (INR) higher than therapeutic range.	Patient identified foods high in vitamin K that are in her routine diet and states "I will be consistent in the amount of these foods in my diet." States understands to check with provider before using over-the-counter medications. Slight bruising noted on buttocks. No signs of bleeding in urine or stool.
Patient will verbalize understanding of need for regular medical follow-up and periodic laboratory clotting times before discharge.	Instruct her to maintain close contact with provider to monitor clotting times. Explain dosage schedule. Give written instruction sheet.	Monitoring of INR important to evaluate effectiveness of warfarin therapy. Provides reference for safe administration of drug.	Verbalizes need to keep appointments for follow-up laboratory studies. Given written instructions to be followed when taking warfarin. Verbalized understanding.
Patient will completely stop smoking within 1 mo.	Give smoking cessation information. Get order for nicotine patch or other assist product. Refer to support group.	Cigarette smoking constricts vessels and contributes to blood coagulability.	Is willing to work with a smoking cessation counselor.
Patient will establish a walking program when acute stage has resolved.	Assist to establish walking schedule. Caution not to sit with legs crossed or to sit for long periods without elevating legs. Caution not to wear constricting clothing.	Walking promotes venous return by calf muscles compressing the veins. Crossing the legs decreases venous return and promotes blood pooling in the extremity. Sitting causes dependent pooling in legs. Tight clothing can decrease venous return and cause pooling in extremities.	Is thinking about a walking schedule. States understands not to sit with legs crossed or for long periods with legs dependent. States she understands not to wear tight clothing items.

Critical Thinking Questions

1. List the signs and symptoms of pulmonary embolism.
2. What assessment data would you expect to find indicating that the treatment of a patient with deep vein thrombosis was successful?

■ Evaluation

Decrease in leg circumference and adequate blood flow to the extremity as evidenced by color, warmth, and lack of edema indicate that interventions for DVT are working. Evaluation of interventions for thrombophlebitis include checking for decreased redness and swelling.

Varicose Veins

Varicose veins are enlarged and tortuous veins that are distorted in shape by accumulations of pooled blood. Veins that develop varicosities have incompetent valves that allow reflux of blood from the deep to the superficial veins. The increased blood flow and resultant pressure on the vein walls cause the vessels to dilate and become tortuous.

Varicosities usually occur in the saphenous veins and perforator veins in the ankle. Congenital or family disposition that leads to loss of vessel wall elasticity is a primary cause. Standing for long periods, obesity, and pregnancy are contributing factors. Trauma, DVT, and inflammation that results in vein valve damage are secondary causes. Individuals who must be on their feet a great deal are encouraged to wear support stockings to promote venous return.

■ Think Critically

Can you identify two lifestyle changes you could personally make that would decrease your risk of a vascular disorder later in life?

■ Older Adult Care Points

Varicose veins develop in older adults as the veins lose their elasticity and the leg muscles weaken and atrophy from decreased exercise.

Signs and symptoms of varicose veins include dilated, twisted-appearing, superficial vessels on the legs. Swelling of the foot and ankle on the affected leg may occur by the end of the day, and swelling is often accompanied by aching. The patient may complain of pain, itching, or both along varicose veins (Figure 18-8). The legs may feel full and heavy during walking or exercise. Diagnosis is made by thorough physical assessment and patient history.

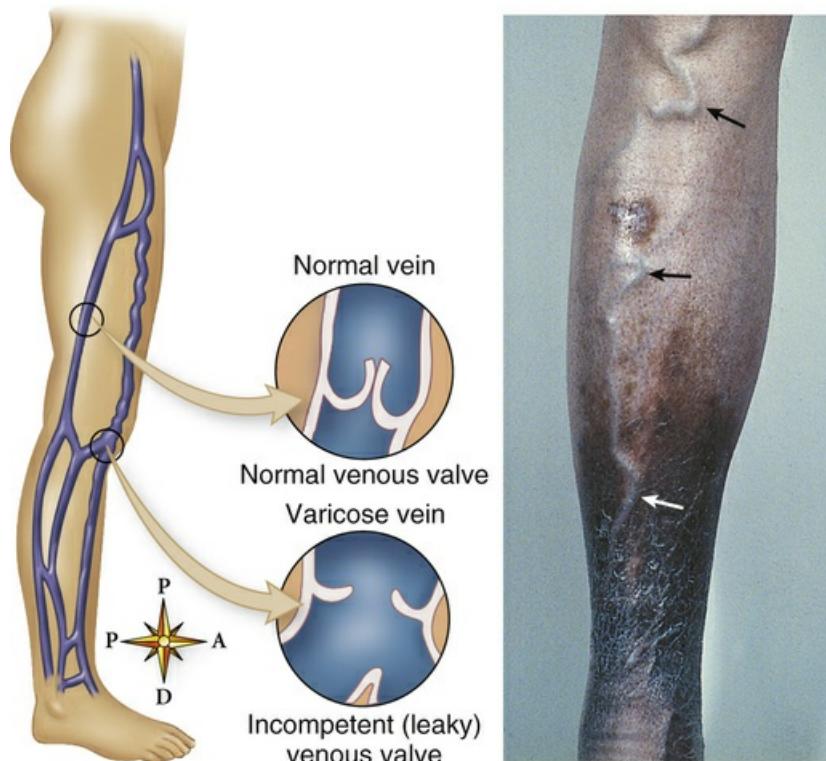


FIGURE 18-8 Varicose veins. (From Patton KT, Thibodeau GA: *The human body in health and disease*, ed. 6, St. Louis, 2014, Mosby.)

Treatment

Treatment of varicose veins includes using elastic support hose, exercising the legs and feet periodically throughout the day, and elevating the legs whenever possible. Prolonged standing, sitting, or crossing the legs is to be avoided. Weight reduction is recommended for patients who are obese. Exercises such as walking or swimming are beneficial, because the muscle contraction encourages venous return to the heart. Some herbs are helpful for varicose veins.

Complementary and Alternative Therapies

Herbs for Varicose Veins

Several herbs have been found to be helpful for patients with varicose veins (but should not be used during pregnancy and lactation):

Bilberry: May cause constipation; affects blood glucose levels, may increase the action of anticoagulants; check drug and herbal interactions

Butcher's broom: Not to be used for patients with hypertension or prostatic hypertrophy

Gotu kola: Also helpful for hypertension

Horse chestnut: Check for interactions with other drugs the patient is taking; do not use with hypoglycemics, salicylates, or anticoagulants

Patients need to be aware of potential side effects of herbs, as well as prescribed medications.

Knee-high elastic stockings or elastic wraps should be used to support venous circulation. See Chapter 17 for correct use and application of support garments.

Clinical Cues

Follow directions carefully and measure the patient's calves and legs before choosing a pair of elastic stockings. Accurate fit is crucial to effective treatment. If standard sizes do not coincide with the measurements, custom stockings may need to be purchased.

Exercise is especially beneficial to patients with decreased blood flow. Walking is the ideal exercise for ambulatory patients. If a patient is unable to ambulate, promote venous return through range-of-motion (ROM) exercises and other kinds of muscular movements. Any activity that causes contraction of the leg muscles will help move venous blood from the legs to the heart.

Medications such as NSAIDs (e.g., aspirin, ibuprofen) may be used for aching. Surgical procedures may be used when medical treatment is ineffective. Small varicosities can be treated by **scleropathy**, which involves injecting an agent that will sclerose the vessel, causing it to dry up and wither. Endovenous occlusion using a laser is performed by placing a catheter within the vein under duplex ultrasound guidance; a laser heats the vessel, causing it to collapse and close off. It can be performed in an office setting or outpatient ambulatory surgery site. Compression stockings are worn for 1 to 2 weeks after the procedure. Patients ambulate immediately after the procedure for 30 to 60 minutes and 1 to 2 hours per day for 1 to 2 weeks. A similar procedure uses radiofrequency energy for closure of the vessel. Vein stripping may be performed for severe cases; a less invasive technique is called *PIN (perforate invaginate) stripping*. In this procedure only two small incisions are used, and the vein is removed much like pulling a sock off inside out. It can be done in an office setting but may also be performed in an operating room.

Chronic Venous Insufficiency

Etiology and Pathophysiology

Chronic venous insufficiency is common among older adults. Many cases are caused by congenital absence of the valves in the veins. It can also occur when the venous valves are damaged and can affect the superficial low pressure vessels or the higher pressure deep venous system, such as occurs with severe cases of DVT. When valves are damaged or absent, there is retrograde venous blood flow, and blood pools in the legs. Swelling results with increasing venous pressure and stasis of blood flow. The condition may lead to venous stasis ulcers.

Venous return occurs by the pumping action of the calf muscles against the venous walls. When valves are incompetent, venous return is compromised, and flow goes both ways in the vessel. The increased pressure leads to leakage of red blood cells into the tissues. The breakdown of the red cells releases hemosiderin, which causes a brownish skin color (Weiss, 2014). Fibrous tissue replaces subcutaneous tissue around the ankle. The skin becomes thick and hardened.

Signs, Symptoms, and Diagnosis

Signs and symptoms of chronic venous insufficiency include chronically swollen legs; thick, brownish skin around the ankles; and itchy, scaly skin (Figure 18-9). Stasis dermatitis is common. Venous stasis ulcers often occur (Figure 18-10). Infection and cellulitis occur if an ulcer is untreated. Diagnosis is made through physical assessment and patient history.



FIGURE 18-9 Characteristic skin changes in a patient with venous insufficiency. (From Swartz M: *Textbook of physical diagnosis: History and examination*, ed. 6, Philadelphia, 2009, Saunders.)



FIGURE 18-10 Venous stasis ulcer. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

Treatment and Nursing Management

Treatment is the use of knee-high elastic support stockings and elevation of the legs for 8 out of 24 hours each day. Teach the patient to avoid prolonged standing or sitting and to sleep with the foot of the bed elevated 6 inches. Legs should not be crossed when sitting and tight, restrictive clothing should be avoided. Legs should be elevated above heart level whenever possible.

Venous Stasis Ulcers

Diabetic patients with venous insufficiency are at high risk for venous stasis ulcers because of compromised circulation in the extremities and a slow rate of healing. The ulcers may extend

deeply into the tissue and are very slow and difficult to heal because of tissue congestion and edema that prevent nutrients from reaching the cells. The ulcer may begin as a small, tender, inflamed area and becomes very painful. With the slightest trauma, the skin breaks and the ulcer enlarges. It is imperative that patients with venous insufficiency be taught the extreme importance of good foot and leg care. An inflamed skin area can be preventively treated with a clear occlusive dressing, such as Tegaderm or OpSite, to help prevent ulcer formation. These transparent dressings allow monitoring of the site for signs of infection or complications of healing. Teach the patient about proper self-care and signs of beginning skin breakdown. The slightest injury to an ischemic area can take a very long time to heal and can easily become infected, because the blood supply is inadequate to provide the usual leukocyte defenses. Any injury to an affected extremity, no matter how minor, should be reported to the provider immediately.

Treatment for an ulcer consists of leg elevation, a moist dressing, and compression. A culture is performed to determine whether infection is present. Saline or mild soap is used to clean around the ulcer. A lanolin-type lotion is used to keep skin moist and supple. The dressing to be used depends on the condition of the ulcer and the amount of exudate produced. A vacuum-assisted drainage device may be needed for excessive drainage. The wound may need a graft to heal completely. Venous stasis ulcers can take weeks to months to heal. Compression dressings are not used if arterial insufficiency is also present. Compression therapy options include compression stockings, elastic tubular support bandages, intermittent compression devices, a paste bandage such as Unna boot, or placement of two to four layers of compression dressings to the affected area. Venous return is accomplished as the patient moves his leg and achieves pressure on the calf muscles. Compression dressings can be placed over wound dressings. The dressings help to reduce ulcer pain, keep the wound moist, and assist debridement. The dressing is changed from every 2 to 3 days to every few weeks depending on the type of dressing applied.

For success, the underlying venous problem must be treated. A graft may be necessary to heal the ulcer. A split-thickness graft or bioengineered skin may be used. Advise the patient to avoid injury to the graft site. Patients are placed on bed rest for several days after grafting to protect the site. Give the patient considerable support, because treatment is long, recurrent, and tedious. Patients with stasis ulcers commonly become depressed. Praise for compliance with instructions and for any small gains made toward healing can do much for a patient's morale.

❖ Nursing Management

■ Assessment (Data Collection)

Subjective information is gathered during history taking. A nutritional assessment is essential. Objective assessment data should include status of the skin, noting color, warmth, and moisture. Stasis dermatitis may be present, and pruritus and edema are common. Document the location, size, and presence of exudate and its color and odor, and include a photograph. Obtain a patient statement of pain at the site on a scale of 0 to 10. Assess the patient's experience with pain, including intensity, when pain occurs, and how it is relieved. Assess arterial pulses and determine the pulse rate, rhythm, and character (force) of the pulse. For diagnostic tests, refer to [Table 17-2](#).

☒ Focused Assessment

Data Collection for Vascular Disorders

Gather data on the following while interviewing the patient.

Health History

- Family history of hypertension, cardiovascular disease, stroke, hyperlipidemia, aortic aneurysm, diabetes mellitus, or PVD
- History of trauma to the lower extremities
- Personal history of any PVD
- All medications taken on a regular basis (prescribed and over-the-counter medications)

- History of tobacco use, especially smoking
- History of alcohol use
- Dietary practices, especially sodium and fat intake
- Current or history of central nervous system occurrences, such as dizziness, headaches, or loss of consciousness
- Occurrence of edema in the legs, feet, or ankles
- Occurrence of leg pain during walking (When? How is it relieved?)

Physical Assessment

- Color of skin of the neck
- Observe for jugular vein distention
- Auscultate carotid arteries for presence of bruit
- Auscultate heart sounds and note any abnormalities
- Assess for any visible abdominal pulsation over aorta
- Auscultate over aorta in abdomen for presence of bruit
- Assess peripheral pulses and compare bilaterally
- Assess blood pressure on both arms, sitting and standing
- Assess skin for temperature, color, appearance, lesions, dryness, presence or absence of hair on legs
- Note presence of varicosities
- Assess capillary refill

Nursing Diagnosis and Planning

Problem statements are chosen based on those assessment data that indicate problems for the patient. Common problem statements associated with vascular disorders are listed in [Table 17-4](#). Nursing diagnoses may be added to the care plan for problems secondary to treatments, such as drug therapy or surgery. Other problem statements sometimes used include:

- Insomnia related to pain in the legs while at rest.
- Decreased self-esteem related to inability to perform usual roles because of chronic leg ulcers.

Appropriate exercise is important to treat vascular disease. Collaborate with the provider and physical therapist about activity, exercises, and the reinforcement of teaching. Work with the dietitian to promote the patient's adequate nutrient intake for healing ([White-Chu and Conner-Kerr, 2014](#)). Specific expected outcomes must be written on an individual basis (see [Table 17-4](#)).

Implementation

A major role of a nurse caring for a patient with venous insufficiency is to monitor the condition and determine whether treatment is effective. [Table 17-4](#) lists helpful interventions for the most common problem statements associated with problems of the vascular system. Nursing interventions for selected problems in a patient with a venous stasis ulcer are summarized in [Table 17-4](#).

Evaluation

Evaluate the patient's response to treatment to determine effectiveness and potential development of complications. Carefully evaluating pulses and comparing them bilaterally are important parts of nursing care for patients with problems of the vascular system. Documenting a good description of the quality and character of the monitored pulses in the nurse's notes will give coworkers an accurate assessment baseline on which to evaluate changes in the pulse (see **Box 17-2**).

It is important to determine whether skin color and temperature have changed since the last assessment. Ulcerated areas are monitored closely, measured, documented in writing, and photographed to determine whether healing is occurring. The color of the healing tissue and presence of exudate also are evaluated. Documentation of the characteristics of any exudate should be included. If the wound is enlarging or not improving, the nursing actions or treatment must be changed.

Subjective data from the patient help evaluate whether treatment and nursing actions are effective. Increases in peripheral circulation may be evident only by a decrease in pain or an ability to walk farther without pain. The patient should be able to demonstrate understanding of the disease process, preventive measures, medications, signs and symptoms to report to the health care provider, and follow-up care.

Community Care

Many patients with vascular disease are treated in outpatient clinics and their homes. Patients who have venous stasis ulcers are often treated by a home health nurse. With early discharge after surgery, many patients receive postoperative care in the home. Patients with arterial bypass may be referred for rehabilitation exercise programs at a rehabilitation center. Your role in these settings is focused on ongoing assessment, coordination of care with other members of the health care team, monitoring progress and compliance with treatment, and patient education.

Include careful monitoring of the blood pressure for the presence of hypertension. Patients should be aware of expected blood pressure levels and critical levels to report to the health care provider. Evaluate the home care patient's understanding of medication, diet, and exercise to accomplish optimal management of hypertension.

Some patients may have the capability of monitoring their coagulation status through home monitoring devices. This is especially important for patients who are taking drugs such as warfarin. There are multiple devices on the market for home testing of INR. The patient then has more information to manage his coagulation status and prevents missed laboratory appointments. Be aware of patient use of these devices and ensure that the patient is using them correctly.

Get Ready for the NCLEX® Examination!

Key Points

- Hypertension is more prevalent and more severe in African Americans than in other minority groups and whites.
- Treatment of hypertension involves measures to assist the patient to maintain blood pressure at or below 120/80 mm Hg.
- Antihypertensive drugs work by decreasing blood volume, cardiac output, or peripheral resistance.
- Nursing care of patients with hypertension includes counseling and education about lifestyle changes, diet, weight control, stress relief, and exercise.
- Noncompliance with the medical regimen for hypertension can result in heart problems, dementia, blindness, stroke, and kidney failure.
- Obesity, stress, and sedentary lifestyle contribute to the incidence of atherosclerosis and hypertension.
- Atherosclerosis is the most common cause of PVD.
- Arterial wall injury may be caused by hypertension, deposit of fatty plaque, chemical toxins, or diabetes mellitus.
- Disorders of peripheral arteries lead to ischemia.
- Quitting smoking, maintaining a low-fat diet, controlling diabetes mellitus, and following an exercise program decrease the incidence of PAD.
- Signs and symptoms of PAD include intermittent claudication, pain at rest, and ischemic changes. The five *Ps* are pain, pulselessness, pallor, paresthesias, and paralysis.
- The best treatment for arterial insufficiency is exercise—specifically, walking.
- Long-term hypertension and atherosclerosis are factors in the development of aneurysms.
- Aneurysms in the aorta may be repaired by surgical resection and graft or stent insertion.
- An aortic aneurysm rupture often causes death.
- The etiology of Raynaud disease is an exaggerated response to cold environment and stress.
- Carotid occlusion is signified by a carotid bruit, confusion, blackouts, extremity weakness or paralysis, temporary loss of vision, or other neurologic symptoms.
- Treatment for carotid stenosis includes carotid endarterectomy or stenting.
- Thrombophlebitis is the development of a clot and inflammation of a vein.
- DVT is a clot in a deep vein occluding blood flow.
- The effects of a thrombus depend on the location and size of the clot and the degree of obstruction to blood flow.
- The etiology of DVT includes immobility, trauma, surgery, cancer, dehydration, and abnormal clotting.
- Treatment of DVT may include IV heparin, subcutaneous agents, oral anticoagulants, and hydration.
- Medical management of DVT includes elevation of the extremity when seated, compression stockings, ambulation, warm moist packs, NSAIDs, and sometimes antibiotics.
- Varicose veins are enlarged, tortuous veins engorged with pooled blood.
- The symptoms of varicose veins include fatigue, a feeling of heaviness in the legs after prolonged standing or sitting, pain, and itching along the course of the blood vessel.
- Medical management of varicose veins involves compression stockings, treatment of obesity, and exercise.
- Surgical treatment of varicose veins may include sclerotherapy, vein stripping or PIN stripping, ligation, or endovenous laser treatment.
- Venous insufficiency occurs from damaged valves in veins and pooling of blood.

- Venous stasis ulcers are skin lesions, usually on the lower leg, from venous insufficiency.
- Treatment for venous stasis ulcers includes acute debridement, dressings, compression, and prevention of infection.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- American Lung Association, "Freedom from Smoking," <http://ffsonline.pub30.convio.net/>.
- American Heart Association, www.heart.org
- Blood thinners, www.ahrq.gov/consumer/btpills.htm
- National Heart, Lung, and Blood Institute, "Lowering Your Cholesterol With TLC," www.nhlbi.nih.gov/health/public/heart/chol/chol_tlc.pdf
- Peripheral Arterial Disease Coalition, www.padcoalition.org
- Peripheral arterial disease, www.nhlbi.nih.gov/health/public/heart/pad/index.html
- Society for Vascular Surgery, www.vascularweb.org
- Vascular Disease Foundation, www.vdf.org/diseaseinfo/pad

Review Questions for the NCLEX® Examination

1. A 40-year-old woman complains of leg pains that are associated with fullness during walking. She describes itching on the lower leg and on inspection has a twisted-appearing swelling in her legs. The patient most likely will be treated for:

1. venous stasis ulcers.
2. deep vein thrombosis.
3. arterial insufficiency.
4. varicose veins.

NCLEX Client Need: Physiological Adaptation

2. A nurse reinforces discharge instructions to a patient who is diagnosed with chronic venous insufficiency. Which instruction(s) should be included? (*Select all that apply.*)

1. "Take a low-dose aspirin every day."
2. "Consider swimming for exercise."
3. "Avoid wearing tight clothing."
4. "Reapply elastic wraps in the afternoon."
5. "Decrease fluid intake to help prevent edema."
6. "Elevate the legs above the level of the heart as much as possible."

NCLEX Client Need: Health Promotion and Maintenance

3. If a patient complains of intermittent claudication, the nurse would expect which clinical finding?

1. Strong, symmetrical peripheral pulses
2. Skin mottling
3. Rubor when legs are dependent
4. Continual pain

NCLEX Client Need: Reduction of Risk Potential

4. A patient diagnosed with peripheral arterial disease complains of a sudden onset of pain in his right foot. Identify in priority order the actions of the nurse.

1. Notify the provider.
2. Note the color, temperature, and capillary refill of the foot.
3. Check for pedal and posterior tibial pulses.
4. Check vital signs.

NCLEX Client Need: Physiological Adaptation

5. A patient is started on antihypertensive medications. Which patient statement indicates effectiveness of teaching?

1. "I will be able to perform sit-ups in the morning."
2. "I need to take the medication when I feel dizzy."
3. "It helps reduce the incidence of a blood clot."
4. "Sudden changes in position may cause dizziness."

NCLEX Client Need: Pharmacological Therapies

6. The nurse is receiving a patient who had angioplasty and stenting of his right femoral artery. Which nursing intervention would take priority in the immediate postoperative period?

1. Assessing the right femoral artery pulse

2. Monitoring for signs of fluid overload
3. Determining range of motion
4. Checking right pedal pulses

NCLEX Client Need: Reduction of Risk Potential

7. The nurse is reinforcing the provider's instructions to an older adult woman who is newly diagnosed with hypertension. The patient does not speak the nurse's language and is legally blind. What is the best nursing action?

1. Use a certified translator to provide instructions.
2. Speak slowly and use hand motions to describe information.
3. Use a loud voice and speak directly into the patient's ear.
4. Provide written instructions for the family.

NCLEX Client Need: Health Promotion and Maintenance

8. A 54-year-old man complains of pain when walking and numbness of his lower extremities. On examination, the nurse notes that both extremities are pale and cool to touch. The highest priority nursing diagnosis would be:

1. *Altered peripheral tissue perfusion.*
2. *Altered activity tolerance.*
3. *Altered fluid volume.*
4. *Potential for injury.*

NCLEX Client Need: Reduction of Risk Potential

9. A patient with PAD is prescribed a daily dose of aspirin. The nurse accurately explains the prescription by stating:

1. "Aspirin controls the body temperature to reduce vasoconstriction."
2. "Aspirin helps prevent formation of clots."
3. "Aspirin protects the blood vessels from injury."

4. "Aspirin reduces pain associated with inadequate tissue perfusion."

NCLEX Client Need: Pharmacological Therapies

10. The nurse promotes lifestyle modifications to a 39-year-old man who is diagnosed with prehypertension. Which lifestyle modification(s) should be recommended? (*Select all that apply.*)

1. Smoking cessation
2. Restrict sodium intake to 4000 mg/day
3. Exercise 30 minutes per day most days of the week
4. Limit alcohol intake to two drinks per day
5. Low-fat diet
6. Stress reduction measures

NCLEX Client Need: Reduction of Risk Potential

Critical Thinking Questions

Scenario A

Mrs. Dunn is being discharged from the hospital after being treated for arterial insufficiency in both lower extremities. Her provider requests that Mrs. Dunn receive instruction in the care of her feet and legs before discharge.

1. What findings do you expect on physical examination of Mrs. Dunn's legs?
2. What medication and treatment do you expect the provider to prescribe? Why are these prescribed?
3. List five priority teaching points for Mrs. Dunn.

Scenario B

Ms. Yao, age 27, developed a DVT in her left thigh after surgery to repair a fractured right femur. She is receiving IV heparin and will transition to warfarin starting tomorrow.

1. Describe the pathophysiology of DVT. How does Ms. Yao's diagnosis relate to development of DVT?
2. Identify essential information you need to safely administer the medications prescribed.
3. Develop a teaching plan for Ms. Yao.

Scenario C

Mr. Tompkins, age 66, who is hypertensive and only recently quit smoking, has been diagnosed with a 3-cm AAA.

1. What treatment would you expect for him?
2. What signs and symptoms of complications would you teach him?
3. What measures could he take to help prevent the aneurysm from growing and rupturing?

CHAPTER 19

Care of Patients With Cardiac Disorders

Objectives

Theory

1. Contrast left-sided and right-sided heart failure.
2. Discuss treatment of systolic and diastolic heart failure.
3. Apply the nursing assessment specific to a patient who is admitted with heart failure.
4. Identify life-threatening heart rhythms from a selection of cardiac rhythm strips.
5. Examine usual treatment for atrial fibrillation, third-degree heart block, and ventricular tachycardia.
6. Explain nursing responsibilities in the administration of cardiac drugs.
7. Determine under what circumstances cardiac surgery is appropriate treatment.
8. Analyze the nurse's role in caring for patients with heart disorders in a long-term care facility or in their home.
9. Develop a teaching plan with dietary recommendations for heart disease.

Clinical Practice

10. Develop a plan of care for a patient who has heart failure.
11. Perform a basic physical assessment on a patient who has a mitral valve stenosis and dysrhythmia.
12. Use the nursing process to care for assigned patients who have cardiovascular disorders.
13. Safely administer medications for patients with cardiac disorders.
14. Provide support to patients undergoing diagnostic testing and treatment for cardiac disorders.
15. Develop a teaching plan for patients with a newly implanted pacemaker or implantable cardioverter-defibrillator (ICD).

KEY TERMS

- ablation** (äb-LÄ-shūn, p. 441)
arrhythmias (ä-RĪTH-mē-äz, p. 433)
atrial fibrillation (p. 437)
cardiac tamponade (KÄR-dē-äk täm-pōn-ÄD, p. 442)
cardiomyopathy (kär-dē-ö-mī-ÖP-ä-thē, p. 443)
cardioversion (kär-dē-ö-VĒR-zhūn, p. 439)

dysrhythmias (dīs-RĪTH-mē-ăz, p. 433)
effusion (ě-FŪ-zhūn, p. 442)
ejection fraction (p. 426)
endocarditis (ĚN-dō-kāhr-DĪ-tīs, p. 441)
friction rub (FRIK-shūn, p. 442)
infarct (ĭn-făhrkt, p. 433)
palpitations (păl-pī-TĀ-shūnz, p. 434)
pericardiocentesis (pĕr-ĕ-KĀR-dē-ō-sĕn-TĒ-sīs, p. 443)
pericardiotomy (pĕr-ĕ-KĀR-dē-ĕt-ō-mē, p. 443)
pulsus paradoxus (PÜL-süs păr-ă-DÖK-süs, p. 443)

Disorders of the Heart

Heart Failure

There are more than 5 million Americans with heart failure (HF), and approximately 670,000 are newly diagnosed each year. Approximately 1 in 100 people will develop HF. The prevalence of HF is increasing, and it is a major chronic condition. Half of patients diagnosed with HF will die within 5 years. African Americans have a higher incidence of HF and have higher mortality rates than other populations. HF can occur at any time the heart muscle is prevented from fulfilling its function as a pump and circulator of blood. HF may be acute or chronic, mild or severe. The New York Heart Association scale identifies four stages of HF, classed according to exercise tolerance ([Table 19-1](#)). The American Heart Association (AHA) has identified stages of HF from A-D. The "A" stage includes individuals who have no structural heart problems but are at high risk for HF. Early recognition of risk factors and prevention of HF is being promoted. ([Yancy et al, 2013](#))

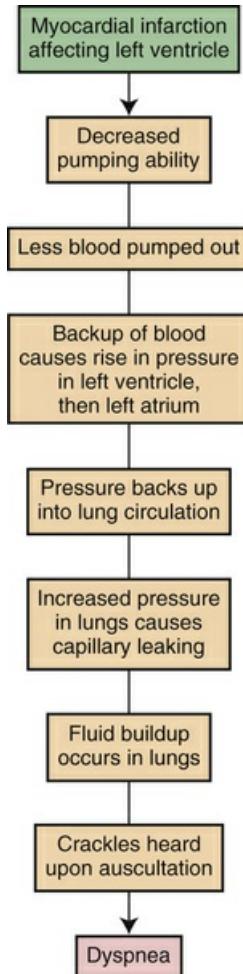
Table 19-1
Classification of Heart Failure

Class	Activity Tolerance
I	Ordinary physical activity with no symptoms
II	Dyspnea with long-distance walking, climbing two flights of stairs, or strenuous activity
III	Dyspnea and fatigue with short-distance walking or climbing one flight of stairs
IV	Dyspnea at rest or with very little activity

Adapted from the New York Heart Association Heart Failure Symptom Classification System. Retrieved from www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/cardiology/heart-failure/Default.htm.

Etiology

The most common causes of HF are coronary artery disease and uncontrolled hypertension. Other factors that contribute to weakness of the heart muscle are toxins, infection, anemia, myocarditis, dilation from blood backup behind diseased valves, and damage from myocardial infarction (MI) ([Concept Map 19-1](#)). Toxins include cocaine, excessive alcohol, certain chemotherapy drugs, nonsteroidal anti-inflammatory drugs (NSAIDs), and thiazolidinediones used for diabetes. Cardiac dysrhythmias also can contribute to HF. (Coronary artery disease [CAD] and MI are covered in [Chapter 20](#), with cardiac surgery.)



CONCEPT MAP 19-1 Pathophysiology of heart failure after a myocardial infarction.

Older Adult Care Points

Heart failure is the most common reason for hospitalization among adults age 65 years or older. As life spans continue to extend, more and more older adults will develop HF related to hypertension and CAD.

Pathophysiology

The key words to understanding HF are *congestion* and *increased pressure*. Congestion develops because the heart is unable to move the amount of blood it receives efficiently through the system. This may occur because the heart muscle is too weak or because the blood vessels throughout the body are narrowed and constricted (because of atherosclerosis or arteriosclerosis). Therefore the vessels cannot accommodate a normal supply of blood, causing the heart muscle to become exhausted trying to overcome the resistance (pressure) in the vessels. Poorly functioning valves may cause the chambers to dilate from blood backup, further decreasing pumping ability. A myocardium damaged by infarct, infection, ischemia, or other factors is not an efficient pump and cannot manage the volume of blood in the circulation. [Box 19-1](#) lists factors that precipitate HF.

Older Adult Care Points

Aging processes also contribute to arteriosclerosis and stiffening of the heart muscle. The combination of high blood pressure, diabetes, and age greatly contributes to the number of older patients who develop HF.

Box 19-1**Factors That Can Precipitate Heart Failure**

- Anemia
- Systemic infection (sepsis)
- Myocardial infarction/ischemia
- Pulmonary embolism
- Uncontrolled hypertension
- Thyroid disorders
- Dysrhythmias
- Pericarditis, myocarditis, or endocarditis
- Chronic pulmonary disease
- Physical, emotional, or environmental stress

HF may be classified as right-sided HF or left-sided HF. The heart has two pumps: a right-sided and a left-sided pump. The right-sided pump receives blood from the body and pumps it to the lungs for oxygenation. The left-sided pump receives blood from the lungs and pumps it out to the body. Although the terms *right-* and *left-sided failure* are used to explain the physiology, clinically it is rare to see pure right or left failure. The circulatory system is a continuous circle and eventually all congestion or increased pressure affects both sides of the heart. Left-sided failure typically occurs first. If the muscle wall of the left ventricle cannot contract effectively, not enough of the blood is ejected from the ventricle; this residual blood prevents part of the blood from the lungs from entering the left side of the heart. This causes fluid to back up into the pulmonary vessels. The pressure within those vessels increases, and fluid leaks into the lung tissue—producing congestion and, eventually, pulmonary edema. If not corrected, left-sided failure, because of the backup of blood and increased pulmonary artery pressure, will soon lead to failure of the right side of the heart. [Table 19-2](#) compares the signs and symptoms of left-sided and right-sided HF.

Table 19-2
Left-Sided and Right-Sided Heart Failure comparison

	Right-Sided Heart Failure	Left-Sided Heart Failure
Selected etiology	Pulmonary stenosis, pulmonary hypertension, severe emphysema, right ventricular MI	Hypertension, coronary artery disease, MI, mitral or aortic valvular disease
Pathophysiology	Increased pump pressure is needed to eject blood into pulmonary arteries. The myocardium of the right atrium and ventricle becomes thickened, and contraction strength weakens.	Weakness of the left ventricle results in reduced cardiac output and backup of blood into the atrium and the pulmonary system.
Signs and symptoms	Fatigue; edema in sacrum, legs, feet, ankles; hepatomegaly; abdominal distention as a result of ascites; weight gain; dyspnea	Fatigue; dyspnea; wheezing; orthopnea; sleep apnea; pulmonary edema (pink, frothy sputum); pallor; clammy skin

MI, Myocardial infarction.

Primary right-sided HF is commonly caused by chronic pulmonary disease. The right ventricle does not usually have to generate a lot of pressure to pump blood to the lungs. Normal systolic pressure in the right ventricle is about 25 mm Hg. Chronic lung disease causes scarring, which makes it harder for the ventricle to eject blood into the pulmonary circulation. This increased resistance requires the right ventricle to squeeze harder, generating more pressure and causing inadequate ejection. This makes it difficult for entry of the venous blood returning to the heart. As pressure in the peripheral vessels increases, the fluid from the intravascular fluid compartment begins to leak into the interstitial compartment. This produces edema. When the right side of the heart fails, the edema is first evident in the lower extremities (**dependent edema**) ([Figure 19-1](#)). There also is an accumulation of fluid in the liver and abdominal organs, as the portal circulation becomes involved. Alteration of blood flow to the kidneys may lead to impaired renal function, preventing normal excretion of urine and causing more accumulation of body fluids. Inadequate

circulation to and from the brain may cause mental confusion and irritability.



FIGURE 19-1 Dependent, pitting edema. (From Bloom A, Watkins PH, Ireland J: *Color atlas of diabetes*, ed. 2, St. Louis, 1992, Mosby.)

The systemic backup of blood that occurs in right-sided HF will eventually lead to left-sided HF, because the heart will have to pump against increasing pressure in the aorta and systemic circulation. The circulatory system is exactly that: a system. Failure of one component affects the entire system.

Think Critically

Can you describe the changes that occur with chronic hypertension that may cause HF?

Left-sided HF is subdivided into systolic and diastolic HF. In the cardiac cycle, diastole is the part of the cycle in which the heart is resting and filling with blood. During this time the valves between the atria and ventricles (tricuspid and mitral) are open. Most of the blood entering the ventricles does so passively by the pressure in the system during diastole. Right before the ventricles are ready to contract, the atria contract and “top off the tank,” contributing about 20% of the volume. Systole occurs, and the exit valves open in the ventricles (pulmonic and aortic), allowing ejection of blood into the circulation. Different problems cause failure of this process. Here the problems occur in either the filling or ejection phase of the cycle.

Systolic failure.

Systolic failure is caused by anything that interferes with ejection of blood from the ventricles. Muscle dysfunction, problems from MI, dilated cardiomyopathy, and aortic or pulmonic stenosis may lead to systolic failure. Inability of the heart to pump an adequate amount of blood to meet the needs of the body can lead to problems in other organs. **Ejection fraction** is the percentage of the filling volume pumped out with each ventricular contraction. In a normal heart, ejection fraction is 55% to 70%. This means that 30% to 45% of the blood is left in the ventricle, which allows the body to increase cardiac output when needed by increasing the force of contraction (through release of epinephrine, responsible for the fight or flight response) and ejecting more blood. An ejection fraction of 40% or less is a marker of systolic HF.

Diastolic failure.

Diastolic failure occurs when conditions prevent the filling of the heart with blood. Tricuspid and mitral stenosis, cardiac tamponade, or constrictive cardiomyopathy can cause diastolic failure. Decreased filling results in decreased stroke volume and cardiac output. Ejection fraction is normal in primary diastolic failure. Medical literature refers to *diastolic failure* as HF with preserved ejection fraction (HFpEF). A hallmark of diastolic failure is neck vein (jugular) distention.

Evidence is emerging that HF with a reduced ejection fraction (HFrEF) and HFpEF are separate

clinical conditions that require very different treatments. Determination of ejection fraction can be done with echocardiography or left heart catheterization and is a key feature in determining the correct treatment.

Think Critically

Can you explain to a patient in simple terms what happens in the body when systolic HF occurs?

Signs, Symptoms, and Diagnosis

Initially, compensatory mechanisms prevent symptoms of HF. Heart rate rises to increase output, and the ventricles hypertrophy to pump out more blood with each contraction. In left-sided failure compensatory mechanisms eventually weaken the heart, and the blood backs up into the pulmonary vessels, pressure within those vessels increases, and fluid leaks into the lung tissue, producing congestion. Fatigue and shortness of breath (SOB) are first noticed with activity and when lying down. If failure progresses, pulmonary edema occurs. There is no single diagnostic test for HF, and diagnosis is made primarily on clinical signs and symptoms and careful history.

Diagnostic tests that are helpful include chest x-ray, echocardiogram, electrocardiogram (ECG), magnetic resonance imaging (MRI), electrolytes, complete blood count (CBC), and brain natriuretic peptide (BNP). BNP measures the level of a protein released when myocardial cells are stretched. A level greater than 500 pg/mL is consistent with HF when other symptoms are present (see [Table 19-2](#)).

Advanced systolic HF signs are S₃ and S₄ heart sounds. Weight gain of 2 lb in 24 hours or 5 lb in 1 week occurs as fluid is retained. Dyspnea is present, and crackles or wheezes are heard in the lungs.

Think Critically

You auscultate the lung sounds of a patient with HF. You hear crackles in the bases and up to mid-chest. What is the significance of this finding?

Treatment

There are multiple causes of HF, but the clinical signs and symptoms are the same. Identification and treatment of the underlying cause of HF should be initiated. Dysrhythmias are controlled. Surgical correction of valve or septal abnormalities may reverse HF. Medical treatment is largely symptomatic and depends on the type and degree of HF present. Drugs and other therapies are used to reduce or eliminate the symptoms and complications of HF, but they only control the condition; they do not cure it. AHA 2013 Heart Failure Guidelines outline strategies for early identification of patients at risk for HF and implementation of interventions to prevent the disease or decrease its effects. For patients experiencing HF, efforts are made to (1) reduce the demand for oxygen and the workload of the heart, (2) strengthen the heart's pumping action, (3) relieve venous congestion in the lungs, and (4) minimize sodium and water retention in the tissues. Some clinical trials have shown that early intervention with appropriate drug therapies can reverse some of the ventricular dysfunction found in HF ([Zile and Gaasch, 2014](#)).

To accomplish the goals of medical intervention, the following may be prescribed:

- Angiotensin-converting enzyme (ACE) inhibitors and angiotensin-receptor blockers (ARBs) decrease the workload of the heart by causing vasodilation; as a result, blood pressure is reduced ([Table 19-3](#)). ACE inhibitors and ARBs also play a role in reducing fluid retention.

Table 19-3

Drugs Used to Treat Heart Failure*

Classification	Examples	Use
Diuretics		
Loop	Furosemide (Lasix), bumetanide (Bumex)	Remove excess fluid
Potassium sparing	Triamterene (Dyrenium), amiloride (Midamor)	Remove fluid but not potassium
Thiazide	Hydrochlorothiazide	Removes fluid but wastes potassium
Angiotensin-converting enzyme inhibitors	Enalapril (Vasotec), captopril (Capoten), lisinopril (Zestril)	Prevent vasoconstriction
Angiotensin-receptor blockers	Losartan (Cozaar), valsartan (Diovan), irbesartan (Avapro)	Produce vasodilation and salt and water excretion
Beta-adrenergic blockers	Atenolol (Tenormin), metoprolol (Lopressor), nadolol (Corgard)	Reduce blood pressure, slow heart rate
Calcium channel blockers	Amlodipine (Norvasc), diltiazem (Cardizem), nifedipine (Procardia), verapamil (Calan)	Produce vasodilation and reduced heart rate

Vasodilators (nitrates)	Nitroglycerin (Nitrostat, Nitro-Bid), isosorbide (Isordil), nitroprusside (Nipride)	Dilate blood vessels; decrease preload and relieve shortness of breath; relieve myocardial ischemia
BNP analog	Nesiritide (Natrecor)	Alleviates dyspnea
Inotropics		
Beta-adrenergic agonists	Dobutamine (Dobutrex), dopamine (Intropin)	Increases cardiac contractility and cardiac output
Phosphodiesterase inhibitors	Milrinone (Primacor)	Reduces preload and afterload; causes vasodilation; increases cardiac contractility
Digitalis	Digoxin	Increases cardiac contractility
Hyperpolarization-activated cyclic nucleotide-gated (HCN) channel blocker	Ivabradine (Coralan) <small>(approved for use in the United States, April 15, 2015)</small>	Directly acts on the sinoatrial node (SA) to reduce heart rate, reduce myocardial work load, and prevent angina.

*The choice of drugs depends on the type of heart failure and whether the left ventricle function is normal.

BNP, Brain natriuretic peptide.

See [Table 18-3](#), [Box 18-1](#), and [Table 19-4](#) for further information and nursing implications for these drugs.

- Beta-adrenergic blockers (e.g., metoprolol [Toprol XL]) are used if tachycardia is causing the HF to slow the heart rate, thereby decreasing oxygen demand. Beta blockers are used cautiously as they can also cause HF.
- Diuretics, especially loop diuretics, are prescribed to reduce fluid retention in the lungs and lower extremities. Watch for ototoxicity with these drugs. Thiazide diuretics such as hydrochlorothiazide (HydroDiuril) may also be prescribed. Measures are taken to prevent electrolyte imbalances from the use of these drugs.
- Digitalis is occasionally used to increase the force of heart contraction (i.e., an inotropic agent) and slow the rate, thereby increasing cardiac output. The most commonly used drug in this category is digoxin (Lanoxin). Several large doses of the drug are given initially, followed by a lower, regular-maintenance dosage. This drug is not recommended for older adult white women, because it increases mortality rates in this group.
- Venous vasodilators such as isosorbide dinitrate (Isordil) and nitroglycerin (NTG), which relax and dilate blood vessels, allow the vessels to accommodate larger percentages of the total blood volume.
- Morphine is prescribed if pulmonary edema is present to relieve anxiety and make breathing easier.
- Benzodiazepines may be used for anxiety and reduction of emotional stress.
- Limited physical activity or bed rest in semi-Fowler or high Fowler position will decrease the workload of the heart and help breathing.
- Oxygen therapy will optimize the amount of oxygen available to be delivered to the tissues.
- Dobutamine (Dobutrex) may be used intravenously (IV) for acute systolic HF to improve cardiac contractility.

Nutrition Considerations

Guidelines for a Heart-Healthy Diet

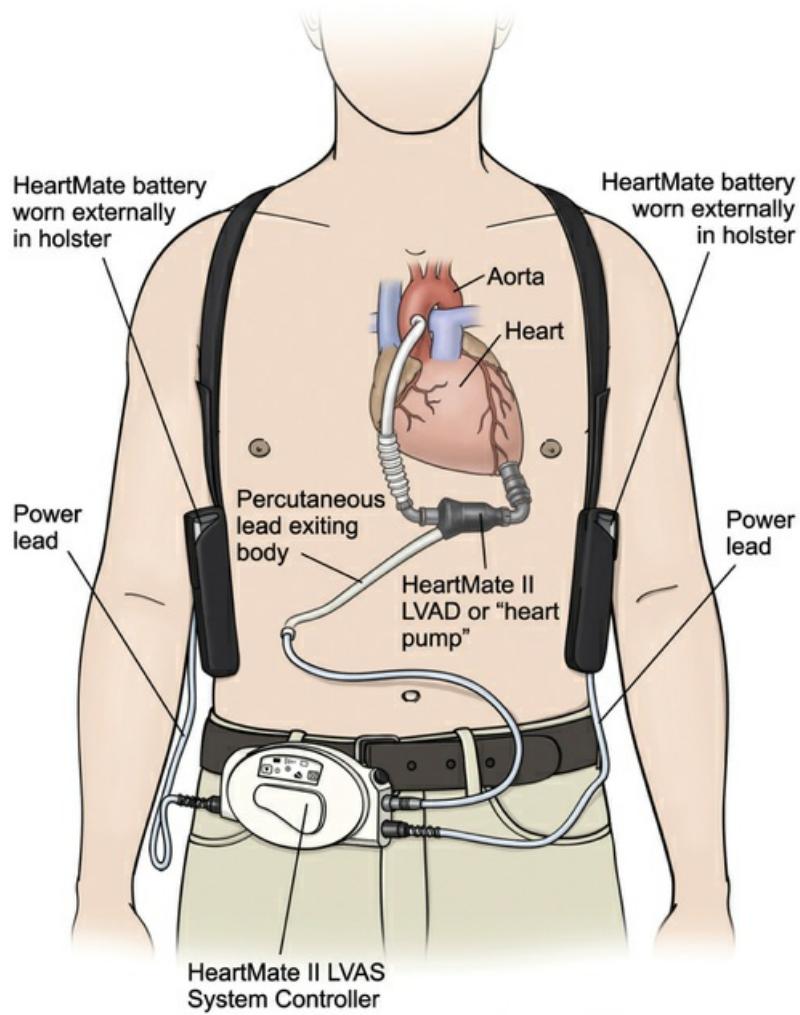
- Limit foods high in saturated fat, *trans* fat, and cholesterol. Limit meat intake to no more than 6 oz of cooked **lean** meat and skinless poultry (singly or in combination) per day. Fix main dishes with pasta, rice, beans, or vegetables mixed with small amounts of lean meat, poultry, or fish to create "low-meat" dishes. Restrict intake of organ meats, such as liver, brains, chitterlings, kidney, gizzards, and sweetbreads, because they are very high in cholesterol.
- Avoid *trans* fat as much as possible. Read product labels. Limit food high in saturated fat, including tropical oils and partially hydrogenated vegetable oils.
- Cook using little or no fat; broil, bake, roast, poach, stir fry, microwave, or steam foods rather than frying them.
- Eliminate as much fat as possible by trimming meat and skinning poultry before cooking. After browning meats, drain off all fat. Chill soups, stews, and so on, and then skim off fat before reheating to serve.
- Use fats with no more than 2 g of saturated fat per tablespoon. Olive, canola, corn, or safflower oil and liquid and tub margarines are good choices.

- Eat fish at least twice a week. Fatty fish such as salmon, mackerel, and tuna are best.
- Eat five to seven servings of fruit and vegetables per day. Use fresh or frozen vegetables and fresh fruit or fruit canned in juice rather than high-fructose corn syrup.
- Increase intake of fiber and carbohydrates by eating six or more servings of whole-grain products, such as cereals and breads, per day. Check labels to see that the product really contains **whole** grains.
- Use skim or 1% fat milk and nonfat or low-fat yogurt, cheeses, and ice creams.
- Limit consumption of egg yolks to three or four per week, including those in baked or cooked items. Check store packages for listing of eggs or egg yolk as an ingredient.
- Eat less than 1500 mg of salt (sodium chloride) per day.
- Have no more than one alcoholic drink per day if you are a woman and no more than two per day if you are a man. Examples of one drink are 12 oz of beer, 4 oz of wine, or $1\frac{1}{2}$ oz of 80-proof spirits.

Note: The heart-healthy diet is promoted by the American Heart Association.

Other treatments may include:

- The pumping action of the atria and ventricles may be synchronized for more efficient pumping by use of a **biventricular pacemaker**. This procedure is called *cardiac resynchronization therapy (CRT)*; pacing wires attached to a pulse generator are placed in the heart to send electrical impulses to the right and left ventricles so they contract at the same time. In a standard pacemaker, only the right ventricle is stimulated to cause ventricular contraction. CRT is the treatment of choice when drug therapy does not control HF.
- A left ventricular assist device (LVAD) may be used to help with the heart's pumping action. This device is implanted in the patient's abdomen or chest and attached to the heart. These devices have proven to be beneficial to adults diagnosed with severe HF. The device may be used while the patient is awaiting transplant and, with continued research, may potentially eliminate the need for transplant in some patients ([Figure 19-2](#)).



Copyright 2008 Thoratec Corporation

FIGURE 19-2 HeartMate II left ventricular assist device (LVAD). (Courtesy Thoratec, Pleasanton, CA.)

- Surgery to reduce the size of an enlarged heart (ventricular restoration surgery) may be effective for some patients. The less effective portions of the left ventricle are removed, and the remaining muscle is reattached and shaped to form a more efficient pump. Sometimes the heart enlarges again.
- Heart transplant may be the only alternative for patients with advanced HF who do not respond to other medical or drug treatment. Heart transplant is discussed in [Chapter 20](#).

Complementary and Alternative Therapies

Hawthorn Use in Heart Failure and Coronary Artery Disease

The herb hawthorn is believed to improve performance of damaged myocardial tissue and to improve myocardial perfusion. Hawthorn is said to reduce the symptoms of mild to moderate HF. Hawthorn should be used cautiously in older adults. Hawthorn may increase hypotension when used in combination with antihypertensive drugs. This herb may increase the effects of cardiac glycosides. Cardiovascular status should be monitored closely ([Reilly and Janson-Sand, 2012](#)).

Short-term treatment for severe HF can be accomplished with an intraaortic balloon pump (IABP). The IABP is positioned in the descending aorta and is designed to increase blood supply to the myocardium and decrease the workload. The balloon inflates during diastole, thus increasing perfusion to the coronary arteries. The balloon deflates during systole, making it easier for the left ventricle to eject blood ([Figure 19-3](#)).

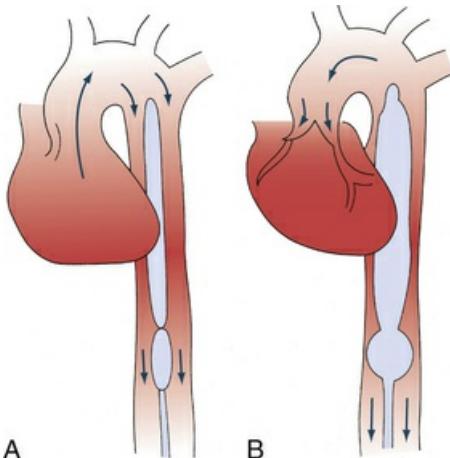


FIGURE 19-3 Intraaortic balloon pump. **A**, The balloon is deflated at the beginning of systole to decrease afterload. **B**, The balloon is inflated during diastole, increasing coronary perfusion. (From Sole ML, Klein, DG, Moseley MJ: *Introduction to critical care nursing*, ed. 6, Philadelphia, 2013, Elsevier Saunders.)

Acute pulmonary edema.

Acute pulmonary edema (acute left ventricular failure) is a medical emergency that must be treated promptly. A patient with this condition has severe dyspnea; a cough productive of frothy, pink-tinged sputum; tachycardia; and moist, bubbling respirations with cyanosis. Nursing interventions for acute pulmonary edema include placing the patient in high Fowler position to relieve the dyspnea; administering oxygen, diuretics, morphine, and other prescribed drugs; limiting and monitoring activity; and assessing cardiopulmonary status.

❖Nursing Management

■ Assessment (Data Collection)

The effects of HF can range from very mild to extremely serious. A thorough nursing assessment can help identify specific patient care problems. Data guide the provider in the evaluation of the patient's response to medical treatment and the decision to continue or change prescribed drugs and other therapies. It is important to ask the patient if her clothes, rings, or shoes fit tighter than previously, indicating edema. Is pedal edema worsening or improving? Obtain an accurate weight. What has the trend of weight been? Feelings of breathlessness or having to catch the breath in midsentence may indicate fluid in the lungs and left-sided HF. Are crackles present in the lungs? Inquire how much activity causes SOB. Does the patient have paroxysmal nocturnal dyspnea (PND) (wakes up at night with SOB) or onset of nocturia (being awakened by the need to urinate)? Ask about medication compliance and any problems or side effects noted. Assess the diet to determine usual sodium, fat, and calorie intake, and obtain a smoking history.

☒ Clinical Cues

It is important for patients who have been diagnosed with HF that is well controlled (**compensated**) to weigh themselves daily at home and to write down the weight. If the patient can see that fluid weight gain is occurring, she may be able to avert a trend back into **decompensated** HF by adjusting diuretic medication, decreasing sodium intake, treating infection, and decreasing activity and resting more.

Significant Findings Indicating Heart Failure Is Occurring

Left-sided failure

- Increasing fatigue.

- Dyspnea and a dry, hacking cough.
- Crackles heard on auscultation of the lungs.
- Pale, cool, and clammy skin, which are signs of poor peripheral circulation.
- Diminished peripheral pulses.
- Dizziness, confusion, restlessness, and difficulty concentrating and remembering because of diminished blood flow to the brain.
- Gradually increasing heart rate, even when the patient is at rest; increased heart rate occurs when the heart attempts to increase cardiac output.
- Extra heart sound (S_3 , S_4).
- Decreased blood pressure as the ventricles fail.

Right-sided failure

- Weight gain without a change in caloric intake
- Dependent, pitting edema (assess feet and ankles in an ambulatory patient or one sitting up most of the time). Assess thighs and sacral region in a patient confined to bed. Patient may feel “bloated” and experience a loss of appetite and nausea because of diminished venous return from abdominal organs, liver enlargement resulting from increased pressure in the portal veins, edema in the intestine, and accumulations of fluid in the abdominal cavity.
- Jugular venous distention; visible jugular vein pulsation more than 4.5 cm above the clavicle when the patient is in a semi-Fowler position.
- Reduced urinary output, which reflects the kidney's response to poor perfusion by retaining sodium and water; need to urinate at night (nocturia).
- Blood pressure increased from fluid overload.
- Waking up at night after a few hours of sleep because of PND.

Older Adult Care Points

Older adult patients who have little cardiac reserve can be at risk for HF from any condition that increases the body's demand for blood or oxygen. Pneumonia, generalized infection, severe trauma, or other conditions that increase the metabolic rate and demand for oxygen can be the precipitating factor, because a heart that is already having difficulty meeting normal body oxygen demands cannot respond. When an older adult patient has an infection, carefully assess the lungs for signs of crackles that might indicate beginning HF. Your quick action can save the patient from considerable problems. Assess urinary output of older adult patients. Renal function is decreased because of the aging process. Loss of perfusion related to HF will place the patient at greater risk of renal insufficiency or failure. Treatment for infection can further compromise kidneys because of the nephrotoxic effect of many antibiotics.

Nursing Diagnosis and Planning

The main problem statements/nursing diagnoses for patients with HF are listed in [Nursing Care Plan 19-1](#) (see also [Table 17-4](#)). Plan extra time when caring for patients with HF because fatigue, possible lack of mobility, and oxygen deficit cause these patients to move slowly and need more time to accomplish the activities of daily living. For each patient outcome criteria are written for each nursing problem statement specific to the patient.

Nursing Care Plan 19-1

Care of a Patient With Heart Failure

Scenario

Miguel Garcia, age 60 years, is admitted to the nursing unit with exacerbation of left- and right-sided heart failure. Physical examination reveals 3+ pitting edema of the right lower extremity and 4+ pitting edema of the left lower extremity. He is in acute respiratory distress and is positioned in high Fowler position to facilitate breathing. He is receiving oxygen with a simple mask at 8 L/min. T 98° F (36.6° C), P 96, R 28, BP 160/90, SpO₂ 90%, Wt. 255 (20-lb increase).

Problem Statement/Nursing Diagnosis

Altered gas exchange/*Impaired gas exchange due to fluid in lung tissue.*

Supporting Assessment Data

Subjective: States has difficulty breathing while lying down.

Objective: SpO₂ 90% on 8 L oxygen, elevated respiratory rate, sitting up to facilitate breathing.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
SpO ₂ 95% on room air.	Assess vital signs and SpO ₂ q2h. Report increase in respiratory rate or decrease in oxygen saturation.	Change in vital signs and oxygen saturation may indicate improvement or deterioration of condition.	SpO ₂ remains within 93%-95%. The respiratory rate is 12-22/min. The heart rate remains between 60 and 100.
	Increase oxygen to maintain SpO ₂ at level specified by provider.	Maintain oxygen saturation at levels that indicate effective gas exchange.	SpO ₂ 94%. O ₂ at 5 L/min by nasal cannula
	Assess lung sounds at least q4h.	Changes in lung sounds indicate positive response to therapy or need to modify treatment plan.	Lung sounds clear on right, fine crackles on left.
	Maintain Fowler position as needed for comfort. Teach patient pursed-lip breathing.	Promotes optimum expansion of thoracic cavity to facilitate breathing and improve gas exchange.	Head of bed at 45 degrees. Continue plan.

Problem Statement/Nursing Diagnosis

Altered activity tolerance/*Activity intolerance due to fluid in lungs, fluid retention in lower extremities.*

Supporting Assessment Data

Subjective: States feet have become more swollen over the past 3 days.

Objective: Pitting edema both lower extremities, dyspnea on exertion, crackles in bases bilaterally.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will be able to complete activities of daily living	Assess activity tolerance.	Provides guidelines for planning care	Able to complete partial bath. Becomes

and personal hygiene without fatigue.	Assist with personal hygiene initially. Monitor oxygen saturation. Provide frequent rest periods. Coordinate care with other health care providers to conserve energy.	activities. Conerves patient energy. Scheduling activities to maximize energy use prevents overexertion. Prevents fatigue.	fatigued, requires assistance. Patient remains fatigued. Continue plan; reassess readiness to meet goals.
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Problem Statement/Nursing Diagnosis

Fluid volume excess/*Fluid volume excess due to pulmonary and venous congestion.*

Supporting Assessment Data

Subjective: Patient reports nonproductive cough.

Objective: 3 to 4+ edema both lower extremities; crackles in lung bases on auscultation.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Lung fields will be clear, pitting edema in lower extremities 0-1+.	Assess lung sounds q4h.	Identifies changes in condition.	Fine crackles on auscultation. Less distress.
	Assess lower extremities each shift.	Identifies effectiveness of drug therapy.	2+ pitting edema bilaterally.
	Elevate legs	Helps move fluid from the tissues back into the circulation so it can be removed by the kidneys.	2+ pitting edema bilaterally—less than on admission.
	Administer diuretics as prescribed by the provider.	To reduce fluid retention through diuresis.	Urinary output 2500 mL q8h.
	Maintain accurate intake and output.	Identify positive or negative response to treatment.	Continue plan. Weight 245 lb.
	Daily weights.		

Critical Thinking Questions

1. List three additional problem statements that are appropriate for this patient.
2. List five items to be included in the discharge teaching plan for this patient.
3. What assessment data might indicate a worsening of this patient's condition?
4. What assessment data might indicate improvement of this patient's condition?

■ Implementation

HF is a chronic disease. Patients with mild HF may not be hospitalized, but they do require instruction in self-care. Instruction includes balancing rest with physical activity, limiting sodium intake, and following other dietary restrictions. The entire family should be included in dietary teaching. Teach self-administration of medications and awareness of adverse side effects that must be reported. Review the dangers of drug-drug interaction when taking nonprescription drugs, particularly NSAIDs. Reconcile medications. Immunize the patient against seasonal flu and pneumonia. Modify lifestyle according to patient needs (diet, smoking, physical activity). Teach symptoms that should be reported to the provider if they become worse or appear for the first time.  An objective of *Healthy People 2020* is to reduce hospitalizations of older adults with HF as the principal diagnosis.  Thorough patient teaching and nursing follow-up helps achieve this objective.

Patient Teaching

Instructions for Patients Taking Warfarin (Coumadin)

Teach the patient who has been prescribed warfarin to:

- Take the medication at the same time every day.
- Keep appointments for international normalized ratio (INR) blood tests or perform the test at home.
- Take a missed dose as soon as it is remembered on the day it is due. Do not double up on the dose the next day if the previous dose was totally forgotten.
- Check all medications, all over-the-counter preparations, and all herbs for possible interactions with warfarin.

- Wear a medical alert bracelet and carry a wallet ID card indicating warfarin use.
- Tell all medical personnel that warfarin is being taken.
- Foods containing vitamin K should be eaten in consistent amounts weekly; asparagus, beans, broccoli, cabbage, spinach, cauliflower, brussels sprouts, kale, and mustard greens are high in vitamin K and should not be eaten in large quantities. Fish, rice, and yogurt also contain vitamin K.
- Avoid consuming more than one or two alcoholic drinks per day.
- Use an electric razor if prone to nicking the skin when shaving.
- Use a soft toothbrush.
- Blow the nose gently.
- Report unusual bleeding or bruising to the provider.
- Report signs of intestinal bleeding (blood in the stool) and blood in the urine.

Older Adult Care Points

An older adult patient who is experiencing HF often is taking many medications. With decreased kidney function, it is especially important to look for drug interactions and to monitor for signs and symptoms of toxicity. Loop diuretics continue to work even after excess fluid is eliminated. Monitor older adult patients for signs of dehydration such as decreased urine output and confusion.

It is of vital importance to monitor patients with HF for electrolyte imbalances, especially imbalance of sodium or potassium. **Electrolyte imbalances may cause serious cardiac dysrhythmias.**

Patients with chronic HF will need encouragement to follow the prescribed regimen. A chronic disease management program is advised based on multiple studies over the past decade indicating better outcomes ([Hanson et al, 2013](#)). If treatment does not stop the progress of the disease, the patient may be admitted to the hospital for reevaluation and a change in therapies. Sometimes the patient's heart continues to fail despite aggressive therapy, and pulmonary edema, liver, and renal failure occur.

Think Critically

Why does weighing the patient daily help you evaluate the treatment for HF? How would you know that the treatment is not effective?

Assisting hospitalized patients with activities of daily living will decrease oxygen demand. Scheduling all activities to promote as much rest as possible is a high priority. Activity is alternated with rest throughout the day. Several pillows may be required to achieve a comfortable bed position. Monitoring intake and output is very important. Daily weight is recorded at the same time each day, preferably before breakfast. Careful attention to frequent repositioning and skin care is essential, because edematous tissue breaks down easily. Particular attention should be given to the sacral area as a pressure point susceptible to skin break down for a patient on bed rest. Bed rest causes venous pooling, and DVT prophylaxis should be implemented. Elastic stockings or sequential compression devices and leg exercises should be used. Careful ongoing physical assessment is essential. Nursing interventions for selected problems in a patient with HF are summarized in [Nursing Care Plan 19-1](#). Instructional materials regarding smoking cessation are sent home with **all** smokers, and they are counseled about the importance of quitting smoking ([The Joint Commission, 2014](#)). *Tobacco treatment*, the term used by The Joint Commission, is a stand-alone core measure and is not specific to any one diagnosis because smoking cessation is key to control of many diseases. Discharge instructions include (1) activity level, (2) diet, (3) discharge medication,

(4) follow-up appointment, (5) weight monitoring, (6) what to do if symptoms worsen, and (7) when to notify the health care provider.

HF patients with left ventricular dysfunction (ejection fraction less than 40%) should receive a prescription for an ACE inhibitor or an ARB medication. Providing education about warning signs of worsening condition (decompensation), exercise needs, diet compliance, and lifestyle changes greatly helps symptom control ([Yancy et al, 2013](#)).

Evaluation

Patients with HF require extensive treatment with medication and lifestyle changes. Evaluate objective and subjective data to determine whether expected outcomes are being met. Note subjective data related to activity tolerance, respiratory status, comfort, and understanding of teaching related to the disease process and self-management. Understanding of the medication regimen is key to the patient's progress. The cardiovascular system should be monitored for improvement of status. Observe the patient for the improvement of symptoms, including edema, respiratory quality, and activity tolerance. Improvement is an indication of patient progress.

Cardiac Dysrhythmias

A normal heart generates electrical impulses and sends them through an electrical conduction system signaling the atria and ventricles to contract. An abnormal heart rhythm occurs when the conduction system or heart muscle is not functioning normally. The goal for a beginning nurse is to be able to determine when the tracing is not a normal sinus rhythm.

Etiology

Alterations in the conduction of cardiac electrical impulses that create heart rate and rhythm may be the result of congenital abnormalities, electrolyte disturbances, too much caffeine, illegal drug use, stress, or medication side effects. Valvular disorders, damage to the heart from **infarct** (area of necrosis caused by ischemia), thyroid problems, infective endocarditis, and problems in the autonomic nervous system also cause rhythm disturbances. Abnormal rhythms are called **arrhythmias** or **dysrhythmias**.

Pathophysiology

The sinoatrial (SA) node generates electrical impulses 60 to 100 times per minute. Each impulse travels through the atria to the atrioventricular (AV) node (or junction), which delays the impulse slightly then relays it via the bundle of His and the Purkinje fibers to the ventricles, causing them to contract ([Figure 19-4](#)). [Box 19-2](#) describes the procedure for evaluating an ECG strip. If the SA node fails to produce an electrical impulse, the AV node will initiate an impulse at 40 to 60 beats per minute. If neither the SA nor the AV node is functioning, the Purkinje fibers in the ventricles will initiate an impulse at a slower rate. When there is disruption of the normal electrical conduction in the heart, an abnormal heart rhythm occurs.

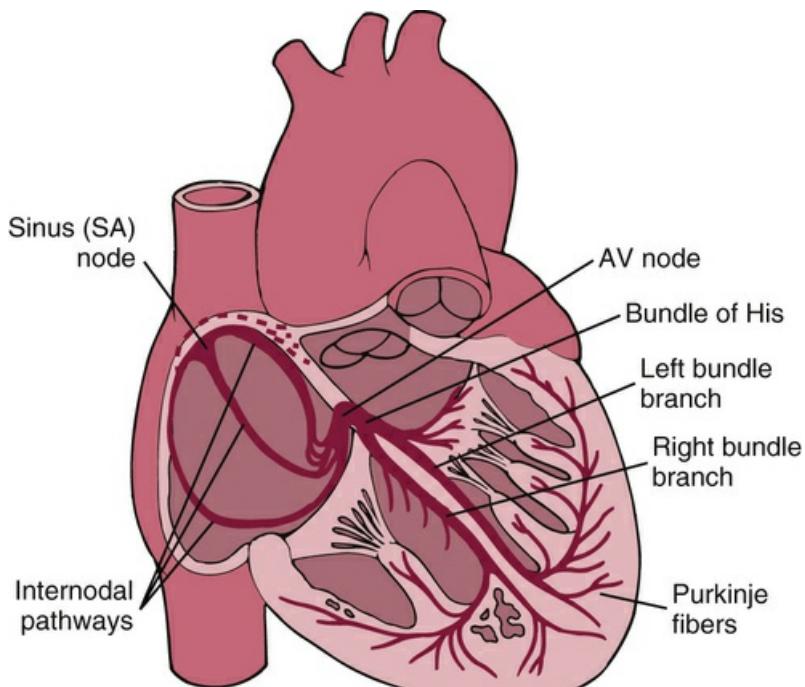


FIGURE 19-4 Cardiac conduction system. SA, sinoatrial; AV, Atrioventricular; (From Aehlert B: *EKGs made easy*, ed. 2, St. Louis, 2002, Mosby.)

Box 19-2

Evaluating an Electrocardiogram Rhythm Strip

- Obtain a 6-sec strip (35 large graph squares).
- Find the QRS. If the rate is too slow or too fast, check the patient before proceeding. Calculate the rate. Count the number of QRS complexes in the 6-sec strip and multiply by 10. Measure with calipers from R wave to R wave throughout the tracing to determine whether the rate is regular. Do all the QRS complexes look the same?
- Look directly in front of the QRS for the P wave. Is there a P wave in front of every QRS? Do the P waves all look alike? Measure the P-R interval. Is it normal (0.12 to 0.20 sec or 3 to 5 little boxes)? Does it vary?
- Measure the QRS duration. Is it normal (0.04 to 0.12 sec or 1 to 3 little boxes)?
- Are there any abnormal beats? Is the QRS wide or normal? Do the beats come in early?

Signs and Symptoms

Normal pulse rate is 60 to 100 beats per minute (bpm). Figure 19-5 shows the ECG pattern of normal sinus rhythm. A pulse below 60 is labeled *bradycardia*. Bradycardia may or may not be a problem. Athletes often have a bradycardia without a pathologic condition because their hearts are so well conditioned they are very efficient. Whether or not a bradycardia requires treatment depends on whether the patient has symptoms of decreased blood flow. Symptomatic bradycardia is treated with atropine or pacing. In an emergency, external pacing pads may be used until a different mode of pacing can be implemented.

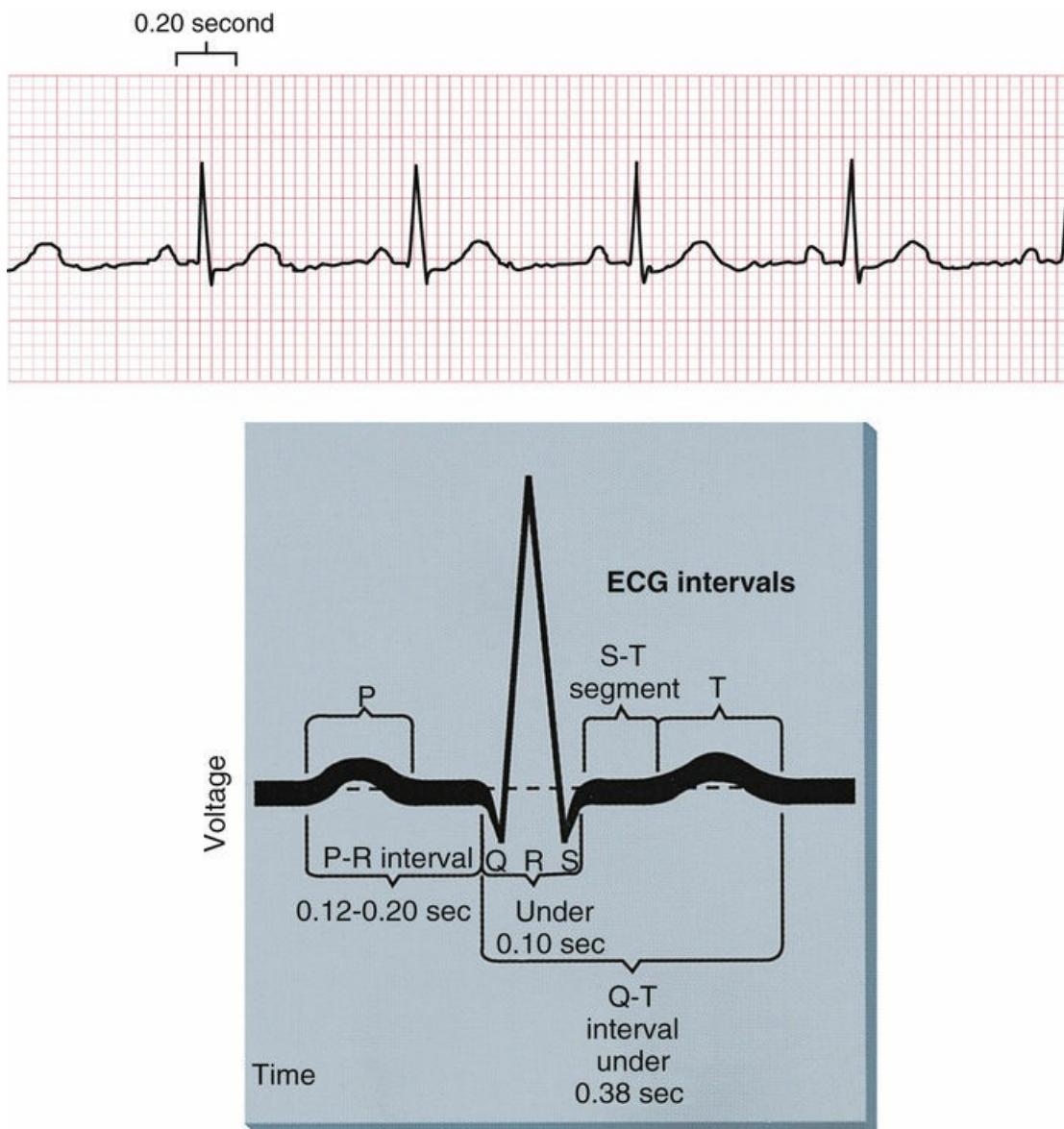


FIGURE 19-5 Electrocardiogram tracing of normal sinus rhythm. (From Aehlert B: *EKGs made easy*, ed. 2, St. Louis, 2002, Mosby.)

If the heart rate rises above 100, the patient has a dysrhythmia known as *tachycardia*. Sinus tachycardia with a rate of 100 to 150 bpm is usually caused by pain, fever, stress, hypovolemia, or hypoxia. Increasing heart rate is the body's response to the need for increased blood flow. It is managed by treating the underlying condition.

When the heart beats too fast, the ventricles do not have adequate time to fill with blood and therefore cannot pump effectively. As a result, cardiac output falls. Heart rates over 150 bpm are considered "too fast" for most patients. Again signs and symptoms of decreased blood flow determine how urgently treatment needs to be administered. When the heart is not stimulated to contract at the correct rate or in an effective manner, adequate blood is not pumped out to the body. Symptoms the patient may experience include dizziness, **palpitations** (abnormally rapid throbbing or fluttering of the heart), fatigue, chest pain, and loss of consciousness; death may occur. The severity of the symptoms depends on whether the abnormal rhythm significantly decreases cardiac output and whether the dysrhythmia is persistent.

It is important to be able to recognize a normal heart rhythm so that abnormalities can be quickly identified (see Box 19-2). The most important component in delivering appropriate treatment is assessment of the patient. The overall health of the patient will determine whether a specific dysrhythmia requires immediate reporting or treatment. Some rhythms are more likely than others to cause decreased cardiac output. The heart rate is the single best indicator as to how the patient

may be tolerating a heart rhythm. The ECG will give additional information about the specific source of the problem, but bedside assessment is key in delivering the correct therapy. The name of the rhythm indicates where the electrical impulse originated to cause the QRS. Sinus rhythms originate in the sinus node; for ventricular rhythms, an impulse starts in the ventricles.

As stated previously, a pulse rate below 60 is a bradycardia. The only time a bradycardia is treated is if the patient has symptoms of decreased cardiac output. The heart fills during diastole, which is the flat line part of the ECG. The amount of blood in the ventricles pumped out multiplied by the number of times per minute the heart pumps is cardiac output. If the heart does not beat enough times per minute to generate enough blood flow, then symptoms occur. Slow heart rates can be caused by hypoxia, electrolyte imbalances, infection, drugs, hypoglycemia, and other treatable conditions. There also may be disease of the conduction system causing the “pacemaker” of the heart—the SA node—to malfunction. **Sinus bradycardia** is the most common form of bradycardia. The rhythm looks like a normal sinus rhythm except for the rate. Conduction problems that produce bradycardia are heart blocks. Normally when the SA node fires it sends the electrical signal through the atria and then to the ventricles through the AV node (also called the AV junction). In heart block the signal is stopped either temporarily or permanently at the AV junction. Heart block is either first, second, or third degree. The higher the degree, the more significant the block and more likely it is to produce bradycardia.

In **first-degree heart block**, impulse conduction between the atrium and the ventricle is consistently lengthened beyond 0.2 seconds. First-degree block can be temporary or permanent. It often occurs after open heart surgery or an MI. Digoxin, calcium channel blockers, and beta blockers may cause this arrhythmia. It usually does not cause hemodynamically significant symptoms.

Second-degree heart block has two types. The first is Mobitz I or Wenckebach, which displays a normal R-R interval on the ECG and increasingly lengthened P-R intervals until a P wave appears without a QRS complex because the impulse was not conducted to the ventricles. This causes a “pause” in the rhythm. The cycle then begins again after the AV node has rested for that one beat. Parasympathetic tone or drug effect from digoxin, calcium channel blockers, beta blockers, or disorders such as electrolyte imbalance, Addison disease, and endocarditis are a few of the possible causes. The arrhythmia is most often transient and rarely progresses to third-degree heart block; it is considered benign.

Type II second-degree block (Mobitz II) is a more severe heart block. The AV node blocks certain beats from traveling through to the ventricles. P waves are seen without a following QRS. There may be a single or multiple P waves without a QRS. The P-R interval is constant throughout. The rhythm can be regular or irregular. This rhythm is dangerous, because it may progress to third-degree heart block and is most often caused by ischemia. This arrhythmia often occurs after open heart surgery. Bradycardia may be the result, and the patient may or may not be symptomatic depending on the ventricular rate. If the patient is symptomatic, a temporary transvenous pacemaker may be inserted, followed by a permanent pacemaker if needed.

In **complete heart block** (third-degree heart block; [Figure 19-6, B](#)) the AV node does not conduct atrial impulses to the ventricles. The atria contract on their own, and an “escape” stimulus from the ventricle provides a slow ventricular rhythm. Cardiac output falls drastically. This dysrhythmia can be life threatening, but it depends on the rate and how the patient is tolerating it.



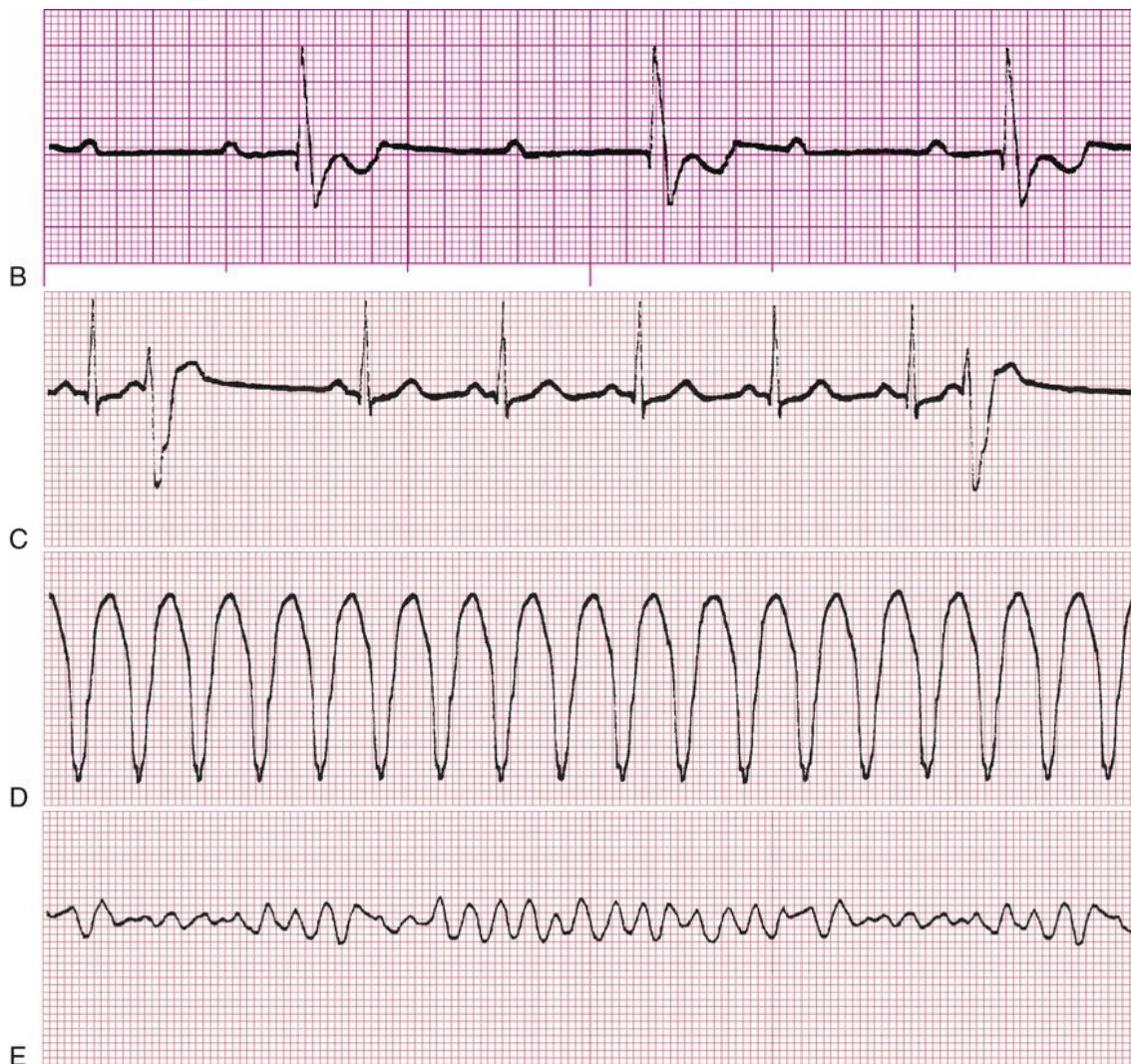


FIGURE 19-6 ECG patterns of abnormal and life-threatening dysrhythmias. **A**, Supraventricular tachycardia. **B**, Complete (third-degree) heart block. **C**, Sinus rhythm with premature ventricular contractions **D**, Ventricular tachycardia. **E**, Ventricular fibrillation. (From Aehlert B: *EKGs made easy*, ed. 2, St. Louis, 2002, Mosby.)

If a rhythm strip has more P waves than QRS complexes, the rhythm is Type I or Type II second-degree block or third-degree heart block. All bradycardia is treated the same, so initially, specific identification is not necessary to implement correct therapy.

Clinical Cues

Any time a person states she has noticed an irregular or rapid heartbeat, ask how much caffeine is being consumed each day. If consumption is minimal, ask about medications being taken, such as decongestants. Ask about the person's stress levels. The problem may disappear when the precipitating factor is removed.

Life-Threatening Cardiac Dysrhythmias

Any fast heart rate has the potential to be clinically significant. It is during diastole that the heart fills with blood. When heart rate increases, the time spent in diastole significantly shortens, reducing the time for filling to occur.

Supraventricular tachycardia (SVT) (see Figure 19-6, A) is a rhythm that originates in or above the bundle of His. (“above” the ventricles) SVTs include sinus tachycardia, atrial flutter or fibrillation, atrial tachycardia, and junctional tachycardia. The rate will be greater than 150 bpm and the QRS will be of normal duration. At this heart rate the origin of the impulse is almost impossible to identify, so the term *SVT* communicates that the rhythm is not ventricular tachycardia.

Ventricular tachycardia.

Ventricular tachycardia (VT) is a potentially life-threatening dysrhythmia that is generated from one or more focal points in the ventricle at a very fast rate (usually 120 to 200 bpm) (see [Figure 19-6, D](#)). The patient may be awake and alert without symptoms or just not feeling well. Or the patient may be pulseless. **The ECG tracing will not tell if the patient has a pulse; feel for the pulse.** VT occurs in bursts, short runs, or as a sustained rhythm. The length of time this rhythm continues and the underlying condition of the heart determine how well the body can tolerate it. The atria do not have a chance to contract and push blood into the ventricles. The ventricles contract too fast to allow for adequate filling with blood. Cardiac output falls drastically, and death may occur. VT can quickly deteriorate into ventricular fibrillation or cardiac standstill. Treatment depends on whether the dysrhythmia is sustained and how well the patient is tolerating the rhythm. Intervention with drugs such as amiodarone (Cordarone) is used to stabilize VT. If the patient is symptomatic with changes in BP, pulse, and level of consciousness, the VT is unstable; synchronized cardioversion starting at 100 joules (biphasic) is the treatment. If the patient is not unstable, treatment is with oxygen and amiodarone. It is usually caused by cardiac ischemia or one of the same causes as for PVCs. Cocaine use is another cause.

Atrial flutter/fibrillation.

New onset **atrial fibrillation** or flutter usually presents with a very rapid heart rate. In a normal heartbeat, the atria provide the “atrial kick,” which is about 20% of the blood volume for the ventricles to pump out. When atrial fibrillation happens, the atrial kick is lost, and the fast heart rate decreases filling time. Some patients are light-headed, have a decreased blood pressure, and are clammy. Atrial flutter may occur with HF, coronary artery disease, hyperthyroidism, or chronic obstructive pulmonary disease (COPD). Instead of atrial contraction there is quivering. P waves are not visible on the ECG tracing. There are only a lot of tiny, erratic spikes visible. Because the AV node cannot respond to the huge number of impulses, it conducts impulses to the ventricle in an erratic manner, resulting in irregular heart rhythm. The rhythm is **irregularly irregular**. Treatment is with loading doses of diltiazem or digoxin, amiodarone, or a beta blocker. If drug treatment is unsuccessful, synchronized cardioversion is performed to convert to a normal sinus rhythm.

Atrial fibrillation predisposes the patient to clot formation in the atria. The quivering rather than pumping of the atria allows blood to pool, leading to formation of clots. Patients with chronic atrial fibrillation are usually placed on oral anticoagulant therapy. Teach the patient the importance of taking the medication as directed by the provider. Dislodged clots from the right atrium can cause pulmonary embolus, and clots from the left side can travel to the brain, resulting in stroke or possibly death.

Premature beats (ectopic beats).

An extra heart beat that interrupts the regularity of the rhythm can be caused by an impulse coming from the atria, junction, or ventricles. Because they occur outside of the normal location, they are considered *ectopic*. They are usually beats that come in early and are labeled according to which part of the heart is responsible for the QRS.

Premature ventricular contractions.

The premature ventricular contraction (PVC) appears on the ECG as an early beat without a P wave and with a wide QRS complex. A ventricular impulse causes a ventricular contraction; it is labeled *premature* because it comes in early (see [Figure 19-6, C](#)). A pause usually occurs after the premature beat. The patient perceives a PVC as a skipped beat, because the PVC is not efficient at pumping blood and may not generate enough blood flow to be felt at a pulse point. An apical and radial pulse deficit may be detected. The ventricular irritability causing PVCs may be from caffeine, drugs, or increased emotional stress. Hypoxia, hypokalemia, and myocardial ischemia also may trigger PVCs. A few PVCs are not abnormal, but when there are more than six or seven in a minute, cardiac output may fall. If PVCs are persistent and symptomatic, antidysrhythmic drugs are used to control them ([Table 19-4](#)). Three or more PVCs in a row are considered to be ventricular tachycardia. PVCs may not all look alike. This indicates more than one area of irritability in the heart muscle. PVCs should be reported to the health care provider when they occur frequently or have multiple shapes or the patient has several in a row or shows signs of decreased cardiac output.

Table 19-4**Drugs Commonly Used to Treat Dysrhythmias**

Examples	Action	Nursing Implications	Patient Teaching
Class I Antidysrhythmics			
1A Quinidine sulfate Procainamide (Pronestyl, Procan) Disopyramide (Norpacing) 1B Lidocaine (Xylocaine) Phenytoin (Dilantin) Tocainamide (Tonocard) Mexiletine (Mexitil) Moricizine (Ethmozine) 1C Flecainide (Tambocor) Propafenone (Rythmol)	Uses: Atrial and ventricular dysrhythmias Actions: Slows the sodium channel, prolongs time of depolarization, and increases refractory period	<i>Quinidine:</i> Monitor for cinchonism: tinnitus, headache, nausea, vertigo, and disturbed vision. Observe for changes in ECG pattern. If patient is taking digitalis , monitor for digitalis toxicity; quinidine can double digoxin levels. Cimetidine increases effects of quinidine . Quinidine may enhance action of anticoagulants. Monitor for diarrhea. Monitor drug level. <i>Procainamide:</i> Monitor for systemic lupus erythematosus-like syndrome: joint pain; hepatomegaly; unexplained fever; soreness of the mouth, throat, or gums. Discontinue medication if this occurs. Observe for side effects or adverse effects of particular drug administered. Monitor electrolyte levels; watch for postural hypotension, especially if patient is taking antihypertensives.	Instruct to report signs of adverse effects of the drug. Report noticeable changes in cardiac rhythm to the provider. Advise to take quinidine with meals to prevent gastrointestinal (GI) upset. Advise to minimize citrus fruit intake; it changes the urine pH and decreases excretion of quinidine. Procainamide is absorbed best on an empty stomach; if GI upset occurs, instruct to take immediately after a meal.
Class II Antidysrhythmics (Beta Blockers)			
Propranolol (Inderal) Acarbose (Sectral) Atenolol (Tenormin) Carvedilol (Coreg) Esmolol (Brevibloc) Nadolol (Corgard) Sotalol (Betapace) Metoprolol (Lopressor, Toprol XL) Esmolol (Brevibloc)	Uses: Atrial and ventricular dysrhythmias Action: Slow sinoatrial nodal impulses	Monitor for signs of congestive heart failure (CHF); monitor pulse and blood pressure, watching for bradycardia and hypotension. Monitor electrolytes. Carefully monitor blood sugar in diabetic patients.	Instruct not to discontinue the drug abruptly. Notify provider if skin rash, confusion, fever, sore throat, or unusual bleeding or bruising occur. Monitor weight and report gain of >2 lb/wk. Report edema or shortness of breath.
Class III Antidysrhythmics (Potassium Channel Blockers)			
Amiodarone (Cordarone) Dofetilide (Tikosyn) Ibutilide (Corvert)	Uses: Supraventricular and ventricular dysrhythmias Actions: Increase the refractory period and action potential duration	Check for drug interactions and for side or adverse effects of specific drug administered. Monitor heart rhythm, blood pressure, and pulse. Monitor renal function.	Instruct to report adverse reactions to specific drug being taken. Advise of need for provider supervision. Report any new heart rhythm irregularities.
Class IV Antidysrhythmics (Calcium Channel Blockers)			
Verapamil (Calan, Isoptin, Verelan) Diltiazem (Cardizem)	Use: Paroxysmal supraventricular tachycardia (PSVT) Action: Converts PSVT to normal sinus rhythm by slowing conduction time through the nodes	Monitor heart rate and rhythm; watch for signs of CHF. Observe for hypotension and edema. Use very cautiously with beta blockers.	Instruct to report signs of edema, shortness of breath, or weight gain of >2 lb in 1 wk. Notify provider of new changes in heart rhythm.
Other Agents			
Atropine		Used to raise the heart rate, monitor rate and rhythm.	Explain goal of use.
Digoxin (Lanoxin)		Monitor heart rate for expected decrease.	Teach signs and symptoms of toxicity: visual changes, anorexia, nausea, vomiting, diarrhea, headache, confusion, new dysrhythmia.
Adenosine (Adenocard)		Monitor for expected decreased heart rate.	Monitor for dizziness, blurred vision, facial flushing, nausea, dyspnea, bronchospasm, new dysrhythmia, and chest pressure.
Magnesium		Used to correct digitalis toxicity, to aid in correction of ventricular dysrhythmias, and in cardiac arrest.	Monitor for muscle weakness, flushing, confusion, nausea, cramps, diarrhea, and circulatory collapse.

Premature atrial contractions.

Premature atrial contraction (PAC) happens when an ectopic electrical focus fires before the next SA node impulse is due, thereby depolarizing the atria. An abnormally shaped P wave appears on the ECG before the QRS wave. The impulse is routed to the AV node and then to the ventricles causing normal ventricular contraction. PACs are common and do not often produce symptoms. PACs result from sympathetic nervous system stimulation, such as occurs with anxiety, hypoxia, or ischemia. Early junctional beats can also occur and are called *premature junctional contractions (PJC)s*. They look much like PACs and are not within the scope of this text to discuss fully. They do not cause hemodynamic compromise and are difficult to distinguish from PACs.

Older Adult Care Points

With increased age the left ventricle and cardiac valves thicken and the amount of fibrous tissue and fat in the SA node increases, which decreases the number of pacemaker cells the SA node

contains. These changes make individuals older than 75 years more prone to cardiac dysrhythmias. Failure of the SA node and the need for a pacemaker are common. Thyroid studies should be performed for patients older than 65 years who have atrial fibrillation, because thyroid problems can be a cause. Hypothyroidism or hyperthyroidism may also aggravate HF.

Absent Pulse

Ventricular fibrillation.

Ventricular fibrillation (VF) is a chaotic random firing of all the ventricular cells. The ventricles quiver rather than contract; there is no cardiac output, and without cardiopulmonary resuscitation (CPR) and defibrillation, death will occur (see [Figure 19-6, E](#)). There is no pulse and no blood pressure. The ECG shows coarse electrical waveforms varying in size and shape, and no intervals can be determined. Immediate intervention is required.

Pulseless Electrical Activity

Sometimes the heart muscle is not capable of responding to the electrical signal with an effective contraction. Severe acidosis, electrolyte imbalances, profound hypovolemia, and other disorders keep the myocardium from contracting because of the toxic environment. The signal is sent and a QRS appears on the ECG, but there is no pulse. The rhythm on the monitor can be anything that would normally be expected to have a pulse generated. The most common rhythm displayed is sinus tachycardia. CPR and correction of the underlying disorder is the only way to regain a pulse.

There are many types of cardiac dysrhythmias. Nurses assigned to a critical care or telemetry unit take a special course in dysrhythmia recognition to learn the patterns, significance, and treatment of each type. All nurses should be able to recognize life-threatening dysrhythmias.

Diagnosis and Treatment

Disorders of the cardiac conduction system are diagnosed by a 12-lead ECG, by continuous ECG monitoring, and by patient history (see [Table 17-2](#)). Drug therapy is effective in correcting or controlling dysrhythmias in many cases. A variety of antiarrhythmic agents may be used alone or in combination to regulate the heartbeat (see [Table 19-4](#)). Oxygenation, acid-base status, and electrolyte balance are watched carefully and corrected as needed. Early recognition and correction of abnormalities decreases life-threatening dysrhythmias.

Synchronized cardioversion.

Patients who experience tachycardia or rhythms that do not respond to drug therapy may be treated with **synchronized cardioversion**. A mild electrical shock is delivered to the heart at a specific time in the cardiac cycle to interrupt the abnormal rhythm and begin a new, normal rhythm of electrical impulse and contraction. The patient is given a sedative before the procedure. Signed consent is required. The procedure may be performed in the cardiac catheterization laboratory or in the emergency department by the provider. Resuscitation equipment must be at hand. The patient must be monitored for response to treatment, including heart rate, rhythm, and blood pressure. If the rhythm has a sudden onset and the patient is unstable, synchronized cardioversion may be done emergently.

Cardiac pacemakers.

Cardiac pacemakers may be used to manage chronic and life-threatening dysrhythmias and are used to support heart rate when bradycardia occurs. Advances in pacemaker technology have led to units that are programmable for single- and dual-chambered control. A pacemaker can be used to pace the atria and one or both ventricles. Some units can override a dysrhythmia and keep the heart at a more steady rhythm. There are rate-responsive pacemakers, in which the pacemaker automatically adjusts to the patient's level of activity. When the patient exercises, the heart rate increases (similar to the normal SA node response).

Pacing can be a temporary measure if the problem is an emergent, transient condition, such as drug toxicity. An external pacemaker often is used in the emergency department. Electricity is passed through the chest wall via external pads. It causes uncomfortable muscle contractions as current passes through the chest, so it is only used until another mode of pacing is available.

A temporary transvenous pacemaker is placed if a transient rhythm such as heart block develops after an MI or drug toxicity. Transvenous pacemakers are inserted by fluoroscopy with local anesthesia. The leads are attached to an external power source. Patient consent is required, and a sedative is given to the patient before the procedure. Epicardial pacemaker wires are often placed during cardiac surgery for quick use should the patient need pacing in the postoperative period. The wires are brought through the chest wall and are attached to an external power source. When the wires are no longer needed, the surgeon will pull them out.

Clinical Cues

Patients are at risk for cardiac tamponade when the epicardial pacer wires are pulled. Monitor patients for signs and symptoms of bleeding into the pericardial sac, including sharp chest pain, dyspnea, hypotension, cyanosis, tachycardia, paradoxical pulse, and distended neck veins.

A permanent pacemaker is implanted for SA node dysfunction, heart block, or treatment of chronic HF. All pacemakers have the same function: to produce effective heartbeats. A permanent pacemaker is inserted in the operating room or cardiac catheterization laboratory to ensure an aseptic environment (Figure 19-7). The pulse generator is placed in a skin pocket below the right or left clavicle.

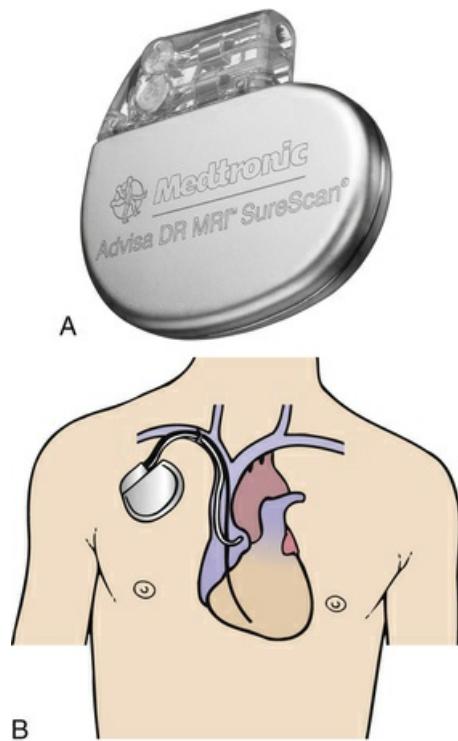


FIGURE 19-7 Thoracic placement of permanent pacemaker and transvenous pacing wires. **A**, Pacemaker. **B**, Placement of pacemaker and wires. (**A**, Reproduced with permission of Medtronic, Inc. **B**, From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 8, St. Louis, 2011, Mosby.)

Nursing Management

If inserting a pacemaker is not an emergency procedure, there will be opportunities to assess the patient's knowledge of and feelings about having her heart rate regulated. Assess the patient's learning needs, seek to identify the source of any fear, and gauge the level of anxiety.

Think Critically

How would you approach discussion with an older adult patient who is fearful of getting a permanent pacemaker?

Both the American Heart Association and the manufacturers of pacemakers provide illustrated booklets to help patients learn more about their cardiac pacers. You can go over these booklets with the patient and perhaps show her a demonstration model and explain how it works to her advantage.

Older Adult Care Points

Older patients who have SA node disease and resulting cardiac dysrhythmias can achieve a far better quality of life with an implanted pacemaker. Many patients are fearful of the surgery required and can benefit from talking to another patient who has had a successful pacemaker implantation.

Postoperative nursing care for patients with a permanent pacemaker includes continuous monitoring of heart rate, rhythm, blood pressure, and temperature. Patients are also monitored for hematoma formation at the site of insertion. Prophylactic antibiotic therapy may be prescribed for a short time. The battery in a pacemaker should last 6 to 9 years, depending on how frequently pacing is required.

Patient Teaching

Instructions for a Patient With a Permanent Pacemaker

A patient who has had a permanent pacemaker implanted should receive these instructions before discharge:

- Avoid lifting the arm away from the body on the pacemaker side until your provider says you may progress to normal activity. Lifting may dislodge the leads from their positions.
- Keep the incision dry for at least 4 days after the surgery.
- Check for redness, swelling, drainage, or fever and report such findings to your provider immediately.
- Refrain from activities that might cause a direct blow to the pacemaker.
- Use cellular or cordless phones on the ear opposite the pacemaker.
- Stay away from high-output electrical generators or large magnets such as a magnetic resonance imager. Such devices can interfere with pacemaker function.
- Monitor your pulse daily and report to the provider if it drops below the set rate.
- Carry a pacemaker information card with you at all times.
- Wear a medical alert bracelet or necklace at all times.
- Keep follow-up appointments with your provider to check the insertion site and to check pacemaker function.
- **Microwave ovens are safe to use, and airport security screening should not cause a problem with the function of the pacemaker. Travel is not restricted.**

The patient must understand the importance of periodic evaluations of her condition for the rest of her life. Some pacemakers have a telephone monitoring device that allows calling a monitoring station to have the pacemaker checked or a telemetry device that sends a report automatically every

night. Instructions for the use of the pacemaker and monitoring device are included in the owner's manual.

Implantable cardioverter-defibrillators.

Implantable cardioverter-defibrillators (ICDs) are used for patients who have an episode of a life-threatening dysrhythmia. They are also indicated in some patients with cardiomyopathy and decreased ejection fraction that are at increased risk of lethal dysrhythmias. The defibrillator is implanted in the same way as a pacemaker. The pulse generator is slightly larger than that for a regular pacemaker because it requires a high-capacity battery. ICDs monitor the heartbeat and provide an electrical shock similar to that delivered in cardiac defibrillation or cardioversion when a life-threatening rhythm is detected. Most ICDs have the ability to pace as well as defibrillate. The patient is warned to avoid exposure to strong magnetic fields such as microwave towers, transformers and electrical transmitters, electrical generators, handheld security devices at airports, and arc welding equipment. The patient should not lean over the alternator of a running car or boat motor. A magnetic field will temporarily inactivate the device. Moving away from the magnetic source will restore normal function.

Radiofrequency catheter ablation.

When drugs will not control supraventricular or ventricular tachydysrhythmia, the irritable focus can sometimes be destroyed with radiofrequency catheter **ablation**. Electrophysiologic studies are completed in a specially equipped cardiac catheterization laboratory to pinpoint the irritable focus. A specially trained provider then uses radiofrequency waves to destroy the irritable focus via heat and subsequent scarring. The procedure may affect the normal conduction system, requiring the implantation of a permanent pacemaker.

Inflammatory and Infectious Diseases of the Heart

The tissues of the heart are subject to the same inflammatory conditions that affect other parts of the body. The inflammation may be present in the inner lining (**endocarditis**), the heart muscle (myocarditis), or the sac surrounding the heart (pericarditis). Inflammation may be from an infectious source or from a noninfectious cause.

Infective Endocarditis

Etiology

Infective endocarditis (IE) is an infection of the endocardial surface of the heart. It may affect the heart valves, the walls, or a septal defect in the heart. IE was formerly called *bacterial endocarditis* (BE), or *subacute bacterial endocarditis* (SBE), but it can be caused by organisms other than bacteria. When the wall of the heart is affected, **myocarditis** is present. Myocarditis is most often caused by the Coxsackie virus but can be caused by a toxin or inflammation from an autoimmune disorder.

Infective endocarditis may be caused by bacteria, viruses, or fungi. Ports of entry are the oral cavity, particularly with dental procedures; the skin, from surgery or invasive procedures; and from infections in the body. Intravenous drug use with unclean needles is a major cause of endocarditis. Patients with irregularity or injury to the endocardium are at risk for organisms to stick to the surface and grow. Rheumatic fever causes injury to the heart valves. The heart valves are covered by the endocardium.

Older Adult Care Points

Systemic infections of the respiratory tract, urinary tract, gastrointestinal tract, or skin often are the causes of endocarditis in older adults. The immune system function decreases with age, making older adults more susceptible to IE. Diagnosis is difficult because symptoms are usually vague. The aortic valve is most often affected.

Although antibiotics—particularly penicillin—have decreased the incidence of rheumatic fever, the danger is still present. Throat culture should be performed any time there is a question whether group A beta *Streptococcus* is the organism responsible for a sore throat. If the streptococcal infection is treated early with antibiotics, inflammation in the heart and heart valve injury is usually prevented.

Pathophysiology

The inflamed tissues of the heart become rough and swollen. The inflamed tissue traps organisms. The bacterial growth on the valves are called *vegetations*. Vegetations decrease the effectiveness of the valve. Damage to the valve from bacteria may require valve replacement. The mitral valve is the most common location of infection (Figure 19-8). Arterial emboli may occur if pieces of the vegetation break off and travel. As mentioned previously, where an embolus lodges depends on the side of the heart from which it emerges: Emboli from the right side of the heart become pulmonary emboli; those from the left side of the heart can lodge in the brain or coronary vessels or can affect other organs of the body.

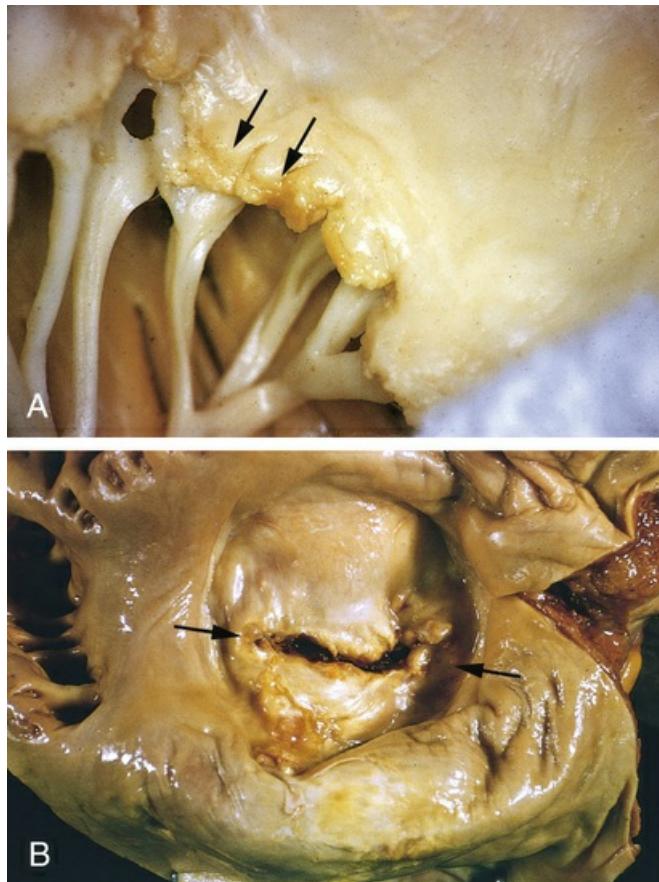


FIGURE 19-8 **A**, Thickening and valve leaflet distortion from infection and inflammation of the endocardium. **B**, Mitral stenosis. (From Kumar V, Abbas A, Fausto N: *Robbins & Cotran's pathologic basis of disease*, ed. 7, Philadelphia, 2005, Saunders.)

Signs, Symptoms, Diagnosis, and Treatment

The signs and symptoms of IE vary considerably. The sedimentation rate or C reactive protein and leukocyte count are elevated, and signs of low-grade intermittent fever are evident. A blood culture will be positive. The spleen becomes enlarged. Splinter hemorrhages (thin black lines) can occur under the nails, and there may be petechiae (pinpoint red spots) inside the mouth, in the conjunctivae, and above the clavicles. Echocardiography or transesophageal echocardiography (TEE) confirms the diagnosis. Fatigue, chills and sweats, malaise, anorexia, muscle aches, and headache may occur.

An existing cardiac murmur may worsen, or a new murmur may appear as a valve is damaged. Cardiac dysrhythmia may appear. There may be complaints of sharp, stabbing chest pain. Each instance of endocarditis further damages the heart valves. The scar tissue that occurs as the inflammation subsides may cause the valve to leak, resulting in regurgitation (lack of closure), or the valve leaflets may become thickened and calcified, causing narrowing or stenosis. The mitral and aortic valves are most commonly affected. When mitral or aortic stenosis or regurgitation causes symptoms sufficient to interfere with the patient's usual lifestyle, surgery becomes necessary. Stenosis and regurgitation of cardiac valves may eventually cause HF.

Older Adult Care Points

The valve leaflets thicken with age; this gives rise to the common systolic murmur heard in persons older than 80 years. This murmur does not indicate cardiac inflammation.

Treatment for IE is with antibiotics for underlying infection. NSAIDs are used to decrease inflammation. Pain medication is provided. Medications for dysrhythmia and HF are administered for those complications. Repair of congenital cardiac problems, such as atrial or ventricular septal

defect, may be performed.

Safety Alert

Infective Endocarditis

Streptococcus viridans, a bacterium found in the mouth, is responsible for about 50% of cases of infective endocarditis. Regular dental care is very important. The health care provider should be advised of all cardiac history before any invasive procedure so that appropriate prophylactic treatment can be provided.

Pericarditis

Pericarditis is inflammation of the pericardium (the sac that encloses the heart). Pericarditis may be caused by cancer and its treatment, systemic connective tissue disease, infectious organisms, renal failure, trauma, or tissue damage from an MI. The serous fluids that typically are produced by inflammation may cause an **effusion** (accumulated fluid) in the pericardium. If the effusion becomes large, it can affect the filling of the heart and the cardiac output. Should the fluid become excessive, **cardiac tamponade** may occur as the fluid restricts the filling and pumping of the heart (Figure 19-9). If unresolved, the heart cannot supply the body with needed oxygen and nutrients and death occurs.

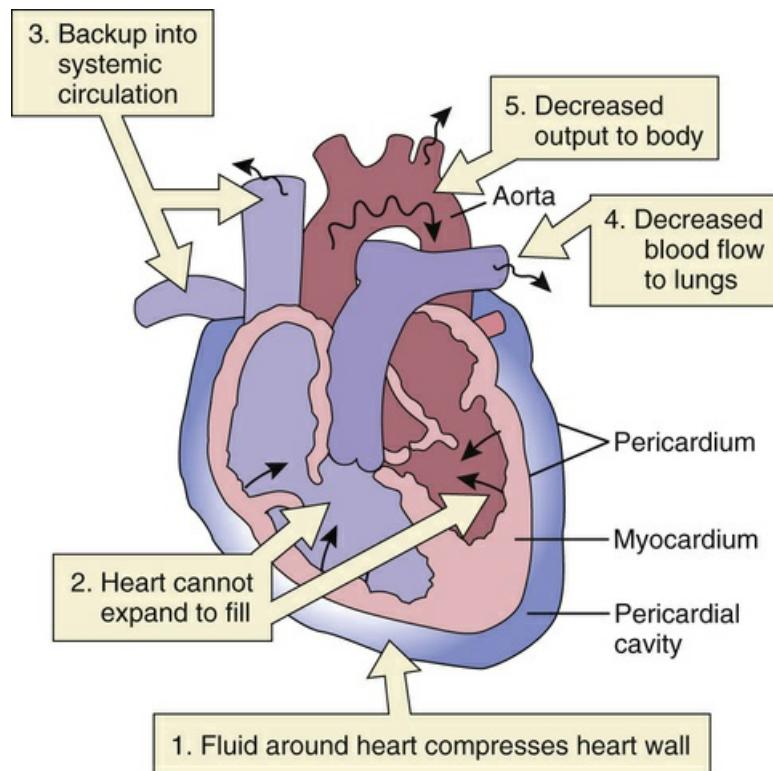


FIGURE 19-9 Effects of pericardial effusion. (From Gould BE: *Pathophysiology for health professions*, ed. 2, Philadelphia, 2002, Saunders.)

Symptoms of pericarditis include fever, tachycardia, chest pain eased by sitting up and leaning forward, dyspnea, and a pericardial **friction rub**. The rub is a high-pitched scratchy sound heard with the diaphragm of the stethoscope placed at the left sternal border at the third intercostal space. The ECG will show changes.

Dressler syndrome is pericarditis with effusion occurring from inflammation after an MI. It appears 1 to 12 weeks after infarct. When effusion is present, there may be malaise and fatigue related to decreased cardiac output and decreased perfusion of the tissues with oxygen. Assess for

fever, muffled heart sounds, tachycardia, restlessness, anxiety and confusion, distended neck veins, and **pulsus paradoxus**—a drop in systolic blood pressure greater than 10 mm Hg on inspiration. This can be noted when measuring the blood pressure.

Diagnosis of pericarditis is made by history and physical examination and confirmed by ECG, echocardiogram, computed tomography (CT) scan or MRI, and laboratory studies of C-reactive protein (CRP), CBC, and erythrocyte sedimentation rate (ESR). **Pericardiocentesis** will be performed at the bedside if effusion is interfering with cardiac output. The fluid extracted is analyzed to determine a cause of the inflammation. Restrictive pericarditis may be treated by **pericardiotomy** and creation of a window in the pericardium. Pain is controlled with medication.

Think Critically

Which patients should you watch for signs of pericarditis?

Cardiomyopathy

Cardiomyopathy is a group of diseases that affect the structure or function of the heart. The risk of cardiomyopathy is increased in systemic hypertension, with chronic excessive alcohol intake, during pregnancy, and in those who have had a systemic infection. The heart enlarges and becomes an inefficient pump. There are three main types of cardiomyopathy: dilated, hypertrophic, and restrictive (Box 19-3).

Box 19-3

Three Main Types of Cardiomyopathy

Dilated

Characterized by extensive enlargement of the ventricles with impairment of contraction. Causes include chemotherapy, alcohol abuse, infection, inflammation, poor nutrition, and connective tissue disorders. Advances to heart failure.

Hypertrophic

Increased growth of left ventricle muscle. May be hereditary as an autosomal dominant gene or be caused by hypertension or hypoparathyroidism. Sudden death may occur.

Restrictive

Stiffened ventricles prevent adequate relaxation after systole, affecting ventricular filling. Caused by systemic diseases such as amyloidosis or sarcoidosis. Progresses to right-sided heart failure. Is the least common of the three types of cardiomyopathy.

The major problems exhibited by patients with cardiomyopathy are HF and dysrhythmias. Signs and symptoms of cardiomyopathy include dyspnea, activity intolerance, angina, dizziness, hypertension, and palpitations. Diagnosis is made through history and chest x-ray, cardiac catheterization, echocardiography, ECG, or MRI/CT scans. Medical treatment for cardiomyopathy includes drugs to increase contractility (such as digoxin), antihypertensive drugs, diuretics, antiarrhythmic drugs, and anticoagulants. Severe cardiomyopathy can be rapidly fatal. These patients are possible candidates for a heart transplant. Because of the possibility of cardiac arrest, families are taught CPR. In later stages, an LVAD may be used to rest the heart or as a bridge to heart transplant. An LVAD can be external or can be implanted. The patient may have an ICD implanted.

Clinical Cues

Takotsubo cardiomyopathy, also known as *broken heart syndrome* or *stress cardiomyopathy*, can occur abruptly in patients with no underlying cardiac disease. Signs and symptoms are similar to an acute MI and can only be diagnosed when a left heart catheterization is performed. No coronary blockages are found, the ejection fraction is reduced, and there is evidence of dysfunction of the left ventricle. The images obtained of the left ventricle show a similar shape to a Japanese ceramic

octopus trap, a takotsubo. The dysfunction is believed to be caused by increases in circulating hormones such as adrenaline that are released with stress. Most patients recover without long-term consequences.

Nursing Management for Infectious and Inflammatory Heart Disease

Complete a thorough history and physical examination and document all data as a baseline assessment. Any abnormalities should be noted and included in the nursing care plan. Assess heart sounds carefully. Assess vital signs on a regular basis and note abnormalities. The patient may experience an elevation in temperature in addition to changes in heart rate and rhythm. Adherence to the prescribed medication regimen is essential to care. Ordered medications must be given on schedule. The teaching plan should include information about the drugs, as well as detailed information about the specific disease process. Activity restrictions are determined by patient tolerance. Make the patient as comfortable as possible and reinforce the rationale for the prescribed activity level. Oxygen administration may be required; discuss the importance of this treatment with the patient. Include evaluation of the patient's physical status, assessment of the patient's understanding of the home care requirements, and teaching related to medications and treatment in discharge planning. Home IV antibiotics may be required for weeks after discharge. Advise that prophylactic antibiotic therapy is necessary before dental procedures that involve gingival manipulation or bleeding. If the patient is at high risk for IE, prophylaxis may be needed before other invasive procedures.

Think Critically

Can you describe why it is important to assess a patient with IE for lung, brain, and abdominal organ abnormalities?

Cardiac Valve Disorders

Mitral and aortic valve disorders are the most common cardiac valve disorders. Tricuspid and pulmonic valve problems are rare. Tricuspid problems are usually from IV drug abuse or rheumatic fever. Pulmonic stenosis is congenital. In addition to congenital abnormalities, untreated hypertension, MI, and IE can cause cardiac valve disorders. The AHA published guidelines for valvular heart disease in 2014. Valve disorders are staged, and treatment recommendations are made according to the severity of the disease.

Mitral valve prolapse (MVP) occurs when the valve leaflets and tendonlike cords supporting the valve weaken and prolapse into the left atrium during systole. This is most often a benign condition. MVP is typically asymptomatic but can cause chest pain, palpitations, exercise intolerance, or fainting. A mid-systolic click heard at the apex is characteristic of MVP.

Mitral Stenosis

Mitral stenosis is most commonly caused by rheumatic fever. This disorder is occurring less frequently as the incidence of rheumatic fever from Group A *Streptococcus* declines. Other causes are systemic lupus erythematosus, rheumatoid arthritis, and related conditions. Valve leaflet thickening and calcification cause stiffening. Left atrial pressure rises, and the left atrium dilates, causing back-up pressure in the lungs. Pulmonary pressure increases, pulmonary congestion occurs, and over time the right ventricle hypertrophies.

The first symptom may be dyspnea on exertion. Paroxysmal nocturnal dyspnea (sudden dyspnea at night), palpitations of atrial fibrillation, and a dry cough may occur. If untreated, right-sided HF may eventually occur. Atrial fibrillation may be present. A diastolic murmur that is rumbling is heard on auscultation. Treatment is based on the stage of mitral stenosis identified by intracardiac pressures and clinical symptoms.

Mitral Regurgitation (Insufficiency)

Rheumatic heart disease is the main cause of mitral regurgitation. Papillary muscle rupture from ischemic heart disease, a congenital anomaly, and infective endocarditis are other causes. Fibrosis and calcification, other causes or insufficiency, prevent the valve from closing completely during systole. Backflow of blood into the left atrium occurs as the ventricle contracts. In diastole, the blood flows back into the left ventricle along with the normal blood flow. This increased volume must be ejected with the next contraction. The left ventricle and left atrium dilate and hypertrophy to accomplish the ejection. More women than men develop mitral regurgitation.

Symptoms take decades to emerge. Fatigue and weakness from reduced cardiac output are early signs. Dyspnea on exertion and orthopnea are later developments. There may be complaints of palpitations, anxiety, and atypical chest pain. Atrial fibrillation may occur. Right-sided HF causes jugular venous distention, hepatomegaly, and pitting edema. Auscultation at the apex reveals a high-pitched systolic murmur. A third heart sound occurs when regurgitation is severe.

Aortic Stenosis

Aortic stenosis is the most common valve disorder in the United States. Atherosclerosis with degenerative calcification of the valve is a common factor in older adults. Congenital valve malformations and rheumatic fever are causes in younger patients. The aortic valve opening narrows and obstructs left ventricular outflow during systole. The increased pressure required to eject the blood causes left ventricular hypertrophy. Eventually cardiac output is decreased to the point that the body's demands cannot be met during exertion. Systolic HF begins, and pulmonary congestion produces symptoms. When the pressure gradient across the valve is significantly increased and the ejection fraction decreases, aortic valve replacement is recommended (Nishimura et al, 2014).

Dyspnea, angina, and syncope on exertion are classic symptoms of aortic stenosis. Later, extreme fatigue, weakness, and peripheral cyanosis become apparent. A narrowed pulse pressure is found when blood pressure is measured. Auscultation reveals a systolic crescendo-decrescendo murmur.

Older Adult Care Points

Older adults with long-term hypertension are at risk for aortic stenosis because of increased atherosclerosis and stiffening of the aorta. Carefully assess the aortic valve sounds of older adult patients, especially if hypertension is not well controlled.

Aortic Regurgitation (Insufficiency)

Infective endocarditis, congenital abnormalities, long-term hypertension, and Marfan syndrome (a rare genetic connective tissue disease) are factors in aortic regurgitation. The valve leaflets do not close properly during diastole, allowing backflow of blood from the aorta into the left ventricle. The left ventricle dilates and hypertrophies from the greater blood volume.

Symptoms do not appear until left ventricular failure happens. Dyspnea on exertion, orthopnea, and paroxysmal nocturnal dyspnea begin. Nocturnal angina with diaphoresis and palpitations particularly when lying on the left side occur late in the disease. The pulse is bounding, and pulse pressure is widened with increased systolic pressure and decreased diastolic pressure. On auscultation there is a high-pitched, blowing diastolic decrescendo murmur.

Treatment of Valve Disorders

Treatment depends on the valve affected and the degree of impairment. Yearly monitoring and drug therapy for symptoms is standard when disease is not severe. Later, heart surgery for valve replacement may be needed. Newer techniques allow for an endovascular approach to some valve replacements or repair.

Medical Treatment

Diuretics, beta blockers, digoxin, and oxygen along with rest are used to improve symptoms of HF and dysrhythmias. Prophylactic antibiotics are no longer recommended for aortic valve stenosis. Atrial fibrillation is corrected with drug therapy and/or cardioversion. If atrial fibrillation cannot be converted to a normal sinus rhythm, drugs such as amiodarone (Cordarone), procainamide (Pronestyl), or a beta-blocking agent may be prescribed to slow ventricular response rate. Patients with chronic atrial fibrillation are prescribed regular anticoagulant therapy. Medical treatment is not the treatment of choice. Interventional procedures are the only effective treatment for the problem.

Surgical Treatment

When valvular disease becomes severe, surgery is required to correct the problem. Reparative procedures are becoming more common. Balloon valvuloplasty is sometimes used to open stenosed valves. It is performed with a balloon-tipped catheter. The catheter is threaded via the femoral artery into the heart and to the diseased valve. The balloon is inflated to enlarge the opening, then is deflated and removed. However, it is questionable as to how long the valve will stay open. Often the stenosis recurs within 6 months.

Direct commissurotomy occurs during cardiopulmonary bypass with open heart surgery. Thrombi are removed from the atria and the leaflets are incised, along with calcification debridement. This opens the valve orifice.

Mitral valve annuloplasty (reconstruction) is performed for acquired mitral regurgitation. The valve ring (annulus) that attaches to the leaflets and supports them is made smaller with sutures or tucks. Leaflets are repaired as well to provide good closure of the valve at systole.

Valve Replacement

Replacement may be performed as an open heart procedure with cardiopulmonary bypass or as minimally invasive surgery. Many mechanical (prosthetic) and biologic (tissue) valves are available (Figure 19-10). Mechanical valves require lifetime anticoagulation postoperatively because of the possibility of clot formation. Biologic valves may be from a pig (porcine), from a cow (bovine), or from a human cadaver. Biologic valves do not require postoperative anticoagulation therapy. Biologic valves tend to wear out in about 15 years, requiring replacement. Mechanical valves are more durable. The aortic valve is always replaced with a mechanical valve because of the high

pressure in the aorta.

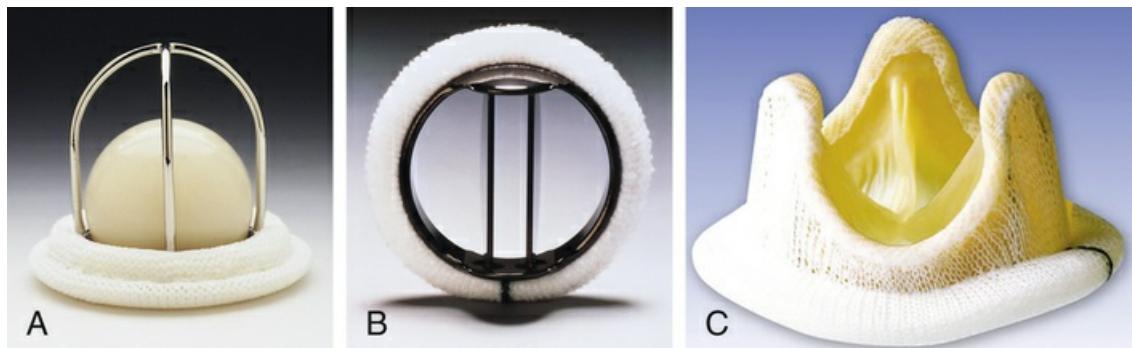


FIGURE 19-10 Examples of mechanical and biologic tissue valves for valve replacement. **A**, Starr-Edwards caged ball valve. **B**, St. Jude bileaflet valve. **C**, Carpentier-Edwards porcine valve. (From Bonow RO, Mann DL, Zipes DP, Libby P: *Braunwald's heart disease: A textbook of cardiovascular medicine*, ed. 9, Philadelphia, 2012, Saunders.)

Transcatheter aortic valve replacement is an emerging technology that allows for replacement of the aortic valve via a percutaneous approach rather than a thoracotomy. A catheter is threaded from the groin (or other arterial access site) through the aorta to the aortic valve. A valvuloplasty is performed on the stenotic valve. The replacement valve is then carefully positioned and deployed. The patient is sedated and the procedure is performed in a hybrid operating room/cath lab suite.

Nursing Management for Cardiac Valve Disorders

The primary nursing goals for patients with cardiac valve disease are to maintain adequate cardiac output, to control dysrhythmias, and to prevent or control HF. Assessing the patient for signs of developing HF, teaching the patient about prescribed medications, and preparing the patient for surgical procedures should all be included in the nursing plan of care. See [Chapter 17](#) for common problems and interventions for complications related to valve problems.

Valve surgery is most often an elective procedure. Preoperative and postoperative care is very similar to that of coronary artery bypass graft surgery (see [Chapter 20](#)). Patients taking anticoagulation drugs preoperatively must stop taking them about 72 hours before the procedure. Any needed dental work is obtained before the valve replacement to decrease the chance of infective endocarditis.

Patients with mitral stenosis may have pulmonary hypertension and stiff lungs. Postoperatively, respiratory status must be monitored very closely during weaning from the ventilator. Patients undergoing aortic valve replacement are at higher risk of postoperative hemorrhage. Be particularly alert for bleeding. Monitor cardiac output closely and watch for signs of HF. Fatigue is a common problem during convalescence. Rest and activity must be balanced carefully. For those with a mechanical valve, teach about the care needed when taking an anticoagulant.

Common Therapies and Their Nursing Implications

The medical treatments most commonly used to manage heart disease include (1) oxygen therapy, (2) pharmacologic agents, (3) surgical and interventional procedures, and (4) dietary controls.

Education and rehabilitation of the cardiac patient also must be included in the plan of care.

Surgical treatment of cardiac conditions most often is used to correct structural defects of the heart and great vessels. Interventional procedures correct blockages, repair structures, or are for implantation of therapeutic devices.

Oxygen Therapy

Administering supplemental oxygen to relieve the dyspnea and hypoxemia of a cardiac patient is a routine therapeutic measure. Any patient experiencing chest pain is started on low-dose oxygen. Responsibilities regarding oxygen therapy for a cardiac patient are primarily concerned with observation to determine a patient's need for supplemental oxygen, maintenance of the ordered flow rate, and the response to therapy once oxygen has been initiated. It is important to be alert for signs of changing oxygen needs, such as increased pulse rate and symptoms of cerebral anoxia, including irritability, confusion, and disorientation. The patient's oxygen saturation can be monitored by pulse oximetry or by blood gas analysis.

Clinical Cues

The patient's PO_2 should be maintained between 95% and 99%. If PO_2 falls lower than 93% consistently, notify the provider. Oxygen saturation by blood gas determination should be 94 to 100 mm Hg. Patients with a history of pulmonary disease such as emphysema may normally exhibit an oxygen saturation between 89% and 92%.

Pharmacologic Agents

Many types of drugs are used to treat heart disorders (see Tables 19-3 and 19-4). Digitalis in its various forms is a widely prescribed drug. However, it is a potent drug that can produce serious toxicity. **Classic symptoms of digitalis toxicity are yellow-green halos around lights, nausea, diarrhea, and confusion.** Digitalis can be very effective in treating certain kinds of cardiac disorders, but its therapeutic range is quite narrow. A therapeutic dose is only about one third less than the dose that will induce toxicity. A recent study (Freeman et al, 2013) suggests that use of digoxin in systolic HF may be contraindicated. Moreover, physiologic changes resulting from age, electrolyte imbalances (particularly hypokalemia or hypercalcemia), renal impairment, metabolic disturbances, and certain heart conditions can predispose a patient to digitalis toxicity. Other drugs given simultaneously, including erythromycin, also can alter the effects of digitalis and make it more toxic. Both beta blockers and calcium channel blockers will lower the heart rate, and beta blockers may cause pedal edema.

Clinical Cues

Remember that digitoxin has a slower and more prolonged action and is 10 times more potent than digoxin. **For this reason, digitoxin and digoxin are not interchangeable.**

Some providers may not want a dose of digitalis held if the patient's pulse rate is below 60 bpm, as long as there are no signs of digitalis toxicity. If the pulse rate is less than 60, check the provider's order before administering the medication.

When life-threatening complications arise from digitalis toxicity, digoxin immune Fab is given to counteract the excess digitalis. This drug is used cautiously, because side effects include hypotension, hypokalemia, worsening of HF, and rapid ventricular rates if the patient is experiencing atrial fibrillation.

Think Critically

Can you list four signs and symptoms that might indicate your patient is experiencing digitalis toxicity?

Anticoagulants are prescribed to inhibit the formation of clots within blood vessels and the heart. Anticoagulants do not dissolve clots that have already formed, but they can prevent existing ones from growing larger and can interfere with the development of new clots. Long-term anticoagulant therapy is necessary for patients with chronic atrial fibrillation or mechanical valve replacement.

Dietary Control

The National Heart, Lung, and Blood Institute cites obesity as a risk factor for cardiac disorders. When obesity is present in conjunction with other factors, such as metabolic syndrome, hypertension, high cholesterol levels, diabetes mellitus, smoking, or family history of heart disease, the likelihood of cardiovascular problems is increased.

Many health professionals consider self-help groups to be most successful in assisting people to lose pounds and then to keep their weight within normal range once the excess is lost. These groups include Weight Watchers, TOPS (Take Off Pounds Sensibly), and Overeaters Anonymous. Results of studies have shown that the behavior-modification techniques these groups use are very successful. To prevent heart disease and decrease the factors that predispose one to cardiovascular disease, the American Heart Association recommends the following measures.

Health Promotion

Heart-Healthy Lifestyle Recommendations

- With daily activities plus exercise, use up as many calories as you consume. To calculate, multiply current weight by 15 if moderately active; if sedentary, multiply weight by 13.
- Follow a heart-healthy diet (see Guidelines for a Heart-Healthy diet).
- Limit portion sizes to recommended amounts.
- Exercise with physical activity at least 30 minutes a day.
- Avoid inhaled smoke and smokeless tobacco products.

Increased fiber will lower cholesterol even without cutting down on dietary fat. Adults should consume about 35 g of fiber per day; the national average consumption is about 12 g. Increasing fiber in the diet also lowers the risk of cancer and helps with weight control by maintaining a feeling of fullness for longer.

Foods containing *trans* fats increase the cholesterol level, especially low-density lipoprotein. A tub of soft-style margarine that lists water or liquid vegetable oil as its first ingredient contains less *trans*-fatty acids than other types (AHA, 2012). Patients should be taught to read food labels for the presence of *trans* fat. Many community hospitals sponsor weight management programs. Local chapters of the American Heart Association provide pamphlets and other sources of information about diet. AHA resources can also be found on the website www.heart.org.

A high intake of sodium is believed to contribute to the development of high blood pressure. Limiting sodium intake is an important part of preventing and treating hypertension. Several cookbooks that make low-sodium, low-cholesterol meals easier to plan and prepare are sponsored by the AHA and organizations. The fact that the tendency to develop cardiovascular disease is familial gives the patient and the family good reason to develop good eating habits and to change to more heart-healthy foods. Restriction of sodium, prescribed because of sodium's association with retention of water in the tissues, is discussed in Chapter 3.

Think Critically

How could you specifically change your eating habits in a way that would help you follow a more heart-healthy diet?

Community Care

Patients with infectious and inflammatory disease of the heart are sent home after a few days in the hospital. A home care nurse is usually assigned to supervise any ordered IV antibiotic infusion and to carefully assess the patient on a regular basis. The importance of taking prescribed NSAIDs for inflammation is discussed. A thorough heart and lung assessment is performed at every visit. The nurse teaches the patient or family how to infuse the antibiotics and how to care for the IV or peripherally inserted central catheter (PICC) line. The importance of tracking temperature daily is stressed. Signs and symptoms to report to the provider are reviewed, including new or increased chest pain, dysrhythmia, fatigue, shortness of breath, change in level of consciousness, sharp abdominal pain, or dependent edema. Assessment for signs and symptoms of adverse reactions is performed. Repeat blood cultures and CBCs are drawn at intervals to determine effectiveness of treatment.

Nurses in long-term care settings must be vigilant for beginning signs of HF, because many older adult residents have had chronic hypertension, previous MIs, or previous episodes of HF. Whenever a resident has an infection, an increased demand is placed on the heart and HF can develop quickly if the heart is already compromised. Episodes of vomiting or diarrhea or of dehydration cause electrolyte imbalances that can lead to dysrhythmias. Heart rates and rhythms should be monitored closely, and fluid and electrolyte replacement should begin early in the course of the illness.

Get Ready for the NCLEX® Examination!

Key Points

- HF is the inability of the heart to pump as it should, and pressure changes cause blood to back up into lungs and systemic circulation.
- Systolic HF is identified by an ejection fraction of 40% or less.
- Diastolic HF results when filling of the ventricles is impaired. A primary sign is JVD.
- Medical treatment of HF includes limited activity initially; oxygen therapy; medications such as ACE inhibitors or ARBs, digoxin, loop diuretics, and antihypertensive drugs; restricted sodium intake; and smoking cessation.
- Recording daily weight and keeping accurate intake and output records are essential.
- Assist the patient to maintain fluid restrictions as required.
- Disruption of normal SA node conduction leads to dysrhythmias; lack of normal regular myocardial contraction decreases cardiac output.
- Life-threatening dysrhythmias include ventricular tachycardia, ventricular fibrillation, pulseless electrical activity, and asystole.
- Dysrhythmias causing decreased cardiac output include severe bradycardia, atrial fibrillation, complete heart block, supraventricular tachycardia, and frequent PVCs.
- Dysrhythmias are diagnosed using 12-lead ECG, continuous ECG monitoring, patient history, and electrophysiologic testing.
- Failure of the heart's natural pacemaker may require an artificial pacemaker.
- Artificial pacing can be temporary or permanent, external, transvenous, or internal.
- ICDs may be used in patients with an episode of ventricular tachycardia or ventricular fibrillation or those at risk for developing fatal arrhythmias.
- Inflammation of the heart may occur as endocarditis, myocarditis, or pericarditis.
- Medical treatment includes rest to reduce workload of the heart, anti-infective drugs to control infection, and surgery to replace or repair valves damaged by the inflammatory process.
- Severe cardiomyopathy is treated by heart transplant.
- Cardiac valve disorders are caused by congenital defect, rheumatic fever, endocarditis, or long-term hypertension.
- Valve disorders include stenosis and regurgitation (insufficiency).
- Valve disease, if left untreated, often progresses to HF.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- American Association of Heart Failure Nurses, www.aahfn.org
- American Heart Association, www.americanheart.org
- Heart Failure Society of America, www.hfsa.org
- Hypertrophic Cardiomyopathy Association, www.4hcm.org
- Mended Hearts, www.mendedhearts.org

Review Questions for the NCLEX® Examination

1. A nurse answers the call light of a patient admitted with HF. The patient states he is short of breath and appears to be in distress. Identify the actions of the nurse in priority order.

1. Apply supplemental oxygen.

2. Raise the head of the bed.
3. Notify the provider.
4. Check vital signs.
5. Listen to lung sounds.

NCLEX Client Need: Physiological Adaptation

2. A patient is admitted with a cardiac dysrhythmia. The morning laboratory values show potassium as 6.1 mg/dL. What action is most important to take?

1. Encourage intake of extra fluid.
2. Notify the provider immediately.
3. Check the breakfast tray for sodium-containing foods before serving.
4. Check the patient's vital signs.

NCLEX Client Need: Physiological Adaptation

3. _____ is the delivery of a mild electrical shock at a specific time of the cardiac cycle to interrupt an abnormal rhythm and to possibly initiate a normal rhythm.

1. Synchronized cardioversion
2. Unsynchronized defibrillation
3. Pacemaker initiation
4. Electrophysiology study

NCLEX Client Need: Reduction of Risk Potential

4. After pacemaker implantation, it is important to teach the patient to:

1. stay away from microwave ovens.
2. count her pulse regularly.
3. refrain from swimming.

4. use a safety razor to shave her legs.

NCLEX Client Need: Health Promotion and Maintenance

5. A 48-year-old patient is admitted for tachycardia, shortness of breath, and chest pain eased by sitting up and leaning forward. The nurse auscultates a high-pitched scratchy sound at the left sternal border of the chest. The patient most likely has:

1. heart failure.
2. pericarditis.
3. pneumonia.
4. aortic stenosis.

NCLEX Client Need: Physiological Adaptation

6. Which assigned patient would take priority for immediate attention?

1. A patient with infective endocarditis who has an antibiotic dose due
2. A patient awaiting aortic stenosis surgery who is complaining of pain
3. A patient with systolic HF whose weight is up 1.5 lb today
4. A patient with dysrhythmia whose heart rate has dropped to 42 bpm and is dizzy

NCLEX Client Need: Physiological Adaptation

7. A patient has HF and atherosclerosis. Which patient statement regarding healthy food choices demonstrates a need for further teaching?

1. "I can have an egg two to three times per week."
2. "I need to watch red meat intake, but can have all the cheese I want."
3. "I should read labels to see how much sodium a serving contains."
4. "Canned goods are often high in sodium."

NCLEX Client Need: Health Promotion and Maintenance

8. The nurse explains the importance of reducing salt in the diet to a Hispanic man who was recently diagnosed with HF. The nurse realizes that the relatives are at the bedside with the patient. An appropriate nursing action would be to:

1. involve the youngest male in the family to translate.
2. ensure patient privacy by directing the relatives out of the patient's room.
3. determine who does the cooking in the family.
4. include all the relatives in the diet teaching.

NCLEX Client Need: Health Promotion and Maintenance

9. While discussing HF with a student, a nurse explains that the underlying weakness of the left ventricle results in reduced cardiac output and backup of fluid in the pulmonary system. The student nurse anticipates which sign/symptom?

1. Edema in the sacrum, legs, feet, and ankles
2. Hepatomegaly
3. Crackles in the lungs
4. Ascites

NCLEX Client Need: Physiological Adaptation

10. The patient asks, "Why am I taking lisinopril (Zestril)?" An accurate statement by the nurse would be:

1. "The medication increases the force of contraction of the heart."
2. "The medication increases the heart rate."
3. "The medication helps prevent vasoconstriction."
4. "The medication causes excretion of extra fluid."

NCLEX Client Need: Pharmacological Therapies

Critical Thinking Questions

Scenario A

Mr. Jenkins, age 56 years, is admitted to the telemetry unit with a diagnosis of atrial fibrillation. Physical assessment reveals a restless, apprehensive man with an irregular heart rate of 155 and dyspnea.

1. Describe the rhythm you expect to note on the telemetry monitor.
2. What treatment do you expect the provider to prescribe for Mr. Jenkins?
3. List five priority teaching points you should establish for Mr. Jenkins if he continues in atrial fibrillation.

Scenario B

Mr. Zulic, age 76 years, received a permanent pacemaker to correct complete heart block. He is 1 day postoperative and preparing for discharge home.

1. What are the indications for a pacemaker?
2. Describe the types of pacemakers and indications for their use.
3. Describe preoperative and postoperative nursing interventions when caring for a patient receiving a pacemaker.

Scenario C

Mr. Postma, age 72 years, is diagnosed with systolic heart failure. He has been experiencing fatigue and shortness of breath when walking the dog for a mile and has gained 5 lb over the past 2 weeks.

1. What stage of heart failure is Mr. Postma in? What symptoms does he have, supporting this stage?
2. What would you expect to be prescribed for him?
3. What topics should your teaching plan cover?

CHAPTER 20

Care of Patients With Coronary Artery Disease and Cardiac Surgery

Objectives

Theory

1. Examine the risk factors for coronary artery disease.
2. Illustrate the pathophysiology of coronary artery disease.
3. Outline nursing interventions to care for a patient experiencing angina, including medication administration and patient teaching.
4. Explain the pathophysiology of myocardial infarction.
5. Compare and contrast the symptoms of and care for unstable angina with those of myocardial infarction.
6. Develop a nursing care plan for a patient experiencing a myocardial infarction.
7. Relate the nursing care of a patient undergoing cardiac surgery.
8. Discuss five complications of cardiac surgery.

Clinical Practice

9. Develop a teaching plan for a patient with coronary artery disease.
10. Identify signs and symptoms that indicate a patient may be experiencing a myocardial infarct.
11. Administer medications to patients experiencing cardiac disorders.
12. Collaborate with other health care providers to care for patients after cardiac surgery.
13. Contribute to discharge planning for a patient after cardiac surgery.

KEY TERMS

- angina pectoris** (än-JÍ-nä PĚK-tör-ís, p. 454)
- atherosclerosis** (äth-ěr-ō-sklē-RŌ-sís, p. 450)
- coronary artery bypass graft (CABG)** (p. 463)
- coronary insufficiency** (KÖR-ō-nér-ě īn-să-FISH-ăñ-sē, p. 451)
- drug-eluting stent** (drūg e-LÜ-tīng stěnt, p. 463)
- infarction** (īn-FÄRK-shún, p. 457)
- metabolic equivalent (MET) units** (p. 462)
- myocardial infarction (MI)** (mī-ō-KÄR-dē-ăl īn-FÄRK-shún, p. 450)
- necrosis** (nē-KRŌ-sís, p. 451)

Coronary Artery Disease

Coronary artery disease (CAD) is a progressive disease leading to narrowing or occlusion (blockage) of the coronary arteries. The coronary arteries are responsible for supplying oxygen and nutrition to the myocardium (see [Figure 17-2](#)). As the coronary vessel narrows, the patient may experience symptoms of ischemia, such as chest tightness and angina. When a sudden obstruction to blood flow through one or more major coronary arteries occurs and cuts off oxygen and nutrients to the cardiac cells, a **myocardial infarction (MI)** occurs. With rapid intervention, the amount of infarcted tissue can be limited.

Etiology

A major factor in the development of CAD is atherosclerosis, in which plaque containing cholesterol and lipids is laid down within the walls of the arteries as fatty streaks. Plaque can occur in the cerebral vessels, the aorta, and arteries other than the coronaries. Coronary arteries are smaller, and narrowing here produces symptoms sooner than in the larger vessels. **Atherosclerosis** is one form of arteriosclerosis. **Arteriosclerosis** is a general term for disorders that cause thickening and loss of elasticity of the arteries.

Factors such as age (older than 40 years), gender, and race contribute to the disease; however, these characteristics cannot be modified. Those who have had one or more immediate family members develop or die of coronary artery disease during middle age are considered to be at high risk for the disorder. Postmenopausal women and women who use oral contraceptives or hormone replacement therapy are at greater risk of coronary artery disease than are women outside these categories.

Cultural Considerations

Ethnicity and Coronary Artery Disease

The incidence of coronary artery disease is disproportionately higher in African Americans, especially African American males. Research continues to determine the etiology of this finding and the approaches to decrease the incidence. Ethnicity-based treatment of heart disease is also explored, because research has demonstrated that some classifications of medications are more effective for persons of diverse ethnicity.

Pathophysiology

The process of atherosclerosis begins during late childhood, when streaks or islands of fatty material are laid down on the inner walls of the arteries. Low-density lipoprotein (LDL) is the major contributing factor to the formation of this fatty material. Plaques accumulate, particularly where there has been irritation or inflammation of the blood vessel from smoking, hypertension, diabetes, or infection. Later, the plaques become fibrous as a result of inflammation and healing. The plaque area protrudes into the artery, decreasing the vessel's size ([Figure 20-1](#)). Over time, the plaque begins to calcify, causing rigidity of the vessel wall. The further narrowing of the coronary arteries causes **coronary insufficiency** (decreased or insufficient blood flow). Obstruction occurs from this process and from thrombosis. Arterial spasm may contribute to deficient blood flow and consequent heart muscle damage.

Older Adult Care Points

Compared with the coronary blood flow in a 25-year-old, coronary blood flow in a 60-year-old is decreased. Older adults have less cardiac reserve, meaning that any added oxygen demands may compromise the coronary circulation and the heart's ability to pump properly.

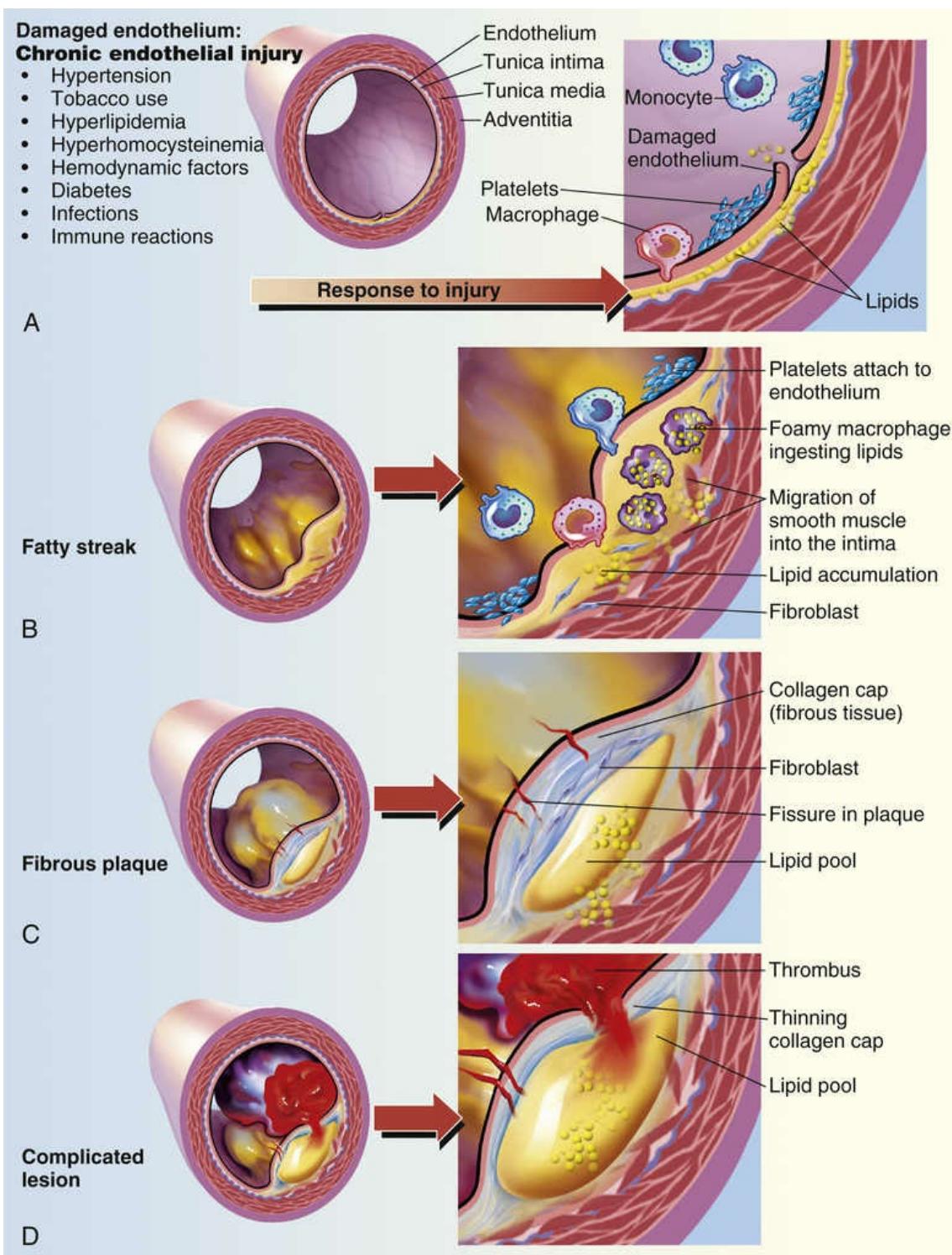


FIGURE 20-1 Progression of atherosclerosis. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 8, St. Louis, 2011, Mosby.)

There is a proven link between hyperlipidemia or high levels of LDL and triglycerides and atherosclerosis. High levels of homocysteine and episodes of inflammation causing an elevated level of C-reactive protein (CRP) are also factors in the development of atherosclerosis. Studies are currently investigating the use of anti-inflammatory and immunosuppressive agents as a treatment to inhibit plaque formation ([Moreira et al, 2015](#)).

As coronary artery disease progresses, the coronary vessels become narrower, decreasing blood supply to the myocardium. When plaque areas rupture, the rough edges cause platelet clumping and clotting (thrombosis). In women the blockages tend to occur in the very small arteries that

branch out from the coronary arteries. This is called *microvascular disease* (MVD; AHA, 2014). This lack of blood supply leads to ischemia and eventually **necrosis** (cell death) of the myocardium. If significant loss of muscle tissue occurs (MI), the heart muscle is unable to pump effectively, and cardiac output is reduced. Cardiac dysrhythmias and death may occur if medical intervention is not obtained.

Signs and Symptoms

Signs and symptoms of CAD are related to the lack of oxygen supply to the myocardium and inability of the heart to pump blood effectively to oxygenate tissues and cells (Box 20-1). Angina pectoris, acute coronary syndrome (ACS), or sudden cardiac death may occur.

Box 20-1

Signs and Symptoms of Coronary Artery Disease

- Chest discomfort, including feeling of tightness, aching, burning
- Chest pain (angina pectoris) radiating to the arm, jaw, or back
- Dyspnea (shortness of breath)
- Palpitations or tachycardia
- Nausea and vomiting
- Cold, clammy skin
- Undue fatigue (particularly in women)
- Weakness and inability to complete usual activities without chest pain or dyspnea

The condition is called *stable angina* when symptoms only appear with activity. *Unstable angina* occurs when symptoms occur even at rest. *Acute coronary syndrome* occurs when ischemic symptoms are prolonged and are not quickly relieved. It is an umbrella term for unstable angina and acute ischemic MI with or without ST-segment elevation on the electrocardiogram (ECG).

Diagnosis

Diagnosis of coronary artery disease is accomplished through tests such as ECG, echocardiogram, cardiac stress test, cardiac angiography (cardiac catheterization), cardiac computed tomography (CT) for calcium index, CT angiogram, or magnetic resonance angiogram.

Treatment

A low-fat diet, weight control, and exercise are prescribed to lower cholesterol and total lipids (Eckel et al, 2013). If elevated cholesterol and triglyceride levels cannot be lowered by a low-fat diet and exercise, lipid-lowering drugs are prescribed (Table 20-1). These medications are not effective alone and may not reduce cholesterol levels to a point of eliminating the risk for CAD. Several herbs and supplements have shown the ability to lower cholesterol. Advise patients to consult with their provider before taking over-the-counter medications or herbs.

 **Table 20-1**

Drugs Commonly Used to Treat Hypercholesterolemia

DRUG	ACTION	COMMON SIDE EFFECTS	USUAL ADULT DOSAGE	NURSING INTERVENTIONS
Bile Acid Sequestrants				
Cholestyramine (Questran, Locholest, Prevate) Colestipol (Colestid) Colesevelam (Welchol)	Bind bile acid in the GI tract, resulting in decreased absorption of cholesterol	Abdominal pain, constipation, nausea	4 g PO once or twice per day	Instruct patient to take before meals. Instruct to mix with 4–6 oz liquid. Advise drug may cause constipation and to increase fluid intake if not contraindicated. Counsel patient to continue low-fat diet and exercise.

Fibrin Acid Derivatives				
Gemfibrozil (Lopid) Clofibrate (Atromid) Fenofibrate (Tricor, Antara, Lipofen, Triglide, Trilipix) Lovaza	Reduce triglyceride production by the liver	Abdominal pain, diarrhea, epigastric pain	500 mg PO 4 times/day	Encourage to keep appointments for follow-up laboratory studies. Encourage to notify provider if symptoms of side effects occur.
HMG-CoA Reductase Inhibitors (Statins)				
Atorvastatin (Lipitor) Lovastatin (Mevacor) Fluvastatin (Lescol) Simvastatin (Zocor) Rosuvastatin (Crestor) Pitavastatin (Livalio) Pravastatin (Pravachol)	Inhibit the enzyme HMG-CoA reductase, which is responsible for synthesis of cholesterol	Abdominal pain, constipation, diarrhea, flatulence, heartburn, rash	Individual drug dependent	Teach to notify provider if severe muscle pain and weakness occur. Encourage to keep follow-up appointments and have periodic laboratory work performed. Pregnancy category X. Advise female patients to notify provider immediately if pregnancy is suspected. Notify provider of alcohol intake. May be at risk for liver disease.
Cholesterol Absorption Inhibitor				
Ezetimibe (Zetia)	Inhibit intestinal absorption of cholesterol	Possible headache and mild GI distress; infrequent	10 mg daily	Can be used along with other statins. Do not use for those with active liver disease. Take bile acid sequestrant 2 hr before or 4 hr after this drug. Obtain periodic lipid levels and liver function enzymes.
Niacin: Contains Nicotinic Acid				
Niacin (Nicobid, Nicotinex, Niacor, Slo-Niacin, Novo-Niacin)	Inhibit formation and secretion of VLDL and LDL	Flushing and itching of face and upper body, nausea and vomiting, indigestion, orthostatic hypotension	1-2 g/day in divided doses Start with 150 mg bid for 7 days and then gradually increase	Monitor liver function when patient is taking high doses. Instruct to take aspirin or NSAID 30-60 min before dose to decrease flushing. Take niacin with food. Increase folic acid intake if homocysteine levels rise.

GI, Gastrointestinal; HMG-CoA, 3-hydroxy-3-methylglutaryl coenzyme A; LDL, low-density lipoprotein; NSAID, nonsteroidal anti-inflammatory drug; VLDL, very low-density lipoprotein.

Complementary and Alternative Therapies

Herbs and Supplements That Naturally Lower Cholesterol

The following have been found to lower cholesterol in patients with hyperlipidemia:

- Garlic
- Omega-3 fatty acids
- Red rice yeast
- Milk thistle
- Fiber
- Phytosterols
- Soy
- Coenzyme Q₁₀

Patients who choose to use these substances should check for interactions with other medications they are taking. Some of the substances only lower cholesterol and LDL; others raise high-density lipoprotein (HDL).

Nursing Management

Patients should be encouraged to adopt a healthy lifestyle, including exercise and a diet low in saturated fat. Obtain a referral to a dietitian and assist the patient by reinforcing the need for changes in dietary habits. A cardiac rehabilitation program referral is very helpful. The program will help the patient choose an exercise regimen that he can manage on a long-term basis. Emphasize the importance of maintaining a normal body weight.

If the patient is on a statin drug to lower cholesterol, remind him that he needs to have blood drawn periodically to determine whether the drug is effective and to monitor for serious side effects.

Nutrition Considerations

Ways to Lower Fat and Cholesterol in the Diet

Teach the patient to:

- Avoid all fried foods; trim fat from meat and stick to 3-oz portions of meat per meal (a piece the size of a deck of cards). Remove skin from poultry.
- Eat fish with omega-3 fatty acids at least twice a week (salmon, mackerel, tuna).
- Use egg whites or Egg Beaters as cholesterol-free egg substitutes, both for breakfast and in recipes.
- Decrease or eliminate all commercial baked goods containing *trans* fat, saturated fat, or high levels of fat. Check the labels. Pies, doughnuts, croissants, and pastries are very high in fat.
- Use unsaturated fats for home baking and cooking. Avoid palm oil, coconut oil, lard, bacon fat, and hydrogenated vegetable shortening. Use olive oil whenever possible in salad dressings and for cooking. Do not use cube margarine that contains *trans* fats.
- Microwave bacon on paper towels to decrease the amount of fat; use turkey bacon rather than pork bacon.
- Check the amount of fat in cheeses and choose the lower-fat varieties. Eat only small amounts of cheese.
- Drink nonfat milk and use a nondairy, no-cholesterol creamer if you must have creamer in your coffee.
- Decrease the use of all dairy products and use only the low-fat or nonfat varieties.
- Eat more high-fiber whole grains, fruits, and vegetables.

Clinical Cues

- Because statins can injure muscle tissue and are toxic to the liver in some patients, blood should be drawn for levels of creatinine kinase (CK; an enzyme released from damaged muscle) and for liver enzymes. Elevated liver enzymes may indicate toxic damage to the liver.
- Patients should be told to report any unexplained muscle tenderness or pain persisting for more than a few days. When a statin drug is started, baseline blood values should be obtained before therapy. Laboratory tests for liver enzymes are recommended at the start of therapy and only when clinically indicated. Grapefruit juice should not be consumed when taking a statin drug. Grapefruit juice interferes with the metabolism of the drug, which can lead to increased serum levels and risk of toxicity ([FDA, 2012](#)).

Angina Pectoris

Angina pectoris (chest pain) occurs when blood supply to the heart is decreased or totally obstructed. The ischemia (inadequate blood and oxygen supply) of the heart tissue causes pain. Angina may be caused by vessel narrowing due to atherosclerosis or arterial spasm (sudden constriction). Any activity that increases the heart's workload increases its need for oxygen. When the narrowed coronary arteries cannot deliver adequate amounts of blood to meet normal needs, the patient experiences an angina attack.

Signs, Symptoms, and Diagnosis

Anginal pain or discomfort may vary in individuals, but in most cases it is described as a dull pressure or ache under the sternum or pain that radiates to the neck or jaw. The pain may also radiate down one or both arms. Angina sensation is seldom sharp or stabbing. The feeling may be described as suffocating. The pain can occur between the shoulder blades. In women, there may be no chest pain, but just a tenderness to touch or a burning or tingling sensation. Patients may think

they are experiencing indigestion or esophageal reflux. Shortness of breath without chest discomfort may also occur.

Stable coronary artery disease (SCAD) (formerly called stable angina) can be induced by stressors such as exercise or emotion. It can also occur spontaneously. Coronary artery disease is an ongoing process unless interrupted by change in lifestyle and medications. Although stages of the disease have had various labels, the symptoms exhibited are not a true reflection of the underlying pathology. Very low levels of troponin are found when high sensitivity tests are performed for patients with SCAD. Any patient exhibiting angina symptoms should be evaluated by a provider.

Medical diagnosis is established on the basis of history, clinical signs and symptoms, and diagnostic testing. Response of the heart muscle to increased oxygen demands can be determined by exercise stress testing in a stable patient. If noninvasive testing is positive, cardiac catheterization with coronary angiography may be performed (Figure 20-2). Echocardiography may be ordered to rule out a valve disorder or to evaluate left ventricular function. Laboratory levels of blood lipids will be tested, and cardiac enzymes may be ordered to rule out an MI. An electrocardiogram is a standard diagnostic procedure.

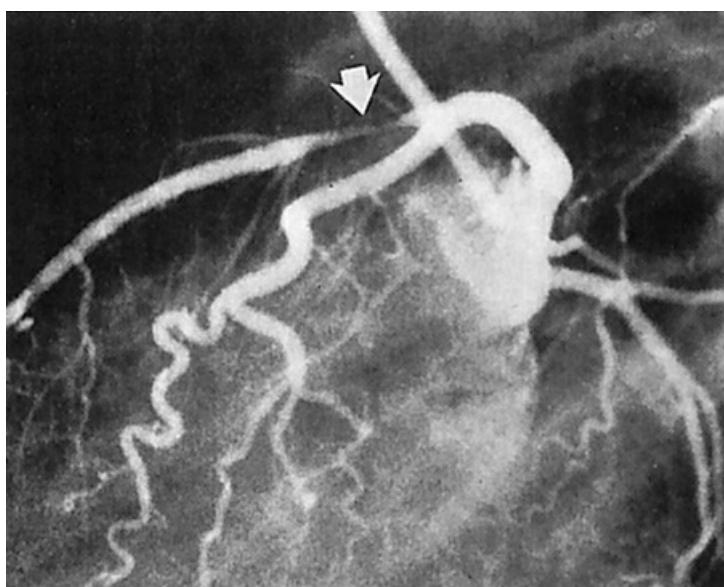


FIGURE 20-2 Stenosis (arrow) of the left anterior descending coronary artery. (From Chabner DA: *The language of medicine*, ed. 6, Philadelphia, 2001, Saunders.)

Treatment

The treatment of SCAD is mostly symptomatic, with emphasis on eliminating those factors that are known to precipitate an attack in the individual patient. With guidance and teaching, the patient may soon be able to correlate certain activities with an attack and thereby learn to avoid one whenever possible. Nitroglycerin, nitrates, calcium antagonists, and beta blockers are used in combination with drugs to lower cholesterol and prevent platelet aggregation. A low daily dose of aspirin (81 mg up to 325 mg) or other antiplatelet medication such as clopidogrel (Plavix) may be prescribed for the treatment of SCAD. Antiplatelet medications help prevent clotting and may prevent a thrombus that could cause an MI. Nitroglycerin administered sublingually is the most common drug for treatment of angina. An aerosol spray and a buccal form of the drug are also available.

Nursing Management

Collect data that assist in determining the type of angina the patient is experiencing. Patients with a history of angina may experience increased episodes when exposed to very cold environments. Externally cold temperatures result in vasoconstriction. The patient should be instructed to wear warm clothing when exposed to cold and may consider remaining indoors when the weather is extremely chilly. Nursing interventions for selected problems related to SCAD are summarized in

Nursing Care Plan 20-1.

Clinical Cues

Sublingual nitroglycerin tablets should be kept in a cool, dark place and should be carried by the patient at all times. Patients should frequently check the expiration date on the bottle and replace the nitroglycerin tablets accordingly. If the mouth is dry, a sip of water should be taken before placing the tablet under the tongue. If possible, the patient should lie down when using nitroglycerin. After taking the first dose, if the pain has not subsided, emergency services should be contacted. In the hospital, a baseline blood pressure should be measured, a tablet given, and then the pressure should be checked again in 5 minutes. If the pain has not eased or the pressure has risen, another tablet is placed under the tongue. Check the blood pressure again in 5 minutes. The blood pressure will likely decrease. If the blood pressure has not decreased significantly and if the pain is still present, administer a third sublingual tablet. Notify the provider immediately if the pain worsens or does not resolve after the three tablets. If oxygen is available, administer it according to hospital policy while waiting for communication from the provider. See the Evolve website for *Healthy People 2020* objectives to decrease the incidence of heart disease.

Nursing Care Plan 20-1

Care of the Patient With Angina

Scenario

Mrs. Ralston, age 63 years, is admitted to the telemetry unit. She has a history of chest pain and dyspnea precipitated by physical or emotional exertion. Her BMI is 30, and she has a history of smoking two packs of cigarettes per day for 40 years. She is admitted for unstable angina and evaluation of cardiac status. Cardiac enzymes are negative for MI.

Problem Statement/Nursing Diagnosis

Acute pain/Acute pain due to cardiac ischemia.

Supporting Assessment Data

Subjective: States she took five nitroglycerin tablets before admission with no relief of chest pain.

Objective: BP 100/70, HR 90, R 26. O₂ sat 92% on 5 L oxygen via nasal cannula.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Pain will be relieved within 15 min.	Assess level and duration of angina.	Determine severity of pain and need for additional intervention	Pain relieved after two nitroglycerin tablets 5 min apart.
	Teach to notify nurse and lie down and rest when pain occurs.	Early intervention for pain relief and assessment of change in condition	Nurse notified within 5 min of onset of pain.
	Assess vital signs during episodes of angina and medication administration.	Recognize side effects, such as hypotension and patient's response to treatment	Blood pressure maintained within 4 mm Hg of beginning of episode.
	Apply oxygen to maintain O ₂ saturation greater than 95%.	Increases available oxygen to cardiac muscle	Saturation 96% on 3 L nasal cannula oxygen.

Problem Statement/Nursing Diagnosis

Anxiety/Anxiety related to diagnostic tests and recurrent chest pain.

Supporting Assessment Data

Subjective: Asks, "Are you sure I didn't have a heart attack this time?"

Objective: Scheduled for cardiac catheterization in the A.M.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize that anxiety has decreased within 12 hr.	Assess level of anxiety. Administer medication if appropriate.	Increased anxiety can precipitate episodes of angina.	States is less anxious.
	Allow patient opportunity to express concerns.	Active listening will help reduce patient's anxiety.	Patient verbalized fear of dying from heart attack or complications of procedures.
Patient will verbalize understanding of cardiac catheterization.	Provide information related to cardiac catheterization.	Adults desire straightforward information concerning their medical status.	Verbalized understanding of procedure. Some anxiety.
	Answer questions or refer to appropriate health care provider as needed.	Provides level of control for decision making.	Reevaluate and continue plan.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/Deficient knowledge due to lack of understanding regarding effect of diet on medical condition or methods to improve cardiac health.

Supporting Assessment Data

Subjective: "I just can't exercise, and I don't understand how to choose and cook foods without salt or frying."

Objective: Wt. 195 lb, elevated cholesterol, resting HR 98.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
By discharge, patient will be able to verbalize how to choose foods that are low in fat and sodium.	Assess current knowledge of food content and reading food labels. Refer for outpatient dietitian consult.	Provides starting point for teaching. Expert knowledge of dietitian needed to determine caloric needs and develop nutrition plan.	Patient able to choose low-fat and low-sodium foods from a menu list. States has dietitian consultation appointment.
Patient will establish regular exercise program. Patient will learn a new method of stress reduction.	Determine whether patient is candidate for cardiac rehabilitation program. Make referral after collaboration with provider. Reevaluate plan, refer to social services for assistance with financial concerns. Collaborate with patient and provider about evaluation of emotional status that may interfere with ability to remain compliant.	Provide structured, monitored exercise program that also includes dietary and emotional counseling. Social workers can assist with financial resources. Stress reduction will help her cardiac status as well as allow her to focus on maintaining her exercise program.	States she will consider participation in a cardiac rehabilitation program if funds are available. Contacted social services for consultation. Patient states that she will use meditation to help calm herself down so she can participate fully in her treatment plan.

Problem Statement/Nursing Diagnosis

Potential for injury/Risk for injury due to continued cigarette smoking.

Supporting Assessment Data

Subjective: "I have tried to quit smoking but it just doesn't work."

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will agree to enter a community smoking cessation program.	Assess willingness to reduce amount of or stop smoking. Teach complications related to heart disease and smoking.	Patient must be internally motivated for optimal success. Provide understanding of role of smoking and vasoconstriction that lead to episodes of angina.	Patient states she had tried many times to stop smoking with limited success. States she understands need to quit smoking and the effect smoking has on her health.
	Refer to social services for community programs available; give a smoking cessation packet of information.	Social services personnel are aware of community resources that can benefit patient care.	Identified smoking cessation program within patient's neighborhood in nearby church. Patient states she will contact program before discharge.

Critical Thinking Questions

1. What are five risk factors for coronary artery disease? What are complications?
2. Provide a teaching plan for a patient with angina. Include commonly used medications and side effects.
3. What is the most commonly used medication for angina/chest pain? How should it be administered?
4. What information would be helpful to know in regards to Mrs. Ralston's living situation?

BMI, Body mass index; *MI*, myocardial infarction; *PO*, orally.

Acute Coronary Syndrome and Myocardial Infarction

If ischemia is prolonged and not quickly reversed, acute coronary syndrome (ACS) occurs. ACS includes unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI). All patients with heart disease should be taught the signs of MI and be advised that the best survival rate is directly related to obtaining medical attention as quickly as possible. About 620,000 Americans experience an MI annually. Although males outnumber females, females die more frequently after an MI. According to the American Heart Association, heart disease is the leading cause of death among American women, claiming about 379,559 lives each year. The incidence of heart disease, including MI, continues to rise among women. Women are more likely to experience heart attacks after reaching menopause; however,

poor dietary habits, sedentary lifestyle, and increased levels of stress contribute to the development of cardiovascular disease earlier in life for an increasing number of women.

Patient Teaching

Guidelines for Patients With Angina

Patients who experience anginal attacks are taught to:

- Avoid eating heavy meals.
- Avoid physical activity for an hour after meals to prevent excessive oxygen demands.
- Take nitroglycerin before heavy physical activity that is known to cause an attack, such as intercourse or sports activities.
- Avoid exposure to cold; do not walk into a cold wind.
- Decrease controllable risk factors, such as lifestyle stress, obesity, hypertension, and improper diet.
- Adopt a graduated exercise program.
- Stop smoking.
- Learn meditation or other deep relaxation techniques.
- Take a sublingual nitroglycerin tablet and lie down at the beginning of an anginal attack. Make certain that the tablet produces a tingling sensation where it contacts the mucous membrane. If the pain does not ease or go away after the first dose, call 911. Nitroglycerin may be repeated twice more at 5-minute intervals for a total of three tablets if the pain persists.
- Check the pulse rate once daily if taking a calcium channel blocker or a beta-adrenergic blocker. These drugs should never be stopped abruptly; call the provider if the heart rate drops below 60 beats per minute.
- Rise slowly from a supine or sitting position because of potential postural hypotension.
- Cleanse area of previous application of nitroglycerin patch when applying a new dose.
- Keep appointments for regular checkups.
- Obtain sufficient rest daily.
- Avoid high environmental temperatures and high humidity; stay in air-conditioned areas when such conditions occur, because they increase cardiac workload.
- Nitrates may initially cause a headache and hypotension.

Etiology and Pathophysiology

An MI is usually caused by thrombosis resulting from a ruptured atherosclerotic plaque. Sustained arterial spasm can produce angina pain or even MI. The pathophysiology is not understood completely, but there is thought to be more than one mechanism. Whatever the cause, blood flow is stopped to a portion of the myocardium. MI occurs most often in those older than 45 years.

An **infarction** is an area of necrosis in tissue caused by an obstruction to the flow of blood to that area for a prolonged period ([Figure 20-3](#)). In an MI, there is an area of necrosis (cell death) in the heart muscle. That portion of the heart muscle cannot contract normally to help pump blood out of the heart. Dead tissue does not return to normal, and scar tissue forms and interferes with the normal functions of pumping and electrical conduction. The prognosis for patients who experience

an acute MI depends on the location and the amount of heart tissue that is damaged. If a large area of the heart is affected, instant death may occur. Smaller ischemic areas may heal if treated promptly and effectively. As the coronary vessels narrow over time, small blood vessels are formed that supply oxygen to the myocardium. A patient with a well-established collateral circulation may experience a milder heart attack with fewer complications. Most MIs occur in the left ventricle, the main “pump.” Significant amounts of myocardial tissue injury cause a poorly functioning pump, leading to heart failure (HF).

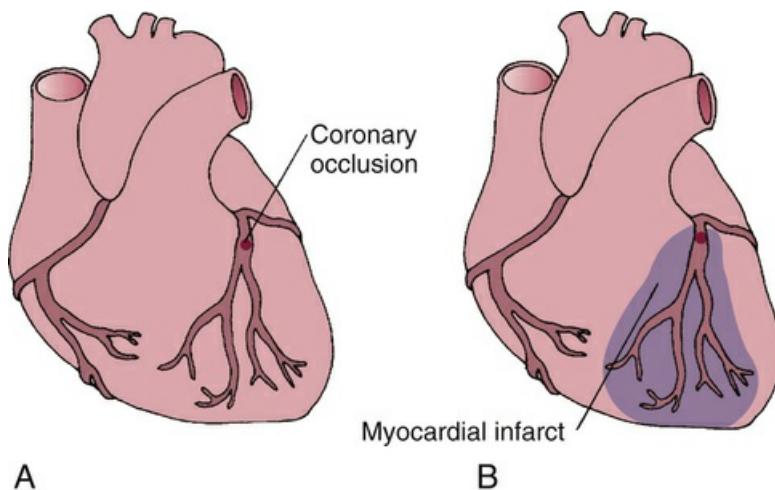


FIGURE 20-3 Occlusion of a major coronary artery (**A**) leads to area of infarct (**B**) resulting from ischemia.

Signs and Symptoms

Classically, during an MI there is a sudden, severe pain in the chest, usually described as tightness, pressure, squeezing, or crushing, that is not relieved by nitrates or rest. The patient also shows symptoms of dyspnea; nausea with or without vomiting; wheezing; and ashen, clammy, cool skin. Signs of shock with pallor, profuse sweating, and anxiety may occur. The heart rate may be very fast (tachycardia) or very slow (bradycardia), or the pulse may be irregular. In older adults, the attack may manifest as fatigue, syncope (temporary loss of consciousness), or weakness. Women often complain of recent episodes of extreme fatigue, with inability to complete daily activities without prolonged rest periods. These episodes may be accompanied by chest pressure, followed by eventual return to a full energy state. Feelings of “indigestion” are common. **Women tend to present with atypical symptoms such as sharp pain, fatigue, and weakness during an MI.** Denial is a significant factor in not seeking quick treatment and can lead to increased heart damage (Zafari, 2014).

Although these symptoms are usually present in an acute MI, they are not always severe, and in some cases patients have described their pain as mild. Sometimes the patient only experiences pain in the left arm, jaw, or back. Some people experience a “silent” MI, in which no symptoms are perceived. **It is paramount for the patient to seek quick medical attention when experiencing any new onset of chest pain.** The window of time to prevent significant myocardial damage is narrow (about 6 hours), and the sooner medical treatment is started for an MI, the greater the chance of saving myocardium and preserving life.

Older Adult Care Points

Older adult patients may never complain of chest pain when having an MI. Associated symptoms such as indigestion, nausea, dyspnea, and confusion are more common complaints.

Diagnosis

An ECG will be performed promptly when a patient is having symptoms that could be ACS. STEMI or NSTEMI will be ruled in or ruled out based on the ECG. Changes occur in the QRS complex, ST

segment, and T wave when ischemia or damaged tissue occurs. The severity of the symptoms will depend on the size of the area of ischemia or infarction. A chest x-ray will rule out other possible causes of the symptoms such as a thoracic aortic aneurysm. When there is necrotic tissue anywhere in the body, the white cell count increases and the sedimentation rate rises. Within 24 hours of an acute attack, the temperature of the patient with MI rises slightly, and mild leukocytosis appears.

In addition to the clinical manifestations, ECG changes, and other diagnostic tests, laboratory determinations of specific enzymes are used to establish a diagnosis of MI and evaluate the extent of damage done to the heart muscle (Table 20-2). Troponin levels are the preferred biomarker for diagnosis. Serum troponin T and troponin I are elevated within a few hours of MI. Troponin is found only in cardiac tissue. CK isoenzymes, lactic dehydrogenase (LDH), and LDH isoenzyme levels are observed over a 72-hour period. The CK is fractionalized into CK-MB, an enzyme that is only found in heart muscle. Other isoenzymes are CK-MM, found in skeletal muscle, and CK-BB, found in brain tissue. The level of CK-MB rises in 4 to 8 hours and begins to decline in 12 to 24 hours; LDH level increases 24 to 48 hours after an MI and stays high for up to 2 weeks. The most significant laboratory finding for diagnosis of MI is an elevated troponin level, especially if accompanied by an elevated CK-MB. Myoglobin levels rise with cardiac damage and do not diagnose MI but can rule out MI.

Table 20-2
Tests Performed to Determine Myocardial Infarction

	NORMAL VALUE	SIGNIFICANCE OF ABNORMAL VALUE
Troponin I (Tn I)	<0.3 mcg/L	Specific to heart muscle damage. Levels may elevate within 4-6 hr after MI, peak within 10-24 hr, and return to normal levels within 10 days.
Troponin T (Tn T)	<0.1 mcg/L	
CPK (creatinine phosphokinase)	Men: 55-170 international units/L Women: 30-135 international units/L	Elevated within 4-8 hr after heart attack (may also rise with injury to other muscles). Peaks within 12-24 hr, returns to normal levels within 3-4 days.
CK-MB	<3 ng/mL	Elevates within 2-6 hr after an MI, peaks within 12-24 hr, and returns to normal within 3 days. CK-MB is specific to myocardial injury.
Myoglobin	0-85 ng/mL	Detects muscle damage to myocardium. Presence of myoglobin is not diagnostic of MI, but absence of myoglobin rules out MI.

Other laboratory tests are listed in Table 17-2.

CK, Creatinine kinase.

Cardiac catheterization with angiography may be performed soon after the patient is admitted to the emergency department if MI is the probable diagnosis. This provides immediate, definitive diagnosis and treatment for occluded vessels. Thoroughly assess the status of the patient after cardiac catheterization. The patient may be up and about within 2 to 4 hours when an arterial closure device is used to seal the procedure site. Distal pulses on the affected leg must be assessed frequently, and the groin area must be assessed for the presence of hemorrhage or a hematoma. Renal function should be monitored because of potential adverse effects of contrast dyes used during the procedure.

Safety Alert

Intravenous Contrast (Dye)

If the patient is diabetic and takes metformin, hold the drug before the contrast-dye procedure. If the procedure is done as an emergency, metformin should be held for 3 days afterward. Metformin and contrast have an adverse effect on kidney function. When any patient has received contrast for a diagnostic test, promote good hydration either by oral or intravenous (IV) fluids. Keeping the patient hydrated will increase the rate of urine flow, dilute the urine, and help prevent kidney damage as the contrast is excreted.

Magnetic resonance imaging (MRI), echocardiography, and a technetium-99m sestamibi scan may be performed to determine whether there is myocardial dysfunction.

Think Critically

How would you prepare the patient who has experienced a probable MI for the diagnostic tests he will most likely undergo? What teaching is required?

Treatment

In many areas of the United States, there are specially designed and equipped mobile units staffed with trained personnel to give immediate care to the patient who has had a heart attack. Chewing and swallowing an aspirin when signs of an MI occur has been adopted as part of the emergency treatment protocol to decrease or prevent heart damage by decreasing platelet aggregation ([Amsterdam and Wenger, 2015](#)).

Outside the hospital, a trained emergency medical team should be called immediately. If the patient shows signs of cardiac or respiratory arrest, help should be called and cardiopulmonary resuscitation (CPR) with defibrillation, if indicated, should be started immediately. Many public areas, such as airports and shopping malls, have automated external defibrillators (AEDs) available which can be used by individuals trained in CPR. The AED will detect and treat possible shockable rhythms until emergency personnel are on the scene and take over care.

As soon as a patient with an acute MI is brought to the emergency department, measures are taken to relieve pain, decrease ischemia, and prevent further circulatory collapse and shock. The MONA (morphine, oxygen, nitrates, aspirin) regimen is initiated. Oxygen via nasal cannula or mask is started, IV access is obtained for administration of fluids and emergency drugs, and the patient is placed on a cardiac monitor. The Joint Commission has Core Measures in place for patients admitted with an MI ([Box 20-2](#)).

Think Critically

A patient has chest pain. The provider orders laboratory studies. Which results may indicate MI versus an episode of angina?

Box 20-2

The Joint Commission Core Measures for Myocardial Infarction

- Aspirin administered upon arrival at the hospital
- Beta blocker started within 24 hours of arrival
- Thrombolytic agent administered within 30 minutes of hospital arrival or percutaneous coronary intervention (PCI) within 90 minutes of arrival
- Aspirin or other antiplatelet therapy at discharge
- Beta-blocker therapy continued at discharge
- Angiotensin-converting enzyme (ACE) inhibitor or angiotensin-receptor blocker (ARB) therapy at discharge for left ventricular ejection fraction <40%

Sublingual nitroglycerin is given unless contraindicated. Drugs administered IV to control pain in a patient with acute MI are morphine sulfate or hydromorphone hydrochloride (Dilaudid). Morphine is the drug of choice because of its vasodilation property. **Pain medication given IV has a shorter duration, and doses must be repeated more frequently to keep the patient comfortable.** A bolus of heparin will be given and a heparin drip started to prevent the clot from enlarging. A nitrate infusion also may be started. Antidysrhythmia drugs are given as indicated by abnormal ECG rhythms. Oxygen is administered. Close assessment of respiration is essential, because the drugs for pain can depress respiration at a time when the heart's oxygen demand is increased. Pulse oximetry is instituted quickly to measure oxygen saturation.

If there is ST-segment elevation and the clinical picture indicates that there is complete occlusion of a coronary artery, the patient may immediately undergo cardiac catheterization and balloon angioplasty with placement of stents to restore blood flow. In many communities, facilities with cardiac catheterization capabilities may be designated as STEMI-receiving hospitals. Protocols are in place to fast track the diagnosis and mobilization of intervention teams to quickly treat a patient

experiencing an MI. If cardiac catheterization is not available, thrombolytic therapy may be considered to dissolve the clot occluding the coronary artery.

Thrombolytic therapy is started preferably within 6 hours but can be given up to 12 hours after the onset of symptoms to prevent necrosis of the myocardium and is indicated when the ECG shows ST-segment elevation (Rivera-Bou, 2014). To meet the Core Measure standard thrombolytics should be given within 30 minutes of arrival to the hospital. Agents used intravenously to dissolve the clot include alteplase (t-PA, Activase), tenecteplase (TNKase), and reteplase (Retavase). These drugs are contraindicated in patients who have severe, uncontrolled hypertension or a history of a hemorrhagic stroke, gastrointestinal (GI) bleed, intracranial or intraspinal surgery within the past 2 months, a brain tumor, arteriovenous malformation, or aneurysm. After one of these agents is infused, a heparin drip may be started to prevent reocclusion. When a patient is not a candidate for thrombolytic therapy, heparin and low-dose aspirin may be administered to prevent further thrombosis.

Think Critically

How would you explain the thrombolytic therapy used when a patient has acute coronary occlusion?

Nursing Management

In the acute phase of MI, nursing care is directed toward:

- Relieving pain.
- Administering ordered medical therapy and observing for side effects.
- Monitoring for signs of complications of MI, such as dysrhythmia, HF, pulmonary edema, pericarditis, cardiogenic shock, or cardiac arrest ([Table 20-3](#)).

Table 20-3
Signs and Symptoms of Complications After Myocardial Infarction

COMPLICATION	SIGNS AND SYMPTOMS
Dysrhythmia	Irregular pulse; abnormal ECG pattern. Ventricular fibrillation is the most common complication after MI. Report more than six PVCs per minute, heart rate of >120 or <40 bpm.
Heart failure (HF)	Dyspnea; pedal edema; sacral edema; crackles in lung bases; distended neck veins; enlarged, tender liver; weight gain of more than 2 lb in 24 hr; pulmonary edema.
Cardiogenic shock	Significant drop in systolic blood pressure (>20 points); diaphoresis; rapid pulse; cold, clammy skin; gray skin; restlessness.
Papillary muscle dysfunction	Mitral valve regurgitation with systolic murmur; dyspnea, pulmonary edema, and decreased cardiac output.
Ventricular aneurysm	Outpouching of ventricular wall may cause HF, dysrhythmias, and angina. May cause formation of thrombi that lead to a stroke.
Pericarditis	Pericardial friction rub on auscultation; chest pain aggravated by movement and lessened by sitting up and leaning forward.
Dressler syndrome	Occurs 4-6 weeks after MI. Chest pain, fever, friction rub, pleural effusion, and arthralgia.

bpm, Beats per minute; ECG, electrocardiogram; MI, myocardial infarction; PVCs, premature ventricular contractions.

- Maintaining a patent IV access at all times

In the recovery phase of MI, nursing care is directed toward:

- Decreasing anxiety and stress for the patient. Explain the function of all equipment and tests in simple terms. Explain the routine of frequent assessment and tests so the patient will know what to expect. Decreasing the family's anxiety by reinforcing what the provider has told them about the patient's condition and treatment.
- Monitoring physical status by performing a thorough cardiovascular assessment every 4 to 8 hours and monitoring vital signs every 2 to 4 hours.
- Recording daily weight and comparing with previous weight. Intake and output are accurately recorded and compared with previous amounts.
- Promoting rest.
- Monitoring tolerance of activities of daily living (ADLs) and ambulation.
- Assisting with rehabilitation activities.

Patients with damage to the myocardium are admitted to the critical care unit (CCU), or telemetry where they are initially kept on bed rest. Physical activity is gradually increased according to the patient's individual condition and response to activity. An IV line or a saline lock is maintained to provide a route for administration of emergency drugs to control blood pressure and

dysrhythmias.

Vital signs and SpO₂ are continuously monitored by electronic means and are assessed every 15 minutes to 2 hours. The temperature may be slightly elevated. Continuous ECG monitoring is essential to provide an accurate evaluation of the status of the heart. If death occurs it is most likely within the first 24 hours of an MI and is caused by ventricular fibrillation.

While in the CCU, if hemodynamic instability is present a pulmonary artery flow-directed catheter (Swan-Ganz type) may be inserted to monitor central venous pressure (CVP), pulmonary artery pressure (PAP), pulmonary capillary wedge pressure (PCWP), and cardiac output, which give a better picture of the injured heart's ability to pump. A heart-healthy diet is ordered when the patient's vital signs have stabilized. A stool softener is given to decrease the risk of bradycardia, which can be caused by straining to have a bowel movement. Potassium and magnesium are monitored closely, because imbalances can cause dysrhythmias. Medication to correct dysrhythmia is given as needed (see [Box 20-4](#)). A beta-adrenergic blocker, such as metoprolol (Toprol XL, Lopressor), may be ordered to decrease the heart's workload. An angiotensin-converting enzyme (ACE) inhibitor such as captopril (Capoten) may also be given. Oxygen via mask or nasal cannula is administered to maintain SpO₂ 95% or greater. Various IV drugs may be used to regulate blood pressure or to control dysrhythmias. A temporary pacemaker may be inserted if the patient develops a persistent bradycardia causing symptoms of inadequate cardiac output. External pacing patches can be used for emergency pacing. A transvenous temporary pacing wire will be placed as soon as possible. Rare but deadly complications of MI requiring surgical repair are ventral septal defect, a ventricular aneurysm, or papillary muscle rupture.

Cardiogenic Shock

If the left ventricle is badly damaged, cardiogenic shock may occur. Signs and symptoms are those that accompany decreased cardiac output, such as decreased BP, confusion, restlessness, diaphoresis, rapid and thready pulse, increased respiratory rate, cold and clammy skin, and diminishing urinary output to less than 20 mL/hr. The patient is cared for in the CCU, where a variety of drugs aimed at improving cardiac output may be administered.

An intraaortic balloon pump (IABP) may be used to ease the heart's workload while it begins to heal. ([Figure 19-3](#)) This device uses a balloon catheter positioned in the aorta that inflates during diastole and deflates during systole, effectively decreasing the workload of the heart and increasing blood flow through the coronary arteries. Only registered nurses who are certified in the care of patients on an IABP are assigned to care for these patients. See [Chapter 44](#) for further information on shock.

Intermediate Care

When very frequent assessment and monitoring are no longer essential and the patient is able to participate in his personal hygiene activities without detrimental effects on the healing heart tissues, he is transferred out of the CCU into a telemetry, or "step-down," medical unit. For some patients, this move is frightening because they know they will no longer have a nurse giving constant attention. Every effort is made to assure the patient that he is making progress toward recovery and no longer needs intensive care. While the patient is on the telemetry unit, physical activities are gradually increased according to ability to tolerate exercise, as evidenced by stable heart rate, blood pressure, and respiratory rate. There is close monitoring for symptoms of excessive strain on the heart, such as dysrhythmia or dyspnea, or for the development of complications. These measures may minimize damage from an MI, but the patient still has CAD, requires treatment, and must attend to lowering his risk factors.

If the patient received successful thrombolytic therapy or percutaneous cardiac intervention (PCI), he may have averted significant myocardial damage and not require CCU care after the MI. Patients with a STEMI who arrive for treatment before significant left ventricular damage has occurred may be sent to telemetry after PCI and are only hospitalized for 24 to 48 hours. Intensive teaching needs to occur to help the patient access resources to enable the lifestyle changes needed to prevent another MI.

Rehabilitation

A variety of emotional and behavioral responses may occur after an MI ([Box 20-3](#)). The patient and

his family may need help and support as they work to make the necessary adjustments. Many hospitals offer an outpatient cardiac rehabilitation program to help the patient make lifestyle changes to reduce future risk of cardiac problems. The program provides counseling on dietary changes for a heart-healthy diet; stress-reduction techniques; reduction of risk factors, such as avoiding tobacco use; controlling hypertension and diabetes; and a supervised exercise program with continuous ECG monitoring for 4 to 6 weeks. Such programs have been found to be effective in decreasing cardiac death and HF (Wenger, 2013). Progressive, supervised exercise is continued for an additional 6 to 8 weeks, and then a maintenance program is devised that the patient can do independently. A support group consisting of other individuals who have the same condition or have had similar surgery often is available. Most insurance coverage will pay for the exercise program because it has been highly successful in helping people to develop and maintain a healthier lifestyle and to reduce risk factors.

Box 20-3

Emotional and Behavioral Responses to Acute Myocardial Infarction

Denial

- May have history of ignoring symptoms related to heart disease
- Minimizes severity of medical condition
- Ignores activity restrictions
- Avoids discussing MI or its significance

Anger

- Is commonly expressed as, "Why did this happen to me?"
- May be directed at family, staff, or medical regimen

Anxiety and Fear

- Fears death and long-term disability
- Overtly manifests apprehension, restlessness, insomnia, tachycardia
- Less overtly manifests increased verbalization, projection of feelings to others, hypochondriasis
- Fears activity, recurrent heart attacks, and sudden death

Dependency

- Is totally reliant on staff
- Is unwilling to perform tasks or activities unless approved by health care provider
- Wants to be monitored by ECG at all times
- Is hesitant to leave CCU or hospital

Depression

- Experiences mourning period concerning loss of health, altered body function, and changes in lifestyle
- Realizes seriousness of situation

- Begins to worry about future implications of health problem
- Shows manifestations of withdrawal, crying, anorexia, apathy
- May have more evident depression after discharge

Realistic Acceptance

- Focuses on optimum rehabilitation
- Plans changes compatible with altered cardiac function

CCU, Critical care unit; *ECG*, electrocardiogram; *MI*, myocardial infarction.

From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 8, St Louis, 2011, Mosby.

One area of major concern is sexuality. The patient may be fearful of resuming intercourse, thinking that it may cause a heart attack. The partner often has these fears also. Both partners need reassurance that resumption of normal sexual activities will be possible. The patient may need to take a more passive role during intercourse, at least for a while, using alternate positions that cause less strain and less oxygen demand. The patient should be told that the workload of intercourse with a known partner is equal to climbing a flight of stairs. If a flight of stairs can be climbed without much change in heart rate, respirations, or blood pressure, intercourse should not cause harm. The provider should discuss this area with the patient and his partner, but if the provider does not, see that the proper information is given. Sexual dysfunction may be a side effect of some medications.

Patients should be taught to plan sexual activity for times when they are well rested and to avoid an environment that is too hot or too cold. It is best to space such activity at least 2 hours after eating a meal or drinking any alcohol. Nitroglycerin should be used prophylactically if intercourse causes angina symptoms. If angina does occur, the patient should cease activity, place a nitroglycerin tablet under his tongue, lie down, and rest.

Levels of physical activity are designated through **metabolic equivalent (MET) units**. One MET is the amount of oxygen needed by the body at rest. The patient's rehabilitation program slowly progresses stepwise to higher energy expenditures over a period of months (Box 20-4).

Box 20-4

Energy Expenditure in Metabolic Equivalents

Low-Energy Activities (<3 METs or <3 cal/min)

Activities in Hospital

Resting supine

Eating

Washing hands, face

Activities Outside Hospital

Sweeping floor

Painting, seated

Driving a car

Sewing by machine

Moderate-Energy Activities (3-6 METs or 3-5 cal/min)

Activities in Hospital

Sitting on bedside commode

Showering

Using bedpan

Walking at 3 to 4 mph

Activities Outside Hospital

Bricklaying

Ironing, standing

Cycling at 5.5 mph on level ground

Golfing

Dancing

High-Energy Activities (6-8 METs or 6-8 cal/min)

Walking 5 mph

Performing carpentry

Ascending a flight of stairs

Mowing lawn using walking mower

Very-High-Energy Activities (>9 METs or >9 cal/min)

Cross-country skiing

Running faster than 6 mph

Cycling faster than 13 mph

Shoveling heavy snow

cal, Calories; *METs*, metabolic equivalent units; *mph*, miles per hour.

From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St Louis, 2015, Mosby.

Rehabilitation involves three major aspects: (1) a program of increasing activity based on the patient's individual progress and needs; (2) instruction of the patient and family about the nature of the illness and the rationale for every aspect of its management; and (3) assistance to the patient and family as they work toward the goal of accepting the limitations imposed and the changes in lifestyle that may be required. The goal is to have the patient and family continue with heart-healthy living even after the formal program ends.

Patient Teaching

Guidelines for Recovery From an MI

Teach the patient to:

- Recognize the signs of recurrent MI and to seek immediate medical attention should they occur.

These are chest pain, diaphoresis, nausea, and anxiety.

- Adopt a lifetime regular, graduated exercise program.
- Alter controllable risk factors: reach and maintain a normal weight; cease smoking; keep alcohol consumption at a moderate level (no more than 1.5 oz per day); keep cholesterol within normal limits; control hypertension; continue on a low-fat, low-sodium diet individualized to taste.
- Reduce stress and learn relaxation techniques.
- Observe for complications, such as chest pain, irregular pulse rate, dyspnea, and fatigue.
- Take medications as ordered and monitor for side effects.

It is important to stress to the patient that he has control over his rehabilitation and prognosis. He alone has full control over his lifestyle changes and the treatment program. When the patient feels that he, rather than the provider, is in control, he is much more likely to remain on the treatment program.

Through its local chapters, the American Heart Association provides an abundance of written material designed for the person recovering from an MI (see Online Resources at the end of the chapter). Patients and their families should know about this valuable source of information and support as they work toward the goal of rehabilitation.

Surgical and Nonsurgical Treatment Options

Percutaneous Transluminal Coronary Angioplasty

If only a few areas of stenosis are identified, a PCI may be performed. The patient may have a percutaneous transluminal coronary angioplasty (PTCA) rather than **coronary artery bypass graft (CABG)** to improve blood flow. PTCA is a nonsurgical interventional technique to open blocked coronary arteries. It is performed in the cardiac catheterization laboratory using fluoroscopy. A catheter with a balloon tip is threaded into the blocked artery, and when the narrowed area is reached, the balloon is inflated, pushing aside the plaque and widening the interior of the artery. To maintain patency of the vessel, a coronary stent is usually placed. A stent is made of stainless steel and acts as a brace for the artery wall. A metal or **drug-eluting stent** may be placed in the artery to help maintain the opening (Figure 20-4). Several manufacturers provide drug-eluting stents. They all have a coating of a drug that is released slowly over several weeks after placement. The drug coatings are medications that are used in cancer treatment. The purpose is to either suppress cell growth so the body does not occlude the vessel with new cells or to decrease inflammation with immunosuppressants to reduce swelling and promote healing. Research has shown that the drug-eluting stents may reduce the need to restent the vessels over time because of cellular hyperplasia as the body adjusts to the foreign body. During the procedure a glycoprotein (GP) IIb/IIIa inhibitor such as abciximab (ReoPro), tirofiban (Aggrastat), eptifibatide (Integrilin), or direct thrombin inhibitor bivalirudin (Angiomax) maybe given as an IV infusion to reduce platelet aggregation. When a stent is placed, the patient must take antiplatelet agents, such as aspirin, and/or clopidogrel (Plavix) for up to 1 year after placement. A loading dose of antiplatelet medication is usually given before the patient leaves the cardiac catheterization laboratory; this reduces the need for infusions. CABG may be indicated if there is multivessel disease or a critical lesion that puts a large portion of myocardium at risk. Depending on the nature of the risk, patients may go emergently to the operating room (OR) from the cardiac catheterization laboratory or may be scheduled at a later time.

Safety Alert

Proton Pump Inhibitors

Proton pump inhibitors may interfere with the action of clopidogrel (Plavix); proton pump inhibitors should not be taken when clopidogrel is prescribed ([Juurlink, 2009](#)).

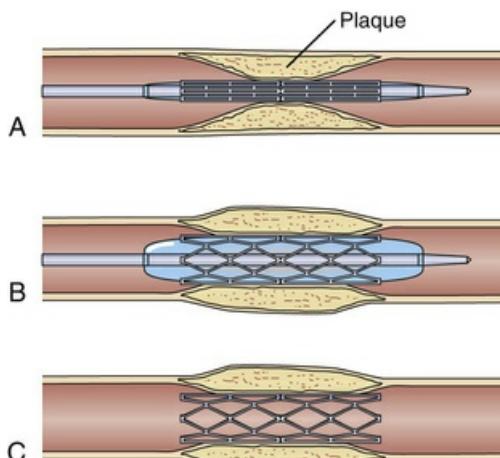


FIGURE 20-4 Placement of coronary artery stent. **A**, The stent is positioned at the site of stenotic lesion. **B**, The balloon is inflated, expanding the stent. The balloon is then deflated and removed. **C**, The implanted stent is left in place. (From Lewis SL, Dirksen SR, Heitkemper MM, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Other procedures to remedy clots and plaque are laser angioplasty, thrombectomy, and atherectomy. Laser angioplasty breaks up the clot. Rheolytic thrombectomy uses low-pressure, high-speed saline jets to break up the clot. Atherectomy devices either excise and retrieve plaque or destroy it. These procedures are sometimes used when a patient has reocclusion after CABG and PTCA. CABG surgery is covered in the section on cardiac surgery.

Studies are ongoing to determine whether a regimen consisting of a very-low-fat diet, regular exercise, reduction of stress, and practice of relaxation techniques can reverse CAD without surgery. These methods have been effective in people who can maintain the discipline to stick to the program.

Clinical Cues

Patients may have a genetic resistance to clopidogrel (Plavix). For clopidogrel to inhibit platelets it must be activated by a sequence mediated by the liver. P2Y12 platelet function testing can identify resistance.

Transmyocardial Laser Revascularization

For patients who are critically ill and are not candidates for PTCA or CABG, transmyocardial laser revascularization (TMR) is an option. This procedure may be available to patients with severe chest pain that limits their ability to perform ADLs, who have a history of CABG, and who have no other treatment options. The procedure is done with general anesthesia without use of cardiopulmonary bypass (heart-lung machine), and the heart is approached through a small thoracotomy incision. A carbon dioxide or holmium:YAG laser is used to drill multiple tiny holes in the heart's left ventricle. These channels heal on the outside of the heart, and over time heal on the inside. The mechanism that causes improvement in patient symptoms is not well understood. Postoperatively the patient will have a chest tube and be monitored in the CCU.

Cardiac Surgery

Open heart surgery is made possible by the heart-lung machine. The machine functions as an artificial heart (pump) and lung (oxygenator). Because all this is done outside the patient's body, the procedure is called *extracorporeal circulation*. The surgeon inserts large tubes in the vena cava and reroutes the unoxygenated venous blood through the heart-lung machine. There, the blood is exposed to an atmosphere of oxygen in which an exchange of gases takes place (carbon dioxide is released and oxygen is taken up), and the oxygenated blood is returned to the patient via the aorta. The blood may be cooled so that the patient's body temperature is lowered (hypothermia), thereby reducing the body's metabolic needs during surgery.

Open heart surgery technically means that the chest is opened, the heart is stopped, and blood is routed through a heart-lung machine. The term is used for any procedure where these conditions take place. Some procedures are done with minimally invasive techniques not requiring a sternotomy. In others, the heart is not stopped, and "off-pump" (beating heart) surgery is performed. Congenital heart defects, valve replacements, bypass of clogged coronary arteries, and heart transplant are conditions requiring surgical repair.

Coronary Artery Bypass Graft Surgery

CABG is performed (1) when ischemia cannot be controlled medically or (2) to prevent greater occlusion and consequent MI. The CABG surgery bypasses the artery that is blocked, replacing it with sections of a vein or artery taken from another part of the patient's body. Usually the mammary artery or sections of saphenous vein or radial artery are grafted. The mammary artery is left attached to the subclavian artery, and the other end is sewn distal to the blockage in a coronary artery. Saphenous vein grafts are sewn to the aorta and then distal to the blockage in a coronary artery. These new vessels supply blood to the myocardium. The patient will have a midsternal incision if an open approach was used and, if saphenous veins were used for the grafts, will have leg incisions. A small dressing as shown in [Figure 20-5, B](#) will be seen if an endoscopic approach was used. [Figure 20-6](#) shows CABG procedures using vein grafts or the internal mammary artery.

Older Adult Care Points

Older adult patients tolerate CABG surgery well, but the recovery period is longer because of the slower healing rate and decreased ability of the body to handle this degree of physical stress.

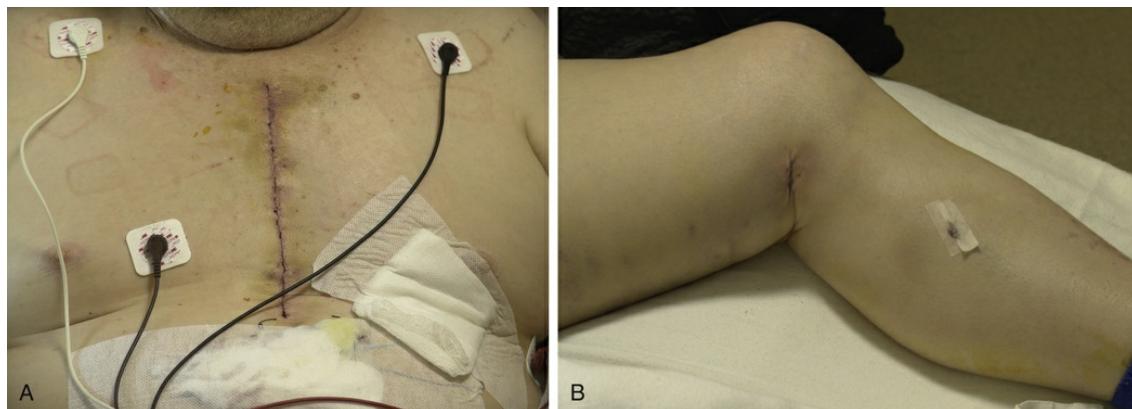


FIGURE 20-5 **A**, Sternal incision for coronary artery bypass graft (CABG). **B**, Endoscopic leg incision for removal of saphenous vein for grafting to coronary arteries.

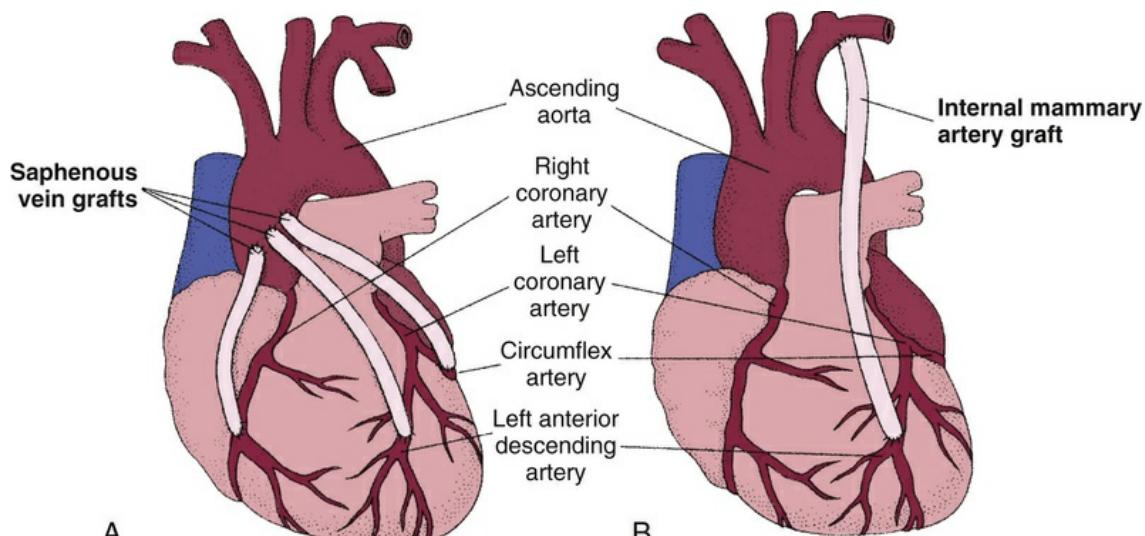


FIGURE 20-6 Two methods of coronary artery bypass grafting. **A**, Saphenous vein grafts. **B**, Internal mammary artery graft.

An off-pump coronary artery bypass technique for CABG procedures—minimally invasive direct coronary artery bypass (MIDCAB)—does not require stopping the heart's activity and therefore does not require using the heart-lung machine. MIDCAB procedures are performed on only the vessels in the front of the heart because the access only allows contact with those arteries. There are other techniques for myocardial revascularization being studied with the goal of reducing recovery time and potential complications. Coronary bypass surgery does not cure the disease; it only relieves the symptoms and may prevent myocardial damage from total occlusion of a coronary artery. After the surgery, anginal chest pain disappears in about 65% of patients, and another 25% show improvement. Many of those patients who had a coronary artery bypass in the past 10 years are returning for a second operation because the grafted arteries or venous bypass grafts have become occluded. A greater emphasis is being placed on the need for adherence to lifestyle changes to prevent a second operation. [Nursing Care Plan 20-2](#) summarizes care of a patient after cardiac surgery.

Nursing Care Plan 20-2

Care of a Patient After Cardiac Surgery

Scenario

Mr. Jacobi, age 57 years, was transferred to the telemetry unit after a coronary artery bypass graft (CABG) and is 2 days postoperative. Mr. Jacobi is married and has three teenage children. He plans to return to his job as a truck driver after surgical recovery.

Problem Statement/Nursing Diagnosis

Altered activity tolerance/Activity intolerance due to postsurgical hemodynamic changes.

Supporting Assessment Data

Subjective: States, "I'm feeling faint and short of breath" after ambulating 30 feet.

Objective: RR 32, SpO₂ 90% after ambulating short distance, PO₂ increases to 95% to 100% when returned to chair, RR decreased to 24.

Goals/Expected Outcomes	Nursing Intervention	Selected Rationale	Evaluation
Patient will be able to ambulate 50 feet in halfway without complaints of dizziness and dyspnea.	Assess SpO ₂ and vital signs before and after ambulation.	Provides baseline values for evaluation.	SpO ₂ 96%, no complaints of dizziness by third postoperative day.
	Provide safety during ambulation (e.g., follow with wheelchair, use gait belt, instruct to use handrails).	Prevent falls if hemodynamic changes occur.	Patient did not sustain fall.
	Provide rest periods every 15 feet.	Improves success of ambulation.	Patient able to ambulate 100 feet without rest period by third postoperative day.
	Gradually increase distance of ambulation as condition stabilizes.	Physical conditioning decreases the workload on heart and facilitates patient recovery.	Patient ambulated 100 feet three times per day without complaints of dizziness and dyspnea by third postoperative day. Continue plan.

Problem Statement/Nursing Diagnosis

Altered skin integrity/Impaired skin integrity due to thoracotomy and saphenous vein graft.

Supporting Assessment Data

Subjective: Patient asks about care of wounds to chest and left lower leg.

Objective: Incisions to midsternum and left lower leg. Both incisions intact, no areas of redness noted. Skin staples intact.

Goals/Expected Outcomes	Nursing Intervention	Selected Rationale	Evaluation
Surgical incisions will remain intact and free of signs of infection.	Assess and document status of incision at the beginning of each shift.	Determines changes in status of wound, such as development of redness, edema, opening of suture lines.	Midsternal incision intact, no signs of infection. Incision to left lower leg slightly edematous, $\frac{1}{2}$ -inch opening of wound on fourth postoperative day. Continue to monitor.
	Assess vital signs.	Elevated temperature and heart rate may indicate beginning of wound infection.	HR 72, T 100° F (37.8° C).
	Provide wound care as ordered.	Keeps incisions free of drainage, irritants, and pathogens.	Wounds are clean and dry with skin staples intact.
	Include wound management in discharge teaching plan.	Provides knowledge to prevent and recognize complications associated with wound healing.	Demonstrated appropriate wound care. Verbalized signs and symptoms of infection.

Problem Statement/Nursing Diagnosis

Acute pain/Acute pain due to midsternal surgical incision.

Supporting Assessment Data

Subjective: States, "It hurts too much to do these breathing exercises."

Objective: Unable to reach incentive spirometer goals; SpO₂ 94%.

Goals/Expected Outcomes	Nursing Intervention	Selected Rationale	Evaluation
Patient will verbalize decreased pain during deep-breathing exercises.	Assess pain level before deep-breathing exercises and use of incentive spirometer. Provide pain medication as needed. Teach to splint incision during respiratory exercises.	Patient will be more likely to complete exercises if he is more comfortable.	Completes breathing exercises without pain medication by third postoperative day.
Patient will reach incentive spirometer goals within 24 hr.	Encourage patient to use incentive spirometer at least q2h. Gradually increase goal.	Prevents postoperative respiratory complications.	Reaches 90% of incentive spirometry goal by third postoperative day.
SpO ₂ will remain at or above	Monitor O ₂ saturation before and after use of incentive spirometer.	Baseline values to determine	PO ₂ 98% before and after use of

98% on room air.		effectiveness of treatment.	incentive spirometer. Continue plan.
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Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge related to postoperative care after discharge from hospital.*

Supporting Assessment Data

Subjective: States, "I don't know how I can manage all this at home. When can I return to work?"

Objective: Patient anxious, irritable during discussion of discharge planning.

Goals/Expected Outcomes	Nursing Intervention	Selected Rationale	Evaluation
Patient and wife will demonstrate knowledge of home care instructions, including wound management, medications, exercise, diet, ADLs, and when to return to work.	Assess level of understanding of discharge instructions.	Baseline for developing discharge plan.	Verbalized understanding of discharge instructions.
	Provide opportunity to verbalize concerns.	Reduces patient anxiety.	Verbalized concerns openly, stated some anxiety relieved.
	Provide instructions concerning medications, wound care, ADLs.	Knowledge of expectations increases confidence and reduces anxiety.	Demonstrated understanding of instructions.
	Refer to dietitian/nutritionist for dietary requirements.	The dietitian can help the family understand the dietary requirements and how to adapt their traditional diet to comply.	States understands diet instructions and will attempt to follow them. Wife also states understanding.
	Collaborate with provider concerning additional instructions, such as return to work and cardiac rehabilitation recommendations.	Expert knowledge may be needed to provide appropriate information.	Patients states understanding of how to make an appointment with cardiac rehabilitation and when he may expect to return to work.
	Reinforce information as provided by provider.	Patients may not question a provider even if they do not understand all they were told. The nurse is in the best position to reinforce the information given by the provider.	Verbalized disappointment that he will be unable to return to work for at least 8 wk. May require part-time basis for longer period. Continue plan.

ADLs, Activities of daily living; *RR*, Respiratory rate.

Critical Thinking Questions

1. List five additional nursing problem statements that are appropriate for a patient after cardiac surgery.
2. List five additional priority assessments you should complete for this patient.

The vein grafts have an average life of 10 years before occlusion begins, unless the patient truly makes the commitment to a heart-healthy diet, lowers stress, and exercises regularly. Multiple studies have shown that patients with CAD symptoms and disease well controlled by medical therapy do not show an improvement in mortality rates by having surgery or PCI. Those without adequate medical control showed no difference in mortality rates whether they received surgery or PCI ([Kalyanasyndaram, 2012](#)).

Heart Transplant

Heart transplants are performed for selected patients who have a history of hospitalizations for HF, need a left ventricular assist device (LVAD), increasing types and doses of medications or documentation of decreased oxygen supplied to the body as measured by VO₂ (VO₂ is the amount of oxygen consumption by the tissues of the body), have good renal function, and are psychologically stable. There is some flexibility with the age requirements.

Candidates for heart transplant undergo psychological evaluation and a thorough physical assessment. Patients must also be evaluated for the ability to remain in compliance with health care instructions and for the ability to obtain and administer antirejection medications. Transplant patients must take immunosuppressants and other medications for the remainder of their lives. Very few donor hearts are available, and the waiting lists are long. Allocation of available organs is determined by evidence-based criteria with oversight of the United Network for Organ Sharing (UNOS). In addition to meeting transplant criteria, patients are limited by geography. A heart can only be out of the donor body for 4 to 6 hours if it is to be successfully transplanted into the recipient. Patients who receive a heart transplant face considerable financial cost, a life of taking immunosuppressive drugs that have many serious side effects (including risk for infection), and the constant threat of organ rejection. However, the benefits are considerable, with an average 1-year survival rate of about 85% to 90%, a 3-year survival rate of about 75%, and a 5-year survival rate of 79% ([Eisen, 2014](#)). A significant number of heart transplant patients survive beyond 10 years.

Transplant patients must adhere to strict dietary and exercise regimens to prevent the new heart from becoming affected with problems that led to the original HF. Heart transplants are performed in highly specialized medical centers. Patients who are too unstable for care in the home may remain in the hospital for an extended period until a heart is available. Other patients may be given a special pager for notification of an available heart. These patients must be available for immediate admission to the hospital. Patients awaiting a heart transplant are placed on a national waiting list. A heart may be available within 24 hours, or one may be months away. Unfortunately, some patients die before a suitable heart is available. There has been increasing success with use of LVADs and mechanical artificial hearts in providing needed perfusion for patients awaiting transplant surgery. For some patients who are not a candidate for transplant, smaller, fully-implanted LVADs have been used as the intervention to support and improve perfusion (see [Figure 19-2](#)).

Nursing Care of Patients Having Cardiac Surgery

Preoperative care.

Before cardiac surgery, the patient undergoes diagnostic tests and examinations, mostly on an outpatient basis. The teaching plan should include expectations during the preoperative and postoperative periods. There is considerable apprehension on the part of both the patient and the patient's family when faced with open heart surgery. If the surgery was emergent, teaching must be done postprocedure.

The patient is given information about the procedure, explaining what to expect and what kind of equipment will be used. Admission occurs early the morning of surgery. Specific information regarding what medications to take and which ones to stop is included in the preoperative instructions. See [Nursing Care Plan 20-2](#) for care of the patient after cardiac surgery.

Postoperative care.

During the early postoperative period, the patient remains in a CCU, where specialized cardiac monitoring equipment is used and highly skilled personnel are in constant attendance. Cardiac rate and rhythm are monitored closely. For patients who had an open heart procedure, chest tubes for drainage and proper re-expansion of the lungs are in place for 24 hours. The patient often continues to receive mechanical ventilation for a few hours after surgery. Once consciousness has fully returned, weaning from the ventilator is begun if oxygenation is adequate. Autologous blood transfusion is performed with blood drained from the chest cavity. Chest tubes are usually removed before the patient is moved out of the CCU. Temporary epicardial pacemaker leads may be in place and may or may not be connected to a pacemaker pulse generator. Usually, a multilumen central line is in place for medication delivery and fluid maintenance, as well as an arterial line and PA line for hemodynamic monitoring. If saphenous vein grafts were used, there will be leg incisions to care for along with the chest incision. Urine output is initially monitored hourly for 8 hours and thereafter every 2 hours to detect signs of decreased perfusion to the kidneys.

After the first 12 to 24 hours, the surgeon will assess the patient's condition and decide whether transfer to a step-down unit is appropriate. The patient will continue to need special nursing care and continuous ECG monitoring. Vital signs must be taken and recorded at frequent intervals; urinary output is monitored closely. Lung sounds and oxygenation are priority assessments. Daily weight is monitored to assess fluid balance.

Clinical Cues

Priorities for care of the postsurgical patient must be established. Plan on frequent assessment of respiratory and cardiac status, care of invasive lines and chest tubes, wound assessment and care, fluid and electrolyte balance, pain management, and assessment of emotional status.

Coronary artery bypass surgery can produce many special problems related to rehabilitation of the patient. Among the physiologic symptoms that can persist into the home recovery period are fatigue and weakness, incisional discomfort, edema in the donor leg, dysrhythmias, loss of appetite, and unusual physical sensations. Depression for weeks to months is not uncommon after heart surgery. Patients should be alerted to this possibility and referred for assistance if this occurs.

Women are more likely than men to experience depression after heart surgery, and their cases are more severe.

Most patients do not experience all these problems during the home recovery period after coronary artery bypass surgery, and some have relatively trouble-free recovery periods. It is important that bypass surgery patients and their families realize that bypass surgery is not a cure for CAD. Bypass surgery is simply one form of therapy for a chronic condition that will require continued management to slow the disease process and reduce the incidence of life-threatening events in the person's life. Other specific postoperative care is directed at preventing infection to the surgical sites, managing wounds, monitoring for complications, and promoting rehabilitation.

With an uncomplicated recovery, the patient is usually discharged home within 3 to 7 days and referred to a cardiac rehabilitation outpatient program.

Cardiac transplant patients are at risk for organ rejection, infection, and development of CAD in the new heart. Heart biopsies are performed regularly. Post-transplant malignancy is a known risk factor and is believed to result from the prolonged immunosuppression. Skin cancer is the most common malignancy after organ transplant.

Community Care

With early discharge from the hospital after surgery, many patients have continuing care from home health nurses. Patients recovering from cardiac surgery, MI, atherosclerotic heart disease, angina, or valvular heart disease all may be referred to a cardiac rehabilitation program. The goal of such programs is to reduce risk of further heart problems or death.

Home care nurses have many patients diagnosed with heart disease. The goal of home care is to monitor the patient's condition and to prevent complications, such as life-threatening dysrhythmias, MI, and CHF. Nurses supervise the medication regimen, monitor weight gain, draw blood for laboratory tests to determine drug levels and electrolyte status, and assess for beginning signs of complications. By detecting complications early, patients can be treated at home rather than at the hospital, thereby decreasing costs of care.

Many residents in long-term care facilities have cardiac disorders. Assessing changes in condition is a high priority. If changes can be identified quickly, the severity of a complication can be reduced in this population. It is important to know each resident's history.

Get Ready for the NCLEX® Examination!

Key Points

- High levels of cholesterol (LDL) contribute to development of atherosclerosis, a major factor in occlusion of coronary vessels.
- Ischemia occurs as blood supply is decreased to the myocardium.
- A cardinal sign of myocardial ischemia is angina pectoris (chest pain).
- SCAD may be treated medically or by PCI.
- *Acute coronary syndrome* is an umbrella term for a group of symptoms indicating severe myocardial ischemia.
- Nitrates (nitroglycerin) are the most commonly used drugs to treat angina.
- Patients should be monitored for hypotension and development of a throbbing headache while taking nitroglycerin.
- When a coronary artery becomes completely obstructed, necrosis of myocardial tissue occurs (MI).
- Necrotic myocardial tissue cannot perform its function of pumping.
- Diagnosis of MI is made by patient history, ECG, and serum cardiac enzyme levels.
- A patient may be given an aspirin tablet if an MI is suspected. Aspirin helps prevent further clot formation.
- Emergency care for a patient suspected of experiencing an MI includes oxygen; IV access; cardiac monitoring; pain management, usually IV morphine sulfate; ECG; and management of dysrhythmias. These activities are done promptly if STEMI is suspected.
- Medications prescribed after MI may include nitrates, antihypertensive drugs, anticoagulants, beta blockers, ACE inhibitors, and antidysrhythmic drugs.
- Cardiac catheterization is likely to be performed on a patient experiencing an MI.
- Nursing care after cardiac catheterization includes cardiac monitoring, maintaining the patient in a supine position with the legs straight for at least 2 hours, monitoring the femoral area for hematoma formation, assessing peripheral pulses frequently, and monitoring urinary output.
- Stents may be placed to maintain patency of coronary vessels in an attempt to prevent the need for CABG. Stents may be placed during PTCA.
- CABG may be needed when a patient's angina cannot be controlled by medical means or when there is myocardial damage caused by occlusion of one or more coronary vessels.
- An alternative to CABG is MIDCAB performed off-pump.
- A heart transplant may be needed for a patient with end-stage left ventricular heart failure.
- Patients receive physical and psychological assessment before acceptance into a cardiac transplant program. Family counseling is also advisable.
- Donor hearts are not readily available; therefore patients must be carefully screened to determine the most appropriate recipient.
- Patients who are candidates for cardiac transplant must be advised of potential complications, the need to follow through on dietary and exercise recommendations, and the need to continue medications, such as immunosuppressants, for the remainder of their lives.
- Nursing care of patients after heart transplant includes intense monitoring in the CCU; assessing for signs of complications; wound management; administration of emergency, antirejection, and appropriate cardiac drugs; pain management; assessment of respiratory function; and initial return to physical activity such as out of bed to chair.
- Discharge planning should prepare the patient for return home and the beginning of care in the community.
- Monitoring the patient's understanding of and compliance with prescribed medications is an important responsibility of the home health nurse.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• Online Resources

- American Heart Association, www.heart.org
- Mended Hearts, www.mendedhearts.org
- National Cholesterol Education Program,
<http://www.nhlbi.nih.gov/files/docs/guidelines/atglance.pdf>

Review Questions for the NCLEX® Examination

1. After reviewing risk factors for cardiac disease, a patient is prescribed atorvastatin (Lipitor) to reduce cholesterol levels. The nurse must include which instruction(s)? (*Select all that apply.*)

1. Report any muscle weakness.
2. Avoid exposure to sunlight.
3. Keep appointments for laboratory work.
4. Drink grapefruit juice.
5. Maintain a low-protein diet.

NCLEX Client Need: Pharmacological Therapy

2. A patient asks, "What causes angina pectoris?" An accurate response by the nurse would be:

1. "It is caused by the decreased blood flow to the coronary arteries resulting from shunting of the blood."
2. "It is caused by a decreased blood flow to the myocardium resulting from partial obstruction of the coronary arteries."
3. "It is caused by poor oxygenation of the coronary arteries resulting from poor gas exchange across the alveolar basement membrane."
4. "It is caused by the inflammation of the sternal cartilage."

NCLEX Client Need: Physiological Adaptation

3. A patient is diagnosed as having attacks of angina pectoris. As part of the discharge instructions, the patient is instructed on the appropriate storage and use of sublingual nitroglycerin. Which of the following patient statements indicates a need for further instructions?

1. "The tablets should be kept in a cool, dark place."

2. "I need to lie down after I take the medication."
3. "I can take the tablet every 15 minutes for angina pains."
4. "The expiration date on the bottle is important."

NCLEX Client Need: Pharmacological Therapy

4. A 44-year-old patient is admitted with a sudden, severe chest tightness unrelieved by rest or nitroglycerin and profuse sweating. Which test would exhibit an elevated level only if the patient has had an MI?

1. Serum troponin
2. Blood urea nitrogen
3. Myoglobin level
4. Prothrombin time

NCLEX Client Need: Reduction of Risk Potential

5. Immediate therapeutic measures provided for a patient entering the hospital with an acute myocardial infarction include which measure(s)? (*Select all that apply.*)

1. Morphine sulfate
2. Oxygen therapy
3. Furosemide
4. Nitroglycerin
5. Aspirin

NCLEX Client Need: Physiological Adaptation

6. Which food has been found to reduce cholesterol levels?

1. Garlic
2. Onion
3. Ginger

4. Nutmeg

NCLEX Client Need: Reduction of Risk Potential

7. The provider explains the treatment options to a Hispanic woman diagnosed with occlusion of multiple coronary vessels. Before signing an informed consent, the patient is most likely to defer her health care decisions to her:

1. oldest adult son.
2. oldest adult daughter.
3. brother-in-law.
4. husband.

NCLEX Client Need: Psychosocial Integrity

8. A patient has experienced an MI and has ST-segment elevation on the ECG. The priority problem would be:

1. Altered gas exchange.
2. Limited coping ability.
3. Altered tissue perfusion.
4. Altered activity tolerance.

NCLEX Client Need: Reduction of Risk Potential

9. Postoperative nursing care of a patient who has undergone CABG includes which priority intervention(s)? (*Select all that apply.*)

1. Assessing cardiac rate and rhythm
2. Encouraging use of incentive spirometer
3. Monitoring liver enzymes
4. Assessing bowel sounds
5. Managing pain

NCLEX Client Need: Physiological Adaptation

10. After the change-of-shift report, which of the following assigned patients should the nurse attend to first? The patient with:

1. stable vital signs who returned 40 minutes ago after a PCTA.
2. an MI complaining of a headache who was transferred from the CCU earlier.
3. stable angina whose chest pain was relieved by two nitroglycerin tablets 2 hours ago.
4. unstable angina who is having chest pain, shortness of breath, nausea, and anxiety.

NCLEX Client Need: Physiological Adaptation

Critical Thinking Questions

Scenario A

Ms. Trotter, a 62-year-old woman, comes to the clinic for her annual examination results. Her cholesterol level is 260 mg/dL, with HDL 30 mg/dL and LDL 220. She has a family history of atherosclerosis and heart disease. She asks about the danger of her high cholesterol level.

1. Describe to her how atherosclerosis can lead to heart problems.
2. Help her identify ways to decrease her cholesterol level and raise her HDL level.
3. Describe to her the symptoms of heart problems she should report to her doctor.
4. Have her identify the symptoms that might indicate a heart attack and what she should do if they occur.

Scenario B

Mrs. Yee, a 50-year-old woman, comes to the emergency department complaining of a burning, squeezing sensation in her chest and a feeling of nausea. She is diaphoretic and apprehensive.

1. Compare and contrast the symptoms of heart attack between men and women.
2. Describe the probable emergency treatment of Mrs. Yee in the emergency department.
3. What laboratory tests may be ordered to evaluate for possible MI? What is a significant ECG finding indicating MI?

Scenario C

Ms. O'Hare, a 45-year-old woman, is on the list for a heart transplant. She has a LVAD and is waiting at home.

1. What signs and symptoms would be displayed indicating that Ms. O'Hare was no longer stable enough to wait at home?
2. Describe the purpose of the LVAD.
3. Develop a discharge teaching plan for Ms. O'Hare after transplant.

UNIT VII

Neurologic System

OUTLINE

Chapter 21 The Neurologic System

Chapter 22 Care of Patients With Head and Spinal Cord Injuries

Chapter 23 Care of Patients With Brain Disorders

Chapter 24 Care of Patients With Peripheral Nerve and Degenerative Neurologic Disorders

CHAPTER 21

The Neurologic System*

Objectives

Theory

1. Define the vocabulary particular to problems of the nervous system.
2. Examine the differences in the action of the sympathetic and parasympathetic nervous systems.
3. Devise four specific ways in which a nurse can contribute to preventing neurologic disorders.
4. Provide rationale for the appropriate preparation and postprocedure care for patients undergoing lumbar puncture (spinal tap), electroencephalogram (EEG), and radiologic studies of the brain and cerebral vessels.
5. Demonstrate techniques used for assessment of the nervous system.
6. Compare and contrast the various signs and symptoms of the common problems experienced by patients with nervous system disorders.

Clinical Practice

7. Gather a pertinent history for a patient with a nervous system problem.
8. Demonstrate a “neuro” check.
9. Score the neurologic status of a patient with a nervous system disorder according to the Glasgow Coma Scale.

KEY TERMS

- accommodation (äk-köm-ě-DÄ-shūn, p. 487)
aphasia (ä-FÄ-zhā, p. 496)
Babinski reflex (Bab-INS-key, RĒ-flēks, p. 484)
calculi (KÄL-kū-lī, p. 494)
caloric testing (käl-Ö-rik, p. 484)
clonus (KLÖ-nūs, p. 484)
decerebrate posturing (dē-SĒR-ě-brāt PÖS-chür-ěng, p. 487)
decorticate posturing (dē-KÖR-tī-kāt, p. 487)
delirium (dē-LĒR-ě-ūm, p. 495)
dysphagia (dīs-FÄ-jē-ă, p. 493)
hemiparesis (hēm-ě-pă-RĒ-sīs, p. 492)
hemiplegia (hēm-ě-PLĒ-jă, p. 492)
nystagmus (nis-TÄG-mūs, p. 486)
quadriplegia (kwöd-rī-PLĒ-jă, p. 493)
tetraplegia (TĒT-ră-PLĒ-jă, p. 492)

Anatomy and Physiology of the Neurologic System

Organization of the Nervous System

- The functional unit of the nervous system is the neuron, which consists of a cell body, dendrites, and an axon (Figure 21-1). Neurons react to stimuli, conduct impulses, and influence other neurons. There are afferent and efferent neurons.

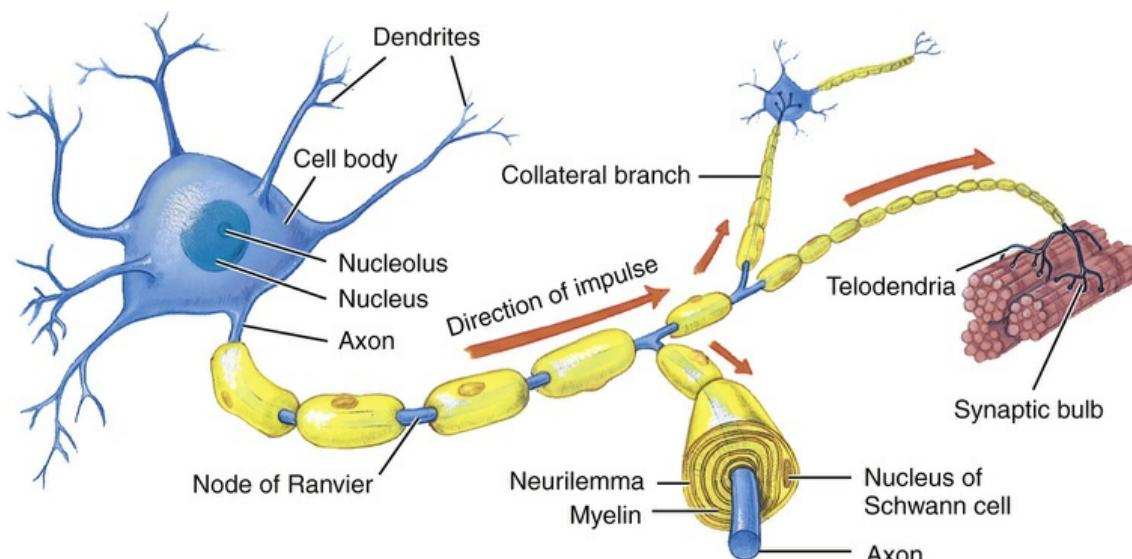


FIGURE 21-1 Structure of a neuron. (From Applegate E: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2011, Saunders.)

- The nervous system consists of the central nervous system (CNS) and the peripheral nervous system (PNS).
- The CNS is made up of the brain and spinal cord (Figure 21-2).

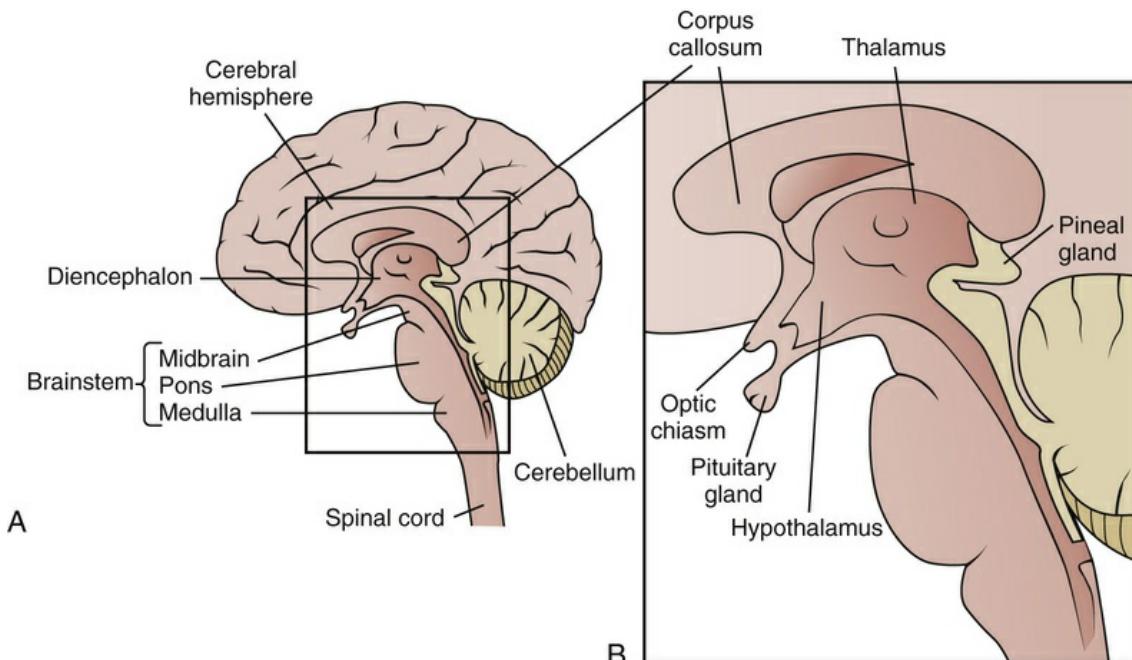


FIGURE 21-2 A, Main divisions of the central nervous system. B, Diencephalon (thalamus and hypothalamus).

- The brain is divided into the cerebrum, diencephalon, cerebellum, and brainstem, which each perform various functions. [Table 21-1](#) lists the functions of the various divisions of the brain.

Table 21-1
Functions of the Divisions of the Brain

DIVISION	FUNCTION
Cerebrum	Center of intellect and consciousness. Receives and interprets sensory information; controls voluntary movements and certain types of involuntary movements; responsible for thinking, learning, language capability, judgment, and personality; stores memories.
Cerebellum	Responsible for coordination of movement, posture, and muscle tone that are the mechanisms of balance.
Diencephalon	Consists of two parts.
Thalamus	Relay center between spinal cord and cerebrum.
Hypothalamus	Controls body temperature, appetite, and water balance; links nervous and endocrine systems.
Brainstem (consists of three parts):	
Midbrain	Mediates visual and auditory reflexes; controls cranial nerves III and IV and certain eye movements.
Pons	Links connecting various parts of the brain; helps regulate respiration.
Medulla oblongata	Contains reticular formation that regulates heartbeat, respiration, and blood pressure; controls center for swallowing, coughing, sneezing, and vomiting; relays messages to other parts of the brain.

- The brainstem consists of the midbrain, pons, and medulla.
- The different parts of the brain control various functions ([Figure 21-3](#)).

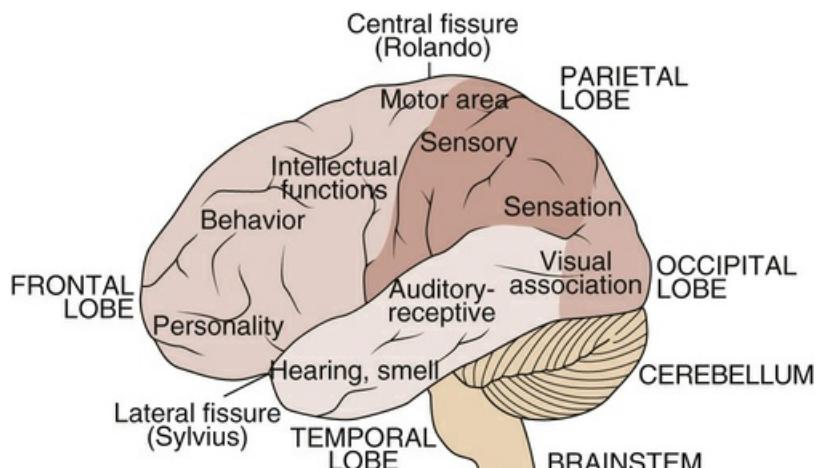


FIGURE 21-3 Specialized functions of the lobes of the cerebrum.

- The PNS is composed of the sensory organs—eyes, ears, taste buds, olfactory receptors, and touch receptors—12 pairs of cranial nerves, and 31 pairs of spinal nerves and ganglia that link the sensory organs, muscles, and other parts of the body to the brain and spinal cord. The distribution pathways of the spinal nerves are called *dermatomes* ([Figure 21-4](#)).

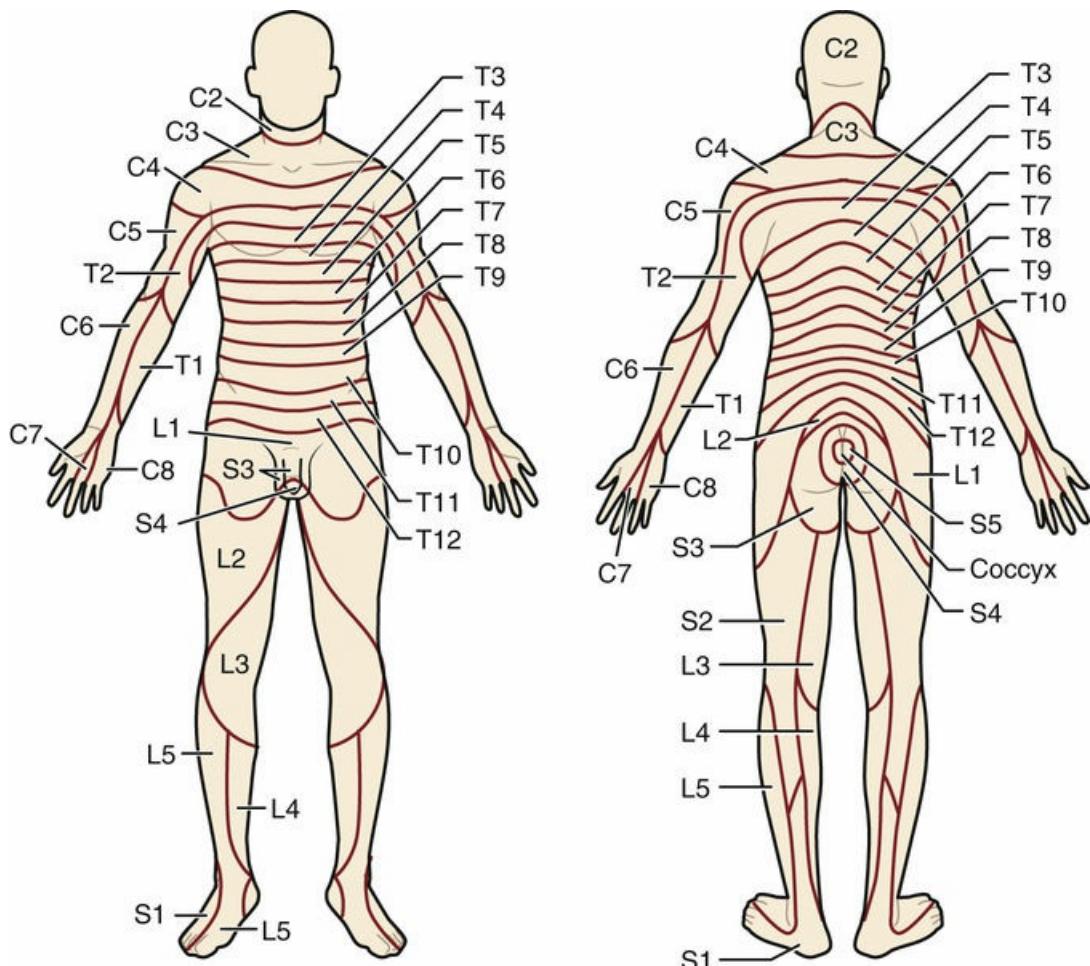


FIGURE 21-4 Dermatomes (cutaneous innervation of spinal nerves). Stimulation of the skin in the depicted area for each nerve causes reflex activity. C, Cervical spinal nerves; L, lumbar spinal nerves; S, sacral spinal nerves; T, thoracic spinal nerves. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.)

- There are 12 pairs of cranial nerves, some of which are sensory nerves and others of which are motor nerves (Table 21-2).

Table 21-2
The Cranial Nerves and Their Functions

TYPE AND FUNCTION	
Olfactory (CN I)	Sensory: smell
Optic (CN II)	Sensory: visual acuity, field of vision, pupillary response (afferent impulse)
Oculomotor (CN III)	Motor: eyelid elevation, extraocular eye movement, pupil size, convergence, pupillary constriction (efferent impulse)
Trochlear (CN IV)	Motor: extraocular eye movement (inferior and lateral)
Trigeminal (CN V)	Sensory: corneal reflex Motor: facial sensation; chewing, biting, lateral jaw movement
Abducens (CN VI)	Motor: extraocular eye movement (lateral)
Facial (CN VII)	Sensory: taste Motor: facial muscle movement, including muscles of expression; lacrimal gland and salivary gland control
Acoustic (CN VIII)	Sensory: hearing, sense of balance
Glossopharyngeal (CN IX)	Sensory: sensations of the throat, taste (posterior tongue) Motor: gagging and swallowing movements
Vagus (CN X)	Sensory: sensations of posterior tongue, throat, larynx; impulses from heart, lungs, bronchi, and gastrointestinal tract
Spinal accessory (CN XI)	Motor: shoulder movement and head rotation
Hypoglossal (CN XII)	Motor: tongue movement, articulation of speech

- The spinal cord extends from the medulla to the level of the first lumbar vertebra.
- The spinal cord is a conduction pathway for impulses going to and from the brain and also serves as a reflex center for nerve impulse transmission. Sensory impulses travel to the brain on ascending conduction pathway tracts; motor impulses travel on descending tracts.
- Pyramidal tracts are conduction pathways that begin in the cerebral cortex and end in the spinal cord. These tracts control skeletal muscle movement. All other conduction pathways are

extrapyramidal tracts, and they control muscle movements associated with posture and balance.

Nerves Conduction of Impulses

- The axons of many neurons, bundled together and wrapped in connective tissue, make up a nerve. Ganglia are collections of nerve cell bodies outside the CNS.
- When in a state of polarization, neurons have the capacity to become excited (stimulated). They also have the ability to conduct that stimulus along the nerve pathways.
- A stimulus is a physical, chemical, or electrical event that changes the cell membrane and initiates conduction of the stimulus as an electrical impulse along the nerve pathway.
- The stimulus travels from one neuron to another across a **synapse** (the space between two neurons).
- A neurotransmitter secreted by the neuron is necessary for transmission of an impulse across the synapse ([Table 21-3](#)). Acetylcholine, dopamine, and norepinephrine are the major neurotransmitters.

Table 21-3

Neurotransmitters That Affect Transmission of Nerve Impulses

NEUROTRANSMITTER	LOCATION	FUNCTION	COMMENTS
Acetylcholine	CNS and PNS	Generally excitatory but is inhibitory to some visceral effectors	Found in skeletal neuromuscular junctions and in many ANS synapses
Norepinephrine	CNS and PNS	May be excitatory or inhibitory depending on the receptors	Found in visceral and cardiac muscle neuromuscular junctions; cocaine and amphetamines exaggerate the effects
Epinephrine	CNS and PNS	May be excitatory or inhibitory depending on the receptors	Found in pathways concerned with behavior and mood
Dopamine	CNS and PNS	Generally excitatory	Found in pathways that regulate emotional responses; decreased levels in Parkinson disease
Serotonin	CNS	Generally inhibitory	Found in pathways that regulate temperature, sensory perception, mood, onset of sleep
Gamma-aminobutyric acid (GABA)	CNS	Generally inhibitory	Inhibits excessive discharge of neurons
Endorphins and enkephalins	CNS	Generally inhibitory	Inhibit release of sensory pain neurotransmitters; opiates mimic the effects of these peptides

ANS, Autonomic nervous system; CNS, central nervous system; PNS, peripheral nervous system.

From Applegate E: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2010, Elsevier Saunders.

- Neurotransmitter substances are secreted at the synapse, and these diffuse across the synapse to stimulate the postsynaptic membrane on the next neuron. **When the neurotransmitter is absent or decreased at the synaptic junction, the stimulus cannot travel along the nerve pathways normally.**
- Impulses either travel in a reflex arc, going to the spinal cord and traveling back to an effector site, or they travel along nerve pathways to the brain to be interpreted.
- After impulse interpretation, a message may be sent out from the brain through the spinal cord or cranial nerves (PNS) for appropriate action to be taken. In other words, a stimulus produces a response.
- Many axons are surrounded by a myelin sheath that is a white, fatty covering. The myelin sheath is an excellent electrical insulator and it speeds the conduction of nerve impulses. **When myelin is destroyed, as in multiple sclerosis, impulse transmission is slowed or stopped.**

Interaction of the Peripheral Nervous System With the Central Nervous System

- The PNS is subdivided into an afferent division and an efferent division. The afferent division carries impulses to the CNS; the efferent division carries impulses away from the CNS.
- The reflex arc is a simple conduction pathway that uses a receptor (a sensory neuron centered in the spinal cord) and a motor neuron located in an effector (skeletal muscle). A stimulus travels from the sensory receptor through the spinal cord and back to the effector, causing action ([Figure 21-5](#)).

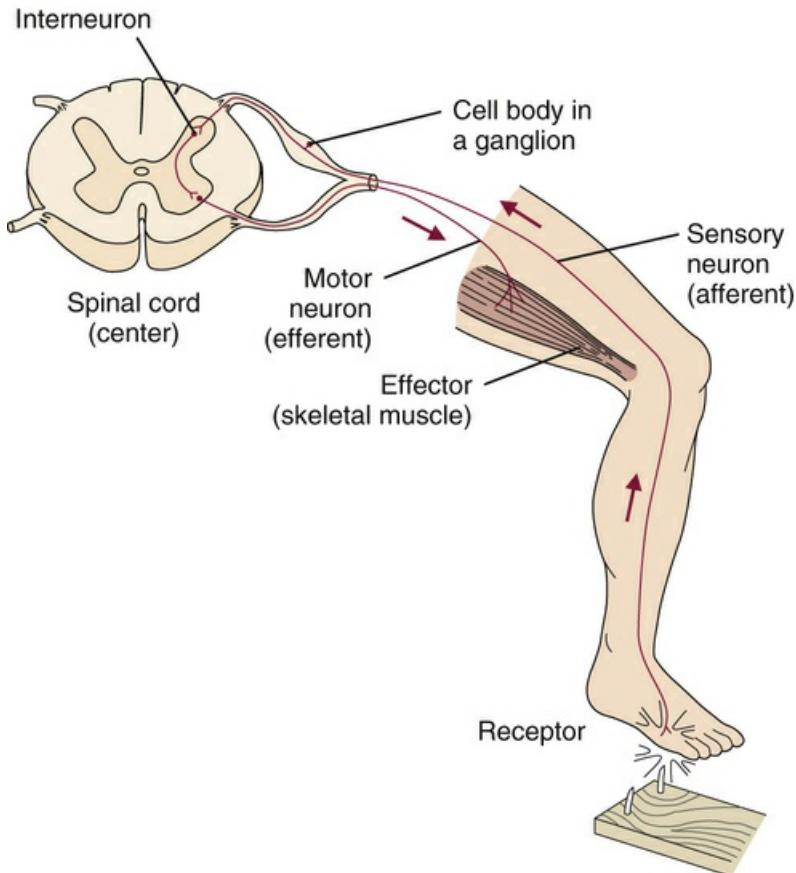


FIGURE 21-5 Components of a generalized reflex arc.

- Reflex arcs are important to most functions of the body, including maintaining an upright position.
- The cranial and spinal nerves are part of the somatic subsystem and respond to changes in the outside world. Because these nerves initiate voluntary action, the somatic system often is called the *voluntary system*.
- The autonomic system of the PNS is active in maintaining internal body balance (**homeostasis**) and is automatic (involuntary) in its actions.
- The autonomic system is divided into the sympathetic nerves, which mobilize energy to initiate changes aimed at maintaining or restoring homeostasis, and the parasympathetic nerves, which conserve and restore energy that has been used to maintain homeostasis.
- **Sympathetic and parasympathetic nerves have opposite effects on many organs** (Table 21-4).

Table 21-4
Autonomic Effects on Various Organs of the Body

ORGAN	EFFECT OF SYMPATHETIC STIMULATION	EFFECT OF PARASYMPATHETIC STIMULATION
Eye		
Pupil	Dilated	Constricted
Ciliary muscle	Slight relaxation (far vision)	Constricted (near vision)
Glands: nasal, lacrimal, parotid, submandibular, gastric, pancreatic	Vasoconstriction and slight secretion	Stimulation of copious secretion (containing many enzymes for enzyme-secreting glands)
Sweat glands	Copious sweating (cholinergic)	Sweating on palms of hands
Apocrine glands	Thick, odoriferous secretion	None
Blood vessels	Most often constricted	Most often little or no effect
Heart		
Muscle	Increased rate Increased force of contraction	Slowed rate Decreased force of contraction (especially of atria)
Coronary arteries	Dilated (beta ₂); constricted (alpha)	Dilated
Lungs		
Bronchi	Dilated	Constricted
Blood vessels	Mildly constricted	Dilated
Gut		
Lumen	Decreased peristalsis and tone	Increased peristalsis and tone
Sphincter	Increased tone (most times)	Relaxed (most times)
Liver	Glucose released	Slight glucose synthesis
Gallbladder and bile ducts	Relaxed	Contracted

Kidney	Decreased output and renin secretion	None
Bladder		
Detrusor	Relaxed (slight)	Contracted
Trigone	Contracted	Relaxed
Penis	Ejaculation	Erection
Systemic arterioles		
Abdominal viscera	Constricted	None
Muscle	Constricted (alpha-adrenergic) Dilated (beta-adrenergic) Dilated (cholinergic)	None
Skin	Constricted	None
Blood		
Coagulation	Increased	None
Glucose	Increased	None
Lipids	Increased	None
Basal metabolism	Increased up to 100%	None
Adrenal medullary secretion	Increased	None
Mental activity	Increased	None
Piloerector muscles	Contracted	None
Skeletal muscle	Increased glycogenolysis Increased strength	None
Fat cells	Lipolysis	None

From Guyton AC, Hall JE: *Textbook of medical physiology with student consult access*, ed. 12, Philadelphia, 2010, Elsevier Saunders.

Protection of the Central Nervous System

- The bones of the skull and the vertebral column form the outer layer of protection for the brain and the spinal cord.
- The meninges are protective membranes that cover the brain and are continuous with the membranes covering the spinal cord. The meninges consist of the pia mater, which covers the brain; the arachnoid, which encases the entire CNS; and the dura mater, which is a tough membrane protecting the brain and spinal cord.
- The subarachnoid space is located between the pia mater and the arachnoid membrane and is where the cerebrospinal fluid (CSF) circulates ([Figure 21-6](#)).

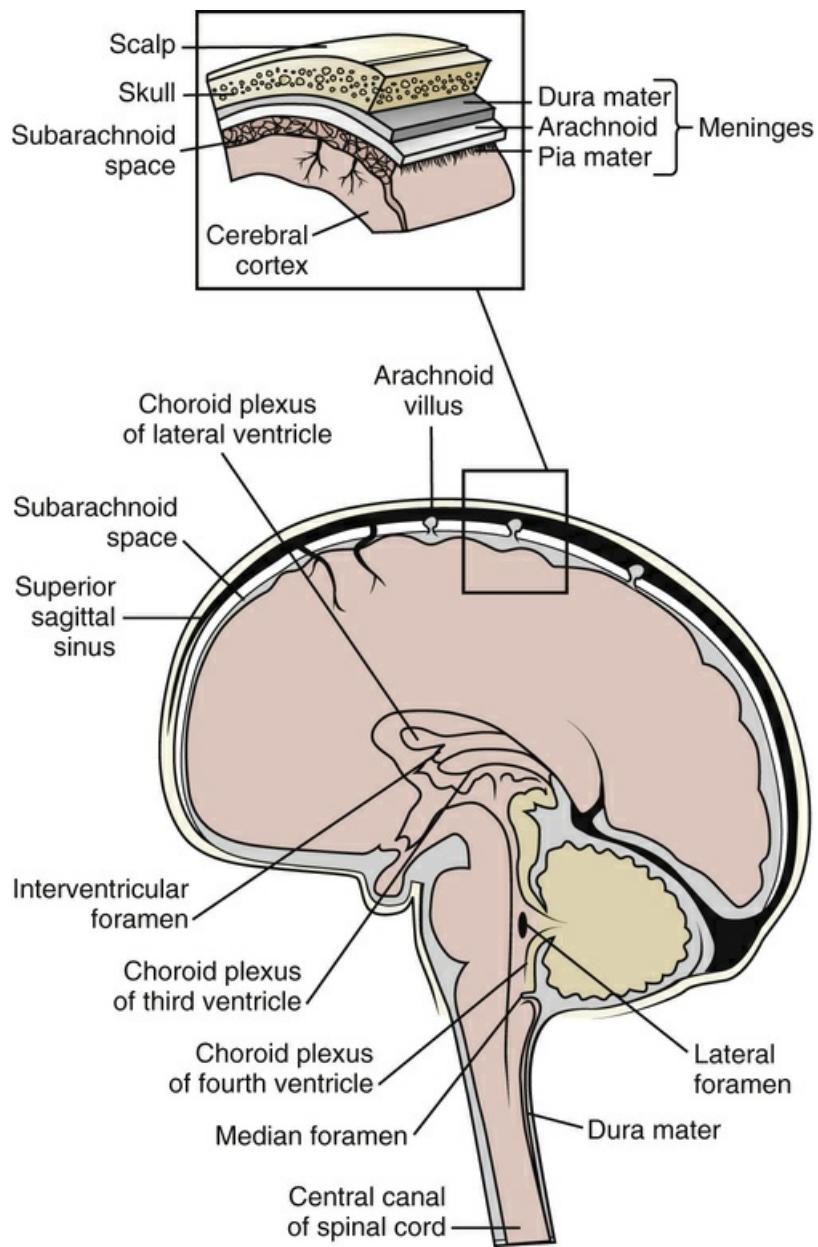


FIGURE 21-6 Flow of the cerebrospinal fluid. *Inset, Meninges covering the brain.*

- CSF serves to cushion and protect the brain and spinal cord. It is formed continuously as a filtrate from the blood in specialized capillary networks in the choroid plexus, located in the ventricles of the brain. It is reabsorbed by the arachnoid villi of the arachnoid membrane at the same rate at which it is formed. The volume of CSF normally stays constant (see Figure 21-6).
- **Normal CSF pressure is 70 to 125 cm water pressure (cm H₂O).** When there is an excess of fluid in the subarachnoid space, the CSF pressure rises above normal.

Special Characteristics of the Nervous System

- Although some cells in the PNS have an outer membrane called the *neurolemma* that may regenerate after damage, cells of the CNS do not have this capability. **Once destroyed, cells in the brain cannot be replaced,** but other brain cells may pick up their function.
- In the PNS, the Schwann cells can regenerate. The Schwann cells form myelin sheaths that wrap around the axons in the PNS.
- Neurons are very sensitive to oxygen and die quickly when deprived of oxygen. **The brain's neurons cannot survive anoxia for more than 4 to 6 minutes.**

Aging-Related Changes in the Nervous System

- There is a loss of neurons with aging, and brain weight may drop considerably after age 70 years; there is no loss of intellectual function attributable to this loss of neurons.
- The number of functioning dendrites decreases with aging. This decrease causes slower impulse transmission and resultant slower reaction time in older adults.
- Blood flow to the brain is decreased with advanced age; this makes older adults more susceptible to permanent damage if blood flow to the brain is further compromised.
- Loss of neurons and slower nerve conduction cause a decrease in efficiency of the autonomic nervous system with advanced age.
- In late adulthood, changes can cause slower movement, slower response time, and decreased sensation. Tremors may occur without rigidity, and tendon reflexes may be hypoactive.
- Body homeostasis is more difficult for older adults to maintain or regain. Exposure to prolonged cold or to excessive heat may cause death. Adaptation to physiologic stress takes much longer, and recovery often is incomplete.
- The aging process affects recent, short-term memory, but long-term, distant memory is often not affected. The ability to learn is not affected by aging, but the learning process is slower. It takes longer to process new information. Abstract reasoning ability slowly diminishes with advancing age, and perception may become impaired.
- Decreases in secretion of the neurotransmitters norepinephrine and dopamine occur with advanced age, and there is an increase in monoamine oxidase, which can affect cognitive function, gait, and balance.
- The number of posterior root nerve fibers and sympathetic nerve fibers of the autonomic nervous system declines with aging of the spinal cord. In the PNS, the motor nerve fibers and the myelin sheath degenerate with advancing age, and reflexes may become diminished or absent.
- Pupils decrease in size with advanced age, and more light is needed for reading.
- Older adults may need more time to process questions, solve problems, or learn new information.
- Using the brain and keeping it active promotes continued intellectual function in healthy older adults.

Causative Factors Involved in Neurologic Disorders

Many factors can affect neurologic function, including genetic and acquired developmental disorders. Infections and inflammation, benign and malignant tumors, vascular or neuromuscular degeneration, and metabolic and endocrine disorders can all cause damage to or interfere with normal function of the nervous system. Chemical or physical trauma often causes permanent damage to the brain or spinal cord. **Box 21-1** lists by category the most common neurologic disorders in adults.

Box 21-1

Classification of Common Neurologic Disorders

Genetic/Developmental Disorders

- Cerebral palsy
- Muscular dystrophy
- Huntington disease (chorea)

Trauma

- Head injury
- Penetrating brain injury
- Spinal cord injury
- Ruptured intervertebral disk

Cerebrovascular

- Cerebrovascular accident
- Ruptured aneurysm
- Arteriovenous malformation
- Migraine, cluster headache

Tumor

- Brain tumor
- Spinal cord tumor

Infection

- Meningitis
- Encephalitis
- Brain abscess
- Poliomyelitis
- Guillain-Barré syndrome

Neuromuscular Disorders

- Multiple sclerosis
- Myasthenia gravis
- Amyotrophic lateral sclerosis

Degenerative Disorders

- Parkinson disease
- Alzheimer disease

Cranial Nerve Disorders

- Bell palsy
- Trigeminal neuralgia

Prevention of Neurologic Disorders

The nervous system coordinates all sensory and motor activities by receiving, interpreting, and relaying messages that are vital to the proper performance of all the body's activities. Respiratory, circulatory, digestive, and endocrine functions all depend on an intact and normally functioning autonomic nervous system.

Nurses can help prevent neurologic problems in many ways. The goals for *Healthy People 2020* encourage health protection through education about safety and responsible self-care.

Health Promotion

Protecting the Nervous System

- Encourage people to wear helmets when biking, in-line skating, skateboarding, or riding motorcycles, and when involved in other sports activities that may lead to head injury.
- Remind people that wearing safety hats or helmets when in a workplace where head injury is a danger reduces the number of injuries.
- Review safety precautions when diving and swimming. To help prevent spinal cord injury, never dive into water of unknown depth.
- Encourage people to fasten their seat belts before putting the car into gear.
- Be certain that children are fastened into appropriate restraints.
- Wear mask, gloves, long pants, and long-sleeved shirt when spraying with insecticide; wash up immediately afterward and change clothes.
- Refrain from using recreational drugs, because they can affect the cardiovascular system and can cause a stroke.

Teaching about the dangers of recreational drug use, such as the possibility of stroke from the use of "crack" cocaine and the potential for accidents while under the influence of some drugs, are other areas for public education. Informing the public about the damaging effect of too much alcohol on brain cells, as well as the increased incidence of alcohol-induced accidents, is another area for education.

Promoting immunizations to protect from tetanus, measles, poliomyelitis, and infectious diseases that may cause high fever and resultant brain damage is an area in which nurses can be effective. **Control of hypertension and cholesterol can reduce the number of strokes and the damage they cause.** Teaching people to recognize the symptoms of stroke and to seek early treatment may prevent permanent disability.

Pesticides and various chemicals in household and work environments can cause neurologic toxicity and damage. Parkinson disease is particularly more prevalent in farm workers and others who handle pesticides or work where pesticides are frequently used (Seaman, 2013). Read information on containers of pesticides carefully. Wear long-sleeved clothing and gloves when spraying pesticides in the garden. Spray in quiet, nonwindy conditions. Wash hands and exposed skin with soap and water afterward. Change clothes and launder the clothing worn after pesticide spraying.

Evaluation of Neurologic Status

The complete neurologic examination performed by the health care provider systematically measures the ability of the body to perform its myriad motor and sensory functions. Mental acuity, memory, and emotional stability also are assessed. A complete neurologic examination is a very long procedure and may be performed in stages over several days. However, gross assessment of the cranial nerves, coordination and balance, muscle strength, and reflexes is standard for every patient with a neurologic complaint. Nurses sometimes do all or part of the examination.

Cranial Nerves

The 12 cranial nerves (CNs; designated as CN I through CN XII) control both sensory and motor activities within various parts of the body (see [Table 21-2](#)). [Table 21-5](#) explains how to perform a basic assessment of cranial nerve function.

Clinical Cues

A mnemonic for remembering the CN names is as follows:

"On Old Olympus's Towering Top A Finn Very Gladly Viewed A Hop" (Olfactory, Optic, Oculomotor, Trochlear, Trigeminal, Abducens, Facial, Vestibulocochlear, Glossopharyngeal, Vagus, Accessory, Hypoglossal).

Table 21-5
Quick Gross Assessment of Major Cranial Nerves

CRANIAL NERVE TESTED	QUICK METHOD OF TESTING*
Olfactory	Have patient smell a sample of ground coffee, perfume, and pickle juice.
Optic	Test visual acuity with a Snellen eye chart. Test visual fields by asking patient to hold the head still and identify items on various areas of a chart.
Oculomotor, trochlear, and abducens	Assess pupil size, direct and consensual constriction, and accommodation. Assess the cardinal fields/directions of gaze.
Trigeminal	Ask patient to clamp jaw shut, open the mouth against resistance, open the mouth widely, move the jaw from side to side, and make chewing motions. Test sensation by placing a warm and then a cold item on various portions of the face. Ask whether item is warm or cold.
Facial	Observe the face for symmetry; ask patient to smile, frown, raise the eyebrows, tightly close the eyes, whistle, show the teeth, and puff out the cheeks.
Vestibulocochlear (or acoustic)	Whisper from varying distances and locations behind the patient and ask patient what was said. Test equilibrium with Romberg test: ask patient to stand with feet only slightly apart and eyes closed. Observe for swaying of the body.
Glossopharyngeal and vagus	Ask patient to open mouth wide and say "Ah." Place tongue depressor on first third of tongue to flatten it and observe movement of the uvula and palate; they should rise symmetrically with the uvula at midline. Assess gag reflex by touching each side of the pharynx; there should be a brisk response. Have patient swallow a bit of water.
Spinal accessory	Ask patient to elevate the shoulders with and without resistance, turn the head to each side, resist attempts to pull the chin back toward the midline, and push the head forward against resistance.
Hypoglossal	Ask patient to open mouth wide, stick out tongue, and rapidly move it from side to side and in and out. Watch for deviation from midline. Apply pressure to cheek and ask patient to push tongue against hand to check for strength.

*These maneuvers do not check for every function of these cranial nerves, but will provide data indicating whether a more thorough assessment is needed.

Coordination and Balance

This portion of the neurologic examination evaluates functions controlled by the higher centers of the brain, the cerebrum and cerebellum. The patient is asked to stand with her feet together and to close her eyes (Romberg test). If the sense of balance is normal, a steady posture will be maintained and there will not be swaying from side to side. Next ask the patient to walk across the room, and assess the gait. Then stand in front of the patient, hold up a finger, and ask the patient to touch your finger and then her own nose; move your finger to different locations in front of the patient. This tests both the ability to follow directions and coordination.

Neuromuscular Function Testing

Groups of large muscles are tested for strength and coordination. Evaluate the patient's gait while walking, hand grip strength, and arm and leg strength as the patient pushes against resistance. More sophisticated tests include electromyography ([Table 21-6](#)).

Table 21-6
Diagnostic Tests for Neurologic Disorders

PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
Skull and Spine Radiographs		
To detect fractures, bone loss, and other bony abnormalities	Radiographs are taken of the desired area from various angles.	Explain that the test is noninvasive. Advise that the patient will have to move into various positions.
Lumbar Puncture (Spinal Tap) (see Figure 21-11)		
To determine whether CSF pressure is elevated; to determine whether there is a blockage to the flow of CSF; to inject medications; to obtain fluid for chemical analysis and culture	Provider performs a sterile puncture into the arachnoid space, using local anesthetic, between L3 and L4 or L4 and L5; opening pressure is obtained; fluid is aspirated and placed in sterile test tubes labeled 1, 2, and 3. Fluid is analyzed for color, pH, cell count, protein, chloride, and glucose; a culture is usually done. Local anesthetic is used.	Procedure requires a signed consent form. Obtain sterile lumbar puncture tray, local anesthetic, sterile gloves, and tape. Assist patient into position with back bowed, head flexed on chest, and knees drawn up to the abdomen. Patient may be lying or sitting. Assist patient to maintain position and to hold still during procedure. Reassure patient and provide emotional support. Personnel must wear a mask during procedure. <i>Postprocedure:</i> Appropriately label tubes with patient data and transport them to the laboratory immediately. Keep patient flat in bed to reduce headache for 1 hr or longer after procedure and encourage fluid intake unless contraindicated. Observe the site for signs of drainage and inflammation.
Electroencephalography (EEG) (Figure 21-12)		
To detect abnormal brain wave patterns that are indicative of specific diseases, such as seizure disorder, brain tumor, CVA, head trauma, and infection; to determine cerebral death	May be performed while patient is asleep, drowsy, or undergoing stimulation such as hyperventilation or rhythmic bright light. Test may be done at the bedside or in the EEG laboratory. Tracing is taken with patient in reclining chair or lying down. Electrodes are applied to the scalp with an electrode paste. Test takes 45 min-2 hr.	Explain purpose of test to the patient; assure her she will not receive an electrical shock, the test is not painful, and that the machine does not determine intelligence or read her mind. Hair should be clean and dry. No sleeping pills or sedatives the night before test; check with provider regarding other drugs to be held; restrict coffee, tea, caffeine, and alcohol for 24-48 hr. If a sleep EEG is ordered, patient may need to be kept up most or all of the night before the test; do not keep NPO, as hypoglycemia can affect the test. <i>Postprocedure:</i> Wash hair to remove the electrode paste. <i>Nothing touches the patient during the procedure.</i>
Magneto-Encephalography (MEG)		
To pinpoint the area of the brain damaged by a stroke, where seizure activity is originating, or location of other injury or disorder	A biomagnetometer machine detects the small magnetic fields generated by neurons.	<i>Postprocedure:</i> Care is the same as for electroencephalography.
Electromyography (EMG)		
To measure electrical activity of skeletal muscle at rest and during voluntary activity to determine abnormalities in muscular contraction; helpful in diagnosing neuromuscular, peripheral nerve, and muscular disorders	With the patient sitting in a chair or lying on a table, needle electrodes are inserted in selected muscles. Tracings of electrical activity are taken with the muscles at rest, then with various voluntary activities that produce muscle contraction. The test takes 1-2 hr depending on how many muscles are tested.	Procedure requires a signed consent form. Explain the procedure to the patient; tell her that there is discomfort when the electrodes are placed. Check with provider regarding medications to be withheld; muscle relaxants, cholinergics, and anticholinergics can influence test result. There is no food or fluid restriction. If serum enzymes are ordered, they should be drawn before the EMG.
Myelography		
To detect spinal lesions, intervertebral disk problems, tumors, or cysts	Contrast medium is injected into the spinal canal, and fluoroscopic examination and radiographs are made. The study is contraindicated if the patient has increased ICP. The patient is placed prone and strapped to the x-ray table for the spinal puncture; as the contrast medium is injected, the table is tilted. After the test, if oil-based medium was used, it is withdrawn. The patient is kept in bed with head of bed elevated 60 degrees or flat depending on the contrast medium used. Procedure takes 1 hr. Rarely performed.	Procedure requires a signed consent form. Explain what to expect. Patient may feel a warm flush when contrast medium is injected. Bowel evacuation regimen may be ordered the night before. Keep NPO for 4-8 hr before procedure. Check for medications to be withheld before and for 48 hr after test. Assess for allergy to iodine or shellfish. Dress in myelogram pajamas; administer preoperative sedative or analgesic if ordered. <i>Postprocedure:</i> Monitor VS q30min × 2 hr, then hourly × 4 hr. Assess pulses and sensation in extremities; monitor urinary output; catheterize as ordered if patient cannot void in 8 hr; encourage increased fluid intake. Observe for signs of meningitis.
Computed Axial Tomography (CAT or CT Scan); Xenon CT; Intrathecal Contrast-Enhanced CT		
To examine the brain from many different angles, obtaining a series of cross-sectional images that provide views from three dimensions To identify hematomas, tumors, cysts, hydrocephalus, cerebral atrophy, obstruction to CSF flow, and cerebral edema	May be done with or without contrast dye enhancement. Patient lies on a narrow table with her head cradled and is moved so that her head is inside the circular opening of the machine. A security strap is wrapped snugly around her. CT scanner produces a narrow x-ray beam. Various clicking and whirring noises are heard as the machine rotates the scanner for different views. The test takes 45 min-1½ hr. A lumbar puncture is needed for an intrathecal contrast-enhanced CT.	Procedure requires a signed consent form. Explain the procedure and what patient will see, hear, and feel. If contrast dye is used, the patient will feel a warm flush and have a metallic taste in her mouth as it is injected. If contrast dye is used, patient should be NPO for 3-4 hr before test to prevent vomiting. Assess for allergy to iodine or shellfish. Remove all hairpins, jewelry, and metal from the head and neck. Patient may need to be sedated if she is prone to claustrophobia; the table can be uncomfortable for those with arthritis or back problems. She will be able to communicate with the machine's operator. <i>Postprocedure:</i> Care is the same as for lumbar puncture.
Cerebral Angiography		
To visualize the structure of the cerebral arteries to determine the presence of stricture, tumor, aneurysm, thrombus, or hematoma	Radioopaque liquid is injected through a catheter inserted into the common carotid artery, and a series of radiographs is taken. Fluoroscopy is used during the procedure. Digital subtraction angiography (DSA) is done by using a computer along with the angiography procedure. Test takes 1-2 hr.	Procedure requires a signed consent form. Assess for allergy to iodine and shellfish. Explain procedure; patient will be supine on x-ray table; local anesthetic will be used to introduce the catheter; an IV line will be started in case of need for emergency drugs; patient will feel a flush as the dye is injected. Patient should be NPO 8-12 hr before test; anticoagulants are discontinued beforehand. May be given preprocedure sedative, antihistamine, or steroid to decrease possibility of allergic reaction to dye. <i>Postprocedure:</i> Assess for bleeding at catheter site; assess distal pulses; perform neurologic checks; monitor VS q15min × 2 hr, then hourly × 4 hr or until stable. Assess for dysphagia and respiratory distress that could indicate internal bleeding in the neck. Activities are restricted for 24 hr.
Radionuclide Imaging (Brain Scan)		
To detect an intracranial mass: tumor, abscess, hematoma, or aneurysm	A radioisotope is administered IV. Abnormal tissue usually absorbs more of the isotope than normal tissue. After a 1- to 3-hr waiting period for absorption, a scintillation scanner is used to image the brain. The test takes 30 min-1 hr.	Explain the procedure; patient will sit or lie on a table; the scanner makes clicking noises; the amount of radioactivity is very low and is not dangerous to the patient or others. Patient will need to lie or sit still during the scanning. A drug may be given the night before to block uptake of the radioactive element by the thyroid and salivary glands. There is no food or fluid restriction; no special aftercare.
Magnetic Resonance Imaging (MRI)		
To visualize soft tissue without the use of contrast media or ionizing radiation; provides excellent images of soft tissue, eliminating bone; can visualize lesions undetected by CT scan To detect white matter areas in nervous system that represent demyelination, as in multiple sclerosis	An electromagnet is used to detect radiofrequency pulses produced by alignment of hydrogen protons in the magnetic field. Computer produces tomographic images with high contrast of area studied. Cannot be used in the presence of metal. Is quite expensive. A contrast agent often is used for better visualization and definition of specific structures.	Inform patient that the test is painless; no dietary restrictions. Remove all metal objects before test. Screen the patient for hidden sources of metal, such as bullet fragments, iron filings, aneurysm clips. MRI is contraindicated for patients with pacemakers. Patient must be still during test. Explain that body part to be imaged is moved inside large machine; some patients become claustrophobic. Patient will be able to communicate with the machine operator. Requires a signed consent for use of contrast media.
Magnetic Resonance Angiography (MRA)		
To evaluate intracranial and extracranial blood vessels and for diagnosing cerebrovascular disease; is rapidly replacing cerebral angiography	Similar to MRI. Uses differing signals of flowing blood to collect data. May be enhanced with use of contrast media.	Explain the need for lying completely still for 1 hr. May require sedation. Screen patient for any metal on body before test. Requires a signed consent for use of contrast media.
Magnetic Resonance Spectroscopy (MRS)		
To determine loss of neurons with markers of neuronal integrity (e.g., N-acetyl	Uses MRI to gather information about chemical composition of brain tissue.	Same as for MRI.

aspartate) and to study brain diseases		
Positron Emission Tomography (PET)		
To assess for cell death, damage in brain tissue	Radioactive material is given and provides differing color in areas of cellular activity.	Procedure requires a signed consent form. Explain that two IV lines will be inserted. Patient is to avoid sedatives or tranquilizers before test. Ask to empty bladder before test. Patient may be asked to perform various activities during the test.
Single-Photon Emission Computed Tomography (SPECT)		
To visualize glucose or oxygen metabolism in the brain and to visualize blood flow	Radiolabeled compounds are injected, and their single-photon emissions are scanned. Images are made of the accumulated radiolabeled compounds.	Same as for PET.
Ultrasound Arteriography (Doppler Flow Studies)		
To study flow and determine areas of constriction or obstruction in cerebral arteries To detect arterial spasm	Noninvasive test. Doppler image scanning device is used with computer to visualize anatomy of major cerebral arteries.	Tell patient that the test is noninvasive and painless. A small Doppler wand is positioned over particular "window" areas on the skull (temples), and with the computer, sound waves are directed so as to produce an image of the interior arteries and their blood flow. No special preparation or aftercare.
Carotid Duplex Doppler Studies		
To determine whether blood flow in carotid arteries is decreased or blocked	Sound waves graph a picture of blood flow in the carotid arteries.	Explain that the test is noninvasive and painless. Patient will lie flat with head turned to one side and then the other as metal wand passes along the artery.
Evoked Potential Studies		
To measure response of the CNS to visual, auditory, or sensory stimulus and helpful in detecting tumor of CN VIII, blindness in infants, or brainstem lesions; also useful in diagnosing multiple sclerosis	May be done in conjunction with EEG. Electrodes are used to pick up and transmit impulses to a computer while a stimulus is delivered to the patient. Signals are displayed on an oscilloscope, and data are stored for later interpretation.	Explain the procedure to the patient. Visual-evoked potentials: stimulus may be a bright flashing light or checkerboard patterns. Somatosensory-evoked potentials require stimulation of a peripheral sensory nerve with a mild electric shock. Auditory brainstem-evoked potentials use various noises or tone bursts through earphones. Discomfort is minimal. Test takes 30-60 min.
Cerebrospinal Fluid Analysis and Culture		
To detect abnormalities that are indicative of specific neurologic problems and determine which organism is responsible for infection	CSF is obtained by lumbar puncture. It is analyzed for color, cell count, protein, chloride, and glucose. The fluid is cultured to detect the presence of organisms; if present, an antibiotic sensitivity test is done to determine which drug will best kill the organism. CSF pressure also is measured. Normal CSF values for the adult are: Color: clear Cell count (WBCs): 0-8 mm ³ Protein: 14-45 mg/dL Chloride: 118-132 mEq/L Glucose: 40-80 mg/dL Pressure: 70-150 cm H ₂ O or <20 mm Hg	Follow lumbar puncture procedure. Label the test tubes as 1, 2, and 3 and be certain they are filled with at least 3 mL of CSF in this order. Do not refrigerate the tubes; transport to the laboratory immediately. Maintain Standard Precautions (see Appendix B).
PLAC (Lipoprotein-Associated Phospholipase A₂/Lp-PLA₂)		
To detect enzyme marker for increased ischemic stroke risk	This substance is thought to be partly responsible for atherosclerosis formation.	Explain that this is a simple blood test. Results take 7-10 days.

CN, Cranial nerve; CNS, central nervous system; CSF, cerebrospinal fluid; CVA, cerebrovascular accident; ICP, intracranial pressure; IV, intravenous; NPO, nothing by mouth; VS, vital signs; WBCs, white blood cells.

Reflexes

A **reflex** is an action or movement that is built into the nervous system and does not need the intervention of conscious thought to take place. In other words, it is an automatic response. The knee jerk is an example of the simplest type of reflex. When the knee is tapped, the nerve that receives this stimulus sends an impulse to the spinal cord, where it is relayed to a motor nerve. This causes the quadriceps muscle at the front of the thigh to contract and to move the leg upward. This reflex, or simple reflex arc, involves only two nerves and one synapse. The leg begins to jerk up while the brain is just becoming aware of the tap on the knee (see [Figure 21-5](#)).

The knee jerk, or patellar reflex, tests nerve pathways to and from the spinal cord at the level of the second through fourth lumbar nerves. In addition to testing the patellar reflex, a neurologic examination might include testing the biceps reflex (pathways for the fifth and sixth cervical nerves), triceps reflex (seventh and eighth cervical nerves), brachioradialis reflex (fifth and sixth cervical nerves), and Achilles tendon reflex (first and second sacral nerves). Reflexes are graded as follows: 0/5 = absent; 1/5 = weak response; 2/5 = normal; 3/5 = exaggerated response; and 4/5 = hyperreflexia with clonus. **Clonus** is a continued rhythmic contraction of the muscle while there is continuous application of the stimulus.

Another reflex action widely used as a diagnostic aid in CNS disorders is the **Babinski reflex**, which is elicited by scraping an object such as a key along the sole of the foot. In a normal response to this stimulus, the toes will bend downward. In a *positive* Babinski reflex, the great toe bends backward (upward) and the smaller toes fan outward. A positive Babinski reflex in an adult who is not under the influence of chemical substances indicates an abnormality in the motor control pathways leading from the cerebral cortex ([Figure 21-7](#)).

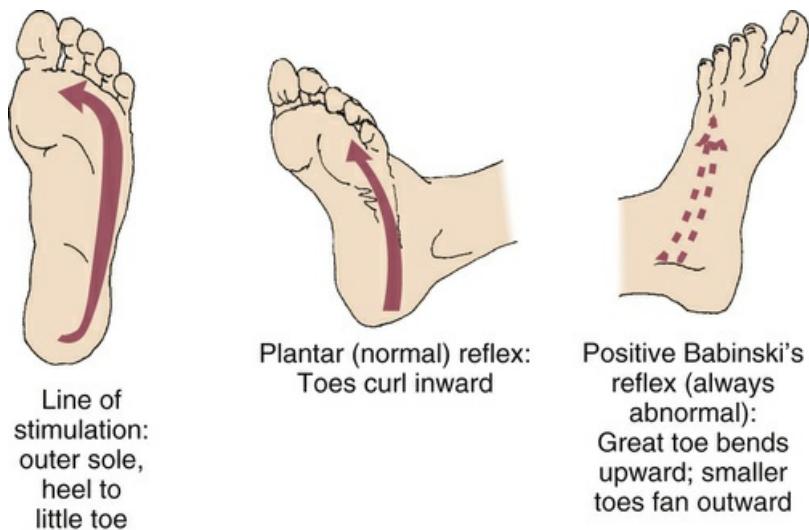


FIGURE 21-7 Normal and Babinski reflexes.

For an unconscious person, tests are performed to determine brainstem function. After ruling out spinal cord injury, the oculocephalic ("doll's eye") and oculovestibular reflexes are assessed. For the doll's eye reflex, the examiner places a hand on each side of the patient's head, using the thumbs to gently hold open the eyelids. While watching the patient's eyes, the head is rotated briskly to one side and eye movement is observed in relation to head movement. If the brainstem pathways are intact, the eyes appear to move in a direction opposite to that of the head movement; that is, if the head is rotated to the right, the eyes appear to move to the left. This finding is a "positive" doll's eye reflex and indicates an intact brainstem. If the eyes remain stationary and do not appear to move, then the result is a "negative" doll's eye reflex and is abnormal. After ensuring that the tympanic membrane is intact, the oculovestibular reflex is assessed by **caloric testing**. With the patient's head elevated at least 30 degrees, 20 to 200 mL of cold or ice water is instilled into the ear with a catheter-tipped syringe. While the external ear canal is irrigated, the patient's eye movements are observed. Normally the eyes will show nystagmus, darting away from the irrigated ear. Absence of eye movement may indicate a brainstem lesion.

❖Nursing Management

■ Assessment (Data Collection)

Neurologic nursing requires special training and experience in observation, critical judgment, and specific skills to help patients cope with myriad problems. You not only must be aware of subtle changes in the patient's condition but also must recognize the significance of these changes and act promptly when medical attention is needed. LPNs/LVNs assist RNs with the gathering of data for the neurologic assessment.

Assignment Considerations

Reporting Observations

If a patient with a neurologic problem that may affect the level of consciousness is assigned to a CNA for bathing and morning care, remember to remind the assistant to report to you any change in wakefulness, irritability, speech, eye appearance, gait, or balance. It is best not to assign a patient who has already shown some signs of deteriorating level of consciousness to a CNA.

Patient History

Because neurologic disorders can be present in conjunction with or in addition to disorders of other body systems, include questions about neurologic status in the initial and ongoing assessments of all patients. For example, a surgical patient could have had a previous stroke, or could have a history of seizures or an existing neuromuscular disease such as multiple sclerosis. Although these

may not be the primary reason for admission to a hospital, they will certainly influence the course of the illness or injury for which admission occurred.

Focused Assessment

Data Collection for the Neurologic System

When gathering a history for a patient who may have a neurologic problem, ask the following questions:

- Do you or does any member of your family have any genetic disorder of the nervous system?
- Have you ever had a seizure or been told you have epilepsy?
- Have you ever had difficulty in speaking, concentrating, remembering, or expressing thoughts? Have you noticed any changes in these functions?
- Have you had any changes in muscle strength or coordination?
- Have you ever injured your head?
- Have you ever had a really high fever?
- Have you had any severe sinus, ear, tooth, or facial skin infection?
- Do you recall any episodes of tremors, muscle spasms, fainting, dizziness, ringing in the ears, or blurred vision?
- Have you had any “blackout” spells?
- Have you noticed any changes in taste or smell?
- Do you have any numbness or tingling in the extremities?

Physical Assessment

A basic nursing assessment of neurologic function is performed on any patient who is suspected of experiencing a neurologic problem. Nurses often need to assess for the occurrence of cerebrovascular accident (CVA, or stroke) or of a neurologic deficit after a surgical procedure. Basic neurologic assessment includes assessment of the following areas.

Vital signs. Assessing and recording temperature, pulse, respirations, and blood pressure are essential. The patient's temperature is important and may be elevated for a number of reasons. Infection or damage to the temperature control mechanisms within the brain from increasing intracranial pressure (ICP) may be present.

Changes in blood pressure, particularly a rise in systolic pressure and a widening pulse pressure, may indicate an ICP increase. The pulse may become slow and bounding, and breathing may become irregular and labored as ICP rises. Changes in breathing pattern often indicate a problem with neurologic control of respiration. Any identified change must be reported to the provider promptly.

Clinical Cues

When the systolic and diastolic pressure readings are farther apart, a widening pulse pressure has occurred. For example, if the blood pressure was 128/78 mm Hg earlier and is now 136/64 mm Hg, there is a widened pulse pressure. Notify the provider when the pulse pressure widens.

Current vital signs should be compared with those from the previous several days to determine any changes or trends. Look for changes in blood pressure, pulse rate and quality, and respiratory pattern and for rising temperature.

Mental function and level of consciousness. Patients experience varying levels of consciousness and ability to respond. It is necessary to determine where the patient is in relation to level of consciousness (LOC), the extremes being alert wakefulness and deep coma (no responsiveness at all).

When observing a patient to determine LOC, the best assessment is based on established criteria or standards that are understood by the observer as well as by others who will be reading the results of the observations. The Glasgow Coma Scale (GCS) is a tool that is universally used in one form or another for this purpose ([Table 21-7](#)). The patient's LOC is scored in three different categories. The first category is eye opening, the second is best motor response, and the third is best verbal response. A number is assigned for each category depending on what the assessment reveals. Assessment in the first and last categories determines whether the patient can respond to voice commands or to pain or does not respond at all. Verbal responses are evaluated according to whether the patient is oriented and "making sense," confused, making inappropriate remarks, incomprehensible, or silent. **The score in each area is added together, with the optimal score being 15, which indicates a fully alert patient. A score of 3 indicates a totally comatose patient.** A score of 8 or less indicates coma level. Some of the criteria for assessing LOC include: Does the patient awaken easily? Is she oriented to person (herself as well as others), place, and time? Is she able to follow commands? Does she fail to respond to any stimulus, even physically painful ones? Is she restless? Combative? Does she respond to pain with abnormal posturing?

Table 21-7
Glasgow Coma Scale

	SCORE
Eye Opening	
Spontaneous	4
To sound	3
To pain	2
Never	1
Motor Response	
Obey commands	6
Localizes pain	5
Normal flexion (withdrawal)	4
Abnormal flexion posturing	3
Extension posturing	2
None	1
Verbal Response	
Oriented	5
Confused conversation	4
Inappropriate words	3
Incomprehensible sounds	2
None	1

*A score of 8 or less indicates coma. The highest possible score is 15.

The FOUR (Full Outline of UnResponsiveness) score developed by Eelco Wijdicks, a neurologist at the Mayo Clinic, is becoming the preferred scale to assess comatose or intubated patients who cannot speak. A score of 0 to 4 is assigned in each of four categories: eye, motor, brainstem, and respiratory function. A score of 0 indicates no function and a score of 4 indicates normal function ([Wijdicks et al, 2011](#)).

Think Critically

If your patient's blood pressure was 138/84 mm Hg and is now 146/76, what is happening? Is the ICP probably increasing or decreasing?

For an alert patient, note changes in mental function by asking questions to determine orientation to person, place, and time: "What day is today? What month is it? Where are you now?" Memory lapses may be assessed by asking when the patient was born, what state she resides in, what the last major holiday was, and so on. Thinking can be evaluated by asking the patient to add three numbers together; to count by sixes; or to solve a simple puzzle, such as "If a man goes to the store and purchases four oranges at 40 cents each, two apples at 60 cents each, and two bananas for 46 cents, how much did he spend?" (Allow pencil and paper to be used.) If the patient can read English, hand her a card with a command written on it, such as "walk to the sink" or "turn on your right side" (assuming she is physically capable of performing such a task).

Judgment can be grossly tested by assessing whether the patient has been making rational choices in her day-to-day life and by asking her what she would do in a particular situation. Asking

specifically what she would do should there be a fire in the trash can will provide information about her judgment.

Neurologic and neuromuscular status. While watching the patient perform morning activities of daily living (ADLs), basic assessment of cranial nerves and motor function can be performed. Assess the following: Does the face move symmetrically when she smiles? Is speech clear when she answers questions? Does she move left and right extremities without noticeable problems? Is there anything abnormal about her gait as she moves across the room or down the hall? Does she have difficulty eating or swallowing? Observe the pupils of the eye for size and equality. Pupils should be equal size and should constrict and dilate readily when the environmental light changes ([Figure 21-8](#)). Can the patient hear you if you speak to her when her back is turned? Does she seem as alert as usual? Is she having any trouble with balance?

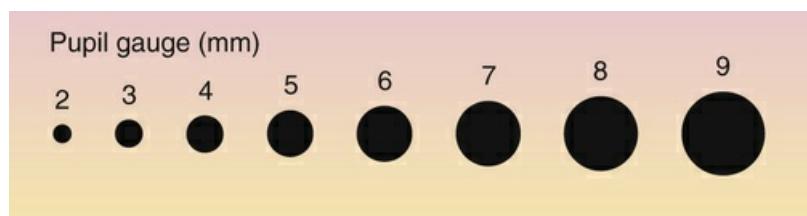


FIGURE 21-8 Pupil gauge (mm). (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2014, Saunders.)

Evaluate the extraocular muscle movements. Ask the patient to follow your finger while you move it through the cardinal positions of gaze ([Figure 21-9](#)). Note whether both eyes move together (conjugate) or one deviates. If there is deviation, it is important to note the direction of the deviation. Note any quick back-and-forth oscillation (**nystagmus**) of the eye at the end points of each direction. Nystagmus can indicate abnormality, such as multiple sclerosis, or can be a side effect of medication, such as phenytoin (Dilantin).

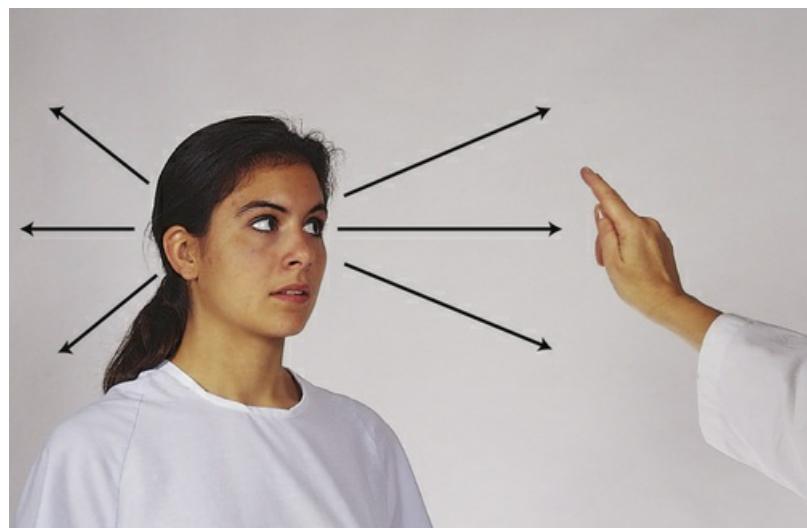


FIGURE 21-9 Checking the cardinal positions of eye movement. (From Jarvis C. *Physical examination and health assessment*, ed. 6, Philadelphia, 2011, Saunders.)

Neuromuscular assessment is concerned with the function of the motor pathways. Test each of the upper and lower extremities. Ask the patient to follow verbal commands such as "raise your left leg," "bend your right knee," "touch your left elbow with your right hand," and "touch your face with your left hand." Have her push against the palms of your hands first with one foot and then the other to test the strength of the leg muscles. To test muscle strength, have the patient extend her arms in front of her, and press down on each arm one at a time, while asking her to try to raise her arm. If the patient has an extremity that is not responding, another stimulus may be necessary to

test it. If the patient does not respond to voice commands at all, and deafness is not an issue, test the degree of unconsciousness. First use a louder voice to try to arouse the patient; then, if she does not respond, gently shake her as you would to awaken a child. If that is not successful, painful stimuli are applied for 20 to 30 seconds. First try applying pressure above the eye by placing a thumb under the orbital rim beneath the middle of the eyebrow and pushing upward. If there is no response, pinch the trapezius muscle at the angle of the shoulder and neck; twist the fingers slightly. If there is no response, apply pressure to the angle of the mandible with the index and middle fingers. If there is still no response, the sternum is rubbed with the knuckles in the form of a fist; a twisting motion is used. **The sternal rub is performed on subsequent assessments only if there is good reason to believe that the patient's comatose status is changing, as it causes bruising.**

The levels of response are:

- Purposefully withdrawing from the stimulus or an attempt to push it away
- Nonpurposeful response, in which the patient may frown or move her arm or leg in a random fashion
- Failure to respond at all

Nonpurposeful responses to pain occur in two ways. **Decorticate (flexor) posturing**, which is the extension of the legs and internal rotation and adduction of the arms with the elbows bent upward, occurs with damage to the cortex. In **decerebrate (extensor) posturing**, the arms are stiffly extended and held close to the body, and the wrists are flexed outward. This response means there is damage to the midbrain or brainstem, which indicates a very serious injury ([Figure 21-10](#)). The response may be “lateralization,” wherein one side of the body shows typical decorticate or decerebrate posturing. An important aspect of neurologic assessment is to look for changes in the patient from each day to the next. Bilateral flaccidity is usually present when there is no response at all.

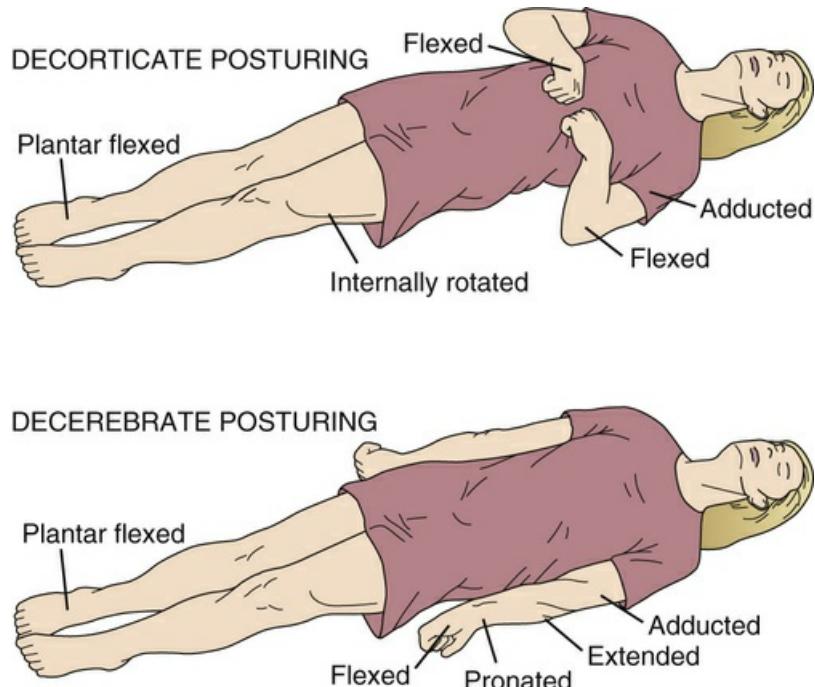


FIGURE 21-10 Decorticate and decerebrate posturing indicating brainstem injury.

Pupillary reactions. Changes in pupil size in response to a bright light are commonly used to determine whether the areas of the brainstem that help control consciousness are functioning normally. Cranial nerves II and III control pupil movement. When ICP rises beyond a certain point, pressure on these nerves causes changes in the pupils. If at all possible, find out the normal pupil size for the patient. Although pupils of equal size are considered normal, some people have pupils that are unequal in size. The size of the pupils also may vary from person to person (see [Figure 21-8](#)). It is best to measure pupil size rather than estimate it.

Examine the pupils in a room with low light, when the pupils would usually be dilated. Direct a

bright light into each eye from the side while the other eye is covered. Observe whether the pupil into which the light shines constricts and whether it does so briskly or sluggishly (**direct reflex**). Finally, shine the light into each eye while watching to see if the pupil constricts in the other eye (**consensual reflex**) (Table 21-8). When pupils have been previously reactive, changes in pupil size or reactivity may signal an emergency, and the provider must be notified immediately. To test for **accommodation** (eyes able to focus on both near and far objects), ask the patient to look at an object across the room away from the light source, and then to look at your fingers held about 6 inches from the eyes. The lenses should change shape and the pupils constrict. If a flow sheet is not being used for charting, normal pupil responses often are charted as "PERRLA," meaning "pupils equal, round, and reactive to light with accommodation."

Table 21-8
Pupillary Abnormalities and Possible Causes

ASSESSMENT DATA	APPEARANCE	POSSIBLE CAUSES
Unilateral, fixed, dilated pupil. Unreactive to light. May be accompanied by ptosis and deviation to side and downward.		Damage to oculomotor nerve related to increased intraocular pressure; compression of oculomotor nerve; head trauma with epidural or subdural hematoma
Bilateral dilated and fixed pupils that do not react to light.		Hypoxia associated with cardiopulmonary arrest Pressure on midbrain Severe CNS disorder Anticholinergic drug overdose
Bilateral small, fixed pupils that do not react to light. Accompanied by motor deficits, drowsiness, confusion, headache, vomiting, incontinence when caused by damage to diencephalon.		Side effect of opiates such as morphine Miotic eyedrops Hemorrhage into the pons Damage to the diencephalon
Unequal pupil size; both pupils react to light unless there is underlying pathology.		Ocular inflammation Congenital aberration Adhesion, as of iris to cornea or lens Disturbance of neural pathways

CNS, Central nervous system.

Pupils that remain dilated and fixed in the presence of a bright light indicate brain damage if there are no drugs in the system that affect the pupils. One pupil that remains fixed and dilated indicates increased ICP. If both pupils remain constricted, there probably is damage to the pons.

Safety Alert

Report Changes Immediately

If changes in data indicate a rise in ICP or a decrease in LOC, it is important to alert the charge nurse and provider. This is even more important when possible intracranial bleeding is suspected, because it may indicate an emergency situation.

Although changes in the pupils, such as unequal constriction or decreased rate of constriction, indicate increased ICP, sometimes changes in pupils can be caused by medications. For example, atropine and scopolamine can produce dilated pupils, and opiates, miotics, and street drugs can cause constriction (see [Table 21-8](#)).

The “neuro” check. Monitoring the neurologic status of a patient with a known neurologic disorder includes a “neuro” check on a set schedule. It is performed to determine whether increased ICP is present or ICP is rising. For example, monitoring is necessary after a traumatic head injury, after ingestion of an overdose of a drug or other chemical, when a stroke has occurred or is suspected, or for any other condition in which the patient has lost or may lose consciousness. A  neurologic assessment flow sheet is used to chart assessment data so that the trend in function of each area can be quickly identified. Four areas are monitored: vital signs, LOC, pupil reaction, and motor function. Neuro checks may be ordered as frequently as every 15 minutes or at intervals from 2 to 8 hours.

Assignment Considerations

The Neuro Check

Although the measuring of vital signs can be assigned to assistive personnel, the gathering of data for the neuro check should not be delegated. It is important to compare current data with previous data and to carefully assess neuromuscular and pupillary response.

Think Critically

You arrive at the home of an older adult woman who has severe heart disease and atherosclerosis and is very weak. Her spouse says she is confused and lethargic and that she would not eat breakfast. He is worried. As her nurse, what specific assessments would you perform in an attempt to determine whether she has suffered a CVA?

Diagnostic tests. The major diagnostic tests most commonly used to evaluate the neurologic system are presented in [Table 21-6](#). Basic physiologic testing is also performed to rule out disease in some other system that might be affecting the nervous system. A nerve or muscle biopsy may be performed to determine pathologic changes in these tissues. [Figure 21-11](#) shows the technique used for lumbar puncture.

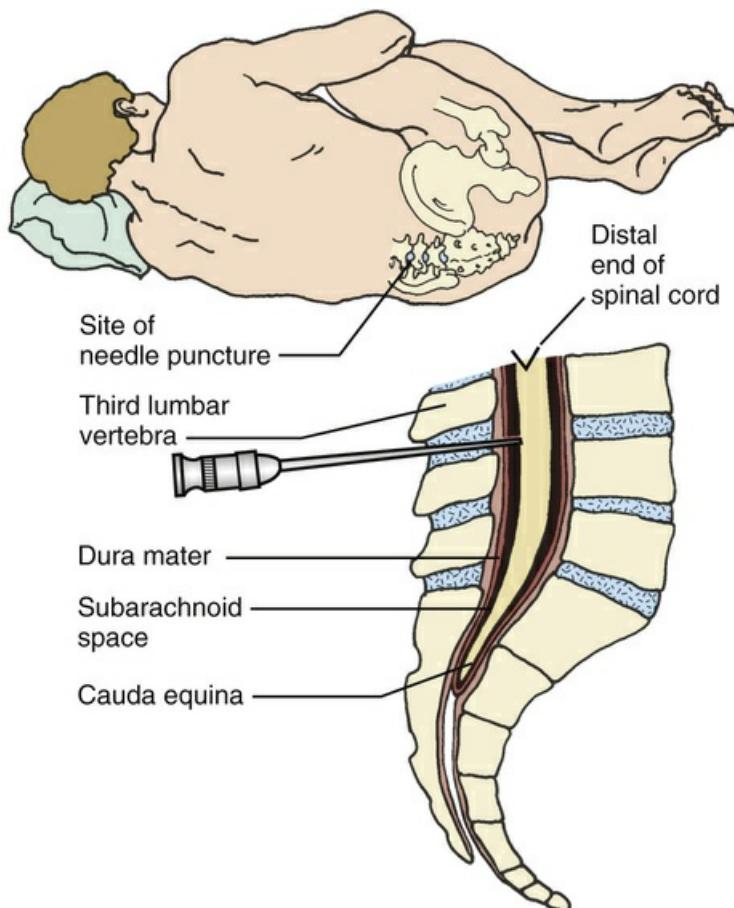


FIGURE 21-11 Lumbar puncture technique.

Nursing Diagnosis

The most common problem statements for patients with neurologic disorders are listed in **Table 21-9**. Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover). Each problem statement/nursing diagnosis chosen for the patient should be individualized to fit the situation. Problems included in a care plan vary according to whether the patient is in the acute stage, recovery stage, or rehabilitative stage of the disorder. General expected outcomes for each problem statement are presented in **Table 21-9** along with appropriate interventions.

Table 21-9

Common Problem Statements, Goals/Expected Outcomes, and Nursing Interventions for Patients With Neurologic Disorders

Problem Statement	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Potential for injury due to decreased level of consciousness, paralysis, or decreased sensation	Patient will have no evidence of injury or trauma.	Side rails up at all times patient is unattended. Bed in low position when patient is unattended. Pad side rails if seizure activity or restlessness indicates need. Provide eye care for unconscious patient and if corneal (blink) reflex is absent; lubrication and eye patch or shield as needed. Position carefully; protecting extremities from contact with side rails. Maintain correct body alignment. Administer anticonvulsants as ordered to prevent seizure activity. Protect from thermal injury. Use hand mitts to prevent injury from dislodging tubes.
Altered breathing pattern to neurologic disruption of respiration	Maintain a patent airway.	Assess respiratory status q2-8h depending on patient condition.
	Maintain a PO ₂ of 80-100 mm Hg.	Position to maximize open airway and to promote chest expansion.
	Patient will have no evidence of pulmonary infection.	Insert oropharyngeal airway as ordered. Suction secretions PRN as ordered. For controlled ventilatory support: auscultate to verify that both lungs are inflating. Check ventilator settings with those ordered. Keep alarm set to "on" at all times. Remove excess water gathering in ventilator tubing as needed. Suction patient using sterile technique as ordered PRN. Monitor blood gas values for changes. Provide frequent mouth care (i.e., q2-4h). Monitor hydration status.
Altered physical mobility due to CNS deficit, weakness, paralysis, or fatigue	Patient will maintain mobility of all joints.	Perform passive ROM or supervise active ROM qid.
	Patient will have no	Teach ROM exercises to patient and family.

	evidence of contractures.	
	Patient will regain optimal physical mobility neurologically possible.	Teach transfer techniques to hemiplegic patient and family. Collaborate with physical therapist to maximize activity.
Altered skin integrity due to impaired mobility, decreased sensory awareness, or decreased sensation	Patient's skin will remain intact.	Inspect pressure points for redness, warmth, tenderness, or edema each time patient is turned. Thoroughly inspect skin every shift. Position and pad joints to prevent pressure ulcers. Formulate regular turning/repositioning schedule and stick to it. Use special mattress or special bed to enhance skin protection. Teach patients in wheelchairs to shift weight q15min. Teach patient and family to inspect pressure areas and skin for beginning signs of breakdown.
Altered self-care ability due to neurologic impairment: paresis, paralysis, decreased LOC, or confusion	Patient will meet self-care needs of hygiene, toileting, feeding, and grooming. Patient will resume self-care at level physiologically and neurologically possible.	Assist with hygiene, toileting, feeding, and grooming as needed. Assist patient to set small, attainable goals for self-care. Explain and demonstrate specific ADL in small, one-task segments. Obtain and demonstrate adaptive devices to assist with ADLs. Offer patience, support, and encouragement for each attempt at self-care. Maintain chart of self-care improvement to track achievement so that patient can see progress.
Altered nutrition due to inability to swallow or danger of aspiration	Patient's nutritional status will remain adequate as evidenced by normal weight and adequate levels of serum protein.	Institute tube feeding as needed. Check tube placement before initiating each feeding; aspirate stomach contents; test acidity if there is doubt about origins of aspirated fluid. Check residual before each intermittent feeding or q4h for continuous feedings; if greater than 150 mL or more than half of previous feeding, replace and delay next feeding for 1-2 hr. Position patient with head of bed up at least 30 degrees when feeding and for 30-60 min after feeding. Monitor for adverse side effects such as diarrhea. Flush tube with 30-60 mL water after each feeding. Instill water between feedings to maintain hydration. Monitor glucose levels after initiation of feedings until blood glucose is stable. Check weight at least twice a week. Monitor intake and output. <i>For patient with dysphagia who can take oral feedings:</i> Serve semisoft foods. Provide six small meals per day; provide nonstressful atmosphere with few distractions for mealtime. Teach to sit upright with head slightly forward and neck flexed; encourage to place food on strongest side of mouth and tongue; encourage to take small bites at a time. Remain with patient to decrease fear of choking; keep suction at hand and turned on during meal. Ensure privacy for meal to decrease embarrassment about drooling, dropping food, or choking. Provide appropriate tube care (see Chapter 28).
Altered elimination/diarrhea/bowel incontinence due to decreased level of consciousness, neurogenic impairment, or side effects of medications	Patient will have normal bowel movements as evidenced by soft, formed stool. Patient will attain bowel continence.	Monitor bowel movements and evaluate regularity based on nutritional intake. Administer stool softeners, rectal suppositories, or enemas as ordered for constipation. Check for and remove fecal impaction if it occurs, guarding against spinal dysreflexia in the paralyzed patient. Institute bowel training program if needed (see p. 495). If diarrhea occurs, determine cause and alleviate if possible. Administer antidiarrheal if ordered. Keep rectal area clean and dry; protect rectal mucosa. Monitor hydration status; evaluate intake and output.
Altered level of consciousness due to neurologic disease or injury	Patient will respond to family interaction as evidenced by movement, hand squeezing, eye opening, or speech. Patient will return to alert state as evidenced by proper orientation to person, time, and place.	Speak of current events or daily happenings while providing care. Encourage family members and friends to speak to patient of day's occurrences or fun times in past. Play music on the radio that is to the patient's taste. Play videotapes on topics of interest to the patient. Turn on the patient's favorite television shows. Ask questions and patiently listen for a response. With a tape recorder, introduce sounds from the patient's home and work environment.
Social isolation due to immobility and intellectual limits imposed by neurologic impairment	Patient will have social interaction with visiting friends.	Encourage friends and family to visit.
	Patient will maintain relationships with family members and loved ones.	Instruct friends and family on how to interact with the patient.
	Patient will make new friends among support group members.	Encourage patient to discuss her feelings regarding social contact. Encourage participation in an appropriate support group. Encourage development of a social network. Encourage participation in church, civic, volunteer, and social groups in community. Provide referrals to community job retraining resources if patient is unable to resume former employment or lifestyle.
Altered family coping due to role changes, uncertainty of the future, and financial constraints	Each family member will demonstrate appropriate coping methods.	Assess strengths of each family member; look for signs of stress.
	Each family member will regain an optimistic outlook.	Provide opportunity for verbalization of fears and concerns and feelings about patient's changed condition.
	Each family member will accept the patient in her changed state.	Refer to social worker and community resources for support services.
	Each family member will use referrals to support groups and community resources.	Arrange for psychological counseling or family therapy as needed. Encourage contact with appropriate support group. Initiate interaction and honest communication between patient and family members when patient and each member is ready. Teach problem-solving methods if coping skills are weak.

ADLs, Activities of daily living; CNS, central nervous system; LOC, level of consciousness; Po₂, partial pressure of oxygen; PRN, as needed; qid, four times a day; ROM, range of motion.

■ Planning

Overall goals for patients with neurologic disorders depend on whether there is a physiologic possibility that full function may be regained. When permanent neurologic deficit occurs, as may occur with some spinal cord injuries, the ultimate goal is for the patient to function at the highest physiologic level. This requires adjusting to limitations imposed by the neurologic deficit so that the patient may live life in a meaningful way. A goal for all patients with neurologic disorders is to prevent injury, whether from complications of immobility, accidents related to lack of sensation, aspiration from difficulty in swallowing, or any of the other problems that the neurologic deficit may cause.

Caring for patients with neurologic deficits can be very time consuming and requires considerable patience and understanding. If the patient has any weakness, paralysis, or decreased sensation in the extremities, or is confused, disoriented, aphasic, or otherwise incapacitated, providing care will take more time than usual. Extended time must be included in the daily work

plan. When a patient is comatose or paralyzed, it is best to team up with another helper to provide care and to turn or reposition the patient. By working together, care is smoother and less taxing.

■ Implementation

Interventions for each problem statement concerning neurologic disorder problems are listed in **Table 21-9**. Patients should be given information about the disorder and taught about diagnostic tests and self-care. Positive coping skills should be reinforced and ongoing support offered. Interventions are discussed in the following sections on common care problems and with the specific neurologic disorders in [Chapters 22, 23, and 24](#).

■ Evaluation

Evaluation of interventions is performed to determine whether goals are being met. Are the interventions chosen helping to meet the specific expected outcomes written? If not, the plan needs to be changed. Progress in the patient experiencing a neurologic deficit is often slow. It may take a considerable time for improvement to be noted. Long-term goals of a realistic nature are appropriate. Keep in mind that certain types of neurologic deficits, such as those caused by spinal cord severance, may not improve.

Common Neurologic Patient Care Problems

Neurologic disorders and illnesses cause many of the same problems. Whether the patient has encephalitis, has a head injury, is recovering from cranial surgery, has suffered a stroke, or has multiple sclerosis or Parkinson disease, she may need nursing intervention in one or more of the following areas.

Ineffective Breathing Pattern

Weakness of the diaphragm or respiratory muscles or interruption of normal brain function may occur with a variety of neurologic disorders. Monitor the adequacy of respiratory effort and promote a patent airway and chest expansion. Elevating the head of the bed 30 degrees allows the diaphragm to drop more easily and promotes chest expansion. This is only done when there is no spinal injury or severe head injury. When consciousness is depressed, the tongue may be flaccid and fall back, blocking the airway. Positioning the patient on the side allows the tongue to fall to the side and opens the airway. Insertion of an oropharyngeal tube or oral airway is helpful.

Assisting the patient with deep breathing and the use of an incentive spirometer can help prevent atelectasis and improve ventilation. Respiratory assessment is performed every shift and includes auscultating the lungs for signs of atelectasis or retained secretions and judging the quality of respiratory effort. If respiratory efforts are considerably impaired, the patient may need intubation and mechanical ventilation. Interventions for patients undergoing mechanical ventilation are presented in [Chapter 14](#).

Impaired Mobility

The nurse, the physical therapist, and the patient work together to help the patient cope with muscle weakness or paralysis. Activities such as proper positioning and range-of-motion (ROM) exercises are started immediately to preserve proper alignment of joints and limbs and prevent contractures and muscle atrophy. Assistive devices, such as splints and slings, may be used. Patients with **hemiplegia** (paralysis and loss of sensation in an extremity) are taught to become aware of arm or leg placement when turning or transferring to a chair to prevent injury to the affected extremity.

For example, a patient with left hemiplegia from a CVA may neglect her paralyzed side. She must therefore be taught to attend to the affected side of her body by scanning it frequently. To prevent discomfort in the shoulder and arm on the affected side and to prevent dislocation of the shoulder, take care not to pull on the affected arm or shoulder during transfers or ambulation. Support the affected arm with pillows or an armrest to keep it from dangling when the patient is seated. Use a sling for comfort and to promote better balance when ambulating and transferring the patient.

Patients with hemiplegia are taught, step-by-step, the safest way to transfer from the bed to a wheelchair and back, and how to use assistance from others. They are also taught how to care for and protect their skin in areas of decreased sensation.

Patients with **hemiparesis** (one-sided weakness) are taught how to strengthen their muscles and use assistive devices, such as walkers, crutches, or canes, to walk. They are taught the best ways to get out of bed and into and out of a chair. Patients with **tetraplegia** (four limbs paralyzed) are helped to learn to cope with this drastic life-changing alteration and how their energies might be directed toward different, but attainable, goals. (An older term for tetraplegia is **quadriplegia**.)

All patients with a recent impairment of mobility need help with the grieving process, support in establishing healthy and effective coping patterns, and assistance with depression.

Attention to pain relief and muscle spasm is necessary for these patients to achieve the highest level of rehabilitation possible. Paralyzed extremities are susceptible to edema; to decrease this problem, extremities should be elevated when the patient is at rest. The patient needs to be turned frequently to prevent complications from pressure and sluggish circulation.

Older adult patients may suffer joint stiffness from arthritis. Assess joints for tenderness and pain before performing ROM, and be gentle and considerate when turning and repositioning them.

Take measures to promote skin integrity. Place the patient on a special bed or protective mattress cover or pad, inspect pressure points frequently, and keep the skin clean and dry. [Chapter 9](#)

discusses the effects of immobility on each body system, along with the nursing activities necessary to prevent disabilities resulting from inactivity. The principles and practices presented in that chapter are relevant to the nursing care of a patient with a neurologic disorder that produces some type of paresis or paralysis and for a patient who is unconscious.

Self-Care Deficit

Neuromuscular impairment may interfere with the patient's ability to perform hygiene activities or other ADLs. She may need assistance with bathing, grooming, oral hygiene, dressing, eating, and toileting. Work with the patient as her condition dictates, assisting with techniques to perform self-care despite disability when possible, offering encouragement, and praising any effort at accomplishing a self-care task.

Inability to carry out the most basic of self-care activities can erode a person's sense of independence and self-esteem. The ability to feed, clothe, and take care of toileting is an important part of independence. Regaining some level of self-care in these areas is of particular concern to the adult who, because of neurologic dysfunction, may have to relearn ways to perform the simplest of daily activities.

If the patient is unconscious, the mouth must be kept clean to avoid infection of the parotid gland. The lips, tongue, and gums are cleansed and lubricated at frequent intervals, because mouth breathing makes them excessively dry. This cleansing may be done by turning the patient to the side, turning on the oral suction device, and—with a toothbrush or a tongue depressor with gauze taped to it—wiping the oral surfaces. A solution of 50% water/50% mouthwash, or water with a small amount of hydrogen peroxide and sodium bicarbonate, may be used to moisten the gauze. Too much hydrogen peroxide will cause excessive foaming. Using an irrigation syringe filled with water in one hand and the oral suction device in the other allows rinsing of the mouth while preventing aspiration of the liquid. It is easiest for two caregivers to work together to rinse and suction the mouth. Each time the mouth is cleansed, the patient should be positioned on the opposite side to ensure thorough cleansing of each side of the mouth. Oral suction should be available and turned on any time mouth care is given to a patient who has a weakened gag reflex, cannot swallow normally, or has weakness of the facial muscles. Studies show that tooth and tongue brushing decreases iatrogenic infection significantly.

When the patient cannot shut her eyes, the nurse or caregiver must provide care to prevent keratitis or corneal ulceration. The eyelids are cleansed with warm sterile water or normal saline every few hours to remove discharge and debris. Artificial tears or a lubricant is instilled as prescribed to prevent dryness. If the corneal reflex is absent, an eye shield or patch is placed over the eye. The eyelid is closed before a patch is applied. The eyes are examined each day for signs of inflammation.

The ability of relatives to learn how to care for the patient, and their willingness to do so, are important parts of assessing and planning for rehabilitation. Goals for rehabilitation must be realistic and mutually agreed on by the patient, her family, and the health care team.

Assistive devices help patients with neurologic deficits to feed and dress themselves. Occupational therapists can help the patient relearn how to perform elementary tasks necessary for daily living. Patients are retaught how to feed themselves; how to get in and out of a bed or a chair; how to select and put on clothes and fasten them; and how to bathe, brush teeth, and comb hair.

Provide assistance when the patient cannot do a task completely, and—most of all—provide encouragement and praise for efforts made. **When pursuing self-help rehabilitation, remember that the patient tires easily; tasks must be spaced apart so that energy is available to achieve them.** Pushing the patient to try another task when she is too tired only sets her up for failure and frustration.

Dysphagia

Every patient who has suffered a neurologic insult (damage) from head injury, stroke, or intracranial surgery should have the swallowing reflex assessed: have the patient try to sip plain water before attempting to eat food. Check periodically that the patient automatically swallows saliva before offering water. Patients who have paresis from a stroke or who suffer from myasthenia gravis or other neurologic disorders often have difficulty swallowing (**dysphagia**). Those patients who have difficulty eating are at risk for nutritional disorders and aspiration

pneumonia. Patients with dysphagia should be sitting upright or in a high Fowler's position to eat. The position should be maintained for at least 30 minutes after a meal (Hughes, 2011). A nonstressful meal environment without distractions is best, because stress makes dysphagia worse.

When the patient cannot swallow without choking or aspirating, tube feeding is necessary. When the patient is receiving nutrients by tube, the caloric intake should be assessed frequently. Tube-fed patients are weighed twice a week and intake and output are recorded and evaluated. Interventions for the patient receiving tube feedings are outlined in [Chapter 28](#).

Incontinence

Many patients with CNS disorders experience temporary or permanent urinary or fecal incontinence. Some patients experience constipation. The patient must be kept clean and dry. A condom catheter for male patients or incontinence briefs or pads are used for urinary incontinence.

Perhaps the first step in planning and implementing either a bladder or a bowel training program is to convince the nursing staff and the patient and her family that something can be done to improve, if not completely relieve, the situation. A negative attitude and lack of persistence can doom a program to failure before it is started. Be content with small successes at first, setting short-term goals that will eventually lead to a satisfactory resolution of the problem.

Bladder Training Program

Bladder training is a program designed to help a patient with some degree of loss of normal bladder function and a resulting disturbance of voiding and bladder control. Loss of control can occur in a variety of neurologic disorders, including stroke, spinal cord injury, and tumors and lesions of the spinal cord.

The purposes of a bladder reconditioning program are to prevent urinary complications such as infection and **calculi** (stones) and to allow the patient freedom from fear of embarrassment and loss of self-esteem. Calculi are less likely to develop when there is a high fluid intake and frequent, complete emptying of the bladder.

Bladder function is assessed to determine the optimal neural and muscular control that can be realistically expected in view of the physiologic cause of loss of control. In developing a bladder reconditioning program, the patient's mental and emotional ability to cooperate and take an active part in carrying out the program is evaluated.

The cause of urinary incontinence must be known, and the specific symptoms manifested by the patient must be clearly defined. Significant data include information about:

- Difficulty in starting to void
- Any methods the patient uses to initiate voiding (e.g., pressure on the bladder)
- Degree of awareness of the need to void
- Ability to empty the bladder completely, and amount of residual urine
- Signs of bladder distention and dribbling or overflow
- Nighttime incontinence
- Stress incontinence
- Usual times for voiding

Spinal cord injuries and lesions produce what is known as a cord bladder or neurogenic bladder. Patients with disorders of this type are not aware of the need to void and must be trained in techniques to initiate voiding and emptying the bladder.

The second step in a bladder training program is to keep an accurate record of actual voiding times for a 2- to 3-day period. Some problems of incontinence can be corrected by a simple scheduling of voiding times. Offering a bedpan or getting the patient up to the bathroom one-half hour before times she is usually incontinent may remedy the problem.

A bladder training program usually begins with a 2-hour schedule for toileting. The patient should attempt to drink 2000 to 3000 mL of fluid between waking up and 6 P.M. Coffee, tea, alcoholic beverages, and soda with caffeine should be avoided after dinner, because they have a diuretic effect. The patient is toileted before retiring for the night. The maintenance of an accurate training record is essential. A trial of 6 weeks is necessary before determining whether the training is successful. Various drugs that affect the voiding process, such as oxybutynin chloride (Ditropan),

flavoxate hydrochloride (Urispas), or solifenacain (VESIcare), may be helpful for certain types of patients. Assess whether the medication is beneficial.

Patients who have nerve damage and paralysis are trained in specific techniques to empty the bladder. The Credé maneuver, in which the open hand is pressed over the bladder area and directed toward the suprapubic area, can facilitate emptying a flaccid bladder. Self-catheterization is taught to patients with paraplegia so that they are not dependent on an indwelling catheter or on other people for their urinary elimination (Sheldon, 2013) (see also [Chapter 34](#)).

Some patients are candidates for the implantation of an artificial sphincter to control bladder release of urine. More and more types of successful devices are developed each year, but these are primarily for patients who have no neurologic control over the bladder.

Every patient undertaking a bladder retraining program needs a great deal of understanding and encouragement and a positive attitude to be successful. Praise for each small achievement should be given. Accidents should be expected and not looked on as "failures." Achieving total continence takes considerable time and effort but is possible for many patients.

Bowel Training Program

Bowel training is used to correct incontinence or prevent constipation and impaction in patients with neurologic disorders or injuries. The bowel training program begins with an assessment of the specific patterns of elimination. It also helps to know the patient's former bowel pattern before illness or injury. Did she regularly rely on the use of enemas or laxatives? Has she been prone to constipation? Next, establish whether the patient is aware of the urge to defecate or has any warning of evacuation.

Bowel training for either constipation or incontinence should incorporate an exercise program that is within the patient's ability, a high-fiber diet, and adequate liquid intake during the day. An accurate recording of bowel movements correlated with times of oral intake over a 2- to 3-day period will help establish the most opportune times to try to stimulate evacuation and thus establish a habit. If incontinence occurs at specific times after eating, toileting 30 minutes sooner and using a rectal suppository or a gloved finger to stimulate the urge to defecate may alter the pattern. Gradually the use of the suppository is discontinued.

For patients who are prone to constipation and incontinence, increasing liquid intake and administering a stool softener can be effective. If this does not work, a planned regimen of suppository or enema use may be necessary to assist with evacuation at a desired time, thus preventing incontinence.

All patients need to be comfortable when attempting to evacuate the bowel. A raised, padded toilet seat, handrails, and perhaps a footstool can provide enough comfort to allow the patient to relax so that evacuation can occur naturally. Privacy is essential. Remember to provide privacy for bedridden patients. Most of all, a positive attitude is needed by staff members. Many times, if the healthcare team and the patient are optimistic and patient, success can be achieved.

Pain

Many patients with neurologic disorders experience pain. The pain often is chronic in nature. Work with the patient to identify the characteristics of the pain, its location and spread, its intensity, and how it is affecting the patient's life. When the patient has suffered a head injury or is experiencing increasing ICP, narcotic analgesics may not be given, because they mask the signs of rising ICP. Other methods of analgesia must be employed.

A trusting relationship between the patient and the nurse is necessary for teaching to be assimilated. Teaching the patient about pain and its relief; the adverse effect of stress, anxiety, and unpleasant stimuli; and the benefits of distraction from the pain become part of the plan. Pain may cause difficulty in sleeping. Pharmacologic agents and alternative methods for pain control are used (see [Chapter 7](#)).

Think Critically

How would you determine whether a patient who has a decreased level of consciousness is experiencing pain?

Depression often occurs with chronic pain and lack of sleep. The combination of an antidepressant and pain medication often is more effective for chronic pain control than either type of drug used alone.

Confusion

Patients with brain tumors, head injuries, and strokes, as well as degenerative diseases, may experience confusion and deficits in memory, intellectual ability, or judgment. Confusion may be acute and short term, or it may be a permanent state. Confusion also may be mild or severe and may be accompanied by anxiety, agitation, and refusal to cooperate. The person is in a state of disorientation, and until the symptoms subside, she cannot behave rationally. She must be supported and protected, or she may injure herself. In states of severe (acute) confusion (**delirium**) the patient may experience hallucinations, delusions, and severe agitation. This is usually an acute, short-term state caused by fever or metabolic imbalance. Patients who experience confusion after a head injury often become combative as their ICP rises. It is not advisable to restrain these patients; be very careful to stay out of range of flailing arms.

Be alert to signs of confusion in any patient with a CNS problem. Subjective and objective assessment data include the following:

- Loss of orientation to person, place, or time
- Inability to cooperate fully with simple tasks and requests, such as eating and bathing
- Inappropriate statements or inappropriate answers to questions
- Restlessness and agitation
- Hostility and anxiety
- Hallucinations or delusions
- Other signs of inability to maintain control over thought processes and behavior

A patient who is confused needs above all else a stable and calm environment. Her thought processes are, in a sense, “fractured” and somewhat beyond her control. Stimuli entering her brain are frightening and threatening to her, and she simply cannot make sense out of most of what is going on around her. A calm, consistent, and orderly approach combined with a set daily routine is most helpful.

Attention to the safety of the patient is a priority. Family members must be taught measures to protect a patient who wanders, is disoriented, or lacks judgment (see [Chapter 47](#)).

Confused patients need a dependable, consistent schedule. If agitation or confusion causes undesirable behavior, the use of distraction can be beneficial. Handing the patient an item, leading her from the area, or decreasing environmental stimuli (turning off the television or radio) can calm the patient.

Patients with memory loss who can still read benefit from written instructions and from a posting of the day's schedule of activities. Measures to protect patients and deal with confusion are presented in [Chapter 47](#).

Aphasia

Aphasia is a defect in the ability to express oneself in speech or writing, or an inability to comprehend spoken or written language. Aphasia is caused by disease or injury of the brain centers controlling language comprehension and expression, located in the Wernicke area of the left cerebral hemisphere.

Aphasia may be **receptive, expressive, or global**. A person with receptive aphasia has difficulty interpreting communications in either spoken or written form. In expressive aphasia, the person has difficulty expressing herself in speech or writing. Global aphasia is when the person has a combination of receptive and expressive aphasia. Aphasias vary in degree and in type of deficit. For example, a person may be able to write a message but not form the words to say it.

A comprehensive assessment of a patient who has aphasia usually is a team effort carried out under the leadership of a specially trained speech therapist. Nurses and others responsible for the care of the aphasic patient can assist by noting specific abilities or inabilities of the patient to communicate with them.

Focused Assessment

Determining Type of Aphasia Problem

Questions to ask when evaluating the type and degree of aphasia a patient is experiencing include:

- Can the patient understand yes/no questions? Are her responses of “yes” and “no” reliable (does that seem to be what she means)?
- Can she point to or look toward objects you have named that are in her line of vision?
- Can she name the objects?
- Is she able to follow simple directions (e.g., “Turn your head.”)?
- Can she repeat simple words? Complex words?
- Can she repeat sentences?
- Can she follow simple written requests?
- Can she write answers to questions?
- Can she write requests?
- Can she read questions or directions?

A patient who suddenly has a problem speaking or understanding words or signs is likely to feel isolated and extremely frustrated unless an effort is made to establish some means of communicating with her as quickly as possible. Once the patient's specific problem is identified, which could be relatively simple or extremely complex, measures are taken to help the patient communicate as fully as her condition will allow.

Goals for the care of aphasic patients are focused on stimulating communication without undue frustration and gradually guiding them to appropriate responses and requests. Reaching these goals may take weeks or months, but there are helpful principles and techniques that can be used by all members of the health team and by family members and friends.

Perhaps the most important rule is to avoid talking to an aphasic person as if she were mentally incompetent. Her inability to communicate does not mean a lack of intelligence. She should be spoken **to**, not spoken **about** as if she cannot hear and understand what others are saying in her presence.

Speak slowly and distinctly in a normal voice as you are facing her. Use body language and sign language to communicate if it seems to help the patient. Your facial expressions, posture, and gestures can often say more than the words you are saying.

Give aphasic patients time to respond to questions. Do not ask more than one question at a time. It takes longer for an aphasic person to process what is being said. If you need to repeat a statement or question, use **exactly** the same words. She may have comprehended only half of the sentence the first time. Only one person should speak at a time. Be certain to establish eye contact with the patient before speaking. Keep the environment orderly, relaxed, and relatively free from distractions that make it difficult to concentrate on communicating.

The speech therapist will plan the patient's speech therapy program and will share with the nurse the details of how best to work with each individual patient. Some general guidelines include:

- Give praise for attempts at communication and for each correctly expressed word or sentence.
- Do not correct the patient's pronunciation, as she is liable to become too frustrated and give up speaking.
- Be very patient.

Problems with aphasia sometimes resolve spontaneously in 3 or 4 months after a CVA. Total speech rehabilitation can take many months and may never reach the pre-aphasia level.

Think Critically

Can you identify three specific techniques you might use to assist a patient with aphasia to communicate her needs?

Among the techniques used to stimulate communication and help the patient deal with her problem of aphasia are self-talk, parallel talk, expansion, and modeling. **Self-talk** helps the aphasic person associate activities with specific words and phrases. The caregiver talks about what he is doing while performing a task (e.g., making the bed). Self-talk is done in the presence of the patient so she can make the connection between what is being said and what she sees being done. **Parallel talk** describes for the patient what she is doing while she is performing some activity. In **expansion**, the person communicating with the patient completes the patient's sentences when she is able to verbalize but cannot yet speak in complete sentences. No new information is added during expansion. In **modeling**, the patient's sentences are completed, and new information is added. New technology is changing our lives daily. Laptops and tablets have programs that can assist aphasic patients through various techniques, such as giving phonemic cues. Often if a patient is just given the first sound of a word she can say the complete word.

It has long been suggested that writing may be the best approach in some cases. New techniques have been developed using text messaging as a lexical writing treatment for individuals with severe aphasia ([Beeson et al, 2013](#)).

All of these techniques are helpful in improving communication. They are forms of therapy, however, and are used only in a planned program that has been designed to meet a patient's individual needs. Whatever techniques are chosen, they should not be used in a condescending manner; an adult patient should always be treated respectfully.

The plan of care for an aphasic patient should not neglect the physical condition of her mouth and tongue. Good oral hygiene is needed to keep the oral mucosa clean and moist and in optimal condition so that it is easier for the patient to form words.

Sexual Dysfunction

Sexual dysfunction from a lesion in neural pathways should be dealt with by allowing expression of the patient's concerns, beliefs, and feelings. Sexual counseling by someone skilled in working with patients with neurologic deficits should be initiated. Alternative techniques for meeting sexual needs must be explored. Many patients can, with teaching, lead a sexually satisfying life.

Psychosocial Concerns

The multiple stresses, alteration in roles, and changes in body image and self-esteem that result from a chronic neurologic disorder can be overwhelming. The patient will need time and assistance in adapting to an altered body image. Be accepting of the patient's expression of anxiety, anger, denial, regression, and depression. Work to support the patient emotionally, attempting to establish realistic hope for quality of life. Exploring the patient's previous methods of coping with adversity, as well as her support systems, talents, and desires, helps to provide clues for how best to help her. Jointly establishing small, accomplishable goals can do much to rebuild self-esteem.

Collaboration with the social worker concerning referral to support groups and interaction with others with similar disabilities who are coping well can prove most beneficial. Contact with community agencies that offer support services and job retraining, if pertinent, is essential. The patient needs a way to be a productive member of society and to contribute to the welfare of her family. The county or state office of vocational rehabilitation may help with funding.

Reentry into the community and a normal social life are other areas for intervention. Often the patient has been out of touch with her normal social circles for many months during the illness and recovery process. Plans should be made before discharge for social contact to be reinstated.

Ineffective Family Coping

A chronic neurologic disorder that disrupts normal function for the patient also disrupts normal roles within the family. Family lifestyle is altered, and changes in roles may lead to family conflict. Family members often feel powerless, ambivalent toward the patient, angry, and guilty for having

angry feelings. Family members need to be included when educating the patient about her disorder, the possibility of remissions and exacerbations, and the self-care measures necessary. Everyone needs time to adjust to the situation. Referrals to counseling and support groups can be very helpful.

Get Ready for the NCLEX® Examination!

Key Points

- When deprived of oxygen, neurons die quickly.
- Many changes occur with aging, and after age 70 years the brain atrophies somewhat.
- Reflexes diminish or are lost as age advances.
- Preventing accidents and head injuries by teaching safety practices reduces the number of neurologic injuries.
- Discouraging recreational drug use helps prevent neurologic damage.
- Teaching patients how to reduce risk factors for stroke can prevent the devastation that a stroke can inflict.
- Nurses routinely perform gross assessment of the cranial nerves, coordination and balance, muscle strength, and reflexes.
- Vital signs, mental function, neuromuscular status, papillary reactions, and level of consciousness are parts of the physical assessment and are always performed as part of the “neuro” check.
- A thorough history is gathered, focusing on areas of neurologic function (see [Focused Assessment](#)).
- Nursing care is individualized, with problem statements/nursing diagnoses, outcome objectives, and interventions chosen to alleviate the various problems (see [Table 21-9](#)).
- Every effort is made to maintain effective breathing for neurologic patients.
- Many neurologic patients experience impaired mobility, and nurses attempt to prevent the associated potential problems.
- Assisting with ADLs when patients have self-care deficits is a major part of nursing care for patients with neurologic disorders.
- Specific techniques are needed for patients with dysphagia to prevent aspiration.
- Many patients with bowel or bladder incontinence can regain continence through bowel and bladder retraining programs.
- Pain control can be a difficult issue, because most pain medications dull the sensorium and will interfere with accurate neurologic assessment and signs of decreasing level of consciousness.
- Many patients with neurologic disorders become confused, and there are special techniques nurses use to assist these patients.
- Learning to work with an aphasic patient is essential to providing care for her.
- When appropriate, neurologic patients should be referred for sexual counseling.
- When a family member has a neurologic deficit, it affects the whole family and can disrupt normal family functioning; families need help to learn to cope.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- Aphasia Help, www.aphasiahelp.org
- The National Aphasia Association, www.aphasia.org
- The American Stroke Association, www.strokeassociation.org
- The National Association of Neuroscience Nurses, www.aann.org

Review Questions for the NCLEX® Examination

1. The nurse demonstrates understanding of the physiologic changes in the nervous system associated with aging by:

1. providing extra time for the patient to process and answer questions.
2. teaching the patient how to perform activities of daily living.
3. finishing the patient's sentences when she is responding to questions.
4. communicating slowly and loudly with low-pitched tones.

NCLEX Client Need: Health Promotion and Maintenance, the Aging Process

2. A nurse scrapes an object along the sole of a patient's foot and notes that the great toe bends upward and the smaller toes fan outward. The clinical finding is suggestive of:

1. sensory abnormality of the cortex.
2. motor abnormality of the cortex.
3. cerebellar tissue destruction.
4. a normal finding.

NCLEX Client Need: Physiological Integrity, Basic Care

3. A nurse assesses consensual reflex. To do this, he:

1. shines a light in one eye and observes for any change in the other eye's pupil.
2. has the patient look at an object in the distance and then at his fingers 6 inches from the eyes, observing for pupil constriction.
3. has the patient look as far in one direction as possible to determine whether the eyes go back and forth rapidly.
4. holds a tissue to the corner of the eye to see whether the patient blinks.

NCLEX Client Need: Physiological Integrity, Reduction of Risk Potential

4. Which nursing intervention(s) would be appropriate when providing care for a patient with right hemiplegia from a stroke? (*Select all that apply.*)

1. Reminding the patient to pay attention to the left side
2. Protecting the right extremities during transfers
3. Supporting the unaffected arm with pillows
4. Using a sling on the affected arm to promote better balance
5. Initiating ROM exercises

NCLEX Client Need: Physiological Integrity, Safety

5. While reviewing a patient's chart, the nurse notes that the patient has a condition known as *expressive aphasia*. What responses might she expect from the patient upon showing the patient a key and asking, "What is this?"

1. The patient responds, "Argh ooh."
2. The patient looks away and gazes out the window.
3. The patient responds, "It is a key and it is used to eat my food."
4. The patient does not respond.

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

6. While assisting a patient with feeding, the nurse describes every step in meal preparation in simple language. This is referred to as:

1. parallel talk.
2. self-talk.
3. expansion.
4. modeling.

NCLEX Client Need: Psychosocial Integrity, Therapeutic Environment

7. A nurse is providing discharge instructions to an older adult Iranian man who experienced a stroke. The nurse notices that the patient seems indifferent to teaching. The nurse must consider:

1. talking to the wife or daughter.
2. involving the entire family in the care of the patient.

3. sending the patient to a long-term care facility.
4. stopping and trying again later.

NCLEX Client Need: Psychosocial Integrity, Coping Mechanisms

8. When giving instructions to a patient with some dysphagia, further teaching is needed if the patient states:

1. "I must sit upright when I eat."
2. "I can watch my crime show on TV while I eat."
3. "I should stay upright after eating for at least 30 minutes."
4. "I should be calm and unhurried when eating."

NCLEX Client Need: Physiological Integrity, Safety

9. With an open hand, a nurse presses over the flaccid bladder of a patient. When questioned regarding the nursing action, an appropriate response would be:

1. "The technique increases the muscle tone of the bladder."
2. "The maneuver facilitates removal of urinary sediments."
3. "The technique assists with complete bladder emptying."
4. "The technique reduces the incidence of bladder irritation."

NCLEX Client Need: Physiological Integrity, Basic Care

10. A nurse uses the Glasgow Coma Scale to evaluate the neurologic responses of a patient. The patient opens eyes to pain, makes incomprehensible verbal sounds, and extends extremities with pain. The score would suggest:

1. locked-in syndrome.
2. brain death.
3. coma.
4. lethargy.

NCLEX Client Need: Physiological Integrity, Basic Care

Critical Thinking Questions

Scenario A

Mr. Lawson is to have several diagnostic tests to determine the cause of his neurologic symptoms, which include headache, visual disturbance, muscular weakness, and personality change.

1. How would you explain an electroencephalogram to Mr. Lawson? A computed tomography scan? Magnetic resonance imaging?
2. If you are to assess Mr. Lawson's "neuro signs" and he is using eyedrops for glaucoma that constrict the pupils, how would you evaluate his pupillary responses?

Scenario B

Mr. Horton has experienced a CVA and has incontinence of urine.

1. How would you institute a bladder training program for him?
2. What would you do to protect his skin, and his dignity, during the bladder training?
3. If bladder training cannot be accomplished, what is the best way to handle his urinary elimination?

*Refer to an anatomy and physiology text for a thorough review of the complex nervous system.

CHAPTER 22

Care of Patients With Head and Spinal Cord Injuries

Objectives

Theory

1. Describe the types of injuries that result from head trauma.
2. Compare and contrast the signs and symptoms of subdural hematoma and epidural hematoma.
3. Explain why an epidural hematoma causes an emergency situation.
4. Review the type of procedure performed to relieve a subdural hematoma.
5. Illustrate the pathophysiology of increasing intracranial pressure in a patient who has experienced a severe head injury.
6. Review the reasons why an older adult is more at risk for an intracranial bleed from a head injury.
7. Explain the possible ramifications of spinal cord injury.
8. Plan appropriate nursing interventions necessary to provide comprehensive care for a patient who has suffered a C5 spinal cord injury.
9. Analyze and review the symptoms of low back pain and correlate them with their causes.

Clinical Practice

10. Teach a family member how to properly assess and care for a patient who has suffered a concussion.
11. Perform a neurologic check on a patient who has suffered head trauma.
12. Participate in a collaborative care planning conference for a patient who has sustained a spinal cord injury.
13. Prepare a plan for teaching self-care measures to a patient who suffers from low back pain.

KEY TERMS

- concussion** (kōn-KÜ-shūn, p. 500)
- contralateral** (kōn-trä-LÄT-är- āl, p. 502)
- contusion** (kōn-TÜ-zhūn, p. 501)
- coup-contrecoup injury** (kū kō-trē-kū, p. 501)
- epidural hematoma** (Ě-pě-DÜ-rūl hē-mă -TŌ-mă, p. 501)
- hydrocephalus** (hī-drō-SĚF-ă-lās, p. 509)
- intracerebral hematoma** (ǐn-trāh-sě-RĒ-brāl, p. 502)

ipsilateral (ip-si-LÄT-ĕr-ăl, p. 502)
nuchal rigidity (NÜ-kăl rĭ-JI-dĕ-tĕ, p. 502)
papilledema (păp-ĕl-ĕ-DĒ-mă, p. 506)
quadriplegia (kwōd-rĭ-PLĒ-jă, p. 511)
subdural hematoma (süb-DÜ-rūl, p. 501)
subluxation (süb-lük-SĀ-shūn, p. 510)

Traumatic Brain (Head) Injuries

Traumatic brain injuries (TBI) are a common cause of injury and death. About 1.7 million people sustain a head and brain injury in the United States each year. Approximately 52,000 die, and 1.2 million are treated for traumatic brain injury and released. Those who survive initial head injury require meticulous observation and care so that damage to the brain cells can be kept at a minimum and death averted. There are about 5.6 million people in the United States who require lifelong help with activities of daily living because of residual disabilities from brain injury (Faul et al, 2010).

Etiology

A blow to the head may cause a laceration of the skin or scalp and fracture of the skull or may only cause a minor contusion. The injury may cause movement of the brain within the skull, tearing blood vessels. Falls are the most common cause of head injury, with motor vehicle accidents being the second leading cause.

Pathophysiology

When a depressed skull fracture occurs, there is bruising, contusion, or laceration of the underlying brain tissue, with the inflammatory changes that occur with any wound. A minor head injury may cause concussion. **Concussion** is the term used to describe a closed head injury in which there is a brief disruption in level of consciousness (LOC), amnesia regarding the occurrence, and headache. A concussion's seriousness is based on the length of time there was loss of consciousness. There can be long-term neurologic deficits from concussion, particularly if an individual suffers repeated concussions from accidents or sports¹.

Skull fractures are described as:

- Linear or depressed
- Simple, comminuted, or compound
- Closed or open

In an **open** injury there is laceration of the scalp and fracture of the skull with damage to brain tissue. A **closed** injury is one in which the scalp and skull remain intact, but the underlying brain tissue is damaged. There may be contused areas or hematoma. In closed injuries a very serious condition known as *increased intracranial pressure* may result.

Older Adult Care Points

The brain atrophies with age and does not take up as much space in the cranial vault. This allows for more movement and more potential for torn vessels and contusions on the brain when an accident occurs that involves a head injury.

In a **contusion**, the brain tissue is bruised, blood from broken vessels accumulates, and edema develops. This could lead to the development of increased intracranial pressure (ICP).

A **coup-contrecoup injury**, or an **acceleration-deceleration injury**, occurs when the head is moving rapidly and hits a stationary object, such as a windshield. The contents within the cranium hit the inside of the skull (coup) and then bounce back and hit the bony area opposite the site of impact, causing a second injury (contrecoup) (Figure 22-1).

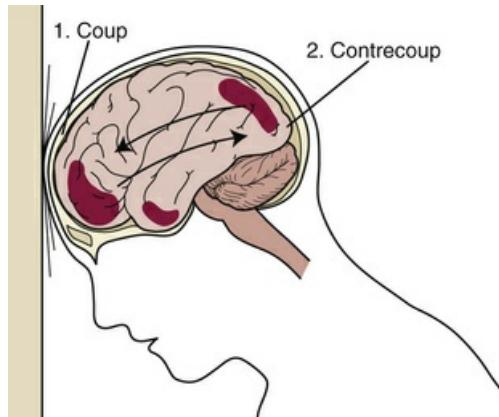
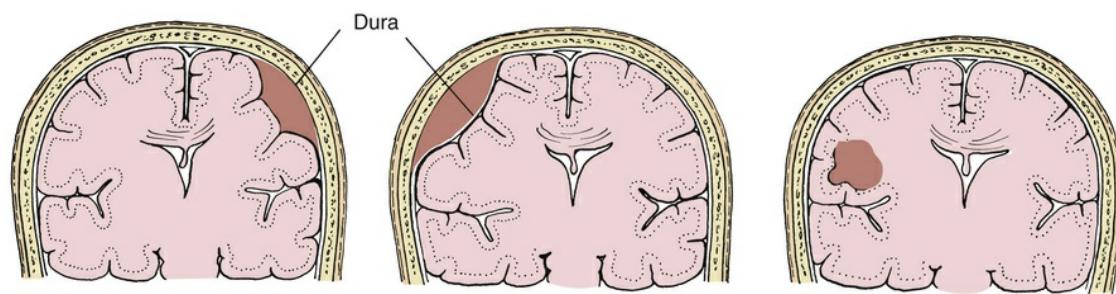


FIGURE 22-1 Coup-contrecoup (acceleration-deceleration) injury.

Subdural hematoma is a common result of head injury. It often happens in older adults as a result of a fall. Anticoagulant therapy puts a patient at greater risk for a subdural hematoma (blood-filled swelling) after even a minor blow to the head. When a blow is delivered to the head, it may rupture the blood vessels that lie between the delicate arachnoid membrane covering the brain and the tough, fibrous dura mater. As the blood leaks under the dura mater (subdural), the hematoma grows in size, pressing against the softer arachnoid and the brain tissue it is covering (Figure 22-2, A).



A Subdural hematoma **B** Epidural hematoma **C** Intracerebral hematoma

FIGURE 22-2 A, Subdural hematoma. As a result of trauma to the head, small ruptured blood vessels leak blood into the space under the dura mater (slower than an epidural bleed). B, Epidural hematoma, the result of a head injury that tears a large meningeal artery, has caused a rapid bleed with a large amount of blood above the dura mater. If not relieved, subdural and epidural hematomas can be fatal. C, Intracerebral hematoma. Small vessels within the brain have torn and bled. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

Diffuse axonal injury occurs from a rapid acceleration-deceleration injury in which there is lateral movement. This is often referred to as a *shearing injury* if there is diffuse injury to the white matter of the brain.

Older Adult Care Points

Because the brain of older adults tends to move more in the cranial vault when head trauma occurs, small vessels may be torn, putting these patients more at risk for a slow-developing subdural hematoma. When such an injury occurs, the person should be watched for several months for signs of personality change, decreasing LOC, increased irritability, and other signs of increased ICP.

An **epidural hematoma** occurs more rarely, but when it does, there is rapid leakage of blood from the middle meningeal artery (or, rarely, from some other vessel), which quickly elevates ICP (see Figure 22-2, B). This constitutes a medical emergency. A craniotomy is needed to repair the damaged vessel and relieve the rapidly rising pressure, before death occurs from the increased ICP. An **intracerebral hematoma** may occur within the brain from a blow to the head (see Figure 22-2,

C).

Signs and Symptoms

The severity of brain damage from a head injury is best judged by the symptoms presented by the patient, a neurologic assessment, the history of the type of blow received, and whether and for how long the victim lost consciousness. The outward symptoms of head injury are fairly obvious; these include bruising, swelling, lacerations, and bleeding. There may be a skull fracture with ecchymoses around the eyes (raccoon eyes), or ecchymoses behind the ear (Battle sign) (Figure 22-3). There may be otorrhea (fluid from the ear), rhinorrhea (fluid from the nose), tinnitus (ringing in the ear) or hearing difficulty, facial paralysis, and conjugate deviation of gaze wherein both eyes deviate to one side. Otorrhea and rhinorrhea should be tested to determine whether there is a cerebrospinal fluid (CSF) leak. Testing with a Dextrostix will determine whether glucose is present; the presence of glucose indicates cerebrospinal fluid. A bleeding into the subarachnoid space may be evidenced by **nuchal rigidity** (neck pain with flexion).



FIGURE 22-3 Battle sign. (From Bingham BJB, Hawke M, Kwok P: *Clinical atlas of otolaryngology*. St. Louis, 1992, Mosby.)

Whenever a moderate or severe head injury has occurred, cervical spine injury is assumed, until proven otherwise.

Clinical Cues

If the fluid from the ear or nose is tinged with blood, a Dextrostix will not give accurate results. Collect about a teaspoon of the fluid on a white gauze pad. Within a few minutes blood will move to the center and a yellow ring (halo) will form around it if the fluid is CSF (Figure 22-4).

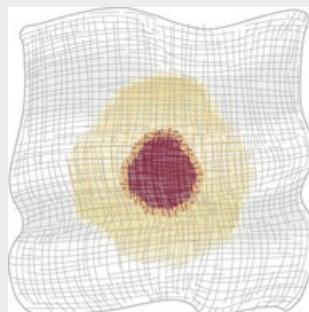


FIGURE 22-4 Assessing for the halo sign on fluid from the nose or ear after a head injury. The blood will draw together in the middle of the gauze pad, leaving a yellow ring (halo) around the blood, indicating the presence of cerebrospinal fluid.

A concussion can cause a brief disruption of the normal LOC, amnesia regarding the event, and headache. A contusion can cause an alteration in LOC and may cause seizures. Box 22-1 shows the downward progression of decreased LOC.

Box 22-1

Decreasing Levels of Consciousness (LOC)

- *Alert:* Responds appropriately to questions and commands with little stimulation. Attends to surroundings.
- *Confused:* Somewhat disoriented to surroundings, time, or people. Judgment may be impaired. Needs to be cued to respond to commands.
- *Lethargic:* Drowsy, but easily aroused; needs gentle touch or verbal stimulation to attend to commands.
- *Obtunded:* More difficult to arouse and responds slowly to stimulation. Needs repeated stimulation to maintain attention and to respond to the environment.
- *Stuporous:* Responds to vigorous stimulation only slightly; may only moan or mutter in response.
- *Comatose:* No observable response to stimulation.

A subdural hematoma² may be acute, subacute, or chronic, building up over time. An acute intracerebral bleed causing hematoma formation is accompanied by unconsciousness, hemiplegia on the **contralateral** (opposite) side, and a dilated pupil on the **ipsilateral** (same) side. However, the symptoms indicating a slow buildup of pressure within the skull are more subtle and less easily detected.

Signs of epidural hematoma may include unconsciousness at the time of the injury, a brief lucid interval followed by decreasing LOC, headache, nausea and vomiting, and dilation of the ipsilateral pupil. The patient is observed for signs of increased ICP, as well as other focal changes (see **Increased Intracranial Pressure** later in this chapter).

Diagnosis

The diagnostic tests and examinations commonly used to determine the extent of head injury include a radiograph of the skull, a computed tomography (CT) scan, magnetic resonance imaging (MRI) with contrast, positron emission tomography, evoked potentials, and electroencephalography (**Figures 22-5** and **22-6**) (see **Table 21-6**).

Think Critically

Why should every patient who has sustained a head injury be monitored closely for 24 to 48 hours?

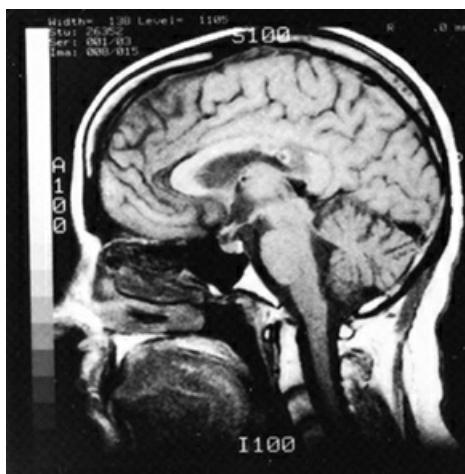


FIGURE 22-5 Magnetic resonance imaging midline sagittal view of the brain. (From Chipp E, Clanin N,



FIGURE 22-6 Electroencephalogram (EEG). (From Fuller G, Manford M: *Neurology*, ed. 3, London, 2011, Churchill Livingstone.)

Treatment

Patients with a head injury usually are initially treated conservatively. If the injury causes an increase in ICP or is a compound fracture of the skull, surgical debridement of the wound and removal of splintered bone from the brain tissues or elevation of the skull fragment is performed. All measures to keep ICP from rising are instituted for serious head injuries.

A patent airway must be secured and the head raised 20 to 30 degrees with the body in correct alignment. Elevation helps reduce ICP. Neurologic signs are monitored closely. An intravenous (IV) line is inserted for access for diuretic drugs, if needed, and for administration of fluid. Intravenous fluids are infused very slowly to prevent fluid overload that would increase the ICP. Diuretics are used to decrease vascular volume and keep ICP as low as possible.

Think Critically

Why would a nurse check for a patent airway before performing a neurologic assessment on a patient with a head injury?

Surgical Intervention

Subdural hematoma is removed surgically either via burr holes or by craniotomy incision. The hematoma is evacuated by suction or surgical instruments. Epidural hematoma necessitates immediate, emergency craniotomy to prevent death from increased ICP. The craniotomy procedure is described in [Chapter 23](#) along with surgeries of the brain.

Preoperative period.

A patient with a hematoma is quickly prepared for surgery. The operative site is shaved after the patient is under anesthesia. For planned surgery, a shampoo may be ordered the evening before surgery. Preoperative preparation is the same as for other surgeries. Any scalp lesions or other unusual conditions that are noted at this time should be reported. Usually the entire head is not shaved, only the operative area, and—if the patient has long hair—any hair that is cut off may be saved to be used as a hairpiece until the patient's hair grows back.

Postoperative period.

During the immediate postoperative period, the patient who underwent a craniotomy is in the intensive care unit for continuous monitoring. Essentially, care will be the same as that for any patient in danger of increasing ICP. Additional postoperative care of a patient who has undergone intracranial surgery includes:

- Positioning the patient according to written orders from the attending surgeon. **Make no exceptions.** Positioning is important to prevent added increases in ICP.
- Keeping the neck in midline and preventing excessive hip flexion to promote venous drainage from the head and keep ICP from rising ([McIlvoy and Meyer, 2012](#)).
- Using nasal suctioning **only** if there is a written order allowing this, because there may be a fracture that allows a pathway to the brain tissue.
- Watching carefully for signs of leakage of CSF from the nose, ear, and operative site, and reporting evidence of leakage immediately. Use aseptic technique in applying dressings to catch the drainage and prevent microorganisms from entering.
- Providing a quiet, nonstimulating environment.
- Administering only those treatments, comfort measures, and medications for which there are specific written orders.
- Reporting promptly any changes in the neurologic status of the patient.

Nursing Management

If it has been determined that there is indeed leakage of spinal fluid through the nose, ear, or an open head wound, special precautions must be taken to prevent infection, and the provider must be notified. These precautions include the following:

- Keep the patient on absolute bed rest with the head of the bed elevated 20 to 30 degrees to promote venous drainage from the head.
- Cover a draining ear with a sterile gauze pad, changing the pad periodically to look for drainage.
- Instruct the patient **not** to blow his nose or pick at it; blowing may increase ICP, and picking may allow entry of microorganisms.
- Do not plug the nose or ear if there is drainage of CSF, because blockage may increase ICP.
- Remind the patient that he is not to change his position **in any way** unless he has been told it is all right to do so, to prevent ICP from rising.

Continued neurologic assessments are an integral part of care. Specific problem statements/nursing diagnoses are listed in [Nursing Care Plan 22-1](#). Specific instruction is required for the observation of a patient treated in an emergency department for head injury and released to go home. The long-term outcome for patients who have suffered a severe head injury is unpredictable. Recovery is a long process, and improvement may occur over many months for some patients. Disabilities may be lifelong.

Patient Teaching

Instructions for Care of a Patient With a Head Injury

Teach the family or significant other to do the following:

- For the first 24 hours, awaken the person every 2 to 3 hours to be certain he can be easily aroused.
- Question the person about where he is, who you are, what happened, and so on, to check orientation.
- Check the pupils to see that they are equal in size and that they will constrict; use a flashlight.
- The patient should avoid strenuous activity for 48 hours.
- Apply an ice bag to areas of swelling for 20 minutes each hour while the patient is awake—continue for 24 hours.

- For 48 hours, watch for and report the following signs:
- Change in level of consciousness (e.g., becoming more groggy, difficult to awaken, confused, restless, agitated)
- Projectile vomiting (vomit travels a distance) without nausea
- Unusual dizziness, sleepiness, loss of balance, or fall
- Change in vision (i.e., seeing double, blurred vision)
- Jerking movements of the eyes
- Increasing headache that is worse when moving
- Any twitching that cannot be controlled (seizures)
- A change in speech or ability to find words or converse
- Behavior that is odd for the individual

Legal and Ethical Considerations

Documenting Patient Teaching

Because there are legal ramifications of inadequate patient and family teaching, document all teaching in the medical record and send home clearly written instructions. It is best to have the patient or family sign a form for the record that indicates that teaching and written instructions have been received.

Think Critically

Why are patients with a head injury positioned with the head of the bed elevated 20 to 30 degrees with the head and neck in proper alignment?

Nursing Care Plan 22-1

Care of a Patient With a Head Injury and Increased Intracranial Pressure

Scenario

Ryan, an 18-year-old boy who suffered a head injury in an automobile accident is groggy, but arousable.

Problem Statement/Nursing Diagnosis

Potential altered cerebral perfusion/*At risk for ineffective cerebral tissue perfusion related to increased ICP from head injury.*

Supporting Assessment Data

Subjective: Hit right side of head on dashboard.

Objective: Nondepressed skull fracture, alteration in LOC, confused as to where he is, what day it is; somewhat combative.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not display further increase in ICP.	Monitor neurologic status hourly using Glasgow Coma Scale (GCS); notify provider of any pupil changes or signs of increasing ICP, such as widening pulse pressure, change in respiratory pattern, slowing of pulse, increase in temperature, or decrease in LOC.	GCS provides good estimate of neurologic status.	GCS maintaining at 12.
	Monitor for seizure activity; institute seizure precautions. Administer ordered anticonvulsant.	Increased pressure on brain tissue may cause cellular irritability and seizure activity.	No sign of seizure activity. Precautions in place; padded tongue blade at bedside.
	Keep head of bed (HOB) at 30 degrees and body in correct alignment; turn side to side q2h if condition warrants.	Keeping head slightly elevated and in proper alignment helps promote venous drainage from the head.	HOB at 30 degrees; positioned in correct alignment with neck midline. Turned q2h.
	Maintain IV infusion at 50 mL/hr.	Decreasing IV rate helps prevent increased ICP and maintains IV access.	IV infusion at 50 mL/hr; patient without redness or swelling at site.
	Administer diuretic as ordered.	Diuretic decreases vascular volume and intracranial volume, lowering ICP.	Mannitol administered.
	Keep room calm and softly lit; do not disturb more than necessary; talk to patient while giving care; allow rest periods between any invasive procedures; monitor intake and output; reorient patient frequently.	Invasive procedures raise ICP.	Room is tidy and softly lit; care procedures grouped at intervals allowing rest; $I > 400 \text{ mL}$, $O > 375 \text{ mL}$.

Problem Statement/Nursing Diagnosis

Altered self-care ability/*Self-care deficit related to confusion, grogginess, and increased ICP.*

Supporting Assessment Data

Objective: Falls asleep during attempts at bath, etc.; confused about how to use ordinary objects such as toothbrush.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have adequate assistance with hygiene and dressing.	Provide assistance with all ADLs.	Patient with ICP may require temporary assistance with ADLs	Assisted with morning care.
	Inspect skin when turning; place foam pad on bed.	Pressure-relieving device helps prevent pressure ulcer formation.	No signs of reddened areas on skin. Foam pad on bed.
Patient will resume self-care by discharge.	Encourage self-care as LOC improves.	Resolution of ICP improves ability to perform self-care.	Continue plan. Not ready for self-care yet.

Problem Statement/Nursing Diagnosis

Altered family coping/*Disabled family coping related to patient's decreased LOC and hospitalization.*

Supporting Assessment Data

Subjective: Mother states she is afraid son is going to die.

Objective: Mother keeps trying to rouse the patient when she is in the room.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Mother's anxiety will decrease as she gains information about her son's condition and prognosis.	Explain to family that confusion and grogginess are usual after head injury.	Knowledge decreases fear of the unknown.	Explained patient's condition to family and measures to keep ICP down. Mother seems less anxious. Discussed need for calm and positive talk in room. Continue plan.
	Explain that the danger is if the ICP keeps increasing; tell what measures are being done to minimize increasing ICP; explain all procedures; explain that calm, rest, and positive talk in the room will help.	Knowing the treatment plan decreases anxiety.	
	Call hospital chaplain or own minister if family desires.	Presence of spiritual advisor can decrease anxiety.	
	Keep family informed of changes in patient's condition.	Families need to make informed decisions.	

ADLs, Activities of daily living; I, input; ICP, intracranial pressure; IV, intravenous; LOC, level of consciousness; O, output.

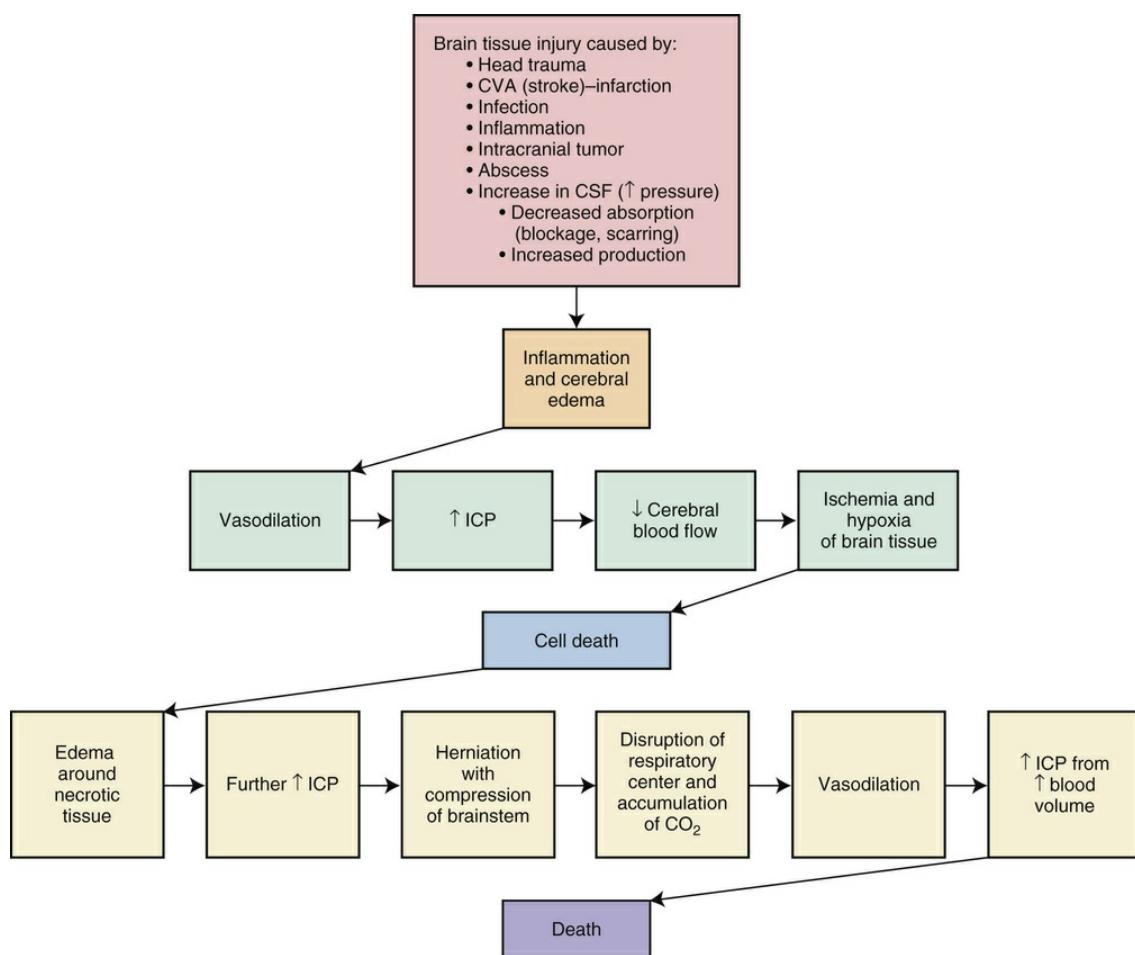
Critical Thinking Questions

- Why would it be contraindicated for this patient to strain to have a bowel movement?
- Why is it important to decrease stimuli and provide a calm, soothing environment for this patient? (Be specific.)

Increased Intracranial Pressure

Etiology and Pathophysiology

Because the skull is a closed bony structure in adults, it is unable to expand. Any lesion or fluid accumulation that begins to take up space within the cranial cavity causes an increase in the pressure within the cavity. Therefore any swelling of the brain tissue from injury or surgery, leakage of blood from ruptured cerebral vessels, excessive production of CSF, or tumors, abscesses, or any other space-occupying lesion within the skull presents an increased ICP risk. Pressure against cerebral veins and arteries interferes with the flow of blood, producing a local ischemia and hypoxia. Pressure against the cells themselves can interfere with their vital functions. If the ICP rises very high and remains high for very long, death can result from inadequate cerebral perfusion or cerebral herniation. Brainstem injuries or pressure on the brainstem from increased ICP cause respiratory depression from pressure on the medulla oblongata—carbon dioxide accumulates, causing vasodilation and further increases in ICP. Normal ICP is 0 to 15 mm Hg. Concept Map 22-1 shows the relationship between the causes and the pathologic occurrences of increased ICP.



Signs, Symptoms, and Diagnosis

When the body can no longer compensate for the increase in volume in the cranial vault, decompensation begins and clinical signs of increasing ICP become apparent. The earliest sign of increasing ICP is lethargy and decreasing consciousness, accompanied by a slowing of speech

and delay in response to verbal cues. **Papilledema** (swelling of the optic disc) viewed with an ophthalmoscope is a classic sign of increased ICP.

When ICP rises, it affects the oxygenated blood perfusion of the brain and tissue hypoxia occurs. Nerve cells are particularly sensitive to hypoxia and cannot be replaced once they have been destroyed. Extended periods of hypoxia cause brain cell death. The body tries to compensate for hypoxia by raising blood pressure, to force more oxygenated blood through the brain tissue. If ICP continues to rise, the brain tissue will herniate through the tentorial notch at the midline of the foramen magnum. This herniation results in pressure on the vital structures of the midbrain, pons, and medulla and causes changes in the vital signs and pupil reactions characteristic of increased ICP.

As brain tissue swells or fluid volume increases in the cranium, damage occurs or pressure is placed on the oculomotor or third cranial nerve. Pupils begin to react slowly; pupil size becomes unequal, progressing to dilation, and then the pupil size becomes fixed as reflexes disappear.

Clinical Cues

Abnormal pupillary responses can reverse to normal if the cause of increased ICP can be resolved in time.

The classic signs of increased ICP, the first three of which are called the *Cushing triad*, are:

- Rising systolic blood pressure
- Widening pulse pressure
- Bradycardia with a full, bounding pulse
- Rapid or irregular respirations (Figure 22-7)

Pattern	Location of Lesion	Description
1. Cheyne-Stokes	Bilateral hemispheric disease or metabolic brain dysfunction	Cycles of hyperventilation and apnea
2. Central neurogenic hyperventilation	Brainstem between lower midbrain and upper pons	Sustained, regular rapid and deep breathing
3. Apneustic breathing	Mid or lower pons	Prolonged inspiratory phase or pauses alternating with expiratory pauses
4. Cluster breathing	Medulla or lower pons	Clusters of breaths follow each other with irregular pauses between
5. Ataxic breathing	Reticular formation of the medulla	Completely irregular with some breaths deep and some shallow. Random, irregular pauses, slow rate

FIGURE 22-7 Common abnormal respiratory patterns associated with coma. (From Lewis SL, Dirksen SR, Heitkemper MM, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

These signs tend to be late, as are pupil changes, and signal a severe emergency and the need for immediate action to try to prevent the patient's death.

Think Critically

Why does increasing intracranial edema cause a double threat to the brain?

Treatment

A patient with greatly increased ICP is usually placed in an intensive care unit. Increased ICP is treated with supportive care to keep the pressure from rising further and with interventions to decrease the cranial blood or CSF volume. Osmotic diuretics (mannitol, glycerol, urea) are administered to remove fluid from the body tissues, thereby reducing fluid in the brain. Dosage is determined by body weight, and electrolytes are monitored every 6 hours, because mannitol and diuretic action can cause electrolyte imbalances. Furosemide (Lasix) is sometimes also given. An indwelling urinary catheter is inserted to monitor output. Electrolytes and fluid balance are watched closely.

Dexamethasone (Decadron) may be given to decrease the inflammatory response and cerebral edema if the ICP is caused by a brain tumor or abscess (Porter and Kaplan, 2013). Histamine-2 (H_2)-receptor blockers or proton pump inhibitors are administered to protect the gastric mucosa. With the head of the bed at 20 to 30 degrees, the head and neck must be kept positioned midline so that venous drainage into the body is not restricted. Hip flexion should be less than 90 degrees. Rolled washcloths, towels, or trochanter rolls can be used for positioning.

If ICP is dangerously high as indicated by a Glasgow Coma Scale score of 9 or less and an abnormal CT scan, the surgeon may insert an intraventricular catheter into the lateral ventricle, through which CSF can be drained in small amounts to relieve the pressure. Pressure can be monitored with the catheter or a separate probe positioned in the epidural area. Cerebral perfusion pressure (CPP) must be maintained at 60 to 70 mm Hg to ensure oxygenation of the brain tissue (CPP = mean arterial pressure – intracranial pressure) (Aries et al, 2012). Normal CPP is 70 to 100 mm Hg. A monitoring device connected to the inserted probe may be used to measure cerebral blood flow. Some new devices monitor cerebral oxygenation and blood flow.

If the patient is on a ventilator and is extremely agitated, pancuronium bromide (Pavulon) to paralyze skeletal muscles, in combination with sedation, may be used to prevent further increases in ICP. Because carbon dioxide is a vasodilator and can increase blood volume within the cranial cavity, hyperventilation is sometimes used short term to combat the increased ICP. This is accomplished by increasing the rate of controlled respiration. A CO₂ level between 25 and 30 mm Hg will improve oxygenation to the brain by causing vasoconstriction. Box 22-2 provides general guidelines for the care of patients with increased ICP.

Box 22-2

Guidelines for Patients With Increased Intracranial Pressure (ICP)

Do

- Conduct neurologic checks at least once every hour unless more frequent monitoring is indicated.
- Report changes immediately.
- Maintain a patent airway and adequate ventilation to ensure proper oxygen and carbon dioxide exchange.
- Elevate the head of the bed 20 to 30 degrees to facilitate return of blood from the cerebral veins.
- Use measures to maintain normal body temperature. Elevations of temperature raise blood pressure and cerebral blood flow. Shivering also can increase ICP.

- Monitor intake and output. Restrict or encourage fluids according to provider's order.
- Give passive range-of-motion exercises.
- Space activities apart.

Do Not

- Allow patient to become constipated or perform Valsalva maneuver.
- Hyperextend, flex, or rotate the patient's head.
- Flex the patient's hips (as in female catheterization).
- Place patient in Trendelenburg's position for any reason.
- Allow patient to perform isometric exercises.

Barbiturates are sometimes used along with continuous brain wave monitoring when patients do not respond to the more common therapies for reduction of ICP. Their purpose is to induce heavy sedation and slow metabolism, thereby decreasing ICP. In general, the short-acting barbiturates are used (e.g., pentobarbital [Nembutal] and thiopental [Pentothal]). Phenytoin (Dilantin) may be used to prevent seizures for several months or up to a year after injury.

Temperature control is achieved by placing the patient on a hypothermia blanket for cooling if increased ICP has affected temperature regulation by pressure on the hypothalamus and the patient is feverish. Fever increases cerebral metabolism and cerebral edema.

Warmed blankets and tepid baths can be used to raise the temperature of a hypothermic patient and prevent shivering. Deep vein thrombosis prophylaxis is started early. Intravenous insulin may be titrated if the blood glucose level rises above 110 mg/dL.

Complications

Damage to brain cells from injury and during periods of increased ICP may cause residual scarring and seizures. **Hydrocephalus** (excessive accumulation of CSF) may occur (see [Chapter 23](#)), causing motor deficits, cranial nerve deficits, or decreased cognitive ability. Rehabilitation efforts are focused on eliminating or decreasing deficits and promoting as much cognitive and physical function as possible (see [Chapter 9](#)).

Diabetes insipidus.

Diabetes insipidus may occur from injury or edema of the pituitary gland. Antidiuretic hormone is released in inadequate amounts, resulting in polyuria, and the awake patient may complain of **polydipsia** (excessive thirst). Intravenous vasopressin and fluid replacement are the preferred treatments. Carefully monitor intake and output and electrolyte balance.

Nursing Management

Assessment (Data Collection)

Early recognition of increasing pressure is extremely important. Careful neurologic assessment with monitoring of the patient's LOC, pupillary reactions, level of neuromuscular activity, and vital signs is essential to accurately evaluate the patient's progress. "Neuro checks" are performed every 15 minutes to every 2 hours for acute patients (see [Chapter 21](#)). The following indications that ICP may be rising should be reported immediately:

- Extreme restlessness or excitability after a period of apparent calm
- Deepening stupor and decreasing LOC
- Headache that is unrelenting and increasing in intensity
- Vomiting, especially persistent, projectile vomiting
- Unequal size of pupils and other abnormal pupillary reactions
- Leakage of CSF from the nose or ear

- Changes in the patient's blood pressure, pulse, or respiration; widening pulse pressure; a slow, bounding pulse

Think Critically

Why do you think an older adult is at greater risk when a head injury or other cause of increased ICP occurs?

Nursing Diagnosis, Planning, and Implementation

The appropriate problem statement is Potential for altered cerebral tissue perfusion due to effects of increasing intracranial pressure.

Goals of nursing care are to:

- Maintain cerebral perfusion
- Reduce ICP
- Maintain adequate respiration
- Protect from injury
- Maintain normal body functions
- Prevent complications

The expected outcome would be that the patient will not experience brain damage from increased intracranial pressure.

Maintaining an open airway and adequate respiration may require suctioning and possibly intubation with mechanical ventilation. (If the patient has sustained a head injury, x-rays to rule out a basilar fracture are necessary before suctioning the nonintubated patient to prevent the possibility of the suction catheter entering the cranial vault.) A patient whose consciousness level is decreased and whose gag and swallowing reflexes are impaired is in danger of aspirating blood, vomitus, mucus, and other material into the air passages.

Position the patient on his side and ask him to exhale as you turn him to prevent a Valsalva maneuver, which could raise ICP. Instruct the patient not to grip the side rails or push with his feet or elbows against the mattress during repositioning for the same reason. Plan uninterrupted rest periods between activities that cause an increase in ICP; preferably, plan rest for 1 hour at a time. Provide a soothing environment free of noxious odors and noise. Keep the room temperature adjusted to normalize the patient's temperature and to prevent shivering ([Mcilvoy and Meyer, 2012](#)).

Nutrition supplied early improves outcomes after brain injury and increased ICP, because nutrition promotes healing ([Pillsbury and Oria, 2011](#)). If the patient  is unable to take food orally, supplementation is begun within 3 days after injury. Full nutritional supplementation should be in place by day 7. Nutrition is planned according to determined metabolic needs and the fluid and electrolyte status. Metabolic needs are calculated based on age, weight, and height.

Unless the patient has a tracheostomy or an oral airway in place, he should be positioned on his side—not on his back—because the tongue may occlude the airway, and mucus cannot drain naturally. **An unconscious patient requires care for all basic needs** (see [Table 21-9](#)).

Evaluation

Data are gathered regarding the success of the nursing interventions. If the interventions are not helping the patient meet the expected outcomes, the interventions should be changed.

Injuries of the Spine and Spinal Cord

Etiology

A person may suffer from injury to the spinal cord in a number of ways. Injury in the cervical and lumbar areas is more common because these segments are more mobile. Automobile accidents, gunshot wounds, diving accidents, and other forms of trauma often inflict severe damage to the spinal cord, but tumors, degenerative disease, and infections also can impair the functions of the spinal cord and its branches. Generally speaking, spinal cord injuries are classified according to their anatomic location—that is, cervical, thoracic, lumbar, or sacral (Figure 22-8). There are 12,000 spinal cord injuries per year in the United States (National Spinal Cord Injury Statistical Center, 2012). Whatever the cause of spinal cord injury, motor and sensory losses may occur. The amount of loss of function and sensation depends on the level and extent of injury to the spinal cord.

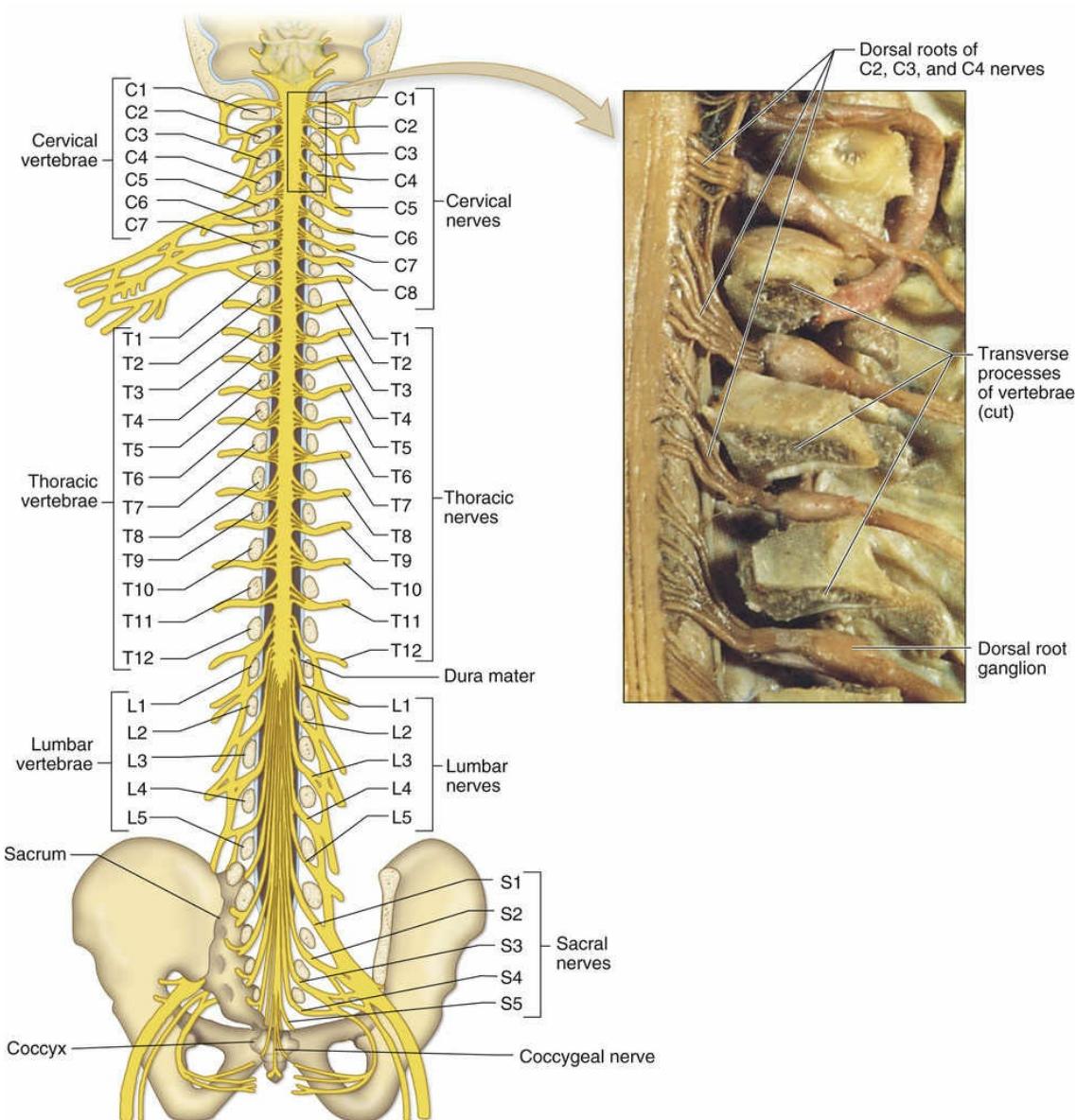


FIGURE 22-8 Divisions of the spinal column and designations of spinal nerves. (From Thibodeau, GA, Patton KT: *Anatomy and physiology*, ed 8, St. Louis, 2013, Mosby. Photo courtesy Vidic B, Suarez RF: *Photographic atlas of the human body*, St Louis, 1984, Mosby.)

Pathophysiology

Fracture, dislocation, or **subluxation** (partial dislocation) of the vertebral column often results in spinal cord damage. Cord injury is caused by compression, pulling and twisting, or tearing of the cord, with two types of injuries occurring: complete and incomplete. Complete injuries result in loss of function below the level of the injury. Incomplete injuries result in various degrees of function and sensation. Penetrating trauma from gunshot or knife wounds or other types of accidents may cause severance, compression, or contusion of the spinal cord. Extreme flexion or hyperextension of the neck, or falling on the buttocks (which causes flexion of the lower thoracic and lumbar spine), all may cause spinal cord damage (Figure 22-9). Tumor growth may compress or destroy spinal cord tissue. Whatever the cause of injury to the spinal cord, nerve transmission to the brain or from the brain may no longer occur below the level of the damage, resulting in various extents of paralysis.

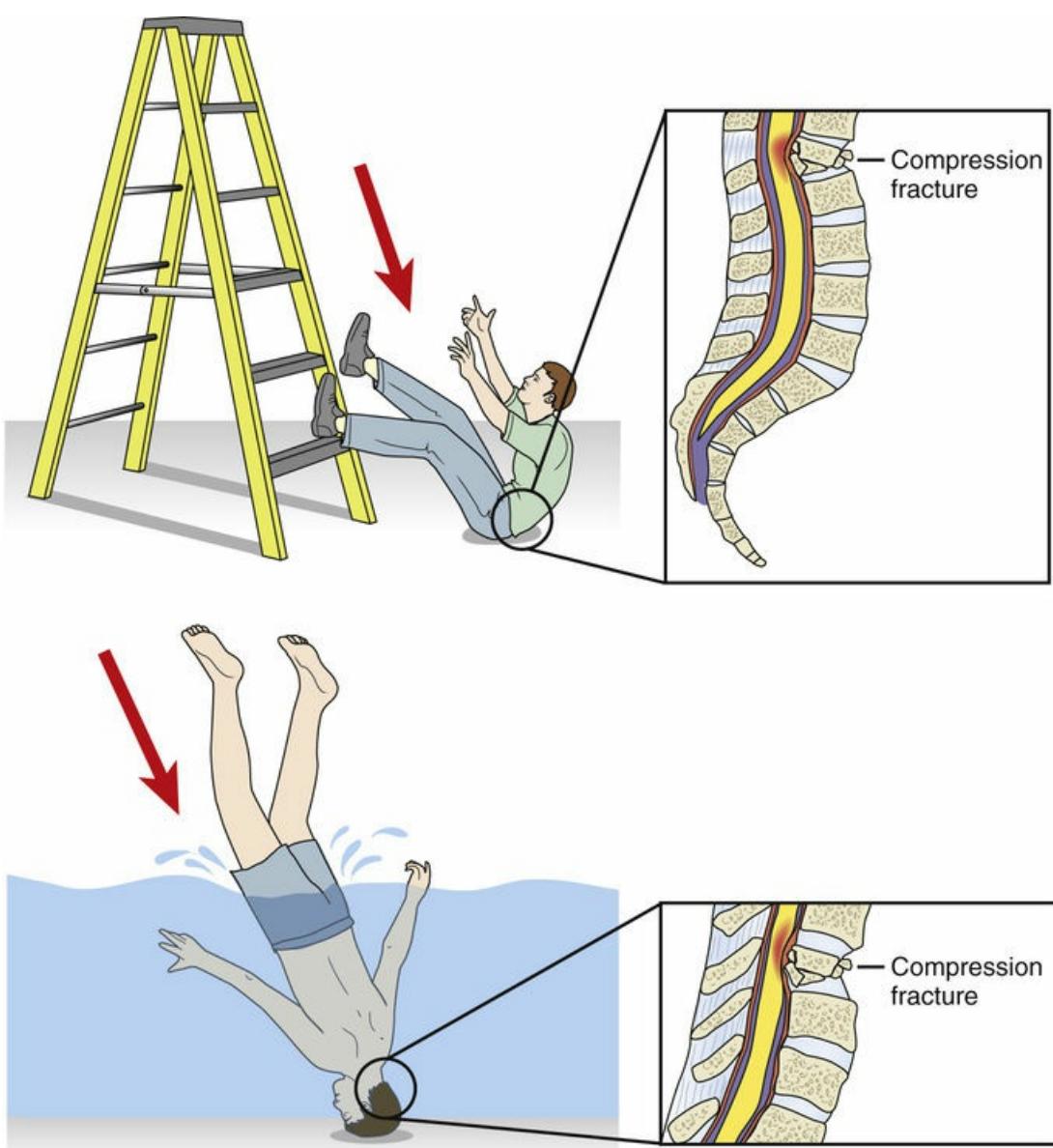


FIGURE 22-9 Accidents can cause vertical compression on the cervical or lumbar spine. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

Microscopic bleeding occurs in the gray matter immediately after spinal cord injury. Irritation of the cells causes edema to develop and spread along the next one or two cord segments. The edema

peaks in 2 to 3 days and subsides in about 7 days after injury. The edema causes temporary loss of function and sensation. Hemodynamic instability with drops in blood pressure may cause decreased blood flow, and hypoxia in the cord increases the initial damage. The inflammatory process may injure the myelin covering the axons, and the chemical and electrolyte changes interrupt nerve impulse transmission.

Signs, Symptoms, and Diagnosis

A complete severance of the spinal cord, or damage to the cord's entire thickness, results in a total loss of sensation and control in the parts of the body below the point of injury. If the cord is damaged in the cervical region, the paralysis and loss of sensory perception may include both arms and both legs (**tetraplegia**), also called **quadriplegia**. Severe injury to the cord above the level of the fifth cervical vertebra often is fatal if emergency care is not immediate, because the phrenic nerves that innervate the diaphragm originate in the third, fourth, and fifth cervical segments. Branches of these nerves play a major role in the control of respiration, and when they are severed, respiration must be maintained by artificial means. If the damage is only partial (incomplete), there will be some losses, but not all motor and sensory innervation is lost².

Interruption of the thoracic spinal cord through L1 and L2 causes **paraplegia** (paralysis of both legs). [Table 22-1](#) presents activities possible with varying levels of cord injury.

Table 22-1
Level of Spinal Cord Damage, Function Present, and Activities Possible

LEVEL OF INJURY	FUNCTION PRESENT/NEUROLOGIC DEFICIT	ACTIVITY POSSIBLE
C1-C3	No respiratory function; usually fatal unless immediate emergency help is available to establish respiration Tetraplegia (quadriplegia)	Respirations stimulated with phrenic pacemaker. Can manipulate electric wheelchair with breath, chin, or voice control.
C4	Loss of diaphragm movement; breathe with assistance Tetraplegia (quadriplegia)	May live if assisted respiration is begun immediately. Can use a mouth stick to turn pages, type, or write.
C5	Partial shoulder movement; partial elbow movement	Can turn head. Able to feed self with special adaptive devices. Able to move wheelchair for short distances and move well with electric wheelchair. Can assist a bit with self-care.
C6	Retains gross motor function of arms; partial shoulder, elbow, and wrist movement possible Tetraplegia (quadriplegia)	Needs adaptive devices; may be able to propel wheelchair. Independent in feeding and with some grooming with adaptive devices. Can roll over in bed. Can drive a car with hand controls. Can assist in transfer. Can self-catheterize the bladder.
C7	Shoulder, elbow, wrist, hand partial movements possible Tetraplegia (quadriplegia)	Manipulates wheelchair with arms; transfers to and from chair; may drive specially fitted car. Excellent bed mobility. Independent in most ADLs.
C8	Normal arm movement; hand weakness Tetraplegia (quadriplegia)	Bed and wheelchair independent. Can perform most ADLs and may achieve vocational and recreational goals. Performs self-catheterization.
T1-T10	Normal arm movement and strength; loss of bowel, bladder, and sexual function	May achieve walking with braces. Able to perform ADLs and achieve vocational and recreational goals.
T11 and below	Loss of bowel, bladder, and sexual function	Wheelchair not essential. Able to perform ADLs, work, and recreational activities.

ADLs, Activities of daily living.

Injury to the spinal cord that does not involve complete severance of the cord may result in a temporary paralysis, which may subside as the spinal cord recovers from the swelling and initial shock of the injury. Initial assessment of the damage is often one or two levels higher than the actual injury because of edema, resulting in decreased function until the edema subsides.

Diagnosis is made by physical examination and testing of reflexes. CT scan or MRI may be performed to determine the extent of the damage and to see whether the cord is completely **transected** (severed). This helps determine whether neurologic deficits are likely to be permanent. A myelogram may be performed when other tests do not reveal sufficient information.

Treatment

There are four main objectives in the treatment and nursing care of a patient with an injury of the spinal cord:

1. To save the victim's life
2. To prevent further injury to the cord by careful handling of the patient
3. To repair as much of the damage to the cord as possible
4. To establish a routine of care that will improve and maintain the patient's state of health and

prevent complications, so that eventual physical, mental, and social rehabilitation is possible

As soon as an injury to the spinal cord occurs, the patient must be handled with extreme care.

Safety Alert

Prevent Further Spinal Injury

Anyone with a head injury is treated as if he has also suffered a spine injury until proven otherwise. The neck must be stabilized to prevent any movement. When no cervical collar is available, use a shirt, towel, coat, or other material rolled and placed around the neck as a collar to keep the neck as straight as possible, preventing it from flexing or hyperextending. If the victim must be moved to safety, he should be rolled like a log, as one straight piece, onto a flat surface, such as a board of plywood or a door removed from its hinges. Roll the patient as one piece onto his side, place the board behind him, and then carefully roll him back onto the board. This is done slowly and carefully to avoid twisting or bending the spinal column. The victim is kept still.

Because a nurse or provider may not be at the scene of the accident to supervise the moving of the victim, laypersons should learn the proper emergency care of such injuries. When an accident victim complains of neck or back pain, or cannot move the legs or has no feeling in them, treat the victim as if he has a spinal cord injury. **To avoid flexion of the neck, no pillow or other kind of support is placed under the head. Do not move the victim unless life-threatening conditions require it.**

Transfer of the patient to the hospital should be done only by trained emergency medical technicians. In the emergency department of the hospital, the patient's condition is stabilized and a thorough examination is conducted to establish the extent of his injuries. Methylprednisolone, a corticosteroid, may be given as soon as the examination and diagnosis of cord injury are made. If given within 8 hours of injury, it is believed to minimize further damage and improve the return of both motor function and sensation (Chin and Kopell, 2014). Use of a corticosteroid is controversial because of recent research about the lack of evidence of benefit versus the many side effects of the drug.

Clinical Cues

Drug metabolism is altered in patients with a spinal cord injury. Drug interactions are more common. Be vigilant in checking for signs and symptoms of drug interactions.

Normal saline is used for fluid replacement, and drugs such as dopamine (Intropin) may be given to sustain a sufficient blood pressure to prevent cord hypoxia. Pulmonary edema and increased ICP if a head injury is present are potential problems, and fluid balance is watched carefully.

Respiratory Management

Intubation and mechanical ventilation are often required to sustain life in patients with an injury at C5 or above. Patients with intact phrenic nerve innervation may receive a phrenic nerve stimulator that assists them to breathe by stimulating action of the diaphragm. Patients who can breathe when they first arrive at the hospital may be intubated, because as cord edema progresses, respiration may become impaired. Mechanical ventilation relieves the muscle work of breathing and conserves the patient's energy during the emergent phase of the injury. An oral airway may be placed if a tracheostomy is unnecessary.

Immobilization and Surgery

Surgery on the spine with removal of bone fragments is performed to relieve pressure, provide stabilization, and prevent further injury. **Cervical spinal cord injury is usually treated with traction to immobilize the affected vertebrae and maintain alignment.** Traction can be accomplished by skeletal traction using Crutchfield or Gardner-Wells tongs with ropes, pulleys, and weights (Figure 22-10) or with a halo ring and fixation pins (Figure 22-11). The halo is often

used for cord injury not requiring surgery and allows for early ambulation.



FIGURE 22-10 Crutchfield tongs for cervical traction. (Courtesy Michael S. Clement, M.D., Mesa, Ariz.)

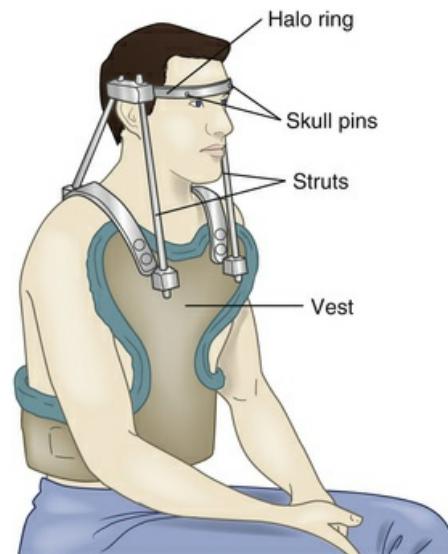


FIGURE 22-11 Halo traction vest for cervical stabilization. Note the rigid shoulder straps and encompassing vest. Various vest sizes are available prefabricated. The halo ring superstructure and the vest are magnetic resonance imaging (MRI) compatible. (Modified from Urden LD, Stacy KM, Lough ME: *Priorities in critical care nursing*, ed. 6, St. Louis, 2012, Mosby. In Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2013, Mosby.)

Selecting the type of bed to be used for a patient with spinal cord injury depends on many factors. Some providers and nurses prefer placing the patient in a special lateral rotation bed that is designed to prevent the problems of immobility while maintaining traction (Figure 22-12). If halo traction is used and the patient has an incomplete spinal cord injury, a standard orthopedic bed may be used. All measures to prevent the problems of immobility are instituted (see Chapter 9).



FIGURE 22-12 RotoRest Delta Advanced Kinetic Therapy system. (Courtesy ArjoHuntleigh.)

Urinary Management

An indwelling urinary catheter is inserted to prevent bladder distention and protect the skin from reflex bladder emptying. After the first week, a bladder management program will be initiated (see [Chapter 21](#)).

Psychological Care

The short-term and long-term psychological changes brought about by spinal cord injury and paralysis are difficult, if not impossible, to measure. Adjustment to such a drastic change in lifestyle is a continuous process that may well last a lifetime (see [Chapter 9](#)).

Grief and mourning response.

Sustaining a spinal cord injury that causes permanent neurologic deficit brings with it many losses. Most patients experience grief and mourning of the losses experienced and the changes that such losses bring to their roles and lifestyle. [Table 22-2](#) presents a review of the stages of grief and the behaviors that might be seen. In caring for these patients, use active listening, be supportive, and help the patient to focus on positive strengths and the possibilities for the future.

Table 22-2
Stages of Grief and Associated Behaviors

STAGE OF GRIEF OR MOURNING	FREQUENT BEHAVIORS SEEN
Shock and denial	Complete dependence, withdrawal, excessive sleep, struggle for survival, unrealistic expectations.
Anger	Hostility toward caregivers and family, manipulative behavior, abusive language, refusal to discuss paralysis and losses, decreased self-esteem.
Bargaining	Bargaining with a higher power/fate: "If you'll let me walk again, I'll pray every day."
Depression	Sadness, "blue" mood, withdrawal, insomnia, agitation, refusal to participate in education for self-care, suicidal thoughts and comments.
Adjustment	Begins active participation in therapy and education for self-care, planning for future, expresses hope for future functioning, finds meaning in whole experience of injury and therapy, return of usual personality.

Sexual Concerns

One area of concern to the patient and his family members that sometimes receives inadequate

attention is that of sexual function and sexuality after spinal cord injury. Many individuals have difficulty discussing sexual matters. A nurse who wishes to help a patient deal with problems of sexuality must first come to terms with her own feelings and attitudes and clarify her own values. She should not be critical or judgmental in her discussions about the patient's sexuality. The patient and his partner must be encouraged to verbalize concerns and questions and should be given guidance about alternative ways to express sexuality and meet sexual needs.

Complications

Spinal shock and neurogenic shock.

The disruption in the nerve communication pathways between upper motor neurons and lower motor neurons may cause spinal shock. Spinal shock is characterized by flaccid paralysis and loss of reflex activity and of sensation below the level of the injury. Spinal shock occurs immediately after injury and lasts 48 hours to several weeks.

Neurogenic shock may occur within 24 hours and is caused by loss of vasomotor tone caused by the injury; neurogenic shock is characterized by bradycardia, hypotension, venous pooling with decreased cardiac output, and occasionally paralytic ileus. Vital signs become labile. Treatment is aimed at maintaining adequate blood pressure and heart rate. Neurogenic shock may occur with a cervical or high thoracic injury.

Muscle spasms.

Immediately after a spinal cord injury, the patient will usually have a flaccid type of paralysis. Later, as the cord adjusts to the injury, the paralysis will become spastic, and there will be strong, involuntary contractions of the skeletal muscles. These muscle spasms, which may be violent enough to throw the patient from the bed or wheelchair, must be anticipated, and the patient must be secured so that accidents can be prevented. If the upper extremities are involved, he is likely to tip over glasses, water pitchers, or anything within reach of his arms when seized with uncontrollable muscle spasms.

The patient and family may interpret these spasms as a return of voluntary function of the limbs and will have false hopes of complete recovery. The nurse or the provider must explain to them that these spasms are common in patients with spinal cord injuries. To avoid stimulating the muscles when moving the patient and thereby precipitating a spasm of the muscles, avoid grasping the muscle itself. The palms of the hands are used to support the joints above and below the affected muscles. The administration of antispasmodic medications such as baclofen (Lioresal) orally or intrathecally may decrease the severity of the spasms ([Table 22-3](#)).

 **Table 22-3**

Drugs Commonly Used to Treat Head and Spinal Cord Injuries

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Corticosteroid			
Methylprednisolone (Solu-Medrol)	Decreases inflammation by suppression of leukocyte migration to injury site; decreases capillary permeability	Give as IV bolus and as continuous infusion. May cause insomnia, increased susceptibility to infection, and GI distress. May delay wound healing. Monitor electrolyte levels. H ₂ -receptor blocker or proton pump inhibitor often given concurrently to prevent stress ulcer.	Advise to report heartburn or stomach pain.
Skeletal Muscle Relaxant			
Baclofen (Lioresal)	Inhibits synaptic responses in CNS by decreasing GABA, thereby decreasing frequency and severity of muscle spasms	Monitor for seizure activity. Observe for muscle weakness and fatigue. Assess for allergic symptoms: rash, fever, respiratory distress.	Advise not to drink alcohol, because it increases CNS depression. Do not discontinue medication quickly or abruptly.
Adrenergic Action Vasoconstrictor			
Dopamine (Intrropin)	Acts on alpha receptors, causing vasoconstriction in blood vessels, thereby raising blood pressure	Monitor vital signs closely; assess for chest pain. Monitor I&O. Place patient on a cardiac monitor during therapy. May cause nausea, vomiting, or diarrhea. Be certain that IV access is patent, because drug will cause necrosis if extravasation into the tissue occurs.	Explain purpose of drug is to raise blood pressure so that brain has adequate perfusion and oxygen. May cause headache.
Osmotic Diuretic			
Mannitol	Increases osmotic pressure of glomerular filtrate; promotes diuresis	Monitor vital signs closely. Track I&O; assess skin turgor and mucous membranes for signs of dehydration.	Explain that the drug will cause increased urine output and that this is its intended action.

		Monitor electrolytes. Observe for nausea, backache, hives, and chest pain.	
Neuromuscular Blocking (Paralyzing) Agent			
Pancuronium (Pavulon)	Inhibits transmission of nerve impulses, producing skeletal muscle relaxation for surgery, endotracheal intubation, and mechanical ventilation when patient is fighting the ventilator	Be certain that alarms are properly set on the ventilator. Observe patient frequently. Keep Ambu bag at bedside. Monitor electrolytes and I&O. Observe for urinary retention. Observe for allergic reaction: rash, fever, pruritus. Protect the eyes with artificial tears and keep lids closed.	Explain that patient will be paralyzed and unable to move. Assure patient that he will be monitored at all times and that there are backup measures in place in case of power outage when ventilator would not work.

CNS, Central nervous system; GABA, gamma-aminobutyric acid; GI, gastrointestinal; H₂, histamine-2; I&O, intake and output; IV, intravenous.

Autonomic dysreflexia (hyperreflexia).

Autonomic dysreflexia (AD) is an uninhibited and exaggerated reflex response of the autonomic nervous system to some form of stimulation that occurs in 85% of all patients who have spinal cord injury at or above the level of the sixth thoracic vertebra (T6). The AD response is potentially dangerous to the patient, because it can produce vasoconstriction of the arterioles with an immediate elevation of blood pressure. The sudden hypertension can, in turn, cause a seizure, retinal hemorrhage, or stroke. Less serious effects include severe headache, changes in pulse rate, sweating and flushing above the level of the spinal cord lesion, and pallor and “goose bumps” below the level of injury.

AD occurs most often with spinal cord disorders at or above the T6 level. The problem can occur any time after a spinal cord injury; in some cases it has first appeared as late as 6 years after the injury.

Many kinds of stimulation can precipitate AD. Tight clothing around the waist may elicit an AD response. However, most are related to the bladder, bowel, and skin of the patient. For example, catheter changes, a distended bladder, the insertion of rectal suppositories, enemas, and sudden changing of position can provide the stimulation that results in AD (Stephenson, 2015).

Clinical Cues

Careful attention must be paid to keeping the bladder from becoming overdistended. If the patient is on bed rest, check the catheter and drainage tubing for the indwelling catheter every couple of hours. When voiding has not occurred, monitor output and time of voiding for patients who do not have an indwelling catheter, and palpate the bladder for distention every few hours.

When a patient exhibits symptoms of AD, an emergency exists. Efforts should be made to lower blood pressure by placing the patient in a sitting position or elevating his head to a 45-degree angle. If the cause of the stimulation is known—for example, an impacted bowel, overdistended bladder, or pressure against the skin—the stimulus should be removed as gently and quickly as possible. The provider should be notified immediately so that the appropriate medications can be prescribed and administered.

Orthostatic hypotension.

Vasoconstriction is impaired after spinal cord injury, and the lack of muscle function in the legs causes pooling of blood in the lower extremities. Sudden change in position from supine to sitting or sitting to standing may cause dizziness and fainting. Compression stockings, moving slowly, and use of a reclining wheelchair may help prevent this problem.

Deep venous thrombosis.

Decreased blood pressure combined with lack of muscle movement slows venous return to the heart. Thrombosis may occur. Compression stockings, sequential compression devices, and/or heparin injections may be needed to prevent deep venous thrombosis.

Infection.

Impaired respiratory muscles with the resultant decreased cough and shallow respirations predisposes patients with a high spinal cord injury to respiratory infection. Mechanical ventilation with intubation provides an avenue for microorganisms to enter the lungs, so mechanical

ventilation is a risk factor for infection. Urinary catheterization for loss of bladder control is a risk factor for infection as well.

Skin breakdown.

Lack of sensation and inability to move for repositioning places the patient at great risk for skin breakdown and pressure ulcers. Pressure-relieving devices, meticulous skin care with regular inspection, and manual repositioning are essential to prevent this problem.

Renal complications.

Urinary reflux from the bladder to the kidney often results from impaired bladder function. Catheterization and immobility predispose to bladder infection; the infection may travel up the ureters to the kidneys. Permanent kidney damage may eventually occur from such infections.

Think Critically

Can you name three care interventions that might trigger an episode of AD? How could you possibly avoid causing this reaction?

Heterotopic ossification.

Heterotopic ossification may occur with long-term immobility. **Heterotopic ossification** is bony overgrowth that may invade muscle. Assess for swelling, warmth, redness, and decreased range of motion of the extremities to detect ossification.

Nursing Management

There often is a tendency to treat a physically disabled patient as if he were less than a “whole” person with the same desires, hopes, and anxieties that all humans share. You can serve patients by reacting to and interacting with physically disabled patients in an open and honest manner. If unprepared to handle a certain problem, readily admit embarrassment, confusion, or lack of information, and seek assistance from other members of the health care team. Rehabilitation of patients with spinal cord injuries is discussed in detail in [Chapter 9](#).

Assessment (Data Collection)

Continued assessment for signs of decreased oxygenation, blood pressure instability, infection, skin breakdown, gastrointestinal or nutrition problems, and urinary problems is essential. Perform a daily review of systems and collection of data regarding physical status. Assess the tracheostomy tube, traction devices and pins, correct placement and use of sequential compression devices or compression stockings, indwelling catheter, IV cannula, feeding tube, and other equipment each shift.

Nursing Diagnosis

Problem statements/nursing diagnoses appropriate for a patient with a spinal cord injury may include:

- Altered gas exchange due to diaphragm paralysis, diaphragm fatigue, or retained secretions.
- Impaired physical mobility related to vertebral column instability, disruption of the spinal cord, and traction.
- Altered cardiac output due to hypotension and decreased muscle action causing venous pooling.
- Altered nutrition due to increased metabolic demand from healing injuries, slowed gastrointestinal motility, and inability to feed self.
- Constipation due to lack of bowel innervation, decreased fluid intake, and immobility.
- Altered urinary elimination related to decreased innervation of the bladder.
- Pain due to muscle spasms.
- Potential for autonomic dysreflexia due to reflex stimulation of sympathetic nervous system.
- Potential for altered skin integrity due to immobility and loss of sensation.
- Altered coping ability due to loss of control over bodily functions and altered lifestyle secondary

to paralysis.

- Altered body image due to paralysis and loss of control over bodily functions.
- Altered family function due to change in role within the family because of neurologic deficits.
- Grief due to neurologic deficits and to changes in roles and lifestyle. Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning, Implementation, and Evaluation

Specific, individual expected outcomes are written for each problem supported by data gathered. Long-term goals are considered, and planning for rehabilitation begins with hospitalization. The patient will often be transferred to a rehabilitation facility for intensive rehabilitation and retraining for activities of daily living.

Care for a patient with a spinal cord injury can be very complex, depending on the level of the injury. Often a head injury accompanies the trauma to the spinal cord. When a stabilization device is in place on the head, assessment and care of the pin sites are performed every shift initially and then twice a day. Sterile technique is used and is performed according to agency policy. Solutions such as sterile normal saline are used for cleansing, and an antibiotic ointment is applied. Weights used for cervical traction must be kept hanging freely to be effective. Traction pull should never be interrupted. Tongs may stay in place for 4 weeks. If the patient is wearing a halo fixation device, skin care must be given frequently and the skin checked to see that the jacket or cast is not causing pressure ulcers. One finger should be able to slip easily beneath the cast or jacket to be sure it is not too tight. The patient is never moved or turned by holding or pulling on the halo device. **The halo jacket is never unfastened unless the patient is supine, because head movement will immediately occur.** Log rolling must be done with extreme care to avoid twisting the vertebral column and further damaging the spinal cord (Figure 22-13).

■ Assignment Considerations

Inappropriate Delegation

Although many tasks may be delegated to CNAs or UAPs, moving or positioning patients with neurologic injury or surgery should **not** be delegated. If given proper, complete instructions, the CNA or UAP may log roll the patient with the nurse's help and supervision.



FIGURE 22-13 Log-rolling procedure using a lift sheet and three people. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2014, Saunders.)

All the nursing measures designed to prevent the disabilities that may result from immobility, to promote healing, and to prevent complications are used to help the patient achieve the goals of rehabilitation. Bladder and bowel training programs, as well as instruction in moving from bed to chair—and other aspects of self-care—may be necessary. Realistic goals should be set for the patient, and every effort made to achieve them.

Encourage the patient to do whatever he can for himself as soon as is feasible. The overall goal is to promote as much independence as possible. A great deal of encouragement and praise are required. Evaluation is ongoing to determine whether the interventions have been successful in achieving the expected outcomes. If they have not been successful, the plan is rewritten.

Rehabilitation

A full team of professionals will be involved in the care and rehabilitation of patients with a spinal cord injury. The physical therapist, occupational therapist, psychologist, physician, respiratory therapist, pharmacist, and ancillary personnel will collaboratively plan the patient's care. The patient and family are often invited to participate in the planning process.

The use of robotics and computers is providing hope for some patients to walk again ([Rehabilitation Institute of Chicago, 2015](#)). A system called *functional electrical stimulation (FES)* is used to generate neural activity and overcome lost function. The system stimulates muscles to make walking motions. The patient is suspended in a harness to support body weight and is retrained to walk using a treadmill. The antidepressant escitalopram (Lexapro), a selective serotonin reuptake inhibitor (SSRI), has improved results of the therapy for some patients. Research is under way on a neuroprosthetic microchip implant that would help certain patients to walk again. The ReWalk brace support suit that is combined with computerized technology has been approved by the U.S. Food and Drug Administration for use at home and in the community ([ReWalk, 2014](#)). It allows an otherwise healthy paraplegic to walk using Canadian crutches. It runs on a power pack carried on the back. A pacemaker for the bladder is under study for the treatment of urinary incontinence.

Communication between team members is crucial to the success of the individual plan. When the patient is discharged, all plans and specifics required for the patient's care must be shared with home caregivers and home care nurses who will be involved in his care. His primary provider must be fully briefed.

Back Pain and Ruptured Intervertebral Disk (“Slipped Disk”)

Etiology

Back pain occurrence is surpassed only by headaches. Emergency providers treat more than 6 million cases of back pain annually. In people younger than 45 years, back pain is the most common cause of work absence and is the most costly health condition for employers. Carelessness and incorrect methods of lifting contribute to a large percentage of back problems. On-the-job accidents and resultant trauma to the spine is another cause. Obesity and lack of exercise, and poor lifting and moving techniques, contribute to the stress placed on the back muscles and to the occurrence of injury or the severity and duration of pain. Exercise promotes good muscle tone. Other risk factors leading to back pain include lack of exercise (causing poor muscle tone), poor posture, cigarette smoking (which decreases oxygenation to the disks and predisposes to degenerative disease), and stress. Repetitive heavy lifting also may cause back pain. This is often a factor for health care workers. Causes of musculoskeletal back pain include:

- Acute lumbosacral strain
- Instability of lumbosacral spine
- Osteoarthritis of the spine
- Intervertebral disk degeneration and spinal stenosis
- Herniation of the intervertebral disk

Preventing back pain and disorders begins with proper posture and the use of correct lifting techniques. Maintaining one's weight within normal limits also helps decrease back strain. Sufficient physical exercise that maintains the condition of the back muscles and specific exercises to strengthen the abdominal and back muscles can greatly decrease the repeated incidence of injuries that lead to back pain.

Pathophysiology

The bodies of the spinal vertebrae lie flat on one another like a stack of coins. Between the vertebral bodies there is a disk of fibrous cartilage filled with gelatinous substance (in the nucleus) that acts as a cushion to absorb shocks to the spinal column. This gelatinous disk may be ruptured by an injury, such as by the strain caused when lifting a heavy object or by wrenching the spinal column or falling on the back. When the disk ruptures, part of the contents squeezes out from between the vertebrae and disk fragments may lodge in the spinal canal. The disk compression on the adjacent nerve root causes the pain ([Figure 22-14](#)). When protein from the disk content leaks out into the canal, the body perceives it as a foreign substance, causing an inflammatory response, with pain. Thus the person suffers from what is sometimes called a *slipped disk*. Another name for this condition is *herniated nucleus pulposus*.

Older Adult Care Points

Older adults have decreased flexibility of the spine and, as age increases, degeneration of the spine. Many older adults suffer from osteoporosis and osteoarthritis. These factors make older adults more prone to back pain, especially if regular exercise is not performed to maintain flexibility and bone density.

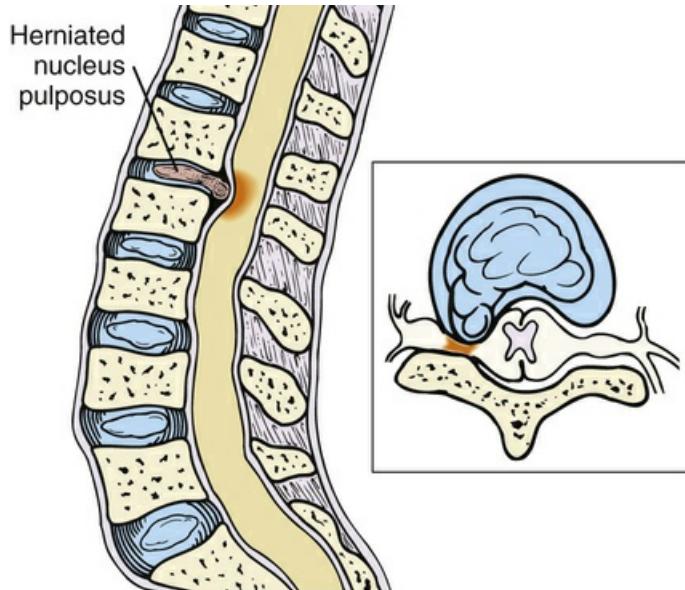


FIGURE 22-14 Herniated disk (nucleus pulposus) with compression of spinal cord. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 7, St. Louis, 2007, Mosby.)

Acute back pain usually occurs from activity that puts stress (hyperflexion) on the tissues of the lower back. Back pain that is a result of muscle spasm is usually self-limiting and often resolves within 4 weeks. Chronic back pain is pain that lasts for more than 3 months or is a repeat episode. Chronic back pain may be caused by degenerative disk disease or osteoarthritis, but lack of exercise, prior injury, and obesity are common factors. The most common sites of disk rupture are L4-L5 and L5-S1. Herniation may also occur at C5-C6 or C6-C7.

Signs, Symptoms, and Diagnosis

Sometimes a lumbar herniated disk causes pain radiating down the sciatic nerve into the buttock and below the knee. Muscle weakness and paresthesias may occur. Cervical herniated disk causes pain in the neck and shoulder, radiating down the arm with numbness and tingling in the hand. Muscle tightening and spasm in the area of injury are common.

Diagnosis requires a history and physical examination. The straight-leg-raising test is often used for low back pain. While the patient is supine, the leg is raised off the bed or examination table with the whole leg straight. If low back pain occurs, the test confirms a disk problem. Reflexes may be decreased or absent. The patient may experience muscle weakness or paresthesias in the legs or feet.

If conservative therapy does not relieve the pain, diagnostic radiographs, MRI, or CT scanning is performed. An electromyogram may be ordered to determine the degree of nerve irritation and to rule out other pathologic conditions.

Treatment

The provider will treat back pain initially with conservative measures in the hope that surgical correction will not be necessary. If there is no sciatic pain, bed rest is not recommended, because research has shown that walking provides a quicker recovery. When sciatic pain is present, bed rest for 2 to 3 days is helpful (Miller, 2015). Ice packs are applied for 5 to 10 minutes at a time each hour for the first 48 hours to reduce muscle spasm in the back. After 48 hours, heat may be more helpful, because heat relaxes strained muscles. Ultrasound treatments are often helpful. Heating pads, hot packs, and hot showers work well to relax the muscles.

Complementary and Alternative Therapies

Help for Pain

Acupuncture, acupressure, and massage therapy have all proven beneficial for back pain. Research from the National Institutes of Health has proven that acupuncture is effective for back pain. For those with chronic back pain, acupuncture is worth trying. Massage and acupressure help relieve muscle spasm, especially when heat is applied to the affected muscles first.

Studies show that wearing a portable heat wrap decreases pain moderately and more than ibuprofen ([Chou and Huffman, 2014](#)). Transcutaneous electrical nerve stimulation may help relieve the patient's pain. Acupuncture has proven useful to help relieve back pain. Back strengthening exercises are prescribed as soon as acute symptoms subside; these exercises are initially supervised by a physical therapist. The exercises are encouraged for a lifetime, because muscles need to be toned to prevent back strain. Specially designed corsets or back braces are sometimes used to maintain proper alignment of the spine when the patient is allowed out of bed. The patient is cautioned not to lift anything heavier than 2 to 5 lb and not to twist when reaching for things. The patient should be up and moving around frequently rather than sitting for long periods. High heels should not be worn.

Swimming or walking for short distances frequently is very beneficial for patients with back pain. Standing for long periods is to be avoided, and when standing the patient should shift weight from one foot to the other frequently. Adjustments and treatments by a chiropractor may also help relieve pain, although chiropractic treatment is not appropriate for all types of back injuries. Chiropractic treatment seems most effective if the pain has been present for less than 16 days. If pain continues beyond 3 to 4 weeks, or if pain is worsening, there is evidence of neurologic deficit, and surgery may be indicated.

For many patients, gentle yoga movements have been more successful than prescribed back exercises for relieving pain. For others, core body stretching and muscle strengthening work well.

Surgical procedures.

For those patients who cannot find relief through conservative measures, surgical removal of the damaged disk may be the only alternative. A discectomy is performed to decompress the nerve root. This is a microsurgical technique that uses a very small incision through which the herniated intervertebral disk material is dissected and extracted. A minimally invasive electrothermoplasty or radiofrequency diskal nucleoplasty may be performed. If the area cannot be handled with microsurgery, an open incision discectomy or laminectomy, which involves removal of the posterior arch of the vertebra along with the disk, is done. A laminectomy may be done in conjunction with spinal fusion.

A percutaneous laser discectomy is an outpatient procedure. A tube is passed through the retroperitoneal soft tissues to the disk's lateral border. Local anesthesia and fluoroscopy are used during the procedure. A laser is used to cut away and destroy the herniated portion of the disk. Small stab wounds are used, there is minimal blood loss, and rehabilitation time is shorter. An artificial Charité disk may be inserted after disk-ectomy when there is degenerative disk disease.

A spinal fusion is necessary in some patients to stabilize the spine. In a spinal fusion, a piece or pieces of bone from the iliac crest or cadaver bone are grafted onto the vertebrae to strengthen them. Fixation with metal rods and screws may be employed to decrease spinal motion and irritability. The Infuse Bone Graft/LT-CAGE device is an alternative option to using bone from the patient for grafting ([Epstein, 2011](#)). Genetically engineered protein contained in the device stimulates new bone growth at the site.

A laminectomy may be performed for conditions other than a ruptured disk—for example, for such degenerative diseases of the spine as Pott disease (tuberculosis of the spine), for fractures of the spine, and for spinal dislocation. Once a laminectomy with a fusion has healed, the fused vertebrae are immobile.

Nursing Management

Preoperatively, a baseline neurologic assessment is performed and documented. Other preoperative care is the same as for other types of general surgery. Postoperatively, the major concern after spinal fusion, laminectomy, or discectomy is to keep the spinal column in alignment so that healing can take place and no further injury occurs to the spinal cord. Pillows are placed under the thighs when the patient is on his back and between the legs when on the side to maintain correct spinal alignment and decrease the pressure to the back. If the surgeon allows the patient to be turned to

the side, log rolling is used to avoid twisting the spine (see [Figure 22-13](#)). Sometimes the surgeon will allow the patient to be positioned only on the back or sometimes the abdomen. Whenever the patient's position is changed, an ample number of people should be available to help move him. Patients who have had cervical spine surgery are placed in a cervical collar and continue to wear a collar for several weeks.

Focused Assessment

Data Collection After Spinal Surgery

Immediately postoperatively, assess every 15 to 30 minutes; after the first 4 hours, assess every 2 to 4 hours postoperatively. Assess the following areas and compare findings with preoperative data:

Sensation

- Check extremities for numbness and tingling.
- Check all anatomic surfaces of forearms and hands, upper and lower legs, and feet.

Movement

- Check for ability to move shoulders, arms, hands, legs, and feet.

Muscle Strength

- Check each extremity for weakness by having the patient push against your hands while you apply downward pressure to the extremity.

Wound

- Assess surgical (and donor) site for drainage, noting amount, color, and characteristics.
- Check carefully for signs of CSF leak at surgical site.
- Determine adequacy of analgesia.

Pain

- Assess for site of pain, characteristics of the pain, and degree of pain on a scale of 1 to 10, with 10 being the worst pain.
- Reevaluate pain after administering analgesia for effectiveness.
- Monitor respirations and vital signs.

Skin Pressure Points

- Check for reddened areas on bony prominences when turning patient.

CSF, Cerebrospinal fluid.

When a patient who has had a laminectomy or spinal fusion is allowed out of bed, a back brace or corset may be prescribed to support the spinal column until complete healing has occurred. For several weeks the patient is not allowed to sit for any length of time. He must walk or lie down. Standing for long periods is discouraged. Patients who have had microdiscectomy are usually up and about the day after surgery. However, weeks to many months of exercises and physical therapy are necessary before recovery is complete.

Clinical Cues

At the time of discharge, the instructions about not sitting or standing for any length of time should be reinforced. Patients tend to overdo sitting or standing when they get home and become very fatigued, have more pain, and become discouraged.

An IV opioid via patient-controlled analgesia pump may be ordered for pain control the first 24 to 48 hours after surgery. Additional boluses for adequate pain control may be needed. Assess frequently for effectiveness of the pain medication. Once fluids are being taken, oral analgesia is started with acetaminophen with codeine, hydrocodone (Vicodin), or oxycodone (Percocet). Muscle relaxants may be given as well.

After spinal surgery a small fracture bedpan is used for toileting if the patient is not to be allowed up. The patient's back must be firmly supported while he is resting on the pan. When the patient is steady enough to be allowed out of bed, a bedside commode (or for the male patient, standing at the bedside) is encouraged to promote complete bladder emptying. Provide privacy for toileting activity. If difficulty with voiding occurs, intermittent catheterization or an indwelling catheter will be required.

Interference with bowel function and paralytic ileus may occur after laminectomy or spinal fusion. Observe for constipation, nausea, abdominal distention, and return of bowel sounds. Stool softeners are used to help prevent constipation. Incontinence or difficulty with bowel evacuation may indicate nerve damage and should be reported to the surgeon.

Permitted activity varies according to the underlying pathology and the patient's progress. Be clear about activity orders, whether a brace or corset is to be worn, and whether it is to be put on while lying down, sitting, or standing.

If a bone graft has been performed, the donor site must be assessed regularly and care provided. Pain is usually greater at the donor site than at the spinal fusion site. If the fibula is the donor site, neurovascular assessments of the limb must be performed on a regular schedule, as edema can occur.

Depending on the type of spinal surgery performed, many weeks to months are needed for complete recovery. The patient must learn to perform activities without twisting the spine.

Patient Teaching

Guidelines for a Patient With Low Back Pain or Spinal Surgery

Do

- Bend knees, with back straight, and crouch to lift an item off the floor.
- Carry items close to the center of your body.
- Perform your back exercises twice a day; periodically review the correct way to do them.
- Maintain appropriate body weight; lose weight if overweight.
- Use a lumbar pillow or roll when sitting and particularly when driving for long distances.
- Stop and walk around at least every 2 hours when on long trips.
- Consider how to safely perform a task before starting to do it.

Do Not

- Lean over without bending the knees.
- Reach to lift items or lift heavy items higher than the elbows.
- Stand or sit for long periods.

- Sleep with legs out straight without pillow cushioning under the thighs or between the legs when on the side.
- Bend from the waist to pick up an item.
- Twist to the side to lift things (e.g., groceries or things in the car or trunk).

Get Ready for the NCLEX® Examination!

Key Points

- Head injuries are open or closed and result in concussion, contusion, acceleration-deceleration injury, skull fracture, or tearing of cranial vessels.
- Subdural or epidural hematoma may result from a head injury; epidural hemorrhage is a life-threatening event.
- A significant head injury causes disruption in normal LOC.
- Drainage from the ear or nose should be evaluated to determine the presence of CSF.
- Any lesion or extra fluid that begins to take up space in the cranial vault causes an increase in ICP.
- The earliest sign of increased ICP is decreasing LOC.
- Treatment of increased ICP includes maintaining a patent airway, administering diuretic agents to decrease edema, monitoring neurologic signs for increased ICP, regulating temperature, maintaining adequate blood pressure, and instituting nursing measures to prevent further increases in ICP (see [Table 21-9](#) and [Nursing Care Plan 22-1](#)).
- Neurologic assessment is performed every 15 minutes to 2 hours for acute patients with injury to or surgery on the brain.
- For maintenance of a patent airway, intubation or a tracheostomy and mechanical ventilation may be necessary.
- Early nutritional support is very important for both head injury and spinal cord injury patients.
- Unconscious patients require care for all basic needs; the eyes must be protected from injury, because the blink reflex may be absent.
- Complications of head injury and increased ICP include hydrocephalus and diabetes insipidus.
- The extent of permanent cord damage often cannot be assessed until many days after injury because of edema and resulting pressure that edema causes on the spinal cord.
- The degree of neurologic impairment and activities that the patient will still be able to perform depend on the level and extent of the injury (see [Table 22-1](#)).
- Autonomic dysreflexia is potentially very dangerous to the patient, because it can severely elevate blood pressure.
- Traction provided by Crutchfield or Gardner-Wells tongs, or a halo ring and fixation pins, immobilizes the spine while healing takes place.
- Back pain can be caused by muscle strain or herniated or ruptured intervertebral disk.
- Back pain should be treated conservatively before surgery is considered.
- Treatment depends on whether or not a disk rupture is present and on the severity of the pain and disability.
- Conservative treatment includes rest, gentle exercise, ice or heat, analgesics, and muscle relaxants. Surgical procedures include minimally invasive procedures, microdiscectomy or laminectomy (with or without fusion), percutaneous laser discectomy, and spinal fusion.
- Postoperative care depends on the type of procedure performed.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- American Association of Neuroscience Nurses, www.aann.org
- American Association of Neuroscience Nurses Clinical Guidelines, <http://www.aann.org/pubs/content/guidelines.html>
- American Pain Society, www.ampainsoc.org
- Brain Injury Association of America, www.biausa.org
- Brain Trauma Foundation, www.braintrauma.org

Review Questions for the NCLEX® Examination

1. A 75-year-old patient who fell and hit his head a week ago is admitted for apparent personality changes, decreased level of consciousness, and irritability. The provider suspects a possible subdural hematoma. A family member asks about the condition. An accurate explanation would be:

1. "It is the presence of bleeding in the brain parenchyma."
2. "Bleeding occurs between the skull and the dura mater."
3. "It is the collection of blood between the brain and the inner surface of the dura mater."
4. "It is the intermittent blockage of circulation in various areas of the brain."

NCLEX Client Need: Physiological Integrity, Physiological Adaptation

2. A nurse is admitting a patient with a possible skull fracture. Which clinical finding(s) would likely confirm the diagnosis? (*Select all that apply.*)

1. Battle sign
2. Partial blindness
3. Ecchymosis around eyes
4. Rhinorrhea
5. Swallowing difficulty

NCLEX Client Need: Physiological Integrity, Physiological Adaptation

3. Which statement by a high school athlete being discharged after experiencing a concussion indicates a need for more teaching?

1. "I can go to football practice tomorrow."
2. "I need to report a worsening headache to the provider."
3. "I'll have to be awakened every few hours when asleep."
4. "I can expect to be more fatigued for a while."

NCLEX Client Need: Safe and Effective Care Environment

4. A nurse keeps a postcraniotomy patient's neck in midline position and ensures that there is no excessive hip flexion. The rationale for the nurse's action would be that this position:

1. restores neutral position of the joints.
2. prevents a further increase in intracranial pressure.
3. promotes comfort and rest.
4. prevents the formation of blood clots.

NCLEX Client Need: Physiological Integrity, Basic Care

5. A nursing assistant is attending to the needs of a patient with a head injury who is lethargic and has increased ICP. Which action by the nursing assistant indicates a need for further instruction?

1. Stopping the patient from coughing up secretions
2. Monitoring blood pressure every 2 hours
3. Dangling the patient on the side of the bed
4. Reporting blood on the dressing

NCLEX Client Need: Safe and Effective Care Environment

6. The classic signs of increased ICP include which of the following? (*Select all that apply.*)

1. Rising systolic blood pressure
2. Widening pulse pressure
3. Bradycardia
4. Positive Babinski sign

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

7. The surgeon inserts an intraventricular catheter into the lateral ventricle of a patient with increased ICP. When asked by a relative about the procedure, an accurate response by the nurse would be:

1. "The catheter allows direct visualization of the brain tissue."
2. "The catheter is used to monitor brain waves."

3. "The catheter is used to remove excess fluid inside the brain."
4. "The catheter is used to infuse fluids and medications into the brain."

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

8. A 30-year-old man is admitted to the emergency department after a motor vehicle accident. After examination, the patient is diagnosed with a T6 spinal cord injury. He has flaccid paralysis, slowed heart rate, low blood pressure, and no bowel sounds. The patient must be developing:

1. autonomic dysreflexia.
2. muscle spasms.
3. spinal shock.
4. diabetes insipidus.

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

9. A 40-year-old man with a T4 spinal cord injury suddenly complains of severe headache, increased pulse rate, sweating, and flushing above the level of the spinal cord lesion and "goose bumps" below the level of injury. Which immediate nursing action(s) should be included? (*Select all that apply.*)

1. Place flat in bed.
2. Identify the cause of stimulation.
3. Decrease blood pressure.
4. Provide measures to facilitate bowel movement.
5. Clamp indwelling catheter.

NCLEX Client Need: Physiological Integrity, Basic Care

10. Instructions for a patient with a "slipped disk" with acute pain and sciatica should include:

1. using ice packs on the area of back pain for 5 to 10 minutes each hour while awake for the first 48 hours.
2. resting in bed for 2 to 3 days and walking every hour even if walking causes more pain.

3. obtaining a massage each day to loosen the muscle spasms in the back.
4. not lifting anything heavier than 10 lb for several weeks.

NCLEX Client Need: Health Promotion and Maintenance

Critical Thinking Questions

Scenario A

Mary is a 22-year-old college student who received a head injury in an automobile accident. She was healthy before her accident. The emergency medical services team brought her to the emergency department (ED). She is stabilized in the ED, cervical spine injury is ruled out, and she is admitted to the neurologic intensive care unit. She is confused and groggy and has leakage of CSF from one ear and irregular respirations.

1. What assessments would you perform?
2. What specific nursing measures would you include in your care plan concerning the leaking CSF?
3. What measures would you take to provide appropriate respiratory care?

Scenario B

Gus Berrini is a 40-year-old truck driver who received a severe spinal injury when he was shot in the back by a hitchhiker. The bullet severed the spinal cord at the sixth thoracic vertebra.

1. What kinds of activities should Mr. Berrini eventually be able to perform?
2. How would you plan his care during the acute stage of his illness so that efforts at rehabilitation might be successful?
3. What other members of the health care team might participate in his care and rehabilitation?

Scenario C

Henry Jones, a 35-year-old construction worker, comes to the clinic with low back pain. He states that this is not the first time he has had a problem with the back pain. He says that this time it is worse and that he can hardly move. He is unable to work.

1. What tests will the health care provider probably perform or order?
2. What is likely to be recommended in the way of treatment?
3. What should Mr. Jones be taught before he leaves the clinic?

CHAPTER 23

Care of Patients With Brain Disorders

Objectives

Theory

1. Choose the appropriate nursing actions and observations to be carried out for a patient experiencing a seizure.
2. Explain why seizure may be a consequence of a stroke, tumor, or infection in the brain.
3. Compare the subjective and objective findings of thrombotic stroke and intracerebral bleed.
4. Devise a nursing care plan for a patient who has experienced a cerebrovascular accident (CVA, or stroke).
5. Write nursing actions to assist a patient who has developed a complication after a CVA.
6. Summarize subjective and objective findings indicative of a brain tumor.
7. Illustrate the pathophysiology behind the symptoms of a brain tumor.
8. Diagram the mechanism by which infection in the brain may cause increased intracranial pressure (ICP).
9. Recognize the signs of increasing ICP from early to late signs.
10. Compare and contrast symptoms of meningitis and encephalitis.
11. Distinguish the assessment data that differentiate migraine headaches from cluster headaches.
12. Compare the signs, symptoms, and treatment of trigeminal neuralgia and Bell palsy.

Clinical Practice

13. Teach a teenage patient recently diagnosed with epilepsy what she needs to know about her disorder and care.
14. Perform neurologic checks on a patient who is admitted with a suspected CVA.
15. Assist with the care of a patient who has had intracranial surgery.
16. Devise a teaching plan for a patient who has experienced a CVA and has right-sided hemiplegia.

KEY TERMS

- agnosia** (ăg-NŌ-zhă, p. 533)
aneurysm (ĕN-ūrĭ-zĕm, p. 530)
aphasia (ă-FĀ-zhă, p. 532)
apraxia (ă-PRÄK-sē-ă, p. 534)
ataxia (ă-TÄK-sē-ă, p. 533)

aura (ĀW-ră, p. 525)
automatisms (ăw-TŌM-ă-tišmz, p. 525)
dysarthria (dīs-ĀHR-thrē-ă, p. 532)
dysphasia (dīs-FĀ-zhă, p. 533)
embolus (ĚM-bō-lūs, p. 530)
epilepsy (Ě-př-lěp-sē, p. 525)
homonymous hemianopsia (hō-MŌN-ǐ-mūs hě-mě-ă-NŌP-sē-ă, p. 533)
hydrocephalus (hī-drō-SĚF-ă-lăs, p. 543)
infarct (ín-făhrkt, p. 530)
nuchal rigidity (NŪ-kăl rĭ-JĬ-dĭ-tē, p. 543)
postictal (PŌST-ĕk-tĕl, p. 525)
ptosis (TŌ-siš, p. 548)
scotoma (skō-TŌ-mă, p. 546)
status epilepticus (STĂ-tūs ěp-ĕ-LĚP-ti-kūs, p. 525)

Seizure Disorders and Epilepsy

Etiology

Seizures can be symptomatic of a large number of disorders, including brain injury from a stroke, pressure from a brain tumor, infectious diseases with high fever, end-stage renal disease with uremia, toxicity (such as that occurring in eclampsia during pregnancy or in drug poisoning), epilepsy, and tetanus. **Seizures also can occur any time the brain is deprived of oxygen.**

Seizures may be symptoms of an underlying illness. Metabolic disturbances such as acidosis, electrolyte imbalances, hypoglycemia, hypoxia, and water intoxication may cause seizures. Alcohol or barbiturate withdrawal can cause seizures. In children, a high temperature is a common cause of seizures. There are at least 40 types of seizure disorders linked to genetic defects. Epilepsy is present when correcting a metabolic problem does not stop the seizures. Epilepsy affects 2.3 million adults and 467,711 children in the United States ([CDC, 2014](#)). Incidence increases in those 60 to 80 years of age.

Pathophysiology

Epilepsy is a chronic disturbance of the nervous system characterized by various types of recurrent seizures that are the result of abnormal electrical activity of the brain. Epilepsy is characterized by spontaneous recurring seizures. It is believed that a group of abnormal neurons fire spontaneously. Some unknown stimulus causes the cell membranes to depolarize. The depolarization of the neurons causes abnormal sensory or motor activity and may cause unconsciousness. The neurons involved have a low threshold for excitation. The excitation spreads to surrounding cells, spreading the activity to a small area or throughout the brain. Seizures are classified as **partial** or **generalized**. Each seizure lasts a few seconds or a few minutes. The abnormal electrical activity generated can be captured by an electroencephalogram (EEG).

Signs and Symptoms

Partial Seizures

Partial seizures are further divided into three subgroups: simple partial seizures, in which consciousness is not impaired but there are other motor, sensory, autonomic, or psychological symptoms; complex partial seizures, in which there is some impairment of consciousness with or without **automatisms** (repetitive, automatic actions such as lip smacking); and partial seizures that become generalized as the seizure continues.

Partial seizures also are called *simple* or *focal seizures* and result from an abnormal localized cortical discharge. Partial seizures with complex symptomatology may also be called *temporal lobe seizures*, because they usually originate in the temporal lobe of the brain. Partial seizures can be unilateral, with involvement on only one side of the brain and activity only on one side of the body.

Generalized Seizures

Generalized seizures are bilaterally symmetric (affecting both sides of the body equally) and do not have a local onset; that is, they do not typically begin in one part of the body. Generalized seizures include absence, myoclonic, clonic, tonic, tonic-clonic, and atonic seizures and infantile spasms (usually caused by increased temperature).

Generalized seizures are characterized by bilateral synchronous electrical discharges in the brain. The whole brain is affected and there is no warning or **aura** (preceding sensation). The patient usually quickly loses consciousness lasting for a few seconds up to several minutes.

The manifestations of epilepsy depend on the area of the brain where the abnormal firing occurs. **Absence or petit mal seizures last only a few seconds. The onset is sudden, with no aura or warning and no postictal symptoms.** Seizures of this type tend to affect children between 5 and 12 years of age and disappear during puberty. There usually is a twitching around the eyes and mouth. The person remains standing or sitting and appears to have had no more than a lapse of attention or a moment of absentmindedness.

With tonic convulsions, there is continued contraction of all muscles, and the body becomes rigid.

Grand mal or tonic-clonic seizures usually begin with bilateral jerks of the extremities or focal seizure activity. There is loss of consciousness with both tonic and clonic convulsions. The patient may be incontinent during the attack, and there is danger of biting the tongue. In the **postictal** (after a seizure) phase, the person is confused and drowsy.

Atonic or akinetic seizures are characterized by loss of body muscle tone that results in nodding of the head, weakness of the knees, or total collapse and falling (“drop attacks”). The person usually remains conscious during the attack.

The third major group, unclassified seizures, simply means that not enough data have been obtained to determine which type of seizure the patient is experiencing.

The fourth designation, status epilepticus, indicates prolonged partial or generalized seizure without recovery between attacks. **Status epilepticus** is a grave condition in which there is a rapid, unrelenting series of convulsive seizures without intervening periods of consciousness, and an absence of respiration. **Irreversible brain damage can occur if the seizures are not controlled.**

In classifying epileptic seizures on the basis of origin, seizures are grouped as either idiopathic or symptomatic. Idiopathic epilepsy has no known cause. Symptomatic epilepsy has a known physical cause (e.g., brain tumor, injury to the head at birth, a wound or blow to the head, toxicity, or an endocrine disorder).

Diagnosis

Diagnosis of epilepsy is based on the history and the actual signs and symptoms observed during a seizure. A thorough physical examination and tests for underlying disease are ordered based on the history and physical findings. Confirmation of the diagnosis is by EEG and magnetic resonance imaging (MRI). These tests help locate the site, or **locus**, and possibly the cause of the seizures. Electrolyte levels are determined, because imbalances may predispose to a seizure.

Treatment

When the cause of seizures is known, as in cases of high fever or drug toxicity, medical treatment is aimed at controlling or eliminating whatever is responsible for the seizures. For recurrent seizures, as in epilepsy, the condition usually is managed with anticonvulsant drug therapy. An implanted vagus nerve stimulator is proving helpful for generalized epilepsy for many patients with uncontrolled seizures.

The major antiepileptic drugs are presented in **Box 23-1**. Patient education is extremely important, because the patient will need to report any untoward effects to the provider or nurse clinician so the dosage can be adjusted or the drug changed. All anticonvulsant drugs cause some central nervous system (CNS) depression with grogginess, dizziness, fatigue, and cognitive changes.

Box 23-1

Medications Commonly Used for Seizure Control

Drugs for Generalized Tonic-Clonic and Partial Seizures

- Carbamazepine (Tegretol)
- Diazepam (Valium)
- Felbamate (Felbatol)
- Fosphenytoin (Cerebyx)
- Gabapentin (Neurontin)
- Lacosamide (Vimpat)
- Lamotrigine (Lamictal)
- Levetiracetam (Keppra)

- Oxcarbazepine (Trileptal)
- Phenobarbital (Luminal)
- Phenytoin (Dilantin)
- Pregabalin (Lyrica)
- Primidone (Mysoline)
- Rufinamide (Banzel)
- Tiagabine (Gabitril)
- Topiramate (Topamax)
- Valproic acid (Depakene)
- Vigabatrin (Sabril)
- Zonisamide (Zonegran)

Drugs for Absence, Akinetic, and Myoclonic Seizures

- Clonazepam (Klonopin)
- Divalproex (Depakote)
- Ethosuximide (Zarontin)
- Phenobarbital
- Valproic acid (Depakene)

General Nursing Implications

- Educate the patient about the importance of taking the drug exactly as it is prescribed.
- All these drugs cause some degree of sedation, drowsiness, and lethargy. Warn about driving or operating machinery when these effects are significant. Advise not to drink alcohol or use other central nervous system depressants.
- The patient should not stop taking an anticonvulsant abruptly without consulting the provider.
- Check interactions with other drugs before administering any of these drugs. Interaction with anticoagulants, oral contraceptives, digoxin, aspirin, certain antibiotics, antacids, folic acid, and other drugs are significant. Some anticonvulsant drugs interact with each other (e.g., phenobarbital).
- Periodic blood work, every 1 to 3 months, should be performed when taking an anticonvulsant. It may be used to check therapeutic blood levels or organ dysfunction.
- Dosages of each drug are based on therapeutic blood level of the drug.
- Anticonvulsants have a narrow therapeutic range; toxicity occurs if too much of the drug is taken.
- The patient should be under the close supervision of the health care provider.
- All of the anticonvulsant drugs can produce some unpleasant side effects, such as fever and leukopenia and, in the case of phenytoin, gingival hyperplasia and rash.

- Physical dependence can become a problem for patients taking either phenobarbital or primidone, which is largely converted to phenobarbital in the bloodstream.
- Toxic side effects such as ataxia, drowsiness, nausea, sedation, and dizziness are not uncommon.

A ketogenic diet is beneficial in younger patients with refractory (difficult to control) generalized seizures. A ketogenic diet provides sufficient calories from fats and proteins, but produces a ketotic (acidotic) state that seems to prevent seizure activity.

Biofeedback techniques are geared toward teaching the patient to maintain a certain brain wave frequency that is not susceptible to seizure activity.

Treatment of status epilepticus depends on its cause. Patients who have been diagnosed with epilepsy commonly arrive in the emergency department with status epilepticus because they stopped taking the medication that controls their seizures for some reason. Preferable treatment in these cases involves administering benzodiazepines: intravenous (IV) lorazepam, intramuscular (IM) midazolam, or rectal diazepam. Phenytoin, phenobarbital, valproate sodium, or levetiracetam in a dose sufficiently high to stop the seizures may be used ([Brophy et al, 2012](#)). Care is focused on supporting vital signs and preventing injury. Intubation may be required for respiratory support. If seizures will not stop, an anesthetic agent may be required. Rectal diazepam has been approved by the U.S. Food and Drug Administration (FDA) in a system called *Diastat AcuDial*. It can be used at home by nonprofessional caregivers, and clinical studies have shown that the system resolved seizures in 85% of patients ([Epilepsy Action, 2010](#)).

Surgical Treatment

Surgical procedures involve removing the epileptic focus or preventing the spread of epileptic activity by sectioning the corpus callosum. A temporal lobe resection may eliminate seizures in more than 70% of patients with temporal lobe seizures. For patients with extensive damage in one side of the brain that causes intractable seizures, a hemispherectomy may be performed. These surgeries involve risk and are reserved for those patients whose seizures cannot be managed by medical treatment and in whom the focus of the seizures is accessible.

For intractable partial seizures, a NeuroCybernetic Prosthesis (vagal nerve stimulator) can be implanted in the chest cavity with a wire tunneled to stimulate the vagus nerve. The device acts like a pacemaker and provides a tiny electric jolt every 5 minutes that stimulates the brain to interrupt seizures ([Englot et al, 2011](#)).

Uncontrolled seizures secondary to hypoglycemia (as in improperly controlled diabetes mellitus) can be relieved by IV administration of 50% dextrose. If the unrelenting seizures are caused by chronic alcoholism or withdrawal, treatment consists of IV administration of thiamine.

Clinical Cues

When IV phenytoin is ordered, mix it in 0.9% saline solution and flush the line before and after administration if a glucose IV solution is running. The patient should have cardiac monitoring while given the first or loading doses (usually 10 to 20 mg/kg divided into three doses; maximum dose 1200 mg total for adults). Glucose is incompatible with phenytoin. **Never administer IV phenytoin faster than 50 mg/min because of the risk of cardiac dysrhythmia, hypotension, or bradycardia.** For patients with a history of heart problems, administer the solution no faster than 25 mg/min.

❖Nursing Management

■ Assessment (Data Collection)

Patients with a known seizure problem usually are treated on an outpatient basis but may be encountered in a hospital or long-term care facility. Assess these patients carefully to provide optimal safety and care. Significant history information includes the kind of seizures they experience, whether they have any sensation just before the appearance of clinically observable signs, what medications they are taking, and what measures are known to be helpful either to prevent a seizure or to assist during a seizure and afterward. Assessment should include any factors that could have triggered the seizure (e.g., hyperventilation, bright lights [photosensitivity], alcohol

and other drugs, fluid and electrolyte imbalances, lack of sleep, and emotional stress).

Focused Assessment

Observations to Make During a Seizure

Observe as much of the following as possible and document your findings.

- Time the seizure began and the time it ended
- What the patient was doing just before the seizure (was the patient picking at clothing?)
- Where in the body the seizure began; what parts of the body are involved
- Which way the eyes are moving; whether they constrict or dilate, deviate to the right or the left, or roll upward
- Which side the head turns toward
- Whether the patient cries out or screams as the seizure begins
- Whether there is evidence of repetitive movements: lip smacking, chewing, grimacing, tapping, or “pill rolling”
- Whether movements are bilateral and symmetric
- Incontinence of urine or stool, vomiting, frothing at the mouth, or bleeding
- Whether the patient becomes apneic or cyanotic
- Changes in skin color or profuse perspiration

Postictal assessment, after a patent airway is ensured, includes determining:

- Length of time before regaining awareness
- Presence of lethargy or confusion
- Presence of headache
- Presence of speech impairment
- Presence of muscle soreness
- Whether there was an aura before the seizure began
- Effects of the seizure on the patient's vital signs

When caring for a patient who is likely to experience a seizure during an acute illness, periodically observe the patient for tremors, unexplained sensory or motor changes, mental changes that indicate confusion or disorientation, and restless or agitated behavior. In many cases, a change in the neurologic status of a patient can signal the possibility that a seizure might occur.

Nursing Diagnosis, Planning, and Implementation

The main problem statement for a patient who experiences seizures is Potential for injury due to seizure activity. Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover). Expected outcomes are written for the individual patient and the type of seizure disorder, possible triggers, and manifestations.

Nursing care of patients with epileptic seizures is concerned with immediate care during and after a seizure and long-term management and control of seizures and their psychosocial

implications. Witnessing a seizure for the first time can be a frightening experience. Your first responsibility is to stay calm, remain with the patient, and call for assistance.

The environment of a patient at risk for seizure should be made as safe as possible. If the patient is very likely to have seizures, the side rails and headboard of the bed are padded. **Never try to pry open the patient's mouth or insert something into it once the jaw is clamping down, because teeth may be broken and the airway may become obstructed.**

If a seizure comes on without warning and the patient drops to the ground, leave her wherever she is lying. If she is on a hard surface, her head should be protected from injury by placing a rolled blanket or coat under it. The head should be turned to the side, if possible, to prevent aspiration of secretions. Do not attempt to restrain the patient's movements or to move her to a bed or chair during the seizure. If supplemental oxygen is near, it should be administered, if possible. Call for help and provide privacy, if possible. When the seizure is over, turn the patient to the side, and suction the airway if needed. Check oxygen saturation with a pulse oximeter. Check the glucose level, if possible, and assess for injuries. Stay with the patient until she is completely conscious. When consciousness is regained, reorient and reassure her. The patient should be allowed to rest or sleep after the seizure. Thoroughly document the event in the medical record with time, duration of the seizure, and observations of the seizure activity and any aura that occurred before its start.

Safety Alert

If a patient who is receiving phenytoin is receiving tube feedings, stop the tube feeding for 2 hours before and 2 hours after administering phenytoin to ensure proper drug concentration and absorption.

The long-term management of epileptic seizures is primarily focused on providing the patient with the information and support she needs to care for herself and to avoid recurring and debilitating seizures. Psychosocial support is necessary to encourage the patient to talk about her fears and concerns. Lifestyle changes will have to be made if she is not permitted to drive. Most states allow resumption of driving when a patient has been seizure free for 1 year. A referral to the local epilepsy society for connection with a support group can be very helpful for both the patient and her family.

Most individuals who have epileptic seizures have normal mental function between seizures; they are not otherwise mentally handicapped and are quite capable of being contributing members of society if only they are provided resources and support to manage effectively.

Patient Teaching

Patients With Epilepsy

Cover these points in the teaching plan:

- Treatment and side effects of anticonvulsant therapy
- Triggers for seizures and how to avoid them (lack of sleep, alcohol and recreational drugs, stress, photosensitivity)
- Necessity of taking medication daily and as close to the same time each day as possible
- The greatest trigger for a seizure is not taking the medication
- Handling a missed dose or inability to retain medication
- Not using over-the-counter or prescription medications without consulting the provider who prescribed the anticonvulsants
- Schedule for laboratory work to determine drug therapeutic levels
- Need for medical alert bracelet, necklace, and wallet card listing provider's phone number and

drugs being taken

- Resources for assistance available in the community
- Need for proper nutrition; dangers of erratic meals
- Avoiding alcohol and excessive fatigue
- Relaxation therapy for stress reduction
- Danger of swimming alone
- Refraining from driving or operating dangerous machinery until seizures are well controlled
- Keeping follow-up appointments with the provider

For Women

- Risk of seizure during menstruation
- Necessity of consulting the provider before becoming pregnant, because some anticonvulsant drugs may cause congenital abnormalities

For the Family

- What to do in the event of a seizure
- How to protect the patient during a seizure:
- For tonic-clonic generalized seizure: assisting to the floor, protecting the head, loosening clothing, turning to the side
- When medical assistance is necessary

Patient Education

Self-care for an epileptic patient requires that she understand the nature of her disorder, the purpose of her prescribed medications, their side effects, and the signs of toxicity that should be reported to the provider. The patient must understand the necessity for compliance with the prescribed regimen to prevent recurrent seizures. She will need assistance in developing coping mechanisms to deal with the psychosocial impact of having epilepsy.

Evaluation

Evaluation is based on whether the expected outcomes are being achieved. This includes whether the patient is seizure free or whether the number of seizures has decreased. Patient compliance with the medication regimen and avoidance of triggers for seizure activity are evaluated as well. Patient teaching may need to be reinforced. If progress toward the achievement of outcomes is not occurring, the plan must be revised.

Think Critically

What safety measures would you teach a 22-year-old man who has just been diagnosed with grand mal seizures?

Transient Ischemic Attack

Between 200,000 and 500,000 Americans experience **transient ischemic attacks (TIAs)** each year. TIAs are caused by a brief interruption in blood flow. Narrowed arteries and vascular occlusion, perhaps by small emboli or vasospasm, cause the interruption. Recreational drugs that constrict vessels are another cause of TIAs. TIAs are warnings that a more serious neurologic event may occur; 11% of patients who experience a TIA have a stroke within 90 days. During the TIA, the person may feel a sudden weakness or numbness on one side of the body, slurring of speech or inability to talk, visual disturbances such as blindness or double vision, confusion, diminished coordination or ability to balance, and a headache. Symptoms are similar to those of a stroke. These symptoms generally last no more than an hour and completely resolve without residual deficits ([Nanda and Singh, 2014](#)). It is very important that the person be evaluated by medical personnel, because the same symptoms may indicate a stroke that will not resolve without treatment.

A thorough history of the event is essential: how it began, the symptoms experienced, and how long it lasted. If carotid obstruction is suspected, carotid duplex ultrasound studies are done to determine whether obstruction in the carotid arteries is preventing normal blood flow from reaching the brain. Multiple tests may be performed if carotid occlusion is ruled out, including blood tests, MRI, and EEG. If there is near-total occlusion of the carotid artery, either an angioplasty procedure with stent implantation or a carotid endarterectomy is considered. If occlusion from plaque obstruction is less than 60%, medical treatment with diet and lifestyle modification and medication to prevent platelet aggregation (i.e., aspirin, clopidogrel [Plavix], dipyridamole [Persantine]) is prescribed.

Cerebrovascular Accident (Stroke, Brain Attack)

Etiology

More than 795,000 first and repeat strokes occur in the United States each year. Stroke is the leading cause of disability and the fourth leading cause of death ([CDC, 2014b](#)). The incidence is about 19% higher in males than in females. About 34% of cases occur in people younger than age 65 years ([CDC, 2014b](#)). An increase in public education about the risk factors for and signs of stroke could result in decreased disability and death from stroke.

Health Promotion

Risk Factors for Stroke

Educate all patients about the risk factors for stroke and encourage measures to alter those factors that can be changed.

Modifiable Risk Factors

- Cigarette smoking
- Using cocaine or other recreational drugs
- Drinking more than two alcoholic drinks (male) or one alcoholic drink (female) per day
- Heart disease (especially atrial fibrillation)
- Diabetes
- High blood pressure
- High cholesterol
- Sedentary lifestyle
- High red blood cell count (polycythemia)
- TIAs
- Use of oral contraceptives or hormone replacement therapy

Nonmodifiable Risk Factors

- Age older than 65 years
- Asymptomatic carotid bruit (indicates atherosclerosis, which increases stroke risk; a bruit is a swishing sound in an artery)
- Heredity (family history of stroke increases individual risk)
- Prior stroke
- Race (African Americans have a 60% higher risk rate)
- Gender (incidence is 30% higher in men)

Cultural Considerations

Greater Incidence of Stroke in African Americans and Hispanic Americans

African Americans have about a 50% greater incidence of stroke than whites and are more likely to die of a stroke. A study at the University of Michigan found that Hispanic Americans have a far greater chance of having a stroke than non-Hispanic whites. Untreated hypertension may be the risk factor involved ([CDC, 2014b](#)).

Control of high blood pressure, quitting cigarette smoking, decreasing intake of cholesterol and controlling blood lipids, maintaining a normal blood sugar level, avoiding excessive alcohol intake, getting sufficient exercise, preventing obesity, and living a lifestyle that helps prevent heart disease can help reduce the risk of stroke. Atherosclerosis is a major cause of stroke, because it can predispose to thrombus formation in the brain vessels or plaque in other arteries that can break off and become emboli.

Pathophysiology

A cerebrovascular accident (CVA) is the result of an interruption of blood flow to a specific area of the brain (i.e., **cerebral ischemia**). Ischemia of cells directly causes cellular **necrosis** (death) and **infarct** (area of tissue that has become necrotic from lack of blood supply) ([Figure 23-1](#)). Ischemia can be caused by:

- Cerebral thrombosis (formation of a blood clot in a cerebral artery)
- An **embolus** (a traveling clot, fat, bacteria, or tissue debris that lodges in a vessel, occluding it)
- Intracerebral hemorrhage (the blood vessel ruptures and leaks blood into brain tissue, or an aneurysm or arteriovenous malformation in the brain leaks or ruptures)
- Pressure on a blood vessel (tumor)

Health Promotion

Dangers of Cocaine or Methamphetamine Use

Caution people about the dangers of using cocaine or methamphetamine. Both of these drugs can cause vasoconstriction and brain ischemia. Cocaine may also cause hemorrhage. Using these drugs causes a fivefold increase in the incidence of stroke. The incidence of this type of stroke has greatly increased in young adults ([Agarwal, 2013](#)).

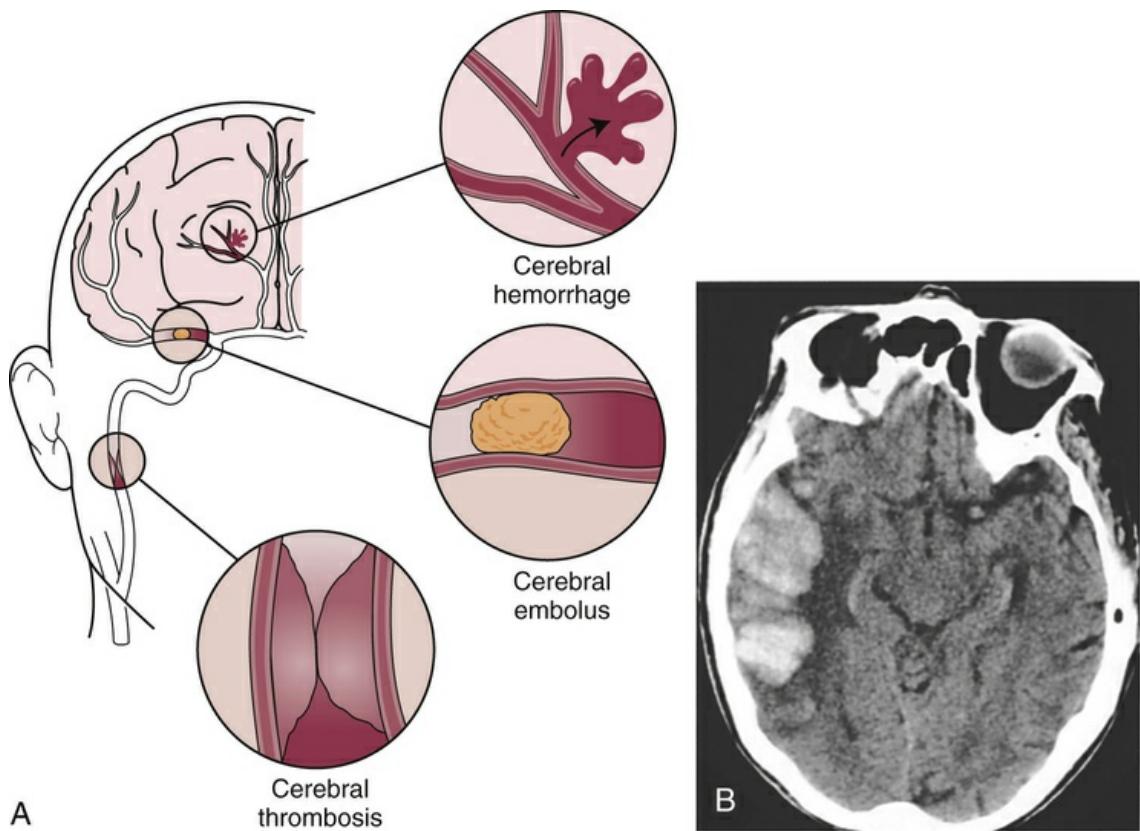


FIGURE 23-1 **A**, Events that cause stroke. **B**, Magnetic resonance imaging showing hemorrhagic stroke in the left cerebrum.

The carotid arteries supply a major portion of the blood that goes to the brain (Figure 23-2). If plaque forms in these arteries as a result of atherosclerosis, the person is at risk for a stroke as blood supply to the brain is diminished or stopped. Less common causes of stroke are arterial spasms, compression of cerebral vessels by a tumor, local edema, rupture of a cerebral aneurysm, or another disorder.

Think Critically

How many risk factors for stroke are present for each member of your family?

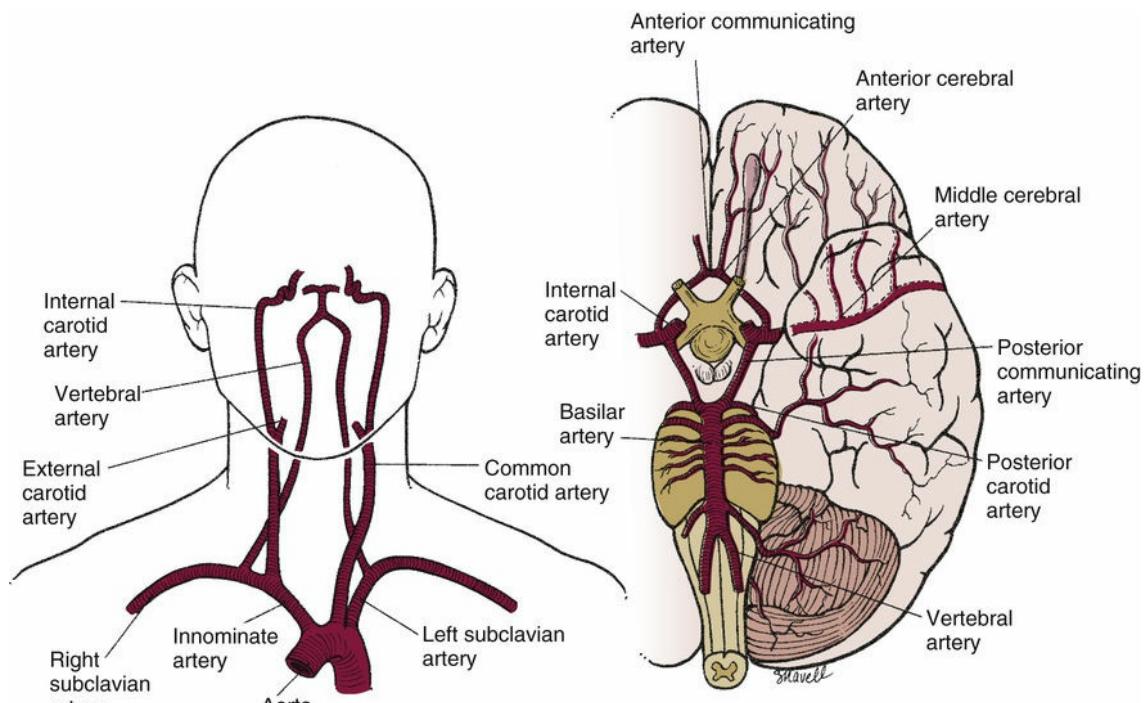


FIGURE 23-2 Major arteries supplying blood to the brain. Blockage of any major artery precipitates a cerebrovascular accident (CVA).

Cerebral Aneurysm and Arteriovenous Malformation

Structures that can cause an intracerebral hemorrhage are an aneurysm and an arteriovenous malformation. An **aneurysm** is an abnormal ballooning of an artery wall (Figure 23-3). It may be congenital or caused by a weakening of the artery wall from chronic hypertension. Rupture of a brain aneurysm causes bleeding into the subarachnoid space or into the ventricles. An **arteriovenous malformation (AVM)** is a congenital abnormality and is a tangled mass of malformed, thin-walled, dilated vessels that form an abnormal communication between the arterial and venous systems. An AVM can leak, causing an intracerebral hemorrhage. Vasospasm often occurs after intracerebral bleeding, leading to further ischemia of the brain tissue and more neurologic impairment. Resultant deficits are the same as for other kinds of strokes.



FIGURE 23-3 Dissected circle of Willis showing a large cerebral aneurysm. (From Cotran RS, Kumar V, Collins T: *Robbins pathologic basis for disease*, ed. 6, Philadelphia, 1999, Saunders.)

Subarachnoid hemorrhage, which refers to bleeding in the brain below the arachnoid, often causes rapid onset of neurologic deficit and loss of consciousness. A leaking cerebral aneurysm may cause a severe headache. However, sometimes bleeding is slower, producing a more gradual progression of headache, neck stiffness, and other neurologic signs, such as blurred vision.

Stroke Prevention

Many strokes can be prevented either by surgical procedures or by medical management of diseases that predispose a person to a CVA. An angioplasty with stent placement is an option for opening occluded carotid arteries. Care for patients undergoing vascular surgery is presented in [Chapter 20](#).

Aneurysms and AVMs can sometimes be surgically corrected, if found before rupture. Medical preventive measures are aimed at eliminating or managing some of the conditions that predispose a person to stroke. Control of hypertension and the effective treatment of inflammatory heart disease, congenital heart defects, cardiac dysrhythmias, and atherosclerosis have significantly reduced the incidence of stroke. Teaching people to seek assistance immediately when signs of stroke occur may allow medical intervention that will decrease permanent neurologic deficit.

Patient Teaching

Warning Signs of Stroke

Teach people to seek immediate medical attention in an emergency department if any of the following warning signs of stroke appears:

- Sudden weakness, numbness, tingling, or loss of feeling in the face, arm, or leg
- Sudden trouble seeing in one or both eyes; double vision
- Sudden confusion, slurred speech, trouble talking, or difficulty understanding what others are saying
- A sudden, severe headache for no known reason
- Sudden trouble walking, dizziness, or a feeling of spinning around
- Loss of balance or coordination
- Blackouts

Should any of these signs occur, ask the person to:

- Smile
- Shrug the shoulders
- Repeat a sentence or repeat what you say
- Tell you who she is and where she is

Clinical Cues

Valve disorders and arrhythmias such as atrial fibrillation predispose to stroke from emboli. Emboli form in the chambers of the heart when blood flow is abnormal, and these emboli can be ejected into the cerebral circulation.

Aspirin or another drug to reduce platelet aggregation and decrease the chance of thrombosis often is prescribed to prevent the recurrence of stroke from thrombosis ([Table 23-1](#)). A combination of results from two inflammatory marker blood tests is showing promise in predicting which

middle-aged people (age 45 to 64 years) are at risk for a stroke. Researchers reported that C-reactive protein and lipoprotein-associated phospholipase A₂ (LP PLA₂) were higher in those who later had an ischemic stroke than in those who did not have a stroke (Feng et al, 2014).

 **Table 23-1**

Drugs Commonly Used for Patients After a Cerebrovascular Accident

DRUG	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
t-PA (alteplase; tissue plasminogen activator)	Converts fibrin to plasminogen, causing lysis of thrombus or embolus of CVA	Frequent VS; monitor for dysrhythmias; frequent neurologic checks; assess for bleeding until 24 hr after infusion. Monitor for hypersensitivity; monitor clotting/bleeding studies. Do not give concurrently with anticoagulants, antiplatelet aggregation drugs, or NSAIDs.	Explain that the intermittent IV infusion is for the purpose of breaking up the clot stopping blood flow to part of the brain.
Aspirin (Ecotrin)	Decreases platelet aggregation	Administer with food; observe for signs of intestinal bleeding, tinnitus. Monitor blood count and liver enzymes.	Instruct to take with a full glass of water and when in an upright position. Ask to report any blood in stool, bleeding gums, nose bleeds, or excessive bruising. Report ringing in the ears or skin rash. Caution not to crush the pill. Warn not to take OTC products containing aspirin or salicylic acid.
Phenytoin (Dilantin)	Alters ion transport, inhibiting spread of seizure activity to motor cortex	Assess for skin rash; monitor drug levels, CBC; observe for respiratory depression. Shake suspension well; dilute before giving via feeding tube. Flush IV line with NS before and after administering slowly by IV piggyback. May cause Stevens-Johnson syndrome.	Teach that PO doses should be taken with meals; urine may turn pink; not to stop taking drug abruptly; to take as directed; to brush teeth and floss thoroughly and regularly and visit dentist q3-6mo; to not use alcohol. Instruct to not use antacids within 2 hr of the drug. Caution to adjust to drug before operating machinery or performing hazardous activities.
Nimodipine (Nimotop)	Inhibits calcium ion flux across cellular membrane; decreases or prevents cerebral vasospasm	Frequent neurologic assessment and VS; monitor liver enzymes; assess BP and apical pulse immediately before administration. Hold if systolic BP is <90 mm Hg Monitor for hypotension. Should be held for heart rate <60 beats per minute.	Advise that the drug may cause hypotension and dizziness with movement.

BP, Blood pressure; *CBC*, complete blood count; *CVA*, cerebrovascular accident; *IV*, intravenous; *NS*, normal saline; *NSAIDs*, nonsteroidal anti-inflammatory drugs; *OTC*, over the counter; *PO*, oral; *t-PA*, tissue plasminogen activator; *VS*, vital signs. See Chapter 20 for information on warfarin (Coumadin).

Cerebral ischemia caused by thrombosis causes signs that progress slowly. Thrombosis develops in an area of the vessel where there is atherosclerotic plaque. Lodging of an embolus in a major cerebral vessel causes sudden neurologic deficit. Emboli most often are the result of heart disease and resultant atrial fibrillation, a cardiac dysrhythmia.

Signs and Symptoms

The neurologic effects of stroke can range from mild motor disturbances to profound coma. Figure 23-4 shows selected control zones of the brain and motor and sensory functions likely to be affected by a stroke. Signs and symptoms will depend on the type of event that has caused the stroke and the location of the clot or bleed. There may be weakness (**hemiparesis**) or paralysis (**hemiplegia**), difficulty or inability to speak or understand (**dysarthria** or **aphasia**), difficulty with vision, loss of balance or poor coordination (**ataxia**), decreased level of consciousness, and confusion. Incontinence may occur. Bleeding into the brain or edema around necrotic tissue causes intracranial pressure (ICP) to increase (see Chapter 22 regarding increasing ICP).

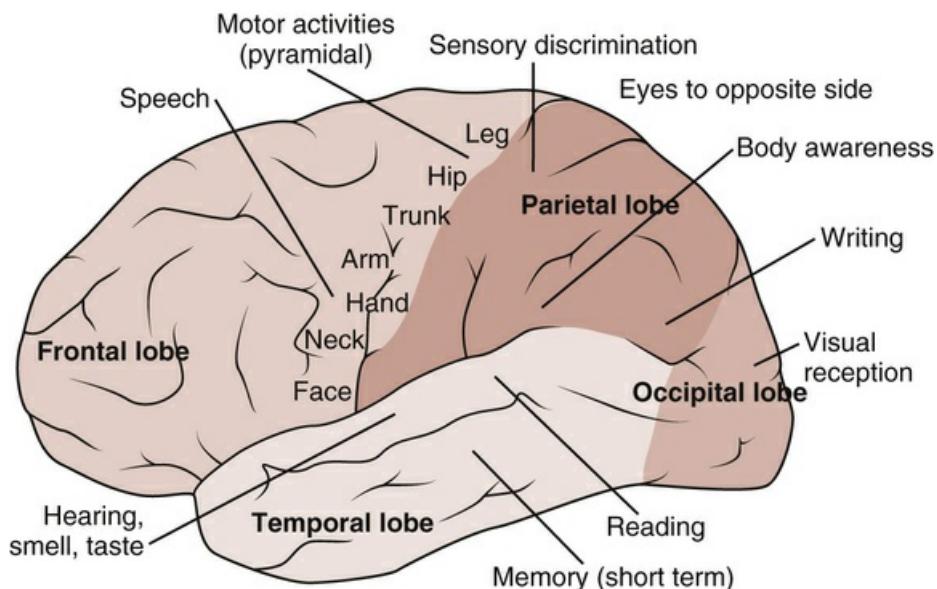


FIGURE 23-4 Each area of the brain controls a particular activity.

Motor function deficits affect mobility, respiratory function, swallowing, speech, gag reflex, and self-care abilities. Because the pyramidal pathways cross at the level of the medulla, injury to brain cells in the right hemisphere affects the left side of the body and damage to cells in the left hemisphere affects the right side of the body. There may be hemiplegia or hemiparesis. Muscle tone is usually flaccid at first, and then there may be spasticity and hyperreflexia. Keeping the body in good alignment to prevent contractures is very important.

Language disorders involve expression and comprehension of both written and spoken words. Aphasia or **dysphasia** (minimal speech activity) or a mixed type of aphasia may occur (see Chapter 21). Many stroke patients experience **dysarthria** (difficulty in speaking) because of lack of muscular control of the tongue. A speech therapist works with the patient to improve speech capability. There are computer software programs for rehabilitation of patients with aphasia that have been beneficial to many.

The frustration of trying to perform a function that has always been easy before the stroke may cause the patient to cry. Alternatively, the patient may display an angry emotional outburst, and sometimes foul language.

Clinical Cues

Because of the damage to the nervous tissue, fatigue is another problem for stroke patients. When working with a patient to relearn walking, dressing, or other activities, keep the session short and allow for adequate rest periods between activities.

Memory and judgment may be affected by the stroke. The ability to learn may be affected, which makes relearning activities to promote independence a slow process. A great deal of patience and encouragement is needed from the staff working with the patient.

Spatial-perceptual deficits may cause the patient to totally neglect input from the affected side of the body (**unilateral neglect**). She must be taught to attend to the body parts on that side of the body to protect them from injury. **Homonymous hemianopsia** (blindness in part of the visual field of both eyes) adds to the spatial-perceptual problems by making it difficult to judge distances (Figure 23-5). The patient is taught ways to deal with the problems of the particular type of visual defect developed. **Agnosia** (inability to recognize an object by sight, touch, or hearing) makes it difficult to do ordinary tasks. **Apraxia** (the inability to carry out learned sequential movements on command) adds to the difficulty in regaining independence.

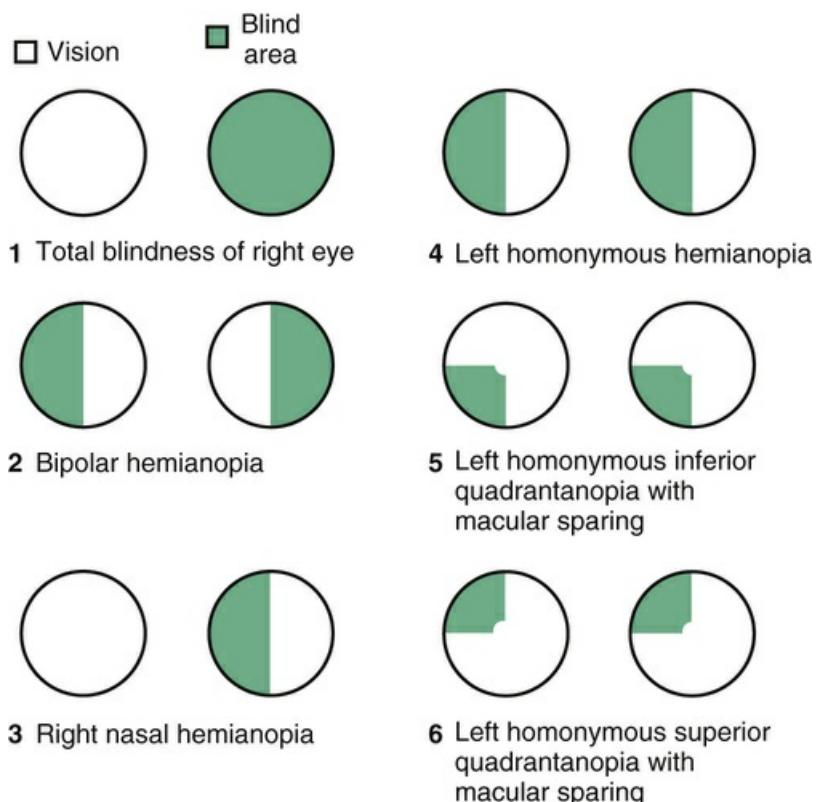


FIGURE 23-5 Homonymous hemianopsia: visual field defects that can occur after a stroke. (Adapted from Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

Bladder and bowel incontinence are often temporary after a stroke. Constipation does occur because of immobility, weakened abdominal muscles, dehydration, and diminished response to the defecation reflex. The patient's inability to express needs and her difficulty in managing clothing contribute to bladder and bowel incontinence and constipation. With time, these problems can be overcome.

Diagnosis

In addition to a complete physical and neurologic examination, the provider may order an MRI scan, computed tomography (CT) scan, or cerebral angiogram to determine the specific cause of the stroke and whether there is bleeding in the brain. An EEG is performed; brain scans or transcranial Doppler flow studies and carotid artery Doppler studies may also be ordered. Testing for blood levels of glutamate, which increases during a progressive ischemic stroke and damages brain tissue, may alert providers to patients whose condition is likely to rapidly deteriorate. If a hemorrhagic stroke is suspected, a lumbar puncture will be performed to determine the presence of blood in the cerebrospinal fluid.

Treatment

When a stroke is suspected, the first priority is to maintain an open airway. All constricting clothing around the patient's neck should be removed, and the patient should be turned to one side to prevent aspiration of saliva and obstruction of the air passages. When outside of the hospital, no attempt should be made to move the person until an ambulance has arrived. Reassure the patient, regardless of whether or not she is able to respond. Elevate the head slightly to reduce ICP.

Once under medical care, supplemental oxygen is started. If breathing is impaired or the patient is comatose, an artificial airway is inserted to maintain a patent airway, and the patient may be mechanically ventilated. Hypovolemia is treated with fluids, and hypertension of greater than 220/130 mm Hg is treated. Vital signs may be unstable. Two IV lines for drug and fluid access are inserted, and normal saline is administered. Electrolytes are assessed frequently to prevent imbalances. If the temperature is elevated and rising, a hypothermia blanket may be used to keep

the temperature down ([Samaniego, 2013](#)). Measures to prevent deep vein thrombosis are instituted.

Clinical Cues

There is a fine line between keeping blood pressure high enough to perfuse the brain when an obstruction is present and keeping blood pressure low enough to prevent vessel rupture or increased bleeding from a rupture that has occurred.

Once the specific cause of the stroke has been determined, the provider is able to plan a more effective regimen of care. Activase (alteplase) or systemic tissue plasminogen activator (t-PA) is used to dissolve clots and emboli in ischemic stroke. It must be administered within 3 to 6 hours of the onset of symptoms and clot location ([Jauch et al, 2013](#)). It has been estimated that this window could be met 28.6% of the time if patients arrived soon after onset. The drugs are effective in about one of eight patients treated. Sometimes the fibrinolytic drug is directed to the clot via a catheter positioned during angiography. Another drug, caffeinol, improves the outcome in ischemic stroke when administered IV. It is a combination of caffeine and ethanol. Platelet inhibitors and anticoagulants may be given to prevent further clot formation. If t-PA has been given, no anticoagulants or antiplatelet aggregation drugs are given for 24 hours. **The drug is not administered to anyone with a known risk of bleeding or who has had an intracerebral bleed.** Antihypertensive drugs are prescribed as appropriate. The patient may be started on oral warfarin (Coumadin) after the acute stage of a thrombotic stroke.

Safety Alert

Cranberry Juice Interaction

The consumption of cranberry juice while taking warfarin can produce an interaction that increases the serum level of the drug, extending clotting time. Patients who drink cranberry juice should consult their providers. Off-and-on intake of cranberry juice will affect the prothrombin time and international normalized ratio (INR).

A recombinant human interleukin-1 receptor antagonist has been shown to be effective in patients with acute stroke symptoms in reducing the amount of injury and residual deficits; research is continuing. Use of a natural growth factor, neuregulin-1, which protects brain cells from the damage caused by stroke, is also under study. The biggest benefit of neuregulin-1 is that its therapeutic window is much longer than t-PA, and it can be administered up to 13 hours after the onset of the stroke. This drug has shown no adverse side effects to date. Desmoteplase is a genetically engineered version of a protein in vampire bat saliva that prevents clotting. The drug can break down a clot without affecting the coagulation system, thereby decreasing the risk of intracerebral bleeding. It works when given within 9 hours of a stroke and is in phase III clinical trials.

Nimodipine or nifedipine may be given to decrease arterial spasm if the stroke is from subarachnoid hemorrhage. Testing of new drugs continues in an effort to find a way to decrease the resultant damage from a stroke. Statins are being studied for their neuroprotective effect ([Jauch et al, 2013](#)). Hypertonic saline infusion is being studied as a treatment for hemorrhagic stroke to improve oxygenation of the brain and to decrease ICP. The patient is given sedation and analgesia for the headache and neck pain. Blood glucose levels are monitored and controlled.

Surgical Procedures

About one third of all strokes can be traced to obstruction of any one of the four arteries in the neck that supply blood to the brain. These arteries are generally accessible, so the surgeon can open the artery and remove the obstruction, which is usually from plaque buildup. The vessel wall is then sutured or a Dacron patch is sewn at the incision, leaving the vessel larger than before.

The Mechanical Embolus Removal in Cerebral Ischemia (MERCI) Retriever can be used up to 8 hours after the onset of an ischemic stroke to remove a thrombus. A catheter is threaded up through the femoral artery to the brain, and a wire device is guided through the catheter to the brain. The

end of the wire resembles a corkscrew and ensnares the clot, which is pulled out through the catheter (Jauch et al, 2013). The interventional radiologist performs this procedure during angiography. If successful, blood flow can be restored to the brain within 20 minutes. Several mechanical methods for clot dissolution or retrieval are undergoing trials. Clot aspiration is another retrieval method. Several methods of mechanical removal of a clot are undergoing trials. There are risks of bleeding with these procedures that must be considered.

A cerebral aneurysm may be repaired during a craniotomy by placing a clip around the stalk of the aneurysm. The aneurysm may be wrapped with a material that prevents the wall from rupturing if it cannot be clipped or resected. A radiologic procedure in which a small platinum wire is guided carefully into the aneurysm is another option. Coils of wire are curled into the aneurysm sac, filling it (Figure 23-6). Electricity is sent down the wire to break the wire off and leave the coils in the aneurysm. Thrombosis completes the solidification of the aneurysm, effectively eliminating it. AVMs are treated in much the same way, but may be eliminated using radiosurgery. More than one type of intervention may be used.

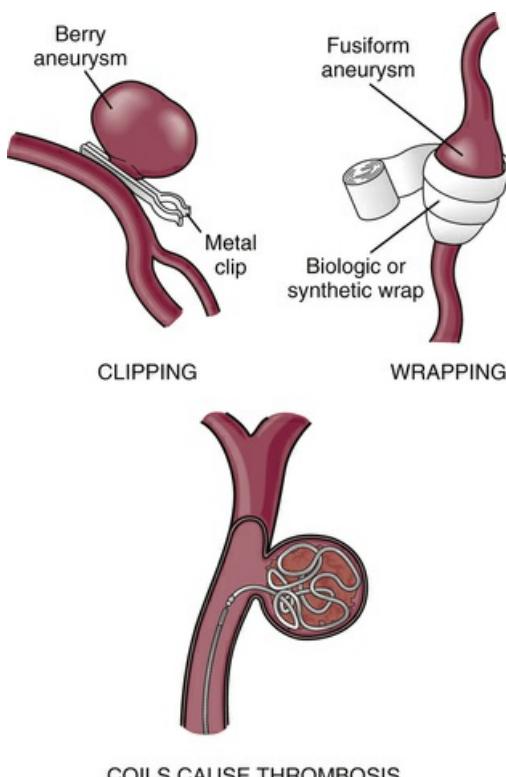


FIGURE 23-6 Techniques used for aneurysm repair.

Neurologic assessments are performed often to monitor closely for signs of increasing ICP (see Chapter 22). Measures are instituted to prevent or alleviate a rise in ICP. Increased ICP occurs most commonly with subarachnoid hemorrhage.

Complications

Extension of Hemorrhage or Rebleed

If initial symptoms were caused by a leaking cerebral aneurysm, rupture is a danger until the aneurysm is repaired. Neurologic signs and level of consciousness are watched closely to detect deterioration of the patient's condition because of further bleeding and a rise in ICP. The patient is kept as quiet as possible, with outside stimuli kept to a minimum. An aneurysm that is repaired by wrapping or embolization has a greater chance of bleeding again than one that is repaired with a clip.

Seizures

Seizures are a common complication of a stroke, because neural pathways are interrupted when blood flow is blocked or there is irritation of the cerebral cortex from an intracerebral bleed. The type of seizure depends on the area of the brain involved and the extent of the intracerebral bleed or blockage of blood flow. Generalized seizures may occur. The patient may be started on an anticonvulsant to prevent seizure occurrence. The tensing of muscles during a generalized seizure increases ICP. Anticonvulsant therapy may be continued for many months to 2 years after the last seizure occurs.

Hydrocephalus

If blood has leaked into the ventricular system, it interferes with the resorption of cerebrospinal fluid (CSF), causing hydrocephalus. This is more common when a subarachnoid hemorrhage has occurred. It may be necessary to prevent increased ICP by shunting the fluid out of the brain; a catheter is placed into the lateral ventricle and then tunneled down to the right atrium or the peritoneal cavity to drain the excess fluid.

❖Nursing Management

When a patient is first admitted to the hospital after a stroke, the general state of health is assessed as well as effects of the stroke. The American Heart Association Council on Stroke and Cardiovascular Nursing has issued clinical practice guidelines for poststroke rehabilitation. The guidelines cover care for inpatient and outpatient settings, for chronic care, and for end of life. It is based on the World Health Organization's framework for an interdisciplinary approach to rehabilitation ([Miller et al, 2010](#)).

Care of patients after a stroke can be divided into three phases: **phase 1**, or initial care; **phase 2**, which is concerned with rehabilitation efforts; and **phase 3**, during which plans are made for continuity of care once the patient returns home. These are not phases in the sense that one begins only after another is finished. There is overlapping of activities in each phase. Because approximately 80% of all stroke patients survive the first or initial phase of their illness, rehabilitation and plans for self-care are of the utmost importance. The Joint Commission's Core Measures require that the patient receive venous thromboembolism prophylaxis, be discharged on antithrombotic therapy and statin medication, receive thrombolytic therapy if appropriate that is discontinued by day 2, receive stroke education, and be assessed for rehabilitation. [Chapter 9](#) discusses concepts of rehabilitation.

Assess stroke patients for risk of falls and institute appropriate interventions to prevent falls. Assess pain regularly using an appropriate validated pain scale. A nutritional and dysphagia screening should be completed within 24 hours of the patient being awake and alert (Edmiston et al, 2010).

■ Assessment (Data Collection): Phase 1

Immediate assessment of breathing and respiratory rate is essential. Level of consciousness (LOC) is assessed next. Initial care of stroke patients includes careful assessment to determine the extent to which neurologic functions have been affected. Complete hemiplegia is a common effect of stroke. Aphasia often indicates ischemia of the brain cells on the left side of the brain and is usually accompanied by right-sided hemiplegia. [Figure 23-7](#) illustrates deficits often experienced by damage to the left or right side of the brain.

☒ Clinical Cues

If any change in the patient's thought processes or LOC occurs, or the patient becomes more restless, notify the provider immediately, because it may be an early sign of increasing ICP. Treatment to decrease ICP may prevent disability and may prevent death from herniation of the brain.

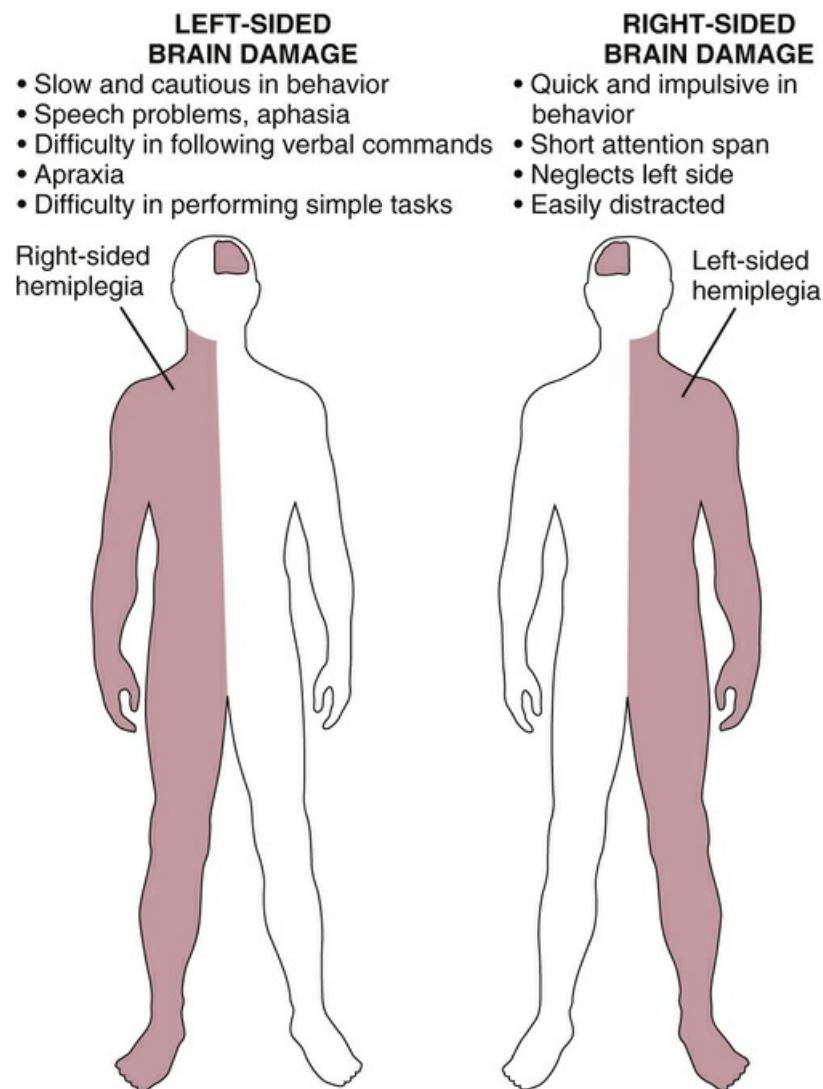


FIGURE 23-7 Comparison of deficits and behavior related to damage to the left and right sides of the brain.

After the acute stage of the stroke has passed and the patient is physiologically stable, an assessment of functional abilities is performed so that rehabilitation goals and plans can be devised. Assessment of and nursing intervention for patients with problems of immobility, incontinence of urine and feces, aphasia, delirium or confusion, and altered LOC are discussed in [Chapter 21](#). Because a patient who has had a stroke is at risk for a second occurrence, assessment for new signs of neurologic impairment is ongoing.

Nursing Diagnosis and Planning

Problem statements for a patient who has experienced a CVA commonly include:

- Potential for injury due to weakness, paralysis, confusion, decreased consciousness, or unilateral neglect.
- Altered physical mobility due to weakness or paralysis.
- Altered nutrition due to impaired swallowing and hemiparesis or hemiplegia.
- Altered self-care ability due to inability to perform activities of daily living (ADLs; feeding, bathing, grooming) without assistance.
- Altered urinary function due to neurologic deficits.
- Altered bowel function due to impaired mobility and neurologic impairment.
- Potential for altered skin integrity due to decreased mobility, paresis, or paralysis.
- Altered communication ability due to inability to clearly verbalize or inability to comprehend

communication.

- Altered body image due to neurologic damage and hemiplegia.
- Altered sensory perception: visual—due to loss of vision in parts of visual field; kinesthetic—related to decreased sense of touch on one side of the body.
- Decreased self-esteem due to alteration in body image and to dependence on others.
- Altered coping ability due to loss of usual lifestyle, neurologic deficits, and dependence on others.
- Potential for injury due to lack of sensation in extremity.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Planning for specific goals must take into account the individual patient's previous lifestyle, age, general health or illness status, and specific problems of care. An 80-year-old retired person will not have the same goals for rehabilitation and recovery as a 47-year-old mother of three who had been working full time as a schoolteacher before her attack.

Major nursing goals during the first phase are to:

- Maintain an adequate airway
- Establish baseline data regarding vital signs, LOC, neuromuscular function, and neurologic status
- Preserve joint and muscle function
- Prevent complications that may interfere with rehabilitation

Specific individual expected outcomes are written for each identified problem or nursing diagnosis ([Nursing Care Plan 23-1](#)).

Nursing Care Plan 23-1

Care of a Patient Who Has Experienced a Stroke

Scenario

Mr. Lewis, age 68 years, had an ischemic stroke, or cerebrovascular accident (CVA), 4 days ago. He is experiencing left-sided paresis, decreased alertness, and difficulty swallowing.

Problem Statement/Nursing Diagnosis

Altered cerebral tissue perfusion/*Risk for ineffective cerebral tissue perfusion related to obstruction from a thrombus.*

Supporting Assessment Data

Subjective: "What day did you say it was?"

Objective: Requires shaking his shoulder and calling his name to arouse him. Thrombotic ischemic CVA.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will show no further decrease in LOC.	Monitor neurologic status q2h. Notify provider of decreasing LOC, pupil changes, change in respiratory pattern, widening pulse pressure, slowing of pulse, or increase in temperature.	Changes in neurologic signs may indicate rising intracranial pressure.	No changes in neurologic signs. Difficult to arouse, but orients quickly.
	Monitor for seizure activity.	Seizure activity is common after a brain injury or CVA.	No signs of seizure activity.
	Administer medications to prevent clot formation as ordered.	Aspirin is effective to help prevent clot formation.	Managed to swallow the enteric-coated aspirin tablet.
	Monitor for bleeding gums, blood in urine or stool.	Anticoagulants may cause bleeding.	No signs of blood in urine or stool; gums not bleeding.

Problem Statement/Nursing Diagnosis

Altered swallowing ability/*Impaired swallowing related to weakness of swallowing muscles.*

Supporting Assessment Data

Subjective: "I almost choked on that capsule."

Objective: Coughing when trying to swallow capsule.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not aspirate food or pills.	Place in high Fowler's position for meals, snacks, and oral medication administration.	Gravity will assist swallowing in this position.	Raised to high Fowler's for oral intake.
	Instruct to tilt head and neck forward when attempting to swallow.	Facilitates elevation of the larynx and posterior movement of the tongue, allowing food to go into esophagus rather than trachea.	Is tilting head and neck forward when swallowing.
	Have swallow a sip of water before eating or taking an oral medication.	Ensure that patient can swallow.	Swallows sip of water without much difficulty now.
	Assist to choose foods for meals that are easily swallowed.	Custard, eggs, canned fruit, mashed potatoes, and other soft foods are more easily swallowed.	Choosing soft foods for tomorrow's meals.
	Encourage to take small bites of food.	Small amounts are more easily swallowed than large amounts.	Is taking small bites of food.
	Use a thickening agent in liquids if they are particularly hard to swallow.	Thickening makes liquids easier to swallow without aspirating.	Thickening agent not needed.
	Avoid putting foods of different texture in the mouth at the same time.	More than one food texture creates higher risk of aspiration.	Is eating one type of food at a time.
	Reinforce swallowing techniques/exercises recommended by speech therapist.	Muscle strengthening exercises may improve swallowing if done regularly.	Is practicing techniques suggested by speech therapist to improve swallowing.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to muscle weakness in left extremities.*

Supporting Assessment Data

Subjective: "I can't put full weight on my left leg."

Objective: Left leg unable to push much against resistance; when trying to stand, left leg will not support full weight.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not fall or sustain injury before or after discharge.	Assist to stand and walk to the bathroom.	Assistance prevents falling.	Using gait belt and cane to walk to bathroom.
	Instructed not to get up without assistance.	Assistance prevents falling.	Asking for assistance to go to the bathroom.
	Place call bell within reach each time he is repositioned.	Allows patient to call for help when wishing to arise.	
	Encourage ROM exercises and strengthening exercises taught by physical therapist.	Working the muscles may improve muscle tone.	Performing ROM and strengthening exercises three times per day.

Problem Statement/Nursing Diagnosis

Altered self-care ability/*Self-care deficit related to weakness and post-stroke fatigue.*

Supporting Assessment Data

Subjective: "I'm too weak to hold the razor properly to shave."

Objective: Hand shakes when trying to grip razor and shave.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will resume some self-grooming by discharge.	Assist with bathing, dressing, and grooming.	Assistance prevents undue fatigue. Assistance helps accomplish daily hygiene activities.	Assistance with bathing, dressing, and grooming provided.
	Encourage patient to attempt to comb hair and brush teeth.	Small accomplishments provide hope of independence.	Attempted to comb hair with right hand; praise given.
	Praise for every successful attempt at self-care.	Praise reinforces desired behavior.	Patient attempted self-grooming activity.
	Help to practice shaving with electric razor using right hand.	New skills improve with practice.	Wife will bring in an electric razor for him tomorrow. Continue plan.

Problem Statement/Nursing Diagnosis

Limited coping ability/*Ineffective coping related to memory impairment, difficulty swallowing, and paresis of left extremities.*

Supporting Assessment Data

Subjective: "I don't want to be a burden to my wife."

Objective: Tends to forget what wife or nurses have told him; eyes fill with tears at times.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will express hope of full recovery before discharge.	Assure that it is too early to tell whether there will be any permanent disability from the stroke.	Validates that the future is not known at this time.	Assurance given during bathing discussion.
	Help patient explore his fears and anxieties about his condition and his future.	Expressing fears decreases anxiety.	Spoke about fear of being dependent on wife for daily care.
	Actively listen with patience when patient shares his thoughts.	Actively listening establishes trust and provides emotional support.	Sat with patient, established eye contact, and listened to his concerns.
	Do not express negative thoughts or opinions about his condition or progress in his or his wife's presence.	Negative thoughts can destroy hope.	No negative comments made.
	Point out each small bit of progress in self-care, eating, and mobility.	Acknowledging progress toward recovery helps dispel fear of permanent dependence.	Acknowledged improvement in swallowing at noon meal. Continue plan.

Critical Thinking Questions

1. How would you incorporate Mrs. Lewis into the care of her husband?
2. What might be accomplished with an occupational therapy consultation for this patient?
3. How could a social services consult be helpful for this patient and his wife?

CVA, cerebrovascular accident; LOC, level of consciousness; ROM, range of motion.

■ Implementation

The amount of activity permitted a stroke patient during the initial acute stage of her illness depends on the cause of the stroke. If there is danger of continued hemorrhage from a ruptured artery and resultant increase in ICP, physical activity will necessarily be limited. When there is no danger of further damage to the brain, the patient usually is encouraged to become active as soon as her condition has stabilized.

■ Think Critically

What interventions would you use to help a patient with unilateral neglect?

Many patients have **dysphagia** (difficulty swallowing) after a stroke. A speech therapist should be called to do a swallowing study and to devise a plan to improve swallowing. Be certain the patient has had the evaluation to ensure intact swallowing before feeding orally. When the patient has dysphagia, aspiration when eating is a real danger.

Measures to prevent complications, such as subcutaneous low-molecular-weight heparin injections and elastic stockings to prevent deep venous thrombosis, skin care to minimize the risk of skin breakdown, physical therapy and splinting to prevent contractures and spasticity, and measures to prevent falls, are included in the complete plan of care. To reduce the possibility of recurrence of a stroke, risk factors are identified and teaching is begun to modify them.

Listening to music after a stroke seems to improve recovery, according to studies done in Finland ([Särkamo and Soto, 2012](#)).

■ Evaluation

Evaluation is based on whether the interventions are effective in achieving the expected outcomes. Assess whether the overall goals have been met. If the outcomes are not being met, the care plan must be revised.

■ Rehabilitation: Phase 2

Plans for rehabilitation should begin the moment the patient is admitted.  This means maintenance of an adequate airway and aeration of the lungs, proper positioning, range-of-motion exercises for affected limbs, adequate nutrition and fluid intake and output, prevention of pressure ulcers, use of devices to keep extremities in anatomic position, and all other nursing measures directed toward maintaining normal body functions until the patient is able to maintain them on her own.

If the patient has homonymous hemianopsia, she has a visual defect affecting the same half of the visual field in each eye. She will not be able to see past the midline toward the side opposite the lesion and must turn her head to scan that side (see [Figure 23-5](#)). The problem may cause accidents when ambulating. The patient must be taught ways to deal with this visual problem. Teach patients with unilateral neglect to bathe both sides of the body. Demonstrate how to dress the affected side first. The weakened arm and/or leg must be positioned in correct alignment when the patient moves. A sling may be used to prevent shoulder subluxation of the affected upper extremity.

If disabilities from inactivity are prevented, rehabilitation has a much better chance of success. During phase 2, various members of the health care team collaborate with the patient and her family to help resolve both psychosocial and physical problems. The team members may include a physical therapist, speech pathologist, social worker, psychologist, and occupational therapist. The patient usually is transferred from the hospital to a rehabilitation facility. The patient is encouraged with physical therapy to strengthen her muscles as well as her resolve to help herself. She will need

to exercise her muscles actively and retrain them.

■ Nutrition Considerations

Patients With Dysphagia

To help prevent aspiration, tell the patient:

- Sit up straight to eat, and tilt your head slightly forward.
- Place only one teaspoon of food in your mouth at a time.
- If you have paresis from a stroke, the food should be placed on the unaffected side of your mouth.
- Place your chin on your chest and swallow; wait a few seconds and swallow again.
- Refrain from taking liquids and solids at the same time.
- Sip from the cup or glass rather than use a straw.
- Remain in an upright position for 45 to 60 minutes after a meal.

Interventions to assist the patient to eat without aspirating include:

- Plan a 30-minute rest and relaxation period before each meal.
- Allow plenty of time for a relaxed meal.
- Serve food cold or well warmed; lukewarm foods are more difficult to swallow.
- Serve foods in the consistency ordered; some patients find semisolid food easier to swallow.
- Avoid serving peanut butter, syrup, and bananas, because they are sticky and difficult to swallow.
- Avoid serving dry foods such as rice, popcorn, toast, or crackers, because they tend to be more difficult to swallow and can stick in the throat.
- Keep the container for liquids more than two-thirds full so that the patient does not have to tilt the head back too far to drink. Tilting the head back tends to cause fluid to go into the trachea.

There are many ways to encourage the patient. Instead of feeding her every item on her tray, let her hold bread and other "finger foods," suggesting that she feed herself these things. Chewing may be slow at first; the patient should not be hurried, nor should she be allowed to chew to the point of exhaustion. Eating often is difficult and messy, and privacy must be provided. If hemiplegia is causing the patient to "pocket" food in the folds of the mouth, the mouth should be checked after meals.

Combing and brushing the hair is good exercise for the arm and shoulder, as are brushing the teeth and washing the face and hands. The patient may not be able to carry all these procedures through to completion at first, but with occupational therapy and encouragement she can gradually improve until she is able to perform much of her own personal care. **The patient who has sustained a brain injury becomes fatigued very quickly, and this must be kept in mind when performing self-care activities.** Encouragement and praise for the smallest accomplishment can help the patient's tattered self-esteem.

Stroke patients can be prone to rapid mood swings and spontaneous weeping. All health care workers must be patient and accepting, and an explanation to the patient and family that this is common after a stroke can ease the patient's embarrassment.

Various rehabilitation techniques are undergoing trials to determine whether more function can be regained in the extremities. Further information on rehabilitation programs is provided in

Chapter 9.

■ Continuum of Care: Phase 3

In phase 3, plans are made for discharge and referral to individuals and agencies outside the hospital that will help the patient and her family adjust to her new way of life. A visiting nurse often is assigned for a period of time to coordinate rehabilitation efforts, assist with teaching, and assess the patient's status. The patient continues rehabilitation as an outpatient under the provider's supervision. In some rural areas, TeleHealth services using the Internet and telephone are available to provide continued speech therapy.

Brain Tumor

Etiology and Pathophysiology

About 200,000 new brain tumors are discovered each year in the United States. About 69,000 of those are primary tumors, and the rest are metastatic tumors from a different site of origin (Table 23-2). It is not known how brain tumors begin, and there are more than 120 different types. Low-grade astrocytomas are more common in young people than in older adults (American Brain Tumor Association, 2015). High-grade gliomas are more prevalent in older adults. Cerebellar tumors are more common in children.

Table 23-2
Different Types of Brain Tumors*

TUMOR	BURDEN†	TYPE OF TISSUE
Gliomas (malignant)	30	Gluey or supportive tissue of the brain
Glioblastoma multiforme	17 (54% of all gliomas)	Primitive stem cells (glioblasts)
Astrocytoma	7 (22% of all gliomas)	Astrocytes and glial cells
Medulloblastoma	1	Primitive neuroectodermal cells
Oligodendroglioma	2	Oligodendrocytes
Pituitary adenoma (usually benign)	13	Pituitary gland cells
Acoustic neuroma (usually benign)	9	Myelin sheath cells of cranial nerve VIII
Meningioma (most often benign)	34	Cells of the meninges
Hemangioblastoma (benign)	1	Cells from blood vessels in the brain
Lymphoma	2	White blood cells
Metastatic tumors (malignant)	2	Mostly from lung, breast, kidney, thyroid, and prostate carcinomas

*Primary brain tumors are classified by the type of tissue from which they derive.

†Refers to portion of total primary brain tumors by type; prevalence.

Neoplasms within the confines of the skull are space-occupying lesions and thus create problems of increasing ICP by compressing adjacent tissues. If the tumor arises from brain cells, the cranial nerves, or the pituitary gland, the neoplastic cells can infiltrate and destroy these structures; other types of tumor can destroy tissue through pressure. Many brain tumors are benign, such as meningiomas and acoustic neuromas. However, because of the increased ICP that tumors cause and the way they can invade brain tissue, a benign tumor also presents a serious condition.

Intracranial tumors may begin in the brain itself, or they may begin in the meninges, cranial nerves, or pituitary gland. Primary malignant brain tumors rarely metastasize outside the brain. Tumors in the cerebral hemispheres are termed *supratentorial*, and those located beneath the tentorium (fold of dura mater) are termed *infratentorial*. This area of the cerebral hemisphere contains the structures of the brainstem and the cerebellum.

Signs, Symptoms, and Diagnosis

There can be as many symptoms of intracranial tumors as there are functions of the structures within the skull. The symptoms depend on location and may appear gradually, or—if the tumor is a highly malignant, fast-growing type—they may appear suddenly. In a slow-growing type of tumor, the patient may first show personality changes, disturbances in judgment and memory, loss of muscular strength and coordination, or difficulty in speaking clearly. Headache awakening the patient is a key sign. Vomiting, visual problems, and other signs of increased ICP also may occur. Approximately 20% to 50% of adults with brain tumors develop seizure activity. Diagnostic procedures to identify the site and extent of intracranial tumors include skull x-rays, MRI and CT scans, and arteriography.

Treatment

The three modes of therapy for intracranial tumors are the same as those for neoplastic diseases elsewhere in the body: surgery, radiation therapy, and chemotherapy. Radiation is usually given 5 days a week for 6 weeks. With brachytherapy, tiny radioactive particles are inserted into the tumor tissue via an implanted catheter. This treatment extends over approximately 5 days. Radiation precautions are needed during this period. If the tumor is found while it is still very small, a stereotactic Cyberknife or gamma knife procedure may destroy it. Gamma knife procedures use a

steel frame attached to the head with ports through which radiation is directed from several angles. Cyberknife procedures use a molded head mask or body mask to keep the patient from moving during treatment. Measurements are calculated by a computer to precisely locate the tumor, and the radiation is delivered only to the tumor, which spares surrounding tissue. These procedures also can be used for small recurrent tumor growth (see [Figure 8-4](#)).

Most chemotherapy drugs cannot cross the blood-brain barrier. To get the drugs into the brain circulation, an Ommaya reservoir may be implanted between the scalp and the skull. An Ommaya reservoir consists of a port attached to a catheter that is placed in the lateral ventricle of the brain ([Figure 23-8](#)). Chemotherapy drugs can be injected into the port and instilled into the CSF in the ventricle. In this way the chemotherapy drug is carried to the tumor cells in greater quantity than can be achieved by infusion of the drugs into the bloodstream. The FDA has approved a wearable device that blasts glioblastoma brain tumors via an electrical field (Printz, 2015).

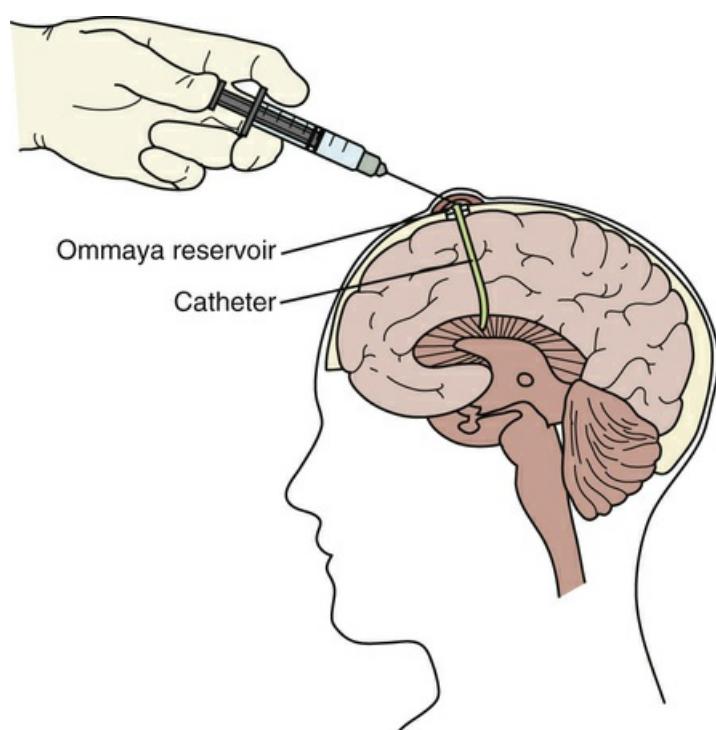


FIGURE 23-8 Implantation of an Ommaya reservoir for chemotherapy of a brain tumor.

In patients for whom chemotherapy and radiation have previously failed, implantation of carmustine (BiCNU; Gliadel) wafers into a glial cell tumor slows growth. The drug is inserted into brain tissue after removal of the glioma, to fight the malignancy and slow or prevent regrowth. Temozolomide (Temodar) is an oral chemotherapeutic drug that crosses the blood-brain barrier. Trials with local hyperthermia, biologic therapy, electrochemotherapy, and immunotherapy are under way. Molecularly targeted drugs include erlotinib (Tarceva), gefitinib (Iressa), and bevacizumab (Avastin). Treatments are discussed more thoroughly in [Chapter 8](#). If there are signs of increased ICP, measures are instituted to try to lower the ICP and to provide supportive care (see [Chapter 22](#)).

Surgery

Surgery is used to remove intracranial tumors, then other modes of treatment are used to destroy remaining cells. Sometimes, however, the tumor has infiltrated vital parts of the brain that must not be traumatized by surgical procedures. If the tumor is located in the cerebrum, a **craniotomy** is performed. A “window flap” of scalp and bone is cut and pulled down, the dura is opened, and the tumor is removed. Tumors in or near the **cerebellum** are removed through an incision under the occipital bone. If all of the tumor cannot be removed, a portion of the tumor may be removed to relieve compression of the brain against the skull. This procedure is only a temporary measure to

relieve the patient's symptoms. Care of patients after brain surgery is presented in [Chapter 22](#).

Think Critically

How should a patient who has had a craniotomy for a supratentorial tumor be positioned?

Nursing Management

Routine neurologic assessments are performed, and the patient's ability to perform ADLs is evaluated. Pain assessment and control are important. Helping the patient and family to communicate fears and cope with the situation should be part of the care plan. Problem statements commonly used for a patient with a brain tumor are:

- Potential for decreased tissue perfusion due to tumor pressure and cerebral edema.
- Pain due to cerebral edema and increased ICP.
- Altered self-care ability due to altered neuromuscular function, sensory deficits, or decreased LOC.
- Anxiety or fear due to diagnosis and prognosis.
- Potential for injury due to seizure activity caused by the tumor.
- Potential for injury due to increasing ICP from tumor growth.
- Altered memory due to damaged cells from pressure.
- Altered home maintenance ability due to physical impairments.
- Decreased self-esteem due to inability to work.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Specific outcomes appropriate for the individual are written and interventions are planned to help the patient meet the outcomes. Evaluation is based on data that indicate the outcomes are being met. (See [Chapter 21](#) for care for common problems and interventions for various problem statements related to neurologic problems; see [Nursing Care Plan 23-1](#) and pp. 537-539 for further interventions.)

Complications

- *Hydrocephalus.* Obstruction of CSF flow may require placing a shunt to reduce CSF pressure and prevent increased ICP. A shunt is a tube placed in a ventricle and attached to a small manual pump that moves excess CSF fluid from the ventricles to the peritoneal cavity or into the atrium of the heart, from where it is absorbed ([Figure 23-9](#)).

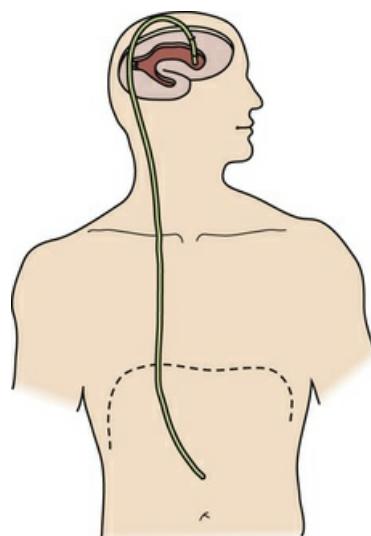


FIGURE 23-9 Ventriculoperitoneal shunt to drain excess cerebrospinal fluid into the peritoneal cavity, where it is absorbed through the mucosa.

- *Intracerebral hemorrhage.* Bleeding in the brain may occur as the tumor erodes blood vessels. Depending on the condition of the patient, the size of the tumor, and prognosis, various measures to stop the bleeding and reduce ICP will be used.

Infectious and Inflammatory Disorders of the Nervous System

Bacterial Meningitis

Etiology and Pathophysiology

Meningitis is an inflammation of the membranes covering the brain and spinal cord and is caused by an infectious agent. Viruses, bacteria, and fungi can cause meningitis. Fungal meningitis occurs mostly in patients with AIDS. The membranes can become infected in a number of ways, because infectious agents can be carried through the bloodstream to the membranes, or brain tissue can become affected as an infection in a particular area of the brain spreads. Infection can spread from the spinal cord or sinuses to the brain. Two examples of how infectious organisms may enter the cranial vault other than via the bloodstream are (1) through an opening in the skull in a head injury or from surgery or (2) by accidental introduction of infectious agents into the spinal canal during spinal puncture.

Many different strains of bacteria can cause meningitis, but the causative organisms are usually *Streptococcus pneumoniae* or *Neisseria meningitidis*. In children the causative organism may be *Haemophilus influenzae* type B. Bacterial meningitis commonly follows an upper respiratory infection. Immunization of all young adults against bacterial meningitis is recommended.

Health Promotion

Meningitis Immunization

Meningitis vaccine is available and is required for all students entering college. It is recommended for all adolescents and for others at increased risk for meningitis. It should be encouraged for adults living in a communal situation. Meningitis can spread quickly when people are in proximity, such as in classrooms or dormitory rooms.

A consequence of bacterial meningitis can be an increase in circulating CSF because of obstruction of the normal mechanisms of CSF absorption. Bacteria, white blood cells, and debris block the arachnoid villi, resulting in an obstructive **hydrocephalus** (increased CSF in the ventricles of the brain) that increases ICP. Meningitis can cause permanent neurologic damage and may cause severe vasoconstriction that requires amputation of part of a limb.

Signs and Symptoms

The most obvious symptoms of meningitis are the **sudden onset of fever and a severe and persistent headache that is greatly aggravated by moving the head**. Other signs of meningeal irritation include pain and stiffness of the neck when flexing the neck (**nuchal rigidity**), exaggerated deep tendon reflexes, irritability, photophobia, and hypersensitivity of the skin. A positive Brudzinski sign can be elicited by placing a hand behind the patient's head and, with the other hand on the chest, gently flexing the patient's neck forward by moving her chin toward her chest. If there is flexion of the knees and hips when you try to flex the neck, the Brudzinski sign is positive and indicates meningeal irritation. To elicit a Kernig sign, have the patient supine and, with the hip and knee flexed at 90-degree angles, slowly extend the knee (Figure 23-10). If there is pain, not just discomfort, behind the knee, the Kernig sign is positive, indicating meningeal irritation. Meningococcal meningitis commonly is accompanied by a petechial rash covering the chest and extremities. Seizures are also typical, as are nausea and vomiting. Quick medical attention is needed to prevent death.

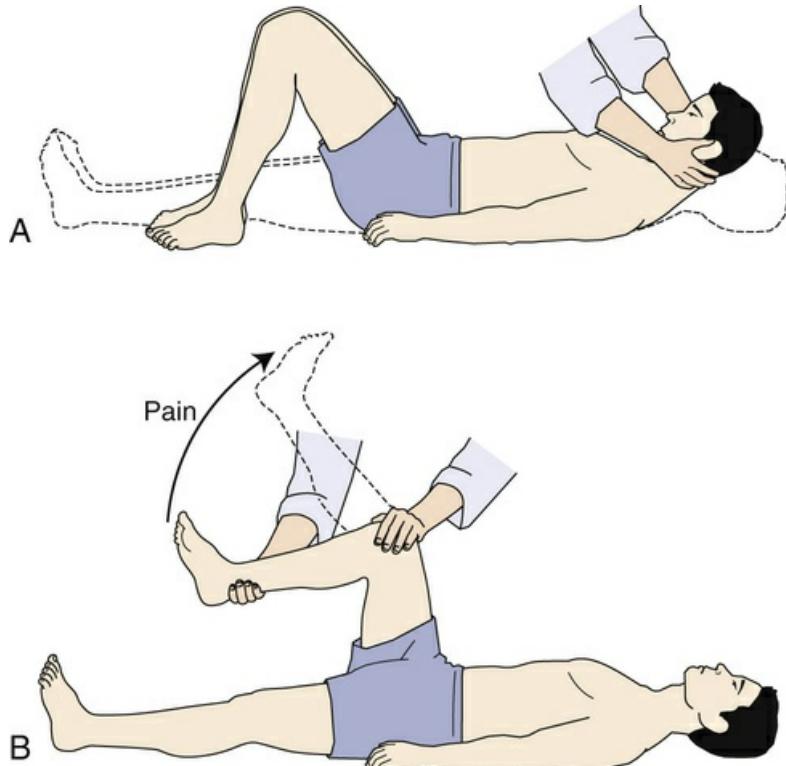


FIGURE 23-10 **A**, A positive Brudzinski sign: Passive flexion of the head and neck causes flexion of the thighs and legs. **B**, A positive Kernig sign: Inability to extend the leg from a position of 90-degree flexion at the hip because of pain and spasms in the hamstring muscle.

Diagnosis

When meningitis is suspected, a spinal tap is performed, and the CSF is examined for the number and type of organisms present. The organisms that cause meningitis produce bacterial toxins that damage the blood-brain barrier, increasing vascular permeability and causing cerebral edema. Thus, the CSF will be elevated (see [Chapter 21](#)). A Gram stain identifies the causative organism. Blood tests may be performed to rule out other disorders that can mimic meningitis.

Clinical Cues

When meningitis is present, the spinal fluid may appear milky as a result of the increased number of white cells suspended in the fluid. Other abnormal findings in the CSF include the presence of protein and decreased amounts of glucose.

Treatment

Successful treatment of meningitis and prevention of permanent disability depend on early recognition and prompt treatment. Antibiotics are started immediately for bacterial meningitis, and when the causative organism has been identified, specific antibiotics to which the organism is sensitive are administered. A combination of two antibiotics is common. The disease usually responds well to IV antibiotic therapy followed by oral doses given for a total of 10 days. Dexamethasone along with the antibiotics has proven beneficial to decrease inflammation for many patients ([Hasbun, 2014](#)). Anticonvulsive drugs are administered to control seizures, and ibuprofen, aspirin, or acetaminophen is given for headache.

Clinical Cues

Narcotics are rarely used for pain control in patients with increased ICP, because they cause sedation and prevent accurate neurologic assessment.

Prophylactic antibiotics are usually given to those in close contact with the patient to prevent the spread of the disease. Death occurs in about 25% of cases.

Viral Meningitis

Several viruses can cause meningitis; the most common are enteroviruses, arboviruses, HIV, and herpes simplex virus. Viral meningitis tends to be milder than bacterial meningitis. The initial signs and symptoms include a headache, fever, photophobia, and stiff neck. Brain involvement symptoms are not common.

The CSF is examined to confirm the diagnosis. A complete blood count will show increased lymphocytes (**lymphocytosis**). A polymerase chain reaction (PCR) test to detect virus-specific deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) can diagnose CNS viral infection.

The disease is self-limiting and is managed symptomatically. Full recovery typically occurs within 7 to 10 days. Sometimes residual effects such as persistent headaches, mild mental impairment, and lack of coordination occur.

❖Nursing Management

■ Assessment (Data Collection) and Nursing Diagnosis

In addition to noting the specific signs and symptoms of meningitis, assess the patient for subjective and objective data relevant to each of the patient care problems that might accompany the disease. Examples include convulsive seizures, elevated body temperature, nausea and vomiting, delirium, pain, increased ICP, and fluid and electrolyte imbalances. Ongoing, vigilant neurologic assessment is a high priority in monitoring for signs of increasing ICP, changes in condition, and response to treatment. An ongoing assessment should be performed each shift.

▣ Focused Assessment

Assessment of a Patient With Brain Infection

An assessment (data collection) should be performed each shift for the following areas:

- Neurologic check for increasing intracranial pressure
- Stiff neck or paralysis
- Temperature and monitoring of temperature trend
- Assessment for electrolyte and fluid imbalance; skin turgor, mucous membranes, condition of lips; intake and output
- Gastrointestinal assessment: bowel sounds, distention, constipation, diarrhea, nausea, vomiting
- Intravenous access site
- Skin condition
- Psychosocial concerns

Problem statements are written for the specific problems identified during the data collection (see [Table 21-9](#) and [Nursing Care Plan 23-1](#)).

■ Planning, Implementation, and Evaluation

Expected outcomes are written for the problem statements chosen. Specific nursing interventions in the care of patients with meningitis are primarily concerned with measures to:

- Conserve the patient's strength
- Prevent seizures

- Promote healing

Preventing the spread of infection includes use of Standard Precautions and droplet precautions.

The patient's room should be quiet and dimly lit. Sudden noises or bright flashes of light can cause a seizure, because the sensory input activates nerve impulses. Care and treatments are coordinated to allow as much rest as possible. Meningitis often produces mental confusion and delirium, as well as the possibility of seizures. *Herpes simplex* (fever blister) commonly accompanies meningitis.

Clinical Cues

The presence of herpes lesions, in addition to drying of the lips and mouth from fever and dehydration, requires special mouth care. Using Standard Precautions (see Appendix B), the lips and mouth should be cleansed and lubricated at least every 2 hours during the acute stage of the disease.

Fluid volume deficit is a common problem. Monitor the patient's intake and output and prevent dehydration. Report excessive vomiting or outward signs of early dehydration promptly so that IV fluids may be given to correct fluid volume deficits. Administration of corticosteroids, mineralocorticoids, estrogens, and progestin can increase ICP, because they cause fluid retention.

Irritation of the neural centers in the brain may cause a decrease in the peristaltic action of the intestines in a patient with meningitis and can lead to an accumulation of flatus and fecal material with severe abdominal distention. Check the patient's abdomen for distention, and note bowel sounds and record them in the medical record. Rectal suppositories, simethicone, or small-volume enemas (less than 150 mL) may be prescribed for relief.

The patient will need support and reassurance because the severity of this illness is frightening. If confusion occurs, frequent orientation is necessary. The family needs information and reassurance as well.

Once the acute stage of the disease is over, the patient is allowed to gradually resume her former activities. Side effects of the disease, such as paralysis, deafness, and visual defects, sometimes occur, but these **sequelae** (results) of meningitis do not usually occur if the disease is diagnosed and treated in the early stages. Gather evaluation data regarding the effect of the interventions performed. Determine whether the expected outcomes are being met. If outcomes are not being met, the plan must be revised.

Encephalitis

Etiology and Pathophysiology

Encephalitis is less common than meningitis. It is an acute inflammation of the brain that is serious and sometimes fatal. Some of the viruses responsible for encephalitis are associated with particular seasons of the year or with geographic locations. Ticks and mosquitoes are the vectors that transmit the disease. Examples of viruses in the United States that cause encephalitis are eastern equine encephalomyelitis, western equine encephalomyelitis, La Crosse encephalitis, St. Louis encephalitis, and West Nile viruses. Encephalitis may occur as a complication of the viral diseases chickenpox, measles, and mumps. Postviral encephalitis is an immune-mediated disorder and follows the end of the viral infection by 2 to 12 days. Herpes simplex virus 1 (human herpesvirus 1) is commonly the cause of non-vector-transmitted encephalitis. Cytomegalovirus encephalitis is a complication in patients with AIDS.

Health Promotion

Protect Against Mosquitoes and Ticks

During mosquito season, wear insect repellent and protective clothing. Prevent water from standing in containers around the home and property to discourage the breeding of mosquitoes. Avoid being out of doors for recreational purposes at dusk and at night, when mosquitoes are more likely to be out. Use insect repellent and protective clothing when out in wooded areas. Skin

should be inspected for ticks after the outing.

Clinical Cues

Whenever a patient is admitted with symptoms of a brain infection, check the skin thoroughly and question the patient about a recent history of herpes lesions. If you find any herpes lesions or are told that they were present within the past several days, notify the provider immediately. Herpes encephalitis can be fatal if not treated early.

Once the virus crosses the blood-brain barrier and enters neural cells, disrupting normal neural function, hemorrhage and an inflammatory response occur in the gray matter.

The severity of the illness may be mild or fatal. The most common type of viral encephalitis in the United States is that caused by herpes simplex virus 1. West Nile virus has emerged as a cause of encephalitis since 1999.

Neurologic impairment is caused by direct infection of neural cells. Western equine encephalitis is usually seen in June and July. Herpes simplex encephalitis spreads from neural tissue to the CNS. It can be a primary or secondary infection and can occur from reactivation of latent virus. **If treatment for the herpes simplex is not started before coma occurs, death is almost certain.**

Signs, Symptoms, and Diagnosis

The onset of encephalitis may be either sudden or insidious. There may be behavioral and personality changes and a decreased LOC. **Stiff neck, photophobia, and lethargy are classic symptoms of encephalitis. Seizures, acute confusion, and flaccid paralysis may occur.** CNS signs usually appear 1 to 4 hours after the onset of other symptoms. Lethargy may progress to coma. A patient with herpes simplex encephalitis may exhibit fululike symptoms that rapidly progress.

Encephalitis symptoms differ from those of meningitis in that with encephalitis there is altered mental status, motor or sensory deficits, and speech or movement disorders.

Diagnosis is confirmed by the presence of the virus in the CSF or bloodstream. The CSF in herpes simplex encephalitis will show a slightly elevated white blood cell count, a small increase in protein, and normal glucose levels. PCR tests for herpes simplex virus DNA and RNA levels in CSF allow for early diagnosis. MRI, positron emission tomography scanning, and an EEG may be performed to demonstrate inflammation and the disruption of normal neural impulses. A brain biopsy may be required to verify the responsible organism so proper treatment can begin.

Treatment and Nursing Management

The treatment of encephalitis is primarily symptomatic, with general supportive measures to maintain cardiac and respiratory function, maintain the patient's strength, promote healing, and prevent complications. Herpes simplex type 1 encephalitis is treated with antiviral IV acyclovir. There is no specific drug treatment for other types of encephalitis.

Specific nursing measures are essentially the same as for any patient who is subject to seizures, high fever, delirium, or altered LOC (see [Table 21-9](#)). The nursing care plan must be individualized to the patient's needs.

Complications

Permanent neurologic disabilities may occur, such as problems with walking, paralysis, cognition, memory, and self-care. About 65% of encephalitis survivors have long-term problems.

Brain Abscess

A brain abscess is a collection of purulent material in a cavity within the brain. A bacterial infection that has traveled from the gums or teeth, sinus, ear, or mastoid region to the brain usually is the cause. An abscess can form from bacteria introduced at the time of any type of head injury or cranial surgery. **Signs and symptoms are headache, fever, and progression to lethargy and confusion.** If the abscess is not treated, ICP will rise as the size of the abscess increases. Teach patients who experience sinus infections with purulent drainage to seek treatment if symptoms last for more than a few days. A combination of antibiotics is used to eradicate the abscess. Surgery may be required to drain the abscess or relieve ICP.

Headaches

Headaches are the most common cause of complaints of pain. Headaches are commonly caused by allergy and related sinus problems or by tension, or are vascular in origin. Arthritis, cervical spondylitis, and temporomandibular joint syndrome may also cause headaches. The pain of a headache may be minor or severe. Persistent headache requires testing to rule out organic problems such as anemia, brain tumor, or cerebral aneurysm.

Treatment for severe, recurrent headaches begins with determining the cause, if possible, and identifying factors that seem to precipitate the headache. Mild headaches usually are relieved by rest and a mild analgesic.

Migraine Headaches

Approximately 23 million Americans have at least one migraine headache a year. Women experience them more than men. It is believed that constriction and subsequent dilation of cerebral arteries cause migraine headaches. Attacks usually occur irregularly and may begin with an aura such as visual disturbances or “spots before the eyes” (**scotoma**). Many patients with migraine do not have an aura preceding the attack. Pain usually begins on one side of the head and is described as throbbing in character. A migraine headache is often accompanied by nausea and vomiting. Symptoms may last for 4 to 72 hours. Light or sound cause irritation and sensitivity, and for some patients with migraine, certain types of light set off the headache. Frequent migraine headaches are very debilitating.

Safety Alert

Triptans and Antidepressant Use

Patients who are taking triptans as migraine medication should not also take antidepressant or mood disorder medications that are selective serotonin reuptake inhibitors (SSRIs) or selective serotonin-norepinephrine reuptake inhibitors (SNRIs). There is a greater risk of increased serotonin levels occurring if triptans are combined with SSRIs or SNRIs, and the resulting serotonin syndrome can be life threatening. Signs and symptoms of serotonin syndrome include restlessness, hallucinations, loss of coordination, tachycardia, rapid changes in blood pressure, hyperthermia, overactive reflexes, nausea, vomiting, and diarrhea. Consult with the provider rather than abruptly stopping the SSRI or SNRI medication.

Lying in a darkened, quiet, odor-free room with eyes closed decreases the symptoms. Sometimes doing this at the very beginning of symptoms can prevent a full-blown migraine headache. Metoclopramide (Reglan), droperidol (Inapsine), or chlorpromazine (Thorazine) is often prescribed for the nausea that accompanies a migraine. Various behavioral treatments such as biofeedback, acupuncture, and relaxation therapy, combined with lifestyle adjustments and medication, seem to offer the best result (NINDS, 2014).

Clinical Cue

Patients should be told that long-term use of metoclopramide may cause tardive dyskinesia (a neurologic disorder) (FDA, 2009).

Treatment consists of using one or more of the agents listed in Box 23-2 (Gilmore and Michael, 2010; Silberstein et al, 2012). A cold compress to the temple, eye, and occiput areas is helpful. Identifying food or other substances that seem to trigger an attack is very important.

Box 23-2

Medications Used for Migraine Headache Treatment

Drugs That Abort Migraine Symptoms

- Acetaminophen-isometheptene-dichloralphenazone (Midrin)
- Almotriptan (Axert)
- Dihydroergotamine (D.H.E. 45 injections, Migranal nasal spray)
- Eletriptan (Relpax)
- Ergotamine tartrate (Cafergot)
- Frovatriptan (Frova)
- Methysergide (Sansert)
- Naratriptan (Amerge, Naramig)
- Rizatriptan (Maxalt, Maxalt MLT)
- Sumatriptan (Imitrex, Imitran)
- Zolmitriptan (Zomig, Zomig ZMT)

Preventive Drugs (Taken Daily)

- Level A: Established efficacy
 - Divalproex sodium (Depakote)
 - Frovatriptan
 - Metoprolol (Toprol)
 - Propranolol (Inderal)
 - Timolol (Blocadren)
 - Topiramate (Topamax)
- Level B: Probably effective
 - Amitriptyline (Elavil)
 - Atenolol (Tenormin)
 - Nadolol (Corgard)
 - Naratriptan (Amerge)
 - Venlafaxine (Effexor)

- Zolmitriptan (Zomig)

If migraine headache tends to occur around the time of menses, taking a prescribed diuretic for 3 to 5 days before onset of menstruation may be effective in preventing the headache.

■ Nutrition Considerations

Finding Foods That Trigger a Migraine Headache

Ask patients who have migraine headaches to keep a food diary to determine whether any of the following foods or additives are triggering the attacks:

- Alcohol
- Caffeine
- Chocolate
- Artificial sweeteners (aspartame, sucralose, saccharin)
- Monosodium glutamate (MSG)
- Citrus fruits
- Meats with nitrites (bacon, salami, etc.)
- Salt
- Foods containing tyramines: peanuts, raisins, vinegars, soy sauce, aged cheese, yogurt, sour cream, chicken livers, sausages, bananas, avocados, pickled herring, freshly baked breads, pork, beans

Various neurostimulator devices are under investigation. Deep brain stimulation has resulted in side effects, but several trials with minimally invasive stimulation are currently under way ([Hoffmann and Suprsonsinchai, 2013](#)). Botox received FDA approval for the treatment of chronic migraine in October 2010. Botox blocks nerve impulses carrying pain messages to the brain. It has not been shown to be effective with any other type of headache ([The Migraine Trust, 2015](#)).

■ Complementary and Alternative Therapies

Vitamin B₆, Herbs, and Vitamin B₂

If taking a diuretic drug is contraindicated, taking time-release vitamin B₆ tablets for 3 to 5 days before the start of menses will often cause enough diuresis to be helpful. Vitamin B₆ should not be taken continuously, because toxic levels can occur that cause neuropathy. All herbs should be approved by the health care provider, because they may interfere with other medications the patient is taking. Herbs that have been found to help prevent or alleviate migraine headache are:

- Bay
- Feverfew
- Ginger
- Lemon balm
- Purslane

- Red pepper
- Willow

A supplement of 400 mg/day of vitamin B₂ is sometimes helpful in preventing migraine headaches.

Cluster Headaches

Cluster headaches have a higher incidence in men and are not as common as migraine headaches. A cluster headache causes the most severe headache pain. The pain is abrupt in onset and usually lasts 30 to 90 minutes. It may start during sleep. The headache may recur several times a day, and the clusters usually last 2 to 3 months. The cause and pathophysiology are not clearly known, but the trigeminal nerve is implicated. Vasodilation occurs, causing the headache. It is believed that the disorder may be caused by dysfunction of the biologic clock mechanisms of the hypothalamus. Alcohol can trigger this type of headache.

Signs and symptoms include severe unilateral orbital, supraorbital, or temporal pain along with one of the following: redness of the conjunctiva of the eye, tearing, nasal congestion, dripping nose, facial swelling, pupil constriction, or **ptosis** (drooping) of the eyelid. The person becomes restless and often paces the floor and is sensitive to touch.

History usually is sufficient to diagnose a cluster headache, but CT, MRI, or magnetic resonance angiography may be performed to rule out tumor, aneurysm, or infection. Treatment for cluster headache includes a combination of analgesic and 100% oxygen by face mask, sumatriptan succinate (Imitrex) and other triptans, internasal lidocaine 4% aqueous solution, or intranasal capsaicin. Opiates should not be used because they can cause rebound headache.

Safety Alert

Caution When Taking Analgesics

Fiorinal should not be used long term, because it contains a barbiturate and is habit forming. Drugs containing acetaminophen should be used within the dosage guidelines and not used daily; acetaminophen can cause liver failure and impaired renal function. The guidelines are to refrain from taking more than 4 g of acetaminophen per 24 hours. Remind patients who take acetaminophen not to combine it with alcohol because doing so can cause liver damage in some people. Those taking aspirin, ibuprofen, or a drug containing either should monitor themselves for peptic ulcer and gastric bleeding. Signs and symptoms to report are epigastric pain, dyspepsia, black stool, or vomiting of blood. Fatigue, headache, and dizziness may indicate anemia from a slow gastric bleed.

Tension Headaches

Tension headaches are quite common but are not as severe as migraine or cluster headaches. This type of headache usually also involves neck stiffness and limitation of range of motion of the neck. Analgesic medication, muscle relaxants, tension-reducing medication or relaxation techniques, massage, yoga, and biofeedback are often helpful. Biofeedback can be very effective in preventing or averting headaches for many people.

Cranial Nerve Disorders

Trigeminal Neuralgia (Tic Douloureux)

Etiology and Pathophysiology

Trigeminal neuralgia is a relatively rare facial pain syndrome. The cause of trigeminal neuralgia is not known, although it can be related to pressure on the nerve root by a tumor or to a lesion of the blood vessels. Multiple sclerosis can be a factor. In many cases, no cause can be found and the disorder is considered idiopathic. This disorder most commonly affects people older than 60 years.

Trigeminal neuralgia involves one or more branches of the fifth cranial (trigeminal) nerve. The three branches of this nerve are the ophthalmic, the mandibular, and the maxillary (Figure 23-11). In most cases of trigeminal neuralgia, the ophthalmic nerve is not involved. The mechanism of pain production is controversial. It may be a result of increased afferent firing in the nerve or failure of inhibitory mechanisms.

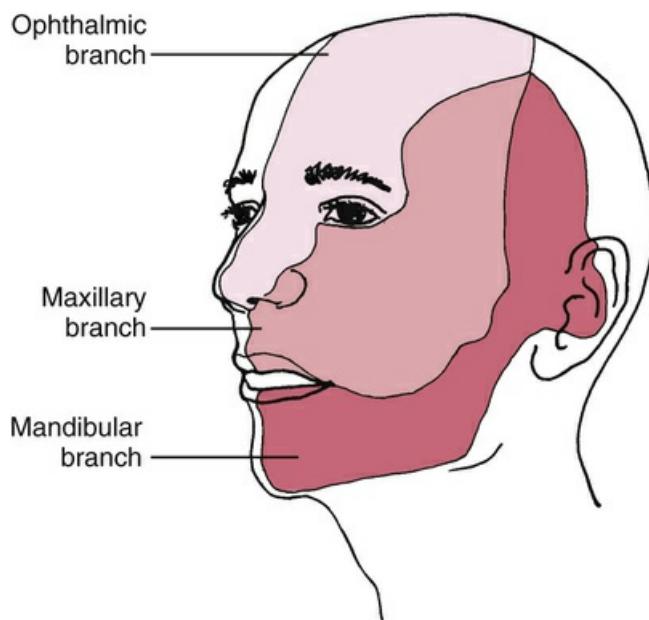


FIGURE 23-11 Areas of innervation by each of the three branches of the trigeminal nerve.

Signs, Symptoms, and Diagnosis

The most notable symptom of trigeminal neuralgia is severe facial pain, which is described as sharp and intense, lasting for 1 to 2 minutes, and located along the pathway of one of the branches of the trigeminal nerve. The pain is localized on one side of the face, rarely affecting both sides. It can extend from the midline of the face across the cheek and jaw to the ear.

Attacks are usually triggered by exposure to drafts, light touch or vibration, drinking cold or very hot liquids, chewing, brushing the hair, shaving, or washing the face. The pain causes a brief muscle spasm of the facial muscles—the tic. Between acute flare-ups the patient may experience no pain or may report a dull ache. The pain during the acute phase is so severe that many patients live in constant fear they will do something to provoke an attack.

Diagnosis is based on the patient's history and chief complaint and tests to rule out a cerebellopontine angle tumor that is affecting the nerve. There is no test to confirm the diagnosis, and there are no observable pathologic changes.

Treatment

Medical management usually is preferred to surgical intervention, because the latter involves dissection (damage) of nerve rootlets with resultant loss of motor and sensory function. Should

dissection be necessary, the patient should be instructed to chew on the side opposite the dissection to prevent injury. The drugs typically prescribed to prevent or relieve spastic pain are the anticonvulsants carbamazepine (Tegretol) and phenytoin (Dilantin) and the muscle relaxant baclofen (Lioresal). Other anticonvulsants are effective in some patients. Intranasal spray of lidocaine or calcitonin may be effective for temporary relief. Relief of severe pain usually can be obtained by injecting glycerol into the terminal branch of the trigeminal nerve (glycerol rhizotomy). Percutaneous stereotactic rhizotomy or microvascular decompression are neurosurgical choices.

❖Nursing Management

■ Assessment (Data Collection) and Nursing Diagnosis

Observing the patient between acute attacks can help identify clues to confirm the presence of trigeminal neuralgia. The patient may not want to wash her face (male patients may not want to shave), and the patient will guard her face or hold it immobile to avoid an attack. The patient is very sensitive to any contact with her face and will indicate the area of pain by pointing to but never touching it.

The problem for patients with trigeminal neuralgia is, of course, Pain. Because chewing can provoke an attack of pain, the patient may be susceptible to nutritional deficit. Small, frequent feedings consisting of food that is moderately warm can help provide adequate nutrition while avoiding precipitating an acute attack.

■ Planning, Implementation, and Evaluation

Specific expected outcomes are written for the patient regarding the control of pain and its triggers. Nursing interventions for a patient who is being treated medically include instruction about the expected actions and adverse side effects of the drug she is taking. Phenytoin can produce **ataxia**, skin eruptions, overgrowth of the gums, nystagmus, and Stevens-Johnson syndrome (a serious immune reaction). Carbamazepine can damage the bone marrow and produce such hematologic reactions as leukopenia, aplastic anemia, and decreased platelet count. Skin eruptions also can occur as a reaction to carbamazepine or baclofen. The patient's blood count and liver function must be closely monitored to detect early signs of drug toxicity. Baclofen may cause transient drowsiness, nausea, weakness, or fatigue.

Surgical treatment of trigeminal neuralgia results in a potential for damage to the cornea when the ophthalmic branch is dissected. The patient must be taught to avoid rubbing her eyes or exposing them to foreign objects, because the normal protective corneal reflex is no longer functional. She should get into the habit of wearing protective goggles when there is the possibility of getting dust and debris in her eyes and should try to blink her eyes often to cleanse their surfaces.

Dissection of the second or third branches of the trigeminal nerve creates a risk of potential damage to the oral mucosa and teeth. The patient cannot feel hot liquids and foods and could be burned, could bite the inside of the mouth without realizing it, or may have dental caries that will not cause pain. Good oral hygiene and periodic dental examinations are particularly important when the body's natural warning system is not operative. Immediately postoperatively, an ice pack is applied to the cheek for 3 to 4 hours to prevent swelling.

Evaluation data are gathered to determine whether the specific expected outcomes are being met.

Bell Palsy

Bell palsy is weakness or paralysis of the muscles supplied by the facial nerve. It usually affects only one side of the face and usually occurs in people older than 30 years. The disorder affects about 23 per 100,000 people and typically affects the right side of the face. The etiology of Bell palsy is controversial. It is believed to be caused by edema and ischemia that compresses the facial nerve. The herpes simplex type 1 and herpes zoster viruses are believed to be a cause ([Taylor and Zachariah, 2013](#)). Stress can be a factor also. Exposure to cold is a risk factor. Sometimes the disorder occurs during pregnancy, most often in the third trimester. **Signs and symptoms are numbness and partial or total paralysis of the facial muscles suddenly or over a few days.** There may be taste disturbances. The eyelid on the affected side loses its blink reflex and the mouth droops, causing problems with drooling.

Diagnosis is by history and exclusion of other neurologic or muscular disorders and Lyme disease. If the patient is asked to raise the eyebrows, the eyebrow on the affected side will not move.

When asked to smile, the face becomes distorted, because the affected side of the mouth and face will not move normally.

Treatment consists of closing and patching the eye if it loses the blink reflex. Artificial tear eyedrops also are used to prevent dryness of the cornea. Corticosteroids are given if they can be started right after the beginning of symptoms. They are ineffective if delayed more than 7 days. Acyclovir may be prescribed as well, because herpes virus may be a causative organism ([Taylor and Zachariah, 2013](#)). Recovery is individual; some patients with total paralysis may not achieve full recovery but will improve as inflammation declines. Between 80% and 90% of patients recover completely within 6 weeks to 3 months. Bell palsy recurs in 10% to 15% of patients.

Get Ready for the NCLEX® Examination!

Key Points

- Many conditions can cause a seizure. Epilepsy is a chronic condition in which abnormal electrical activity is triggered in the brain without an underlying metabolic cause.
- Seizures are classified as generalized or partial.
- Irreversible brain damage can occur if seizures are unrelenting and uncontrolled.
- Treatment of epilepsy is by drugs and/or surgery (see [Box 23-1](#)).
- Close observation of a seizure with documentation by is very helpful (see [Focused Assessment p. 527](#)).
- Patient education is extremely important for safety and for the prevention of recurrent seizures.
- A cerebrovascular accident is caused by a thrombus, embolus, or an intracranial hemorrhage that interrupts circulation to an area of the brain.
- Risk factors for stroke are high blood pressure, atherosclerosis, cigarette smoking, excessive alcohol intake, insufficient exercise, high cholesterol, obesity, and diabetes.
- t-PA is best given within 3 to 6 hours of the onset of symptoms to be effective for thrombotic stroke.
- Cerebral aneurysms and arteriovenous malformations may leak or burst and cause a stroke.
- Subarachnoid hemorrhage is a medical emergency.
- A thrombosis causes cerebral ischemia that progresses slowly; an embolus causes sudden neurologic deficits.
- Homonymous hemianopsia, hemiplegia or hemiparesis, agnosia, apraxia, aphasia, and dysphagia are some of the problems caused by a CVA.
- Fatigue and emotional lability with crying or outburst may be common after a stroke or other injury to the brain, depending on the area of the brain involved.
- Hydrocephalus may be a complication of several disorders of the brain; a shunt can be placed to divert the excess CSF to the peritoneal cavity (see [Figure 23-9](#)).
- Rehabilitation is extremely important for stroke patients and takes extensive work.
- Brain tumors may be benign or malignant; many are metastatic from a different malignant site (see [Table 23-2](#)).
- Brain tumors compress adjacent tissue, causing problems and increased ICP.
- Some common signs of brain tumors are personality change, disturbance in judgment and memory, loss of muscular strength and coordination, and difficulty speaking clearly. Headache, projectile vomiting, visual problems, and signs of increased ICP may be present.
- Depending on the site and type of brain tumor, treatment is by surgery, radiation, and/or chemotherapy. Viral and bacterial infections cause the inflammation of the membranes covering the brain and spinal cord in meningitis.
- Severe and persistent headache with nuchal rigidity are classic signs of meningitis, but a spinal tap is needed for diagnosis.
- Meningitis causes an increase in ICP.
- West Nile virus is a cause of encephalitis and is spread by mosquitoes.
- Encephalitis is most commonly the result of a viral infection or the toxins produced by viral organisms such as measles, chickenpox, and mumps.
- Stiff neck, photophobia, and lethargy are classic symptoms of encephalitis.
- Nursing care for encephalitis is geared toward the problems of seizures, high fever, and delirium resulting from altered LOC (see [Table 21-9](#)).
- A brain abscess can develop from a severe sinus, ear, tooth, or gum infection.
- Headaches are common, and approximately 23 million Americans get migraine headaches.
- Tracking triggers for migraine, avoiding them, and taking medication help prevent migraine attacks (see [Nutrition Considerations on p. 547](#)).

- Migraine may be preceded by an aura and most often causes pain on one side of the head.
- Cluster headaches cause severe pain and tend to be periodic in nature.
- Trigeminal neuralgia is a painful disorder affecting the fifth cranial nerve and the muscles of the face. Only one side of the face is usually affected.
- Bell palsy is believed to be caused by edema and ischemia that compress the facial nerve. It causes weakness or paralysis of the muscles supplied by the nerve.
- Numbness and partial or total paralysis of the facial muscles, usually on one side, occur with Bell palsy.
- Corticosteroids and acyclovir are the drugs used to treat Bell palsy.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• Online Resources

- American Speech-Language-Hearing Association (ASHA), www.asha.org
- American Stroke Association, www.strokeassociation.org
- Brain Tumor Center, <http://btc.mgh.harvard.edu>
- Meningitis Foundation of America, www.meningitisfoundationofamerica.org
- National Aphasia Association, www.aphasia.org
- National Brain Tumor Society, www.braintumor.org
- National Rehabilitation Information Center (NARIC), www.naric.com
- National Stroke Association, www.stroke.org
- Stroke Patient Education pamphlets,
http://www.strokeassociation.org/STROKEORG/Professionals/CommunityResourcesandPatientEd/Resource-Center—Posters-Handouts-More_UCM_463959_Article.jsp

Review Questions for the NCLEX® Examination

1. A nurse determines that the appropriate problem statement for a patient with status epilepticus would be Potential for injury due to seizure activity. An appropriate expected outcome would be:

1. everyone will stay calm during the episodes.
2. the caregiver will stay with the patient during the episodes.
3. the patient will be free from any injuries associated with the seizures.
4. standing orders will be obtained to medicate acute seizure episodes.

NCLEX Client Need: Safe and Effective Care Environment, Safety and Infection Control

2. Nursing care of a patient who **just** had a seizure includes which nursing intervention(s)? (*Select all that apply.*)

1. Assess for injuries.
2. Check the glucose level.

3. Reassure and reorient the patient.
4. Provide uninterrupted periods of sleep and rest.
5. Provide a 24-hour sitter.

NCLEX Client Need: Physiological Integrity, Basic Care

3. Which patient statement indicates a need for further teaching regarding the prevention of seizures?

1. "I need to avoid situations that could potentially trigger a seizure."
2. "Alcohol can lower the seizure threshold."
3. "I must avoid becoming overly fatigued and should pace activities."
4. "I am less likely to have seizures during menstruation."

NCLEX Client Need: Health Promotion and Maintenance

4. A man and his wife are sitting in their pajamas in the living room when the man cries out. He attempts to rise from his chair, but he falls when he discovers the left side of his body has become paralyzed. The left side of his mouth and his left eye are drooping. What should his wife do?

1. Help him stand and walk to the car. She can drive him to the hospital, because it is only 3 miles away. He will receive care more immediately than if the wife calls an ambulance.
2. Sit with him for an hour to see if his condition resolves. If it worsens, she should transport him to the hospital.
3. Call 911 immediately. The emergency team will be able to assess him, give supportive care, and transport.
4. Assess the man's pulse and breathing. If he is in no immediate cardiac distress the wife can help the husband change into street clothes before driving him to the hospital.

NCLEX Client Need: Safe and Effective Care Environment

5. Which are **true** regarding an ischemic stroke? (*Select all that apply.*)

1. The onset may evolve over a period of hours.
2. A fibrinolytic drug may be given.
3. Aspirin therapy may be started within 48 hours, but no earlier than 24 hours after receiving t-PA.
4. Increased intracranial pressure occurs immediately.
5. It may occur as a complication of atrial fibrillation.

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

6. A patient has had a cerebrovascular accident. The nurse assesses the patient's readiness for transfer to another level of care. The patient continues to have agnosia and apraxia. These clinical findings indicate that the patient would:

1. require assistance with undertaking activities of daily living.
2. demonstrate independence in performing ordinary tasks.
3. prompt self to complete sequential tasks.
4. not understand verbal communication.

NCLEX Client Need: Physiological Integrity, Physiological Adaptation

7. Intracranial tumors may be treated by several modes of therapy. What types of therapy are you likely to see? (*Select all that apply.*)

1. Insertion of tiny radioactive particles into the tumor through an implanted catheter
2. High oral doses of iron for 5 days, followed by a selenium infusion
3. Brain surgery where most or all of the tumor is removed
4. Chemotherapy through a reservoir that is placed between the scalp and the skull to get past the blood-brain barrier

NCLEX Client Need: Physiological Integrity, Physiological Adaptation

8. A 21-year-old man complains of a sudden onset of fever, severe headache, and stiffness of the neck. The nurse notes a petechial rash over the chest and extremities. Which nursing action(s)

would be appropriate? (*Select all that apply.*)

1. Institute Standard Precautions and droplet precautions.
2. Administer antibiotics as prescribed.
3. Maintain a quiet and dimly lit patient room.
4. Encourage active range-of-motion exercises.
5. Administer narcotic analgesics for headache and neck pain.

NCLEX Client Need: Physiological Integrity, Basic Care

9. A patient is admitted to the urgent care center for complaints of an abrupt onset of severe headache. Clinical history indicates that symptoms started during sleep and recurred several times during the day. These symptoms suggest:

1. brain tumor.
2. migraine.
3. cluster headaches.
4. tension headaches.

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

10. The nurse providing care to a 60-year-old patient with trigeminal neuralgia identifies that pain is the priority problem. The nurse anticipates:

1. assessing the level of pain based on facial expressions.
2. administering an anticonvulsant class of medication.
3. placing warm cloths on the face.
4. preparing the patient for surgery.

NCLEX Client Need: Physiological Integrity, Basic Care

Critical Thinking Questions

Scenario A

Jack Thompson, age 36 years, had a seizure while walking down the hall at work. He fell to the ground and demonstrated jerking motions of his body.

1. What type of seizure is this most likely to be?
2. What observations should be made if he has another seizure?
3. How would you care for Mr. Thompson after the seizure is over?
4. If Mr. Thompson is diagnosed with epilepsy, what patient teaching will he need?

Scenario B

Part I

Bob Foster is a 77-year-old retired teacher who complained of a severe headache during dinner and then slumped over the table, unconscious. He was rushed to the hospital, and a tentative diagnosis of CVA was made.

1. What diagnostic tests might be appropriate for Mr. Foster?
2. What emergency care could you have given Mr. Foster if you had been present at dinner?

Part II

Mr. Foster's diagnostic tests indicate a subarachnoid hemorrhage from a ruptured aneurysm. He is comatose; his pupils are equal and reactive to light; and he responds to pain with decorticate posturing, opens his eyes at random, and seems to be paralyzed on the right side.

1. What are the priorities of care for Mr. Foster?
2. If Mr. Foster survives, what potential complications might he experience if he has had an intracerebral hemorrhage?

Scenario C

Janice Pringle, age 19 years, has been experiencing headaches more frequently over the past 6 months. She comes to the student health center on her college campus to seek help. This headache is really bad and she is nauseated.

1. What subjective and objective assessment data would you gather regarding this young lady and her headaches?
2. What are your priorities of care for Janice?
3. What interventions would you suggest at this time?

CHAPTER 24

Care of Patients With Peripheral Nerve and Degenerative Neurologic Disorders

Objectives

Theory

1. Compare and contrast the pathophysiology of Parkinson disease and myasthenia gravis.
2. Examine treatments for Parkinson disease.
3. Discuss the nursing care needed for a patient with Parkinson disease.
4. Explain why multiple sclerosis might be difficult to diagnose.
5. Illustrate the differences between Huntington disease and amyotrophic lateral sclerosis.
6. Recognize the signs and symptoms of myasthenia gravis.
7. Compare and contrast the complications of Parkinson disease with those of myasthenia gravis.

Clinical Practice

8. Teach a newly diagnosed patient about the medications for Parkinson disease.
9. Teach a patient about the diagnostic tests that might be ordered if multiple sclerosis is suspected.
10. Write a nursing care plan for a patient with myasthenia gravis who is hospitalized with a respiratory infection.
11. Summarize a home care plan for a patient with multiple sclerosis.
12. Choose a nursing care plan for a patient with Guillain-Barré syndrome.

KEY TERMS

bradykinesia (brā-dē-kī-NĒ-zē-ă, p. 554)

chorea (kă-RĒ-ă, p. 565)

demyelination (dē-MĒ-ĕ-lĕ-nā-shūn, p. 560)

diplopia (dī-PLŌ-pē-ă, p. 565)

hyperesthesia (hī-pĕr-ĕs-THĒ-zē-ă, p. 563)

Parkinson Disease

Parkinson disease (PD) is named after James Parkinson, who first described the syndrome in 1871. PD is considered a major health problem because of its crippling effects. It is a progressive disorder, beginning rapidly at first and then advancing more slowly. It affects more men than women and occurs most commonly after age 60 years. Approximately 5 million people in the world are affected with PD, and about 50,000 people in the United States are diagnosed with PD each year.

Etiology

The specific cause of PD is unknown, but it involves degeneration of the dopamine-producing neurons in the substantia nigra of the midbrain and the presence of Lewy bodies (cytoplasmic inclusions). Genetic susceptibility and environmental toxins appear to play a role. A history of head trauma increases risk (Jankovic, 2014). The most common type of PD is **idiopathic**—that is, the primary or specific cause is not known. Secondary PD can be drug induced, especially by reserpine-type antihypertensives such as methyldopa, phenothiazines, some tranquilizers such as the butyrophenones (e.g., haloperidol [Haldol]), some antiemetics, methamphetamine, and a few other drugs. These drugs block the uptake of dopamine at the receptors in the brain cells, and so may induce PD symptoms. Pesticide and herbicide exposure is largely implicated as a cause of PD.

Pathophysiology

PD affects the extrapyramidal system, in particular the motor structures in the basal ganglia. This is the part of the brain that controls balance and coordination. The basal ganglia are gray matter that is scattered throughout the white matter of the cerebrum beneath the cerebral cortex. Stimulation of the basal ganglia causes muscle tone in the body to be inhibited and allows refined voluntary movements. Two neurotransmitters accomplish this action: dopamine and acetylcholine (ACh) (see Table 21-4 for the action of the common neurotransmitters). ACh-producing neurons transmit excitatory messages throughout the basal ganglia. Dopamine inhibits the function of these neurons to allow for control of voluntary movement (Figure 24-1). There is usually a balance between these neurotransmitters. The degenerative changes in the basal ganglia that occur in PD lead to a decrease in dopamine. The ACh-secreting neurons remain active, creating an imbalance between excitatory and inhibitory neuronal activity. The excessive excitation of neurons prevents a person from controlling or initiating voluntary movements.

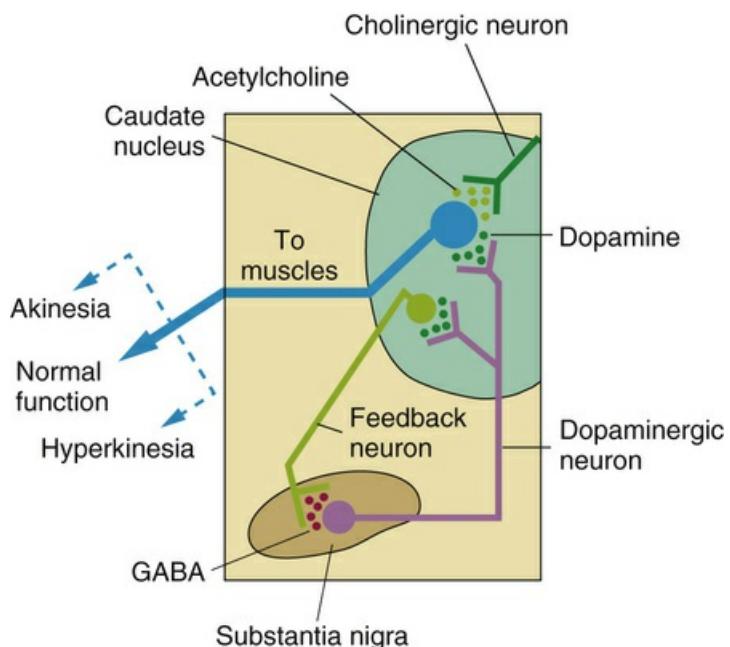


FIGURE 24-1 Dopaminergic synaptic activity is mediated by dopamine. Cholinergic synaptic activity is mediated by acetylcholine. A balance between the two kinds of synaptic activity produces normal motor function. A relative excess of cholinergic activity produces akinesia and rigidity. A relative excess of dopaminergic activity produces involuntary movements. GABA, Gamma-aminobutyric acid. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 8, St. Louis, 2011, Mosby.)

Signs and Symptoms

The onset of PD is gradual and may involve only one side of the body initially. A triad of symptoms is characteristic of PD: tremor, bradykinesia, and rigidity. The first, *tremor*, occurs when the body is at rest, decreases when there is voluntary movement, and is absent when the patient is asleep. The tremor is most often a “pill-rolling” motion of the thumb against the fingers (a circular rubbing of a finger or two as if rolling a piece of string or fuzz into a “pill”). When the patient experiences stress and emotional tension, the tremor becomes more pronounced.

Bradykinesia (a condition that causes slow movement and speech) produces poor body balance, a characteristic gait, and difficulty initiating movement. The gait is shuffling, with short steps that become quicker (Figure 24-2). There is decreased swinging of the arms when walking. A foot may drag or may be stiff, producing a limp. Earlier in the disease process, the patient may lean slightly to one side, propel forward uncontrollably, or fall backward. In advanced stages there is a stiff, bent-forward posture when walking.

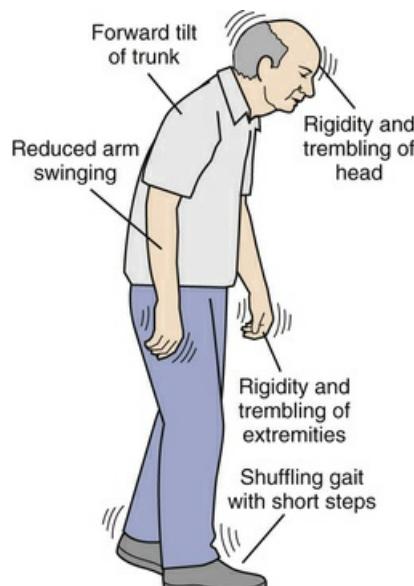


FIGURE 24-2 Parkinson disease causes abnormalities of movement. Movements are jerky in nature.

The third symptom is **rigidity** affecting the skeletal muscles and contributing to postural changes and difficulty in movement. Postural changes affect coordination and balance. The face becomes blank or masklike in appearance with little or no expression. Speech becomes low in tone, monotonous sounding, and slow; enunciation becomes difficult because of the decreased dopamine and the excitatory response from the increased ACh. Drooling may occur. The patient may experience decreased tearing, constipation, incontinence, excessive perspiration, heat intolerance, and decreased sexual ability. PD does not usually affect intellect; however, a percentage of patients do develop a dementia similar to that of Alzheimer disease. Mood disturbance does occur, and depression is a problem. Stress tends to make symptoms worse.

Think Critically

A patient comes into the clinic complaining about hand tremors and “stiffness” of the joints that started recently, excessive sweating, and some urinary incontinence. You notice that his gait is

abnormal. What would be a priority question you would ask him as you start history taking?

Diagnosis

The characteristic symptoms of the disease are used to diagnose the disorder. Laboratory tests usually reveal findings within normal ranges. However, magnetic resonance imaging (MRI) scans of the brain may be performed to rule out other neurologic disorders. Single-photon emission computed tomography (SPECT) can display the reduced uptake of dopamine (Figure 24-3).

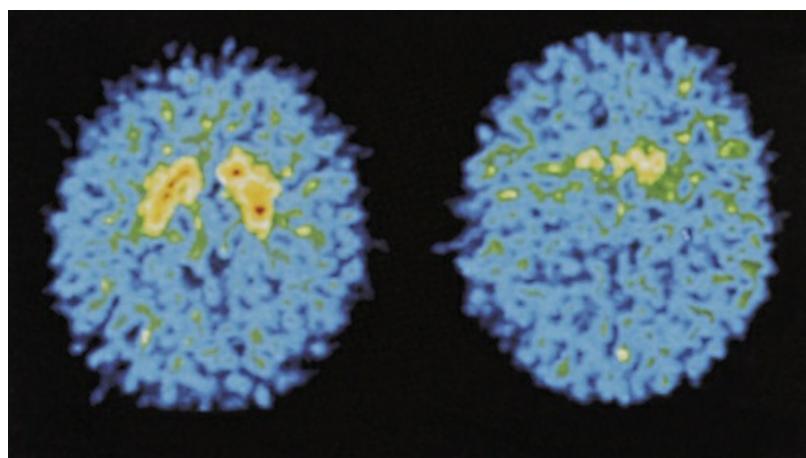


FIGURE 24-3 Positron emission tomography scan showing reduced uptake of dopamine in a patient with Parkinson disease. (From Perkin DG: *Mosby's color atlas and text of neurology*, St. Louis, 2002, Mosby.)

Treatment

Treatment of PD usually includes drug therapy, physical therapy, and considerable emotional support. Currently, medications for PD all involve controlling levels of dopamine. Drug therapy aims to provide dopamine to the basal ganglia and thus reduce symptoms. Anticholinergics, dopamine agonists, and monoamine oxidase inhibitor (MAOI) drugs are used to control symptoms. MAOIs block the metabolism of dopamine, leaving more dopamine in circulation. Deep brain stimulation (DBS) is a surgical procedure used to treat many of the neurologic debilitating symptoms associated with PD ([National Institute of Neurological Disorders and Stroke \[NINDS\], 2014](#)). This procedure does not destroy tissue (as did previous PD surgeries) but serves to block transmission from certain targeted brain areas. Successful treatment usually involves a combination of these therapies.

Safety Alert

Caution When Administering Monoamine Oxidase Inhibitors

When a patient with PD has been prescribed selegiline (an MAOI), caution him against eating foods containing tyramine, such as aged cheeses, anything fermented, smoked fish or meat, yeast extract, some imported beers, Chianti wine, dietary protein supplements, and soy sauce. Administering meperidine to someone taking an MAOI can cause **hyperpyrexia** (excessive elevation of temperature) and possible death. Many drugs interact adversely with MAOIs, and the health care provider or pharmacist should be consulted before a patient takes any other drug with an MAOI.

In the early stages of the disease when disability is not evident, selegiline (Eldepryl), a drug that increases dopamine's action, may be given. When disability is present, L-dihydroxyphenylalanine (L-dopa, or levodopa) or a combination of levodopa and carbidopa (Sinemet) is given. Sinemet is given in increasing doses until control of the symptoms is achieved; however, side effects can be

troublesome (Box 24-1). Various drugs are used either alone or in combination with L-dopa (Table 24-1).

□ Complementary and Alternative Therapies

Supplements Helpful for Parkinson Disease

Nutritional supplements that help slow the progression of PD include the enzyme NADH (nicotinamide adenine dinucleotide, 10 mg); coenzyme Q-10 (100 to 200 mg); phosphatidylserine (200 to 300 mg); and the antioxidants ester-C (1000 mg twice a day), vitamin E as mixed tocopherols (400 mg), and alpha-lipoic acid (100 mg twice a day). Health care providers sometimes prescribe these supplements in addition to the treatment medications.

❑ Think Critically

What would be appropriate nursing interventions for a patient who is beginning to experience dysphagia?

Box 24-1

Nursing Implications for Drugs Commonly Used for Parkinson Disease

When Giving a Drug for Parkinson Disease

- Pay close attention to dosage amount, because therapy is individualized to each patient.
- Check other medications patient is receiving for potential interactions with the antiparkinsonian drug, contraindicating administration of the drug.
- Administer the drugs as close to the time ordered as possible to maintain a consistent blood level of each drug.
- Carbidopa-levodopa may cause many neurologic disturbances, including psychiatric problems; discuss any onset of new symptoms that occur with the provider.
- Administer anticholinergic medications with meals to decrease gastrointestinal irritation.
- Selegiline may increase the side effects of carbidopa-levodopa. If this occurs, seek an order to decrease the dosage.
- Monitor for effectiveness of each drug by observing for a decrease in symptoms, such as tremor, rigidity, or drooling; assess for decrease in side effects of carbidopa-levodopa when anticholinergic drugs are given for that purpose.
- Continually assess the patient for worsening of symptoms that may result from disease progression, side effects of medication, or failure of medication.

Regarding Possible Side/Adverse Effects of the Drug

- Monitor patients taking carbidopa-levodopa, amantadine, bromocriptine, or pergolide for orthostatic hypotension and urinary retention.
- Assess patients who are taking carbidopa-levodopa for excessive or inappropriate sexual behavior.
- Bromocriptine may cause changes in mental status; report observed changes.
- Amantadine and pergolide may cause insomnia and should not be administered at bedtime.

- Many of these drugs can cause nausea, dyspepsia, and abdominal pain.
- Anticholinergics are contraindicated in patients with acute narrow-angle glaucoma.
- Anticholinergics cause dry mouth and constipation; increase fluids to 3000 mL/day; treat constipation as needed per orders; add fiber to diet.
- Monitor blood pressure and pulse during initiation and adjustment of anticholinergic medication; report tachycardia.
- Consult pharmacology book or drug insert for specific side effects of each particular drug.

Teaching for Patients Taking Antiparkinsonian Drugs

- Selegiline may cause dizziness; warn patient to move cautiously during initiation of therapy.
- Orthostatic hypotension causes dizziness and can precipitate falls; it is important for the patient to allow the blood pressure to stabilize in a sitting position before standing, to rise slowly, and to ensure balance while holding on to something when standing before walking.
- Carbidopa-levodopa will turn the urine dark.
- Ropinirole (Requip) may cause drowsiness; advise patient not to operate machinery or drive until adjusted to the drug.
- When taking a catechol-O-methyltransferase (COMT) inhibitor, it is important to have liver function checked regularly.
- Constipation is a problem with the anticholinergic drugs; increases in dietary fiber, plenty of fluid, and exercise can help control constipation; bowel movement frequency should be monitored to prevent impaction.
- Adjustment of dosages and combination of medications that will control symptoms with the fewest side effects may take weeks or months to accomplish.

Table 24-1
Drugs Commonly Used for Patients With Parkinson Disease

DRUG CLASSIFICATION	USE
Antiparkinsonian/Adrenergic	
Levodopa (L-dopa)	Decrease presence of tremor, rigidity, and bradykinesia and improve motor function
Levodopa-carbidopa (Sinemet)	
Bromocriptine mesylate (Parlodel)	
Pergolide (Permax)	
Pramipexole (Mirapex)	
Ropinirole (Requip)	
Apomorphine (Apokyn)	
Antiviral	
Amanitadine (Symmetrel)	Decreases presence of rigidity, bradykinesia
Anticholinergic	
Trihexyphenidyl (Artane)	Decrease tremor
Biperiden (Akineton)	
Benztropine (Cogentin)	
Monamine Oxidase Inhibitor (MAOI)	
Selegiline (Eldepryl, Carbex)	Decrease presence of tremor, rigidity, and bradykinesia and improve motor function
Monamine Oxidase Inhibitor B (MAOI-B)	
Rasagiline (Azilect)	Blocks breakdown of dopamine; initial monotherapy or as adjunctive therapy to levodopa
Catechol-O-Methyltransferase (COMT) Inhibitor	
Tolcapone (Tasmar)	Slow the breakdown of dopamine, thereby prolonging the action of levodopa
Entacapone (Comtan)	

Surgical Treatment

Stereotactic neurosurgery may be performed if the drug therapy fails to relieve a patient's PD symptoms. In one such procedure the area in the thalamus that is causing the involuntary movements is destroyed. Microsurgical procedures such as pallidotomy improve rigidity and bradykinesia ([WebMD, 2010](#)).

DBS uses electrode implants to provide electrical shocks that control tremors by blocking them. The device that delivers the shocks can be adjusted as the patient's symptoms change or worsen

(Hauser, 2014). There has been considerable success with DBS, but it is expensive: approximately \$10,000 for the implant unit and another \$8000 every few years for battery replacement. However, it has become the treatment of choice because it does not destroy brain tissue and it is reversible (Hauser, 2014).

Depression is common among patients with PD, but most respond well to a selective serotonin reuptake inhibitor (SSRI) antidepressant.

Complications

Dysphagia may develop, and mobility becomes severely limited as the disease progresses. Problems of immobility occur (see Chapter 9). Constipation, urinary incontinence, and insomnia are also common.

❖Nursing Management

■ Assessment (Data Collection) and Nursing Diagnosis

A thorough history is gathered and a physical examination is performed for patients who have or are suspected to have PD. [Nursing Care Plan 24-1](#) contains the common problem statements/nursing diagnoses, expected outcomes, and specific interventions for a patient with PD.

☒ Focused Assessment

Data Collection for a Patient With Symptoms of PD

Gather data regarding history by asking the following questions:

- Have you ever had a head injury, meningitis, encephalitis, or cerebrovascular disorder?
- Have you ever been exposed to metals, pesticides, or carbon monoxide for extended periods?
- What medications do you take? (Particularly important are major tranquilizers such as haloperidol [Haldol], phenothiazines, reserpine, methyldopa, and amphetamines.)
- Do you have a problem with fatigue?
- Have you noticed excessive salivation and problems handling secretions?
- Do you have any trouble swallowing?
- Have you been steadily losing weight?
- Do you experience constipation or urinary incontinence?
- Do you sweat excessively?
- Do you have difficulty initiating walking or other movements? Do you fall frequently?
- Has your dexterity decreased? Has your handwriting deteriorated?
- Do you have insomnia?
- Do you experience pain or cramping?
- Do you have mood swings? Are you depressed? Do you have hallucinations?

Points to cover in physical examination:

- Presence of drooling

- Ability to swallow
- Facial expression or lack thereof
- Presence of ankle edema
- Evidence of postural hypotension
- Presence of tremor at rest; pill-rolling movements
- Rigidity of body and jerky movements of extremities
- Slow start, then quick short steps when ambulating; shuffling gait with bent-forward posture
- Difficulty stopping once ambulating

Assignment Considerations

Feeding a Dysphagic Patient

UAP should not be assigned to feed dysphagic patients if at all possible. If an aide must be used to help feed a patient with dysphagia, be certain that suction is turned on and at hand and that the aide has been trained in helping a dysphagic patient to eat. Remind the UAP that the patient should be positioned as upright as possible, to give small bites, to wait for that bite to be swallowed before offering another one, and not to rush the patient. Coaching the patient to drop the chin when swallowing helps prevent choking.

Nursing Care Plan 24-1

Care of a Patient With Parkinson Disease

Scenario

Henry Merkel, a 63-year-old man, is admitted to your unit because of increasing incidence of falling. He is diagnosed with Parkinson disease. He is beginning to have trouble swallowing and his speech has slowed. He has a tremor in his left hand and upper extremity.

Problem Statement/Nursing Diagnosis

Altered nutrition/*Inadequate nutrition due to dysphagia.*

Supporting Assessment Data

Subjective: "I can't chew and swallow very well."

Objective: Difficulty chewing; difficulty getting food to go down.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not aspirate food.	Monitor swallowing during drug administration and meals to assess degree of swallowing difficulty.	Allows assessment of swallowing ability.	Swallowing pills one by one without problem. No choking or difficulty during meal as long as eats slowly.
	Keep suction equipment at hand to remove pooled secretions and prevent aspiration; turn on before meal.	Readies suction and allows removal of secretions.	Suction on and at hand during meals.
	Maintain upright position for drug administration and meals.	Gravity helps food go down to the stomach and helps prevent aspiration.	Sitting fully upright for medications and meals.
	Provide semisoft foods and thickened liquids for diet.	Semisoft foods and thickened liquids are easier to swallow.	Has a semisoft diet. Thickener used for liquids.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to abnormal posture, rigidity, bradykinesia, and difficulty in initiating movements.*

Supporting Assessment Data

Subjective: "I seem to have trouble with balance. I've fallen four times this month."

Objective: Rigidity of joints, jerky movements, shuffling gait, stooped posture.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will ambulate safely. Patient will maintain joint mobility and muscle strength.	Physical therapist to work with patient on joint mobility, muscle strengthening, and ambulation.	Physical therapy helps to decrease rigidity and muscle weakness.	Physical therapist is working with the patient. Patient is performing prescribed exercises with spouse's help.
	Administer antiparkinsonian medication as ordered. Monitor for side effects and effectiveness of medication.	Decreases tremor, rigidity, and bradykinesia.	Receiving ordered medications with no signs of side effects as yet. Rigidity slightly improved.
	Provide cane or walker if necessary.	Assistive device promotes safety.	Using walker when ambulating.
	Teach to perform active ROM exercises bid.	Techniques improve gait and movement.	Performing ROM exercises bid.
	Teach to walk as if over an imaginary line and to rock back and forth to initiate movement.		Physical therapist is coaching the patient in how to walk.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to eating difficulties and inadequate food intake.*

Supporting Assessment Data

Subjective: "I haven't had much appetite lately and I've choked on food a few times."

Objective: Slight drooling, weight down 4 lb this month.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not aspirate food.	Obtain consultation with speech therapist for swallowing studies.	Detects dysphagia.	Consultation with the speech therapist is ordered.
	Reinforce teaching regarding methods to be used for swallowing.	Various maneuvers can assist with correct swallowing and prevent choking.	Teaching plan is in place and teaching is ongoing.
	Obtain consultation with dietitian.	Assists with nutritional problems.	Dietitian will come tomorrow.
	Offer six small meals per day.		Offering between-meal small snacks.
	Serve hot meals on warming tray and do not rush patient with eating.	Keeps food warm while patient rests during meal.	Reheating food as needed during meal.
	Offer nutritional supplements between meals if needed.	Increases caloric intake.	Taking a protein shake in the afternoon.
	Administer anticholinergic medication as ordered.	Decreases drooling.	Medication is showing effect in decreased drooling.
	Monitor for side effects and effectiveness of medication; observe for urinary retention.	Identifies side effects patient experiences.	No urinary retention or other side effect as yet.
	Increase fiber intake and increase fluids to 3000 mL/day to prevent constipation.		Drank 2800 mL today. Fiber in diet increased.

Critical Thinking Questions

1. What are the side effects of Sinemet?
2. What would you suggest be done around the house to help prevent falls?

bid, Twice daily; *ROM*, range-of-motion.

■ Planning, Implementation, and Evaluation

Nursing care focuses on preventing complications of PD, drug therapy, enhancing voluntary movement, and safety. Constipation is a problem and requires the addition of fiber to the diet and an increase in fluids to at least 3000 mL per 24 hours. Grasping coins or other objects may help decrease tremors, because it is an intentional action. Walking may be improved by having the patient think about imaginary lines across the pathway on which to walk. Imagining stepping over something helps prevent "freezing" when walking. Teach the patient to consciously assume correct posture. Not using a pillow when resting helps prevent flexion of the spine. Learning to sleep prone also is beneficial for posture correction. The physical therapist will institute an exercise program to help the patient maintain muscle function and promote joint mobility.

Remember that patients with PD need extra time to finish tasks. A warming tray can be used to keep food hot during meals so that the patient can take rest periods while eating. Considerable patience and understanding are necessary to help the patient deal with the frustration of deteriorating body control and inability to do things that he formerly could easily do. Degeneration of cognitive skills occurs in the late stages of PD.

Falls are common, and safety is a major factor. Using a cane or walker will increase stability and decrease the incidence of falls. Leg braces or foot braces may help to maintain balance. Loose carpets should be removed from the home. Grab bars should be installed in the shower and tub; a raised toilet seat should also be installed. Patients with tremor must be cautioned against carrying

hot liquids, because spills may cause burns. [Chapter 21](#) discusses measures to help with the problems typical of many neurologic disorders. Patient and family teaching is an important part of nursing care for patients with PD.

Patient Teaching

Patients With Parkinson Disease

Patients may benefit greatly from tips on how to cope with the illness. Be sure to keep individual teaching sessions to a minimum to avoid fatigue.

Aids for Daily Living

- Using adjustable tables may help reduce arm fatigue and increase comfort by providing increased support and stabilizing the arms.
- Reacher bars may be helpful in pulling items off of shelves.
- Household chores such as folding laundry may provide gentle exercise.
- Music can provide relaxation, or motivation for exercise.

Healthy Eating

- Take an adequate amount of time to be able to eat comfortably and without rushing.
- Eating foods high in fiber and getting adequate fluids can prevent problems with constipation.

To Prevent Drooling or Salivating

- Sit upright when eating.
- Close your lips and keep your chin up.
- Swallow often.
- Use a straw when drinking to strengthen the muscles of the lips, mouth, and throat.

Writing Tips

- Use big strokes when writing and use lined paper.
- Use a larger pen or marker and change writing position often.
- Try changing to a different pen if your hand tires.

Balance

- Change positions slowly.
- When turning around, do not pivot. Move forward and slowly walk in a circle.
- A sturdy, single cane with a wide rubber tip may help maintain balance.

Exercise

- Avoid moving quickly.
- Avoid moving in a backward direction.
- Be aware of shuffling: stop and check that your posture is upright before continuing.

- Look ahead, not down.

Evaluation includes gathering data about the results of the interventions implemented. Next, determine whether the expected outcomes are being met. If progress toward the outcomes is not occurring, revise the care plan.

Multiple Sclerosis

Etiology

Multiple sclerosis (MS) is a chronic inflammatory disease that causes demyelination in the central nervous system (CNS). The most common type of MS is characterized by periods of remission and exacerbation. Another type is progressive without remission periods. The cause of MS is not known, but it is believed that an environmental factor (bacteria, virus, or chemical) combined with a genetic predisposition for the disease is responsible. MS is considered to be an autoimmune disease, in which the immune system attacks healthy CNS tissue.

There are four clinical progressions of MS (Table 24-2). There is no cure. The disease is most common in people of northern European ancestry. It affects females two to three times more frequently than males. Symptoms typically appear between 15 and 50 years of age but can occur at any age. A genetic factor can be involved; the disease is sometimes seen in more than one family member. It is estimated that there are more than 400,000 people with MS in the United States and 2.3 million around the world (Pietrangelo & Higuera, 2015).

Table 24-2
The Four Clinical Progressions of Multiple Sclerosis

TYPE OF PROGRESSION	CHARACTERISTICS AND CLINICAL COURSE
Relapsing-remitting (most common type)	Clearly defined relapses of acute worsening neurologic function. Partial or complete recovery occurs in remission period.
Primary progressive	Slow but almost continuous worsening, with occasional plateaus and temporary minor improvements.
Secondary progressive	Initial period of relapsing-remitting disease followed by a steadily worsening course. May or may not have occasional relapses, minor remissions, or plateaus.
Relapsing-progressive	Disease steadily worsens from onset, but there are clear acute relapses with or without recovery. Disease progresses between relapses.

Pathophysiology

Lymphocytes and macrophages infiltrate the central nervous system; immunoglobulin G (IgG) levels increase in the cerebrospinal fluid (CSF), indicating a humoral response with B-cell activation. T cells become reactive to a single myelin protein. Myelin is a protective sheath that insulates axons and assists impulse transmission. Axons transmit electrical impulses from one neuron to the next. In patients with MS, plaques form along the myelin sheath, causing inflammation. When myelin is eroded by inflammation and replaced by scar tissue (**demyelination**), nerve impulses cannot travel along the damaged neurons (Figure 24-4). Thus the muscles served by the affected nerves do not receive the impulses they need to perform in a well-coordinated and useful manner. When inflammation subsides, some remyelination occurs, but it is often incomplete, and nerve transmission is not normal.

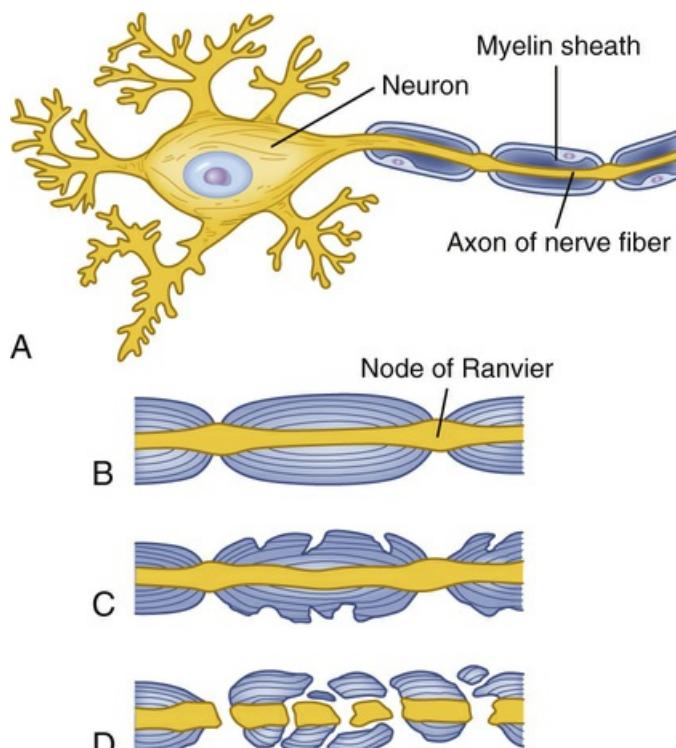


FIGURE 24-4 Effects of multiple sclerosis. **A**, Normal nerve cell with myelin sheath. **B**, Normal axon. **C**, Myelin breakdown. **D**, Myelin totally disrupted; axon not functioning. (From Lewis SL, Dirksen SR, Heitkemper MM, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Signs and Symptoms

Clinical signs and symptoms reflect the pathologic changes that occur as a result of inflammation and subsequent scarring of myelin covering the nerves. MS typically follows a course of unpredictable flare-ups that are followed by periods of partial or complete remission. The very nature of the disease affects a patient's life in terms of ability to make a living, maintain satisfying interpersonal relationships with family and friends, and maintain a positive self-image.

Because the disease can affect any CNS tissue, symptoms can be unpredictable and vary from person to person. The more common manifestations of MS are as follows:

- *Motor dysfunction* can include weakness or paralysis of limbs, trunk, and neck; diplopia caused by oculomotor weakness; and spasticity of the muscles.
- *Sensory dysfunction* may include numbness, tingling, burning, and painful sensations; patchy or total blindness or blurring of vision in one or both eyes; dizziness; ringing in the ears; and hearing loss.
- *Problems of coordination* include ataxia (unsteady gait), intention tremor of limbs and eyes, slurring of speech, and dysphagia (difficulty swallowing).
- *Mental changes* usually are limited to depression and cognitive problems such as impaired judgment, decreased ability to solve problems, and memory loss, which occur late in the disease.
- *Fatigue* is a characteristic of MS and often is worsened by heat (e.g., a hot shower, hot weather, or high humidity may induce or worsen symptoms).
- Other problems that occur late in the disease are related to urinary and bowel incontinence and altered sexual function: loss of male and female self-esteem, physical impotence in men, and diminished sensation in women.

The neuromuscular dysfunctions characteristic of MS are unique to each person and can vary greatly from time to time in the same person. Symptoms may disappear for a while.

Diagnosis

No laboratory test will definitively establish a diagnosis of MS, although most patients have elevated IgG levels in their CSF and oligoclonal bands (bands of IgG produced by electrophoresis of the CSF). An MRI study usually shows characteristic white matter lesions scattered through the spinal cord and/or brain, which confirms the diagnosis of MS. However, the clinical signs and symptoms presented by a patient usually are sufficiently characteristic of the disorder to allow the neurologist to make a diagnosis that the patient possibly or probably has MS. The clinical manifestations of the disease reflect the extent to which inflammation and scarring of the myelin have occurred (Figure 24-5). Diagnosis may take several years, occurring only after a second attack.

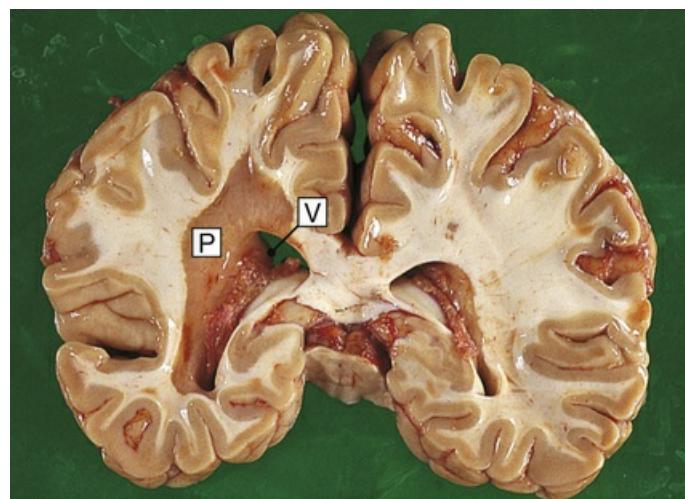


FIGURE 24-5 Chronic multiple sclerosis. Demyelination plaque (*P*) at gray matter–white matter junction and adjacent partially remyelinated shadow plaque (*V*). (From Stevens A, Lowe J: *Pathology: Illustrated review in color*, ed. 2, London, 2000, Mosby.)

Treatment

There has been an enormous amount of success with treatment from biologic response modifier drugs, such as interferon beta-1b (Betaseron), which is effective for many ambulatory patients with relapsing-remitting MS. It is given by injection. It reduces MS attacks by one third and decreases the number of severe attacks. Disease-modifying drugs are very expensive and are used to prevent relapses. Acute attacks are treated with intravenous (IV) methylprednisolone for 5 days, followed by oral prednisone in tapering doses. Adrenocorticotropic hormone (ACTH) may be given for its ability to suppress immune system activity. Most therapeutic efforts are centered on supportive measures to maintain resistance to infection; reduce muscle spasticity; and manage specific symptoms, such as diplopia, speech disorders, muscle weakness, fatigue, and depression. The drug regimen is geared to each patient's symptoms. CNS stimulants may be prescribed to combat fatigue. Sometimes the antiparkinsonian drug amantadine (Symmetrel) is used for fatigue.

The following 10 medications have been approved by the Food and Drug Administration (FDA) for use in MS:

- Aubagio (teriflunomide)
- Avonex (interferon beta-1a)
- Betaseron (interferon beta-1b)
- Copaxone (glatiramer acetate)
- Extavia (interferon beta-1b)
- Gilenya (fingolimod)
- Novantrone (mitoxantrone)
- Rebif (interferon beta-1a)
- Tecfidera (dimethyl fumarate)
- Tysabri (natalizumab)

An exercise program is very beneficial for patients with MS to relieve spasticity and improve coordination (Harmon, 2011). Swimming provides considerable benefits, because exercising in water is less fatiguing than exercising out of water. Because of fatigue, it is often difficult to convince patients with MS to exercise.

In addition, the patient should be provided the support and physical and psychological means necessary to develop a positive and hopeful outlook. There is an understandable tendency to become depressed and pessimistic about the future when confronted with the realities of muscle weakness, incontinence, sexual impotence, and any combination of disabilities likely to be experienced during the course of MS. Antidepressants may be helpful. Disease-modifying agents can reduce disease activity, frequency of relapses, and possibly progression of multiple sclerosis.

Nursing Management

Assessment (Data Collection), Nursing Diagnosis, and Planning

A careful history can provide many clues to the possibility that the patient has MS. Testing extremity strength, looking for visual problems, and checking reflexes are part of the physical examination.

Problem statements are based on the assessment findings and may include:

- Fatigue due to improper transmission of neural impulses.
- Altered physical mobility due to muscle weakness, spasticity, or paresthesias (tingling or numbness).
- Altered self-care ability due to muscle spasticity and neuromuscular deficits.
- Altered urinary function due to sensory motor deficits.
- Altered sexual function due to neuromuscular deficits.
- Potential for altered skin integrity due to immobility.
- Altered family coping due to potential financial problems, changing roles, and fluctuating physical abilities.
- Decreased self-esteem due to loss of usual abilities and roles.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected outcomes are written for each problem statement/nursing diagnosis specific to the individual's problems.

Implementation and Evaluation

Appropriate care for a patient with MS depends on the severity of the disease and the symptoms. Care is individualized for each patient. During the diagnostic phase, the patient and family need a great deal of emotional support as they realize there is no cure.

Ongoing care by an interdisciplinary team focuses on safety, prevention of complications, assistance with physical therapy, and emotional support. The patient should not be exposed to excessive heat or hot baths, which cause weakness to become much worse (Harmon, 2011). Care of the common problems of neurologic patients is covered in Chapter 21. The importance of proper nutrition with adequate fluids and fiber in the diet should be stressed to maintain proper bowel function and decrease the likelihood of urinary tract infections. Calcium and vitamin D should be included in the diet to help prevent osteoporosis that may result from the IV steroid treatments. Medications to decrease stomach acid and prevent ulceration from the steroids may be administered (histamine H_2 -receptor blockers or proton pump inhibitors).

Help the patient and family establish a consistent daily routine that will promote optimum levels of functioning for the patient. The routine should include daily physical exercise balanced by rest periods to prevent fatigue. Patient teaching involves:

- Education about the unpredictability of the disease and the need to prevent stress, infections, and fatigue to maintain independence as long as possible.
- Referral to the National Multiple Sclerosis Society and local support groups. (Additional information and local sources of help for the patient with MS and the family can be obtained at www.nationalmssociety.org or by writing to the National Multiple Sclerosis Society, 733 Third Avenue, 3rd Floor, New York, NY, 10017.)

Evaluation of care is based on whether the expected outcomes are being achieved. If they are not, the plan is revised.

Alzheimer Disease

Alzheimer disease, a form of dementia caused by pathologic changes in the brain tissue of the patient, is covered in [Chapter 47](#). Diagnosis is by history and examination, because the specific diagnostic changes can be detected only at autopsy. The cause of Alzheimer disease is unknown, and considerable research is in progress to better define this disease. Much of this research centers around ways to decrease A β protein in the brain ([Crystal, 2015](#)). Other research seeks to restore memory function by reducing plaque that has formed in the brain. In one recent study on mice, 75% had restored memory function when treated with a noninvasive ultrasound technique. Human trials are expected to be under way by 2017 ([Sciencealert, 2015](#)). Alzheimer disease can occur during middle age or during the later decades of life and causes devastation to the patient and family. The disease has a slow onset, progresses at varying rates of speed through several stages, and is eventually fatal. See [Chapter 47](#) for further information on Alzheimer disease.

Amyotrophic Lateral Sclerosis

Etiology and Pathophysiology

Amyotrophic lateral sclerosis (ALS), also called *Lou Gehrig disease*, is a progressive neuromuscular disease characterized by degeneration of the gray matter in the anterior horns of the spinal cord and the lower cranial nerves. After degeneration, electrical and chemical messages generated in the brain cannot reach the muscles to activate them. The incidence of ALS is 1 per 100,000 people. It most often occurs in people between the ages of 40 and 70 years and affects men more than women. Although some people with ALS can survive for many years, the disease usually progresses rapidly, resulting in death within about 3 years of the onset of symptoms.

Signs and Symptoms

One of the first clinical manifestations of ALS is weakness of the voluntary muscles, especially of the distal muscles of the extremities. Some patients may notice difficulty swallowing and speaking clearly because of oropharyngeal weakness. As the disease progresses, there is atrophy of the muscles. Until atrophy is complete, however, there may be spontaneous contractions or spasticity of the muscles and abnormal sensations (**paresthesias**), such as tingling or prickling. The patient also may report pain, which is probably caused by strain on weakened muscles.

Only the motor neurons are affected in ALS; therefore the patient remains mentally alert and does not have sensory impairment. Depression is relatively common as a result of the unrelenting progression of muscle weakness and atrophy. Death typically results from respiratory infection and dysfunction as weakness and atrophy of the respiratory muscles impede normal respiration and mechanisms to clear bacteria and secretions from the lungs.

Diagnosis and Treatment

There is no laboratory test to confirm a diagnosis of ALS; electromyelography in combination with muscle biopsy and a creatine kinase level provide data for positive diagnosis. Other neuromuscular disorders such as MS, myasthenia gravis, and progressive muscular dystrophy must be ruled out.

There is no cure for ALS. Eventually the muscle paralysis renders the patient totally dependent because of inability to move, swallow, speak, and, ultimately, breathe. The drug riluzole (Rilutek), a glutamate antagonist, has been shown to slow the progression in certain patients ([NINDS, 2014](#)). Ultimately impaired breathing requires a tracheostomy and mechanical ventilation.

Nursing Management

During the first contact with a patient with ALS, conduct a thorough neurologic assessment. As the disease progresses, periodic assessments can identify specific needs. Problem statements likely to be associated with ALS are those related to difficulty with respiration, all problems of immobility, dysphagia, impaired ability to communicate, pain, ineffective coping, and depression.

In the later stages of ALS, the patient and family will need more assistance and guidance to maintain some level of independence and comfort for the patient. Rehabilitation includes obtaining equipment and devices such as a walker, wheelchair, hospital bed, suction machine, and nasogastric or gastrostomy tube feeding supplies.

Because of the nature of the disease, the patient and family are likely to experience issues related to terminal illness, death, and the grieving process (see [Chapter 8](#)). Toward the end of life, the services of a visiting nurse or a hospice program can provide appropriate instruction and physical and emotional support.

Guillain-Barré Syndrome

Etiology and Pathophysiology

Guillain-Barré syndrome (GBS) is a relatively rare disease that affects the peripheral nervous system, especially the spinal nerves outside the spinal cord. It also can affect the cranial nerves. The cause of GBS is not known, but it usually follows a viral respiratory infection or gastroenteritis in adults within 10 to 21 days. In 1976 and again in 2009, a causal relationship was found between the swine flu vaccine and GBS ([NINDS, 2014](#)), and there have been a few cases of GBS in recipients of meningococcal conjugate vaccine. Authorities believe that the disease is a cell-mediated immunologic response preceded by stimulation from a viral infection, trauma, surgery, viral immunizations, HIV, or neoplasm of the lymphatic system. Cytomegalovirus and Epstein-Barr virus are two viruses that have been linked to GBS.

Pathologic changes include demyelination, inflammation, edema, and nerve root compression. These changes bring about the paresthesia, pain, and progressive, ascending paralysis typical of the syndrome. Autonomic nervous system dysfunction with alterations in both sympathetic and parasympathetic systems may occur, causing orthostatic hypotension, hypertension, abnormal vagal responses, bowel and bladder dysfunctions, facial flushing, and diaphoresis. When the lower brainstem becomes involved, the cranial nerves are affected.

Signs and Symptoms

Objective and subjective symptoms of GBS include mild sensations of numbness and tingling in the feet and hands, followed by muscle pain, tenderness, and aching, especially in the shoulder, pelvis, and thighs. There is progressive muscle weakness, usually starting in the lower extremities and moving upward over 24 to 72 hours. However, it also can affect the cranial nerves and facial muscles first and move downward. Symptoms peak in about 14 days. Sensory loss can also occur but is not as common as motor loss. If respiratory function is affected, ventilatory support may be needed.

Pain is common and may be evidenced as paresthesias, muscular aches and cramps, and **hyperesthesia** (abnormal sensitivity to stimuli). Pain often is worse at night when there is less distraction in the environment.

Diagnosis

Diagnosing GBS is difficult, because its characteristic signs and symptoms are similar to those of several other diseases. Analysis of the CSF is helpful. Typically there is an elevated CSF protein content that tends to rise as the disease progresses, peaking in 4 to 6 weeks. The number of leukocytes remains within normal limits, as does CSF pressure. Electromyelography and nerve conduction studies show reduced conduction velocity. For the most part, the provider must depend on the clinical presentation to diagnose GBS.

Treatment

Medical treatment is mainly supportive. Within the first 2 weeks, plasmapheresis, in which the patient's plasma is removed and "washed" to remove antibodies, hastens recovery in some patients and decreases the time ventilatory support is needed. The use of IV immune globulin (IVIG) to hasten recovery is also effective ([NINDS, 2014](#)).

Nutritional support via tube feedings may be required because of dysphagia. If paralytic ileus (halt to bowel peristalsis) occurs, parenteral nutrition will be necessary.

Clinical Cues

Signs and symptoms of paralytic ileus are absence of bowel sounds, abdominal pain, and considerable abdominal bloating with lack of passage of stool.

❖ Nursing Management

■ Assessment (Data Collection), Nursing Diagnosis, and Planning

Assessment is the most important aspect of care during the acute stage. Monitor progression of ascending paralysis; assess respiratory function carefully; and assess gag, corneal, and swallowing reflexes closely. Monitor arterial blood gases and oxygen saturation. Observe vital sign trends and watch for orthostatic hypotension and cardiac dysrhythmia, which can indicate the degree of autonomic nervous system dysfunction.

Problem statements depend on the degree of nervous system involvement but may include:

- Altered gas exchange due to disease progression affecting respiratory nerves.
- Altered physical mobility due to paralysis of muscles from disease progression.
- Potential for injury due to dysphagia.
- Altered nutrition due to dysphagia and inability to feed self.
- Acute pain due to paresthesias, muscle aches and cramps, and hyperesthesia.
- Altered self-care ability due to inability to use muscles to accomplish activities of daily living.
- Fear due to seriousness of disease and unknown outcome.
- Altered communication due to paralysis of speech muscles or intubation.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected outcomes must be written for each problem statement. Overall goals of care are:

- Maintain adequate ventilation.
- Control pain adequately.
- Prevent damage from aspiration.
- Maintain communication.
- Maintain adequate nutritional status.
- Return patient to normal function.

■ Implementation and Evaluation

There are three phases of GBS: the acute phase, the static phase, and the rehabilitation phase. Each demands different kinds of monitoring and intervention. During the **acute** phase, the goals are to sustain life, prevent complications related to immobility, and promote rest and comfort. Respiratory problems are particularly troublesome and may require suctioning, tracheostomy care, artificial ventilation, and other life-support measures.

Vital signs must be checked frequently. Alterations in the autonomic nervous system can cause drastic changes in blood pressure, particularly hypotension. Cardiac arrhythmias are also common, and the patient is continuously monitored.

The paralysis and loss of control that occur with GBS come on so suddenly and are so overwhelming that the patient becomes very frightened. Because the course of the disease usually extends for months with a very slow recovery, the patient begins to have feelings of hopelessness, despair, and isolation.

The **static** phase is a kind of plateau the patient reaches 1 to 3 weeks after the onset of the illness. During this time the motor loss and paresthesias no longer progress, and the patient's condition becomes somewhat stabilized; he gets no better but no worse. This phase can last from a few days to months.

Think Critically

What problems requiring specific nursing interventions would you expect to encounter for a patient with GBS who is now stable but has paralysis of the lower extremities and paresis of the upper extremities?

During the static phase, nursing care is concentrated on preventing complications of immobility and helping the patient deal with his feelings of anger, depression, and anxiety. Exercises are usually begun but are limited to passive and gentle range-of-motion and stretching exercises. There must be a balance of rest and exercise and no sudden changes in posture or position, in case blood pressure suddenly drops.

Meticulous skin care is essential because of immobility. Monitoring for thrombophlebitis is

important, because this is a common complication. Elastic stockings or sequential compression devices are applied to the legs, along with anticoagulant therapy, to try to prevent thrombophlebitis.

Clinical Cues

Signs of thrombophlebitis are warmth, swelling, and pain in the extremity. Temperature may be elevated.

The final phase, **rehabilitation**, is one of gradual recovery. The patient may become elated over the change in his condition and must be prevented from overexertion, which can lead to a relapse. As muscle function returns, the level of exercise and activity is slowly increased ([Andary, 2014](#)). It may take up to 2 years for maximal improvement with return to normal functioning. Approximately 80% to 90% of patients have little residual deficit.

Poliomyelitis and Postpolio Syndrome

Poliomyelitis destroys the motor cells of the anterior horn of the spinal cord, the brainstem, and the motor strip located in the frontal lobe. It is caused by a virus and can be prevented by immunization with the Salk (killed virus) or Sabin (attenuated live virus) polio vaccine. It is rare in the United States where immunization is given in childhood, but outbreaks still occur in other parts of the world. Some people who have had poliomyelitis develop postpolio sequelae or postpolio syndrome. A new onset of weakness, pain, and fatigue may occur in people who had the disease more than 30 years ago. Disability may be temporary or permanent. Treatment is geared toward making lifestyle modifications to preserve energy and physiologic function. Swimming in warm water has been found to promote comfort and help maintain flexibility.

Huntington Disease

Huntington disease or Huntington chorea is a rare, genetically transmitted degenerative neurologic disorder characterized by abnormal movements (**chorea**). It is accompanied by a decline in intellectual capacity and emotional disturbances. Signs of Huntington disease usually become evident during the fourth or fifth decade of life but may occur earlier. Women and men are equally affected. The disorder is progressive and causes disability and then death within 15 to 25 years after signs appear. Death is from neurologic degeneration affecting all body systems. Genetic transmission is by an abnormal gene on the short arm of chromosome 4. It is an autosomal dominant disorder, meaning that the children of a person who has the disease have a 50% chance of inheriting it. If a child does not inherit the disease, the gene is not passed on to the next generation.

A person with Huntington disease progresses from being fidgety and restless to a state of constant movement (chorea). Voluntary movement deteriorates until the patient is completely incapable of independent movement. Intellectual decline causes depression, suspiciousness, and eventual dementia. There is no specific test for the disease, but genetic testing can determine the possibility of it developing; there is no known treatment to alter its course.

Myasthenia Gravis

Etiology and Pathophysiology

Myasthenia gravis (MG) literally means “grave muscle weakness.” The disease is a chronic disorder. Skeletal muscles, respiratory muscles, and muscles enervated by cranial nerves are affected. The muscular weakness can be so mild that it causes a minor inconvenience or so severe that it is life-threatening because of its effect on the muscles used for breathing and swallowing.

Between 80% and 90% of patients with MG have an autoimmune disease in which circulating autoantibody is directed against the postsynaptic ACh receptors at the neuromuscular junction (the point at which nerve impulses are transmitted to muscle tissue) (Davis, 2014). The antibody reduces the number of functional receptor sites and restricts the neuron uptake of ACh. As a result, nerve impulses are not transmitted and the muscle cannot contract properly. Other types of antibodies are present in the remaining patients with MG.

There is a suggested connection between overgrowth of the thymus gland tissue and MG. Associations between MG and hyperthyroidism, treatment with D-penicillamine, interferon alfa, and bone marrow transplantation also exist.

Signs and Symptoms

Symptoms of MG include **diplopia** (double vision), difficulty chewing and swallowing, and ptosis (Figure 24-6). The patient's voice tends to be hoarse or nasal in quality, and voice volume decreases toward the end of a sentence. Severe muscle weakness that improves with rest is the primary symptom of the disorder. Any of the skeletal muscles might be involved; intestinal, bladder, and heart muscles are not affected.



FIGURE 24-6 Ptosis (drooping upper lid) characteristic of the muscle weakness of myasthenia gravis. (Courtesy Heather Boyd-Monk and Wills Eye Hospital, Philadelphia, PA.)

Ocular myasthenia may occur first and be demonstrated by diplopia and ptosis. In a small percentage of patients the disease progresses no further. If cranial nerves become more involved, bulbar myasthenia occurs, with facial and oropharyngeal muscle weakness causing a blank facial expression and a smile resembling a snarl. Swallowing and speaking become difficult. Further progression to generalized myasthenia involves the muscles of the neck, shoulders, limbs, hands, diaphragm, and abdomen. The disease does not affect the level of consciousness. Muscles are strongest in the morning and become weaker with activity. Respiratory muscle weakness may require mechanical ventilation.

Diagnosis

Diagnosis is established by history and physical examination. A Tensilon test may be ordered to confirm the diagnosis. Two divided injections of edrophonium (Tensilon) are administered; a marked increase in muscular strength is noted within 1 minute of the second injection if the patient has myasthenia gravis. The first injection is a test dose to determine whether the patient will have an adverse reaction to the medication. Atropine is kept on hand to reverse the effects of the Tensilon if necessary. A blood test for antibodies to ACh receptors is ordered. Electodiagnostic testing is performed to check muscle function. A chest radiograph and chest computed tomography (CT) will be ordered to check the thymus gland.

Treatment

There are two main modes of therapy; the choice depends on the severity of the symptoms. In milder cases the provider may manage the disease by dealing with the specific symptoms, rather than trying to induce a remission of the disease. In more severe cases, efforts are made to manage the underlying cause of the symptoms by inducing remission.

Because 80% to 90% of patients with MG have autoantibodies against ACh receptors, plasmapheresis (plasma exchange) can be an effective treatment for patients in crisis. It is particularly helpful in restoring muscle function when a patient is dependent on a ventilator. The purpose of the plasma exchange is to remove the circulating autoantibodies from the patient's blood. This mode of therapy may bring clinical improvement in some patients, but it is not a cure for MG.

Anticholinesterase therapy is the primary treatment for MG. Acetylcholine must be present at the point where nerve impulses are transmitted to the muscle for sustained repetitive muscle contraction to occur. Anticholinesterase agents inactivate acetylcholinesterase, a substance that prevents accumulations of ACh at the neuromuscular junction. Anticholinesterase agents temporarily increase muscle strength by allowing ACh to work, but they do not cure the problem. Two drugs commonly used as anticholinesterase agents are neostigmine (Prostigmin) and pyridostigmine (Mestinon). Pyridostigmine is more commonly used because it can be taken orally. Corticosteroids and immunosuppressant drugs such as azathioprine (Imuran), rituximab (Rituxan), or cyclophosphamide (Cytoxan) may be used to suppress the immune response. IVIG infusion is sometimes prescribed.

The dosage of anticholinesterase drugs is precisely calculated for each patient. The aim is to achieve a delicate balance between too much and too little ACh at the neuromuscular junction. Stress can quickly alter a patient's need for ACh; hence overmedication or undermedication can occur rather suddenly. Unfortunately, the symptoms of too much medication are quite similar to those of too little medication, so it is often difficult to adjust the dosage correctly.

Another method of treatment is to remove the thymus gland, which decreases the antibody production. Treatment with IVIG for 5 days may produce a favorable response for 30 to 60 days.

❖ Nursing Management

■ Assessment (Data Collection), Nursing Diagnosis, and Planning

The severity of MG is assessed by asking about the degree of fatigue, what body parts are affected, and how severe the problem is. Observe for ptosis of the eyelid and inquire about diplopia. Knowledge of the disorder should be determined, and the patient's coping abilities assessed. Assessment of respiratory function is a top priority. Assess muscle strength of the face, swallowing, speech volume and clarity, and cough and gag reflexes. Check the strength of the shoulder muscles and of the limbs.

☒ Clinical Cues

When assessing the status of a patient with MG, have the patient look up at the ceiling. Watch to see whether the eyelids start to move downward. This is often an early sign of the disease or that the medication is insufficient.

Problem statements will depend on the severity of the disease and may include:

- Altered breathing pattern due to diaphragm and intercostal muscle weakness.

- Altered airway clearance due to weakness of intercostal muscles and impaired cough and gag reflexes.
- Potential for injury due to difficulty swallowing, weakness of bulbar muscles.
- Altered nutrition due to impaired swallowing ability.
- Altered activity tolerance due to fatigue and muscle weakness.
- Altered communication due to intubation or weakness of larynx, mouth, and pharynx muscles.
- Decreased self-esteem to inability to maintain usual roles and lifestyle.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected outcomes are written for each problem statement based on the specific problem the patient is experiencing.

Patient Teaching

Patients With Myasthenia Gravis

Use your anticholinesterase medication correctly:

- Take the drug with food or fluid.
- Take the drug 45 minutes before meals to permit maximum effect for chewing and swallowing. ☺
- Adjust drug dosage and times of administration as instructed according to your individual pattern of weakness and daily activities.
- Do not take over-the-counter or other prescribed medications without the approval of your health care provider or pharmacist.
- Report signs of cholinergic crisis to the health care provider quickly.
- Modify the diet for ease of chewing and swallowing; soft foods are easier to consume.
- Eat slowly in a calm environment and take small bites.
- Balance rest and activity throughout the day.
- Figure out ways of conserving energy while doing usual activities.
- Compensate with extra rest during periods of extra stress, illness, hormone swings during menstruation, and environmental temperature extremes.
- Wear a medical alert bracelet or necklace at all times; carry a card in your wallet stating that you have myasthenia gravis and list contact numbers for next of kin or significant other.
- Be aware of the signs and symptoms of myasthenic crisis and report them immediately.

Implementation and Evaluation

Infection, surgery, and other physical and emotional stresses can precipitate a myasthenic crisis and cause hospitalization. During the crisis, frequent monitoring is essential. The patient's ability to swallow and breathe on his own can be seriously compromised. Suctioning, tracheostomy, and artificial ventilation may be necessary to maintain life until the crisis is over.

Education of the patient and his family must include instruction about the nature of the illness and the adverse effects of emotional upsets, respiratory infections, and similar stresses. Care focuses on the neurologic deficits and their effect on daily activities. Rehabilitation goals include education and support for the patient and family so that the patient remains as independent as possible.

Because he can become critically ill and need immediate medical attention at any time, a patient with MG should at all times wear a medical alert emblem that identifies him as having the disease. The patient, as well as members of the family and the nurses who care for him in the hospital or at

home, should know the symptoms of overdosage of anticholinesterase medication. The symptoms of myasthenic crisis caused by underdosage of anticholinesterase agents, a precipitating illness, or stress factors are equally important to know (Box 24-2). If any of these symptoms occurs, the provider should be notified immediately.

Think Critically

What immediate action would you take if you found your patient in cholinergic crisis?

Box 24-2

Signs and Symptoms of Cholinergic Crisis and Myasthenic Crisis

Cholinergic Crisis

- Generalized weakness within 1 hour of the dose
- Dyspnea and increased bronchial secretions
- Poor tongue control producing difficulty in chewing
- Difficulty swallowing and excessive salivation
- Restlessness, anxiety, and irritability
- Diaphoresis
- Abdominal cramps, nausea or vomiting, or diarrhea

Myasthenic Crisis

Increase in myasthenia gravis symptoms after failure to take drug as prescribed or after a precipitating illness or increased stress:

- More difficulty swallowing
- Diplopia
- Ptosis
- Dyspnea

Notify the provider immediately if these signs and symptoms appear.

In addition to problems related to anticholinesterase drugs, patients with MG also can experience exaggerated and bizarre effects from a variety of drugs. These include steroids and thyroid compounds; sedatives and respiratory depressants, such as morphine; tranquilizers, such as the phenothiazines; many antibiotics; beta blockers; and some cardiac drugs, such as verapamil, procainamide, chloroquine, and quinidine. Because so many drugs are potentially dangerous to a patient with MG, it is imperative that you ensure that the provider ordering a medication is aware that the patient has MG. **Always check each drug the patient is to receive for interactions and contraindications.**

Restless Leg Syndrome

Restless leg syndrome (RLS) is a sensory-motor disorder that may affect up to 15% of the population, women more often than men ([Harvard Medical School, 2012](#)). It is marked by an uncontrollable urge to move the legs, more often in the evening, and its cause is unknown. However, there does appear to be an underlying genetic component. RLS is classified as primary (which usually occurs before the age of 40 years) and secondary (occurring after the age of 40 years). The latter is a more sudden onset and has been associated with anemia; Lyme disease; rheumatoid arthritis; chronic obstructive pulmonary disease (COPD); hypothyroidism or hyperthyroidism; fibromyalgia; and deficiencies of iron, folate, vitamin B₁₂, or magnesium ([Feuz, 2013](#)).

Three drugs have been approved for treating RLS: pramipexole (Mirapex) and ropinirole (Requip), which are dopamine agonists, and gabapentin enacarbil (Horizant), an adaptation of gabapentin, which is an antiseizure medication. Nurses should monitor medications closely and monitor patients taking dopamine agonists for orthostatic hypotension.

RLS is a frustrating complication for patients, but many benefit from available treatment. Foster an encouraging environment and provide education about the syndrome.

Community Care

After leaving the hospital, patients with neurologic problems often are cared for in long-term care facilities, rehabilitation programs, outpatient clinics, and the home. Nurses who work in long-term care facilities must be confident in caring for patients with PD, because a large percentage of residents in these facilities have this disorder. Nurses who work with patients who have neurologic deficits that cause some degree of immobility must constantly try to prevent the complications of immobility and to achieve as high a level of function for their patients as possible.

Because older adult patients often have more than one chronic illness, it is essential that nurses be knowledgeable about medication interactions and side effects. Each patient's medications must be continually assessed for possible adverse effects and side effects, as well as for data indicating that each medication is producing a sufficient therapeutic effect to warrant continued administration. A close working relationship with the pharmacist can assist you in judging these matters.

Collaborative care between the pharmacist, nurse, nurse aides, physical therapist, social worker, and others who interact with the patient is needed to provide the best plan of care for these patients who require complex care.

Home care nurses interact with entire families and need to continually offer support as the difficulties of learning to live with someone who has a neurologic deficit are met. Family roles often are altered and strained, and the period of adjustment for the patient and family is lengthy. It often is difficult for the family to cope with the personality changes that occur in patients with degenerative neurologic disorders. Referral to community support groups is often helpful for both the patient and the family members.

Get Ready for the NCLEX® Examination!

Key Points

- The characteristic triad of symptoms of PD is tremor, bradykinesia, and rigidity.
- Treatment of PD is with drug therapy (see [Table 24-1](#)), physical therapy, and emotional support.
- When drug therapy for PD fails, surgical treatment may be warranted.
- MS is a chronic inflammatory disease that causes demyelination of axons in the CNS (see [Table 24-2](#)).
- Common manifestations of MS are motor dysfunction, sensory dysfunction, problems of coordination, mental changes, fatigue, bowel and bladder problems, and altered sexual function.
- MS is treated with biologic response modifier drugs and drugs to treat the problems caused by the disease.
- Alzheimer disease is a form of dementia and is covered in [Chapter 47](#).
- ALS is a rare but devastating disease that usually results in death within 3 years after diagnosis.
- ALS affects the motor neurons and causes weakness of the voluntary muscles.
- Nursing care for patients with ALS focuses on preventing complications and dealing with the problems the disease has caused, particularly immobility, dysphagia, inability to communicate, pain, and depression.
- GBS affects the peripheral nervous system and the cranial nerves.
- GBS is a cell-mediated immunologic response to a stimulus from a viral infection, trauma, surgery, viral immunization, HIV, or neoplasm of the lymphatic system.
- GBS usually causes an ascending paralysis and considerable pain.
- Nursing care for GBS is directed at maintaining adequate ventilation, nutrition, and supportive care for immobility and activities of daily living.
- Postpolio syndrome is the reappearance of polio symptoms many years after the initial polio illness.
- Huntington disease is a genetic disease characterized by chorea.
- Huntington disease causes a decline in intellectual capacity, emotional disturbances, and total dependence, with death occurring in 15 to 20 years.
- MG is an autoimmune disease affecting the neuromuscular junction.
- MG is chronic and is manifested by fatigue and muscular weakness (both symptoms improve with rest).
- Ptosis, diplopia, a weak nasal-quality voice, a blank expression, and a smile resembling a snarl are signs and symptoms of MG.
- MG may affect the intercostal muscles and the diaphragm, causing inadequate respiration.
- Anticholinesterase therapy is the common treatment for MG.
- Nurses must know the signs of overdosage of anticholinesterase drugs.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- ALS Association (ALSA), www.alsa.org
- American Parkinson Disease Association, www.apdaparkinson.org
- Huntington's Disease Society of America, www.hdsa.org
- Myasthenia Gravis Foundation of America, www.myasthenia.org
- National Multiple Sclerosis Society, www.nationalmssociety.org
- National Parkinson Foundation, www.parkinson.org

Review Questions for the NCLEX® Examination

1. The provider discusses the treatment options with a patient newly diagnosed with PD. The patient asks, "What will happen to me?" An appropriate response would be:

1. "You seem worried. Let's talk about your concerns."
2. "Your provider can fully explain your condition."
3. "You will be all right."
4. "We all eventually get there."

NCLEX Client Need: Psychosocial Integrity, Therapeutic Communication

2. During a neurologic examination, a patient demonstrates difficulty initiating movement. The steps are short with quick cadence. Arm swings are decreased with subsequent steps. The clinical findings are referred to as:

1. muscle atrophy.
2. akinesia.
3. rigidity.
4. tremors.

NCLEX Client Need: Physiological Integrity, Pathophysiology

3. A nurse observes a nursing assistant feed a dysphagic patient. Which action by the nursing assistant indicates a need for further instruction and guidance?

1. The wall suction is turned on and readily available.
2. The patient is propped up with one pillow.
3. The food is cut into small, bite-size pieces.
4. The nursing assistant coaches the patient to drop the chin.

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

4. A 45-year-old patient newly diagnosed with MS asks about his prognosis for the future. Teaching about the future might include stating:

1. "The condition is a progressive neurologic disease, and you will

likely end up using a wheelchair or scooter. You might start equipping your house to be wheelchair accessible.”

2. “With the new immune-modifying drugs available as treatment, you will not even be able to tell you have the disease.”
3. “MS may begin with exacerbations and remissions, but it will eventually develop into a progressive disease, affecting your entire neurologic system and, thus, your whole body.”
4. “The condition is a periodic demyelination of the central nervous system, often with periods of remissions and exacerbations. It is a manageable disease, and there are many patients who live active and rewarding lives. Use of the new immune-modifying agents will help reduce exacerbations.”

NCLEX Client Need: Psychosocial Integrity, Coping Mechanisms

5. A patient is admitted for progressive muscle weakness in the lower extremities. The patient complains of tingling and numbness in the hands. The patient recovered from the flu a week ago. Which intervention(s) should be anticipated in the care of this patient? (*Select all that apply.*)

1. Medication for pain and discomfort
2. Immediate need for physical therapy exercise
3. Possible need for ventilatory assistance
4. Need for airway suctioning
5. Administration of muscle relaxants

NCLEX Client Need: Physiological Integrity, Basic Care

6. A female patient with MG is admitted with dyspnea and increased bronchial secretions, difficulty swallowing, abdominal cramps, and diaphoresis. The probable cause of these symptoms is _____.

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

7. Thirty seconds after the administration of edrophonium (Tensilon), the patient is observed to have slowed heart rate, sweating, and cramping. An appropriate nursing action would be to:

1. start chest compressions.
2. notify the provider.

3. administer atropine.
4. give pyridostigmine (Mestinon).

NCLEX Client Need: Physiological Integrity, Pharmacological Therapies

8. The nurse reinforces pharmacy instructions regarding safe use of pyridostigmine (Mestinon), an anticholinesterase, by a patient newly diagnosed with MG. Which statement indicates a need for further teaching?

1. "I need to take the medication after meals on a full stomach."
2. "I can adjust the drug dosage and times depending on daily activities."
3. "I shouldn't take over-the-counter medications without provider approval."
4. "I should balance rest and activity throughout the day."

NCLEX Client Need: Physiological Integrity, Pharmacological Therapies

9. The priority nursing assessment of a patient with MG would be to:

1. determine the degree of fatigue.
2. assess the level of knowledge regarding the disease.
3. monitor the adequacy of respiratory function.
4. check the patient's swallowing, speech, and protective reflexes.

NCLEX Client Need: Physiological Integrity, Basic Care

10. Injury is a possible problem statement for patients with RLS. Which nursing intervention(s) would help prevent injury? (*Select all that apply.*)

1. Educate the patient about daytime drowsiness, possibly severe, that may occur with the treatment for RLS. The patient should not drive or operate machinery until reaction to treatment is determined.
2. Apply leg braces for the patient at night.
3. Advise the patient to rise slowly to a standing position from a

sitting or lying position.

4. Install grab bars in the shower and tub.

NCLEX Client Need: Safe and Effective Care Environment, Safety and Infection Control

Critical Thinking Questions

Scenario A

Guillermo Perez had a bout of the “flu” about a week ago. Today he noticed he was having trouble walking. When he got home from an errand, he had trouble pulling his sweater over his head. His wife brought him to the emergency department.

1. Which neurologic problem within this chapter do you think he might have?
2. What might be done to establish a diagnosis?
3. What would be a top priority in his care at this time?
4. What further problems do you think could occur?

Scenario B

Mrs. Jones seems less animated than she has been over the past several months. Her husband tells you she has fallen three times since her last office visit. You notice that she seems more stooped over and her movements are “jerky.” The health care provider examines her and, after a thorough history and physical, tells the couple that he thinks Mrs. Jones has PD. He prescribes Sinemet for her.

1. What can you anticipate that Mr. and Mrs. Jones will need to be taught?
2. What are the potential complications of PD?

Scenario C

A fellow student in your clinical group confides that she has MG. She takes Mestinon for control of the disease.

1. What factors could cause her symptoms to worsen?
2. What might happen if she forgets to take her medication before reporting for her clinical rotation?

Scenario D

A man comes to the clinic complaining of difficulty enunciating, having tingling and prickling in the extremities, and having increased difficulty walking. After diagnostic testing it is determined that he has ALS.

1. What is the focus of interdisciplinary care?
2. What is the prognosis for the patient?

UNIT VIII

Sensory System

OUTLINE

Chapter 25 The Sensory System: Eye and Ear

Chapter 26 Care of Patients With Disorders of the Eyes and Ears

CHAPTER 25

The Sensory System

Eye and Ear

Objectives

Theory

1. Determine ways in which nurses can help patients preserve their sight and hearing.
2. Identify signs and symptoms of eye and ear problems.
3. Compare tests and examinations used to diagnose eye and ear disorders.
4. Select nursing activities associated with assessing the eye and ear.
5. Use the nursing process for patients with disorders of the eye or ear.

Clinical Practice

6. Provide teaching for a patient who is to undergo tests for a vision problem.
7. Perform focused assessments for disorders of the eyes and ears.
8. Assist visually impaired patients to find resources to maximize their vision.
9. Instruct a spouse in ways to effectively communicate with a hearing-impaired partner.

KEY TERMS

- cerumen** (sě-RŪ-měn, p. 582)
- ectropion** (ěk-TRŌ-pē-ōn, p. 574)
- entropion** (ěn-TRŌ-pē-ōn, p. 580)
- exophthalmos** (ěk-söf-THÄL-mös, p. 579)
- keratitis** (kér-ă-TI-tís, p. 574)
- nystagmus** (nís-TÄG-müs, p. 587)
- otorrhea** (ō-tō-RĒ-ă, p. 588)
- photophobia** (fō-tō-FÖ-bē-ă, p. 579)
- presbycusis** (prěz-bē-KÜ-sís, p. 592)
- presbyopia** (prěz-bē-Ö-pē-ă, p. 573)
- ptosis** (TŌ-sís, p. 574)
- refraction** (rē-FRÄK-shūn, p. 572)
- sensorineural loss** (sěn-sō-rē-NŪ-räl lōs, p. 584)
- xanthelasma** (zān-thē-LÄZ-mā, p. 579)

Anatomy and Physiology of the Eye

Structures of the Eye

- The eyeball is spherical in shape and 2 to 3 cm in diameter (Figure 25-1).

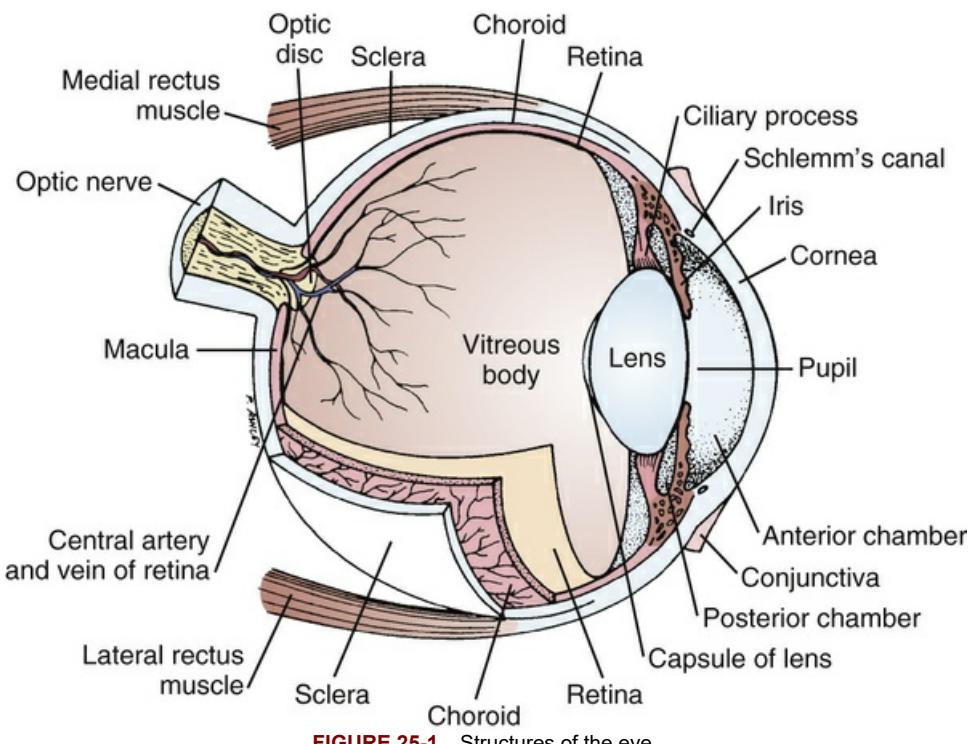


FIGURE 25-1 Structures of the eye.

- The sclera, which is part of the wall of the eyeball, is opaque white and covers the posterior five sixths of the eyeball.
- The transparent cornea is part of the wall of the eyeball and covers the anterior one sixth of the eyeball.
- The choroid is part of the middle layer of the eyeball. It is a highly vascular layer containing brown pigment located between the sclera and the retina.
- The ciliary body is part of the middle layer of the eyeball and contains finger-like ciliary processes that produce aqueous humor. The ciliary body helps change eye shape for near and far vision.
- The iris is the third part of the middle layer of the eyeball; it is the colored portion of the eye and is a doughnut-shaped diaphragm with the pupil as the central opening. The iris contains two groups of smooth muscles that constrict and dilate the pupil to regulate the entrance of light.
- The biconvex, transparent lens, together with the suspensory ligaments and the ciliary body, forms a partition that divides the interior of the eyeball into two chambers. The anterior chamber between the lens and the cornea is filled with aqueous humor. The posterior chamber, between the lens and the retina, contains vitreous humor.
- The suspensory ligaments connect the ciliary body to the lens.
- The retina is the inner layer of tissue of the eyeball and is found in the posterior portion of it. The retina contains several layers. The layer with rods and cones acts as the receptor for light images.
- The optic nerve carries messages from the nerve cells in the retina to the brain.
- The optic disc is formed by the axons of the ganglion cells of the retina.
- The macula lutea is a yellow spot just lateral to the optic disc that allows for visual detail.
- The fovea centralis is the area of the retina that produces the sharpest image.

- The eyelids are composed of skin, connective tissue, and conjunctiva. The conjunctiva is a thin mucous membrane that lines the eyelid and covers the anterior portion of the eyeball, except for the cornea.
- Eyelashes line the edge of the eyelid.
- Sebaceous glands are situated with the eyelashes.
- The lacrimal glands are located in the upper outer area above the eyes. The lacrimal ducts and canals carry tears from the eye to the nose.
- Six muscles attach to the eyeball and allow for movement. The muscles come from the bones of the orbit and insert on the outer layer of the eyeball.

Functions of the Eye Structures

- The bony orbit protects the eyeball.
- The eyelashes help trap foreign particles, keeping them from landing on the eyeball.
- The eyelids protect the eyes from foreign matter and help distribute moisture on the eye surface.
- The sebaceous glands secrete an oily fluid that lubricates the lids.
- Blinking of the eyelid 6 to 30 times a minute stimulates the lacrimal glands to produce tears.
- The lacrimal gland secretes tears that moisten, lubricate, and cleanse the surface of the eye. Tears contain an enzyme that helps destroy bacteria and prevent infections.
- The transparent cornea allows light to hit the lens. It assists with the bending of light rays (**refraction**), so that the rays will hit the retina in the right location for images to be transmitted to the brain.
- The choroid's brown pigment absorbs excess light rays that could interfere with vision.
- The ciliary processes secrete aqueous humor that helps maintain the shape of the anterior chamber; it also nourishes the structures in this part of the eye. The aqueous humor assists with refraction of light onto the retina. **The amount of aqueous humor present determines the internal pressure of the eye.** The aqueous humor is reabsorbed by the blood vessels located at the junction of the sclera and the cornea.
- Muscles in the iris control dilation and constriction of the pupil.
- The suspensory ligaments connected to the ciliary body and lens allow light to focus on the lens and retina, which is necessary for close vision.
- The retina's rods and cones are photoreceptors for light and color. The nerves of the retina transmit the images perceived to the brain.
- The optic nerve conducts nerve impulses from the retina to the brain.
- Visualization of the optic disc provides information about the pressure within the eye and within the skull. When intracranial pressure gets higher, the optic disc appears "swollen" or "choked."
- Visual impulses travel along the optic nerve to the optic chiasma just anterior to the pituitary gland; at this point some of the axons cross over to the other side. Images from the medial portion of the left eye and from the lateral portion of the right eye are carried by the right optic tract. Images from the medial portion of the right eye and from the lateral portion of the left eye are carried by the left optic tract ([Figure 25-2](#)). Images are conducted to the visual cortex in the occipital lobe of the brain.

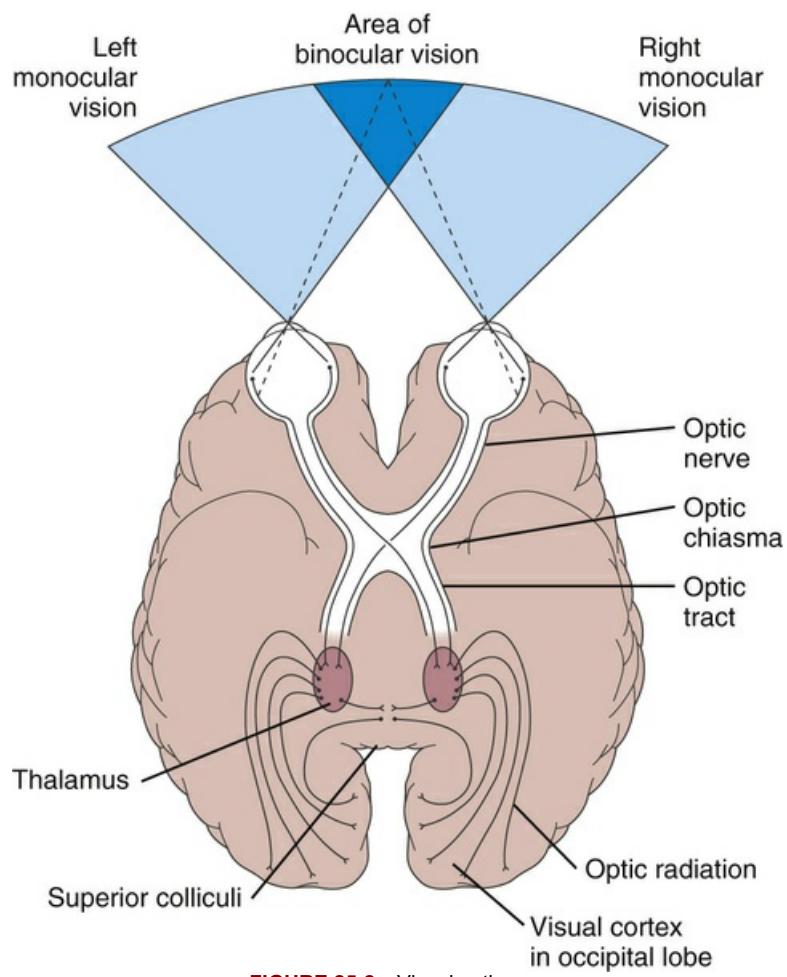


FIGURE 25-2 Visual pathway.

- Six muscles control movement of the eyeball. [Table 25-1](#) lists these muscles and the nerves that control them.

Table 25-1
Muscles of the Eye

MUSCLE	CONTROLLING NERVE	FUNCTION
Extrinsic (Skeletal) Muscles		
Superior rectus	Oculomotor (CN III)	Elevates eye or rolls it superiorly and toward the midline.
Inferior rectus	Oculomotor (CN III)	Depresses eye or rolls it inferiorly and toward the midline.
Medial rectus	Oculomotor (CN III)	Moves eye medially, toward the midline.
Lateral rectus	Abducens (CN VI)	Moves eye laterally, away from the midline.
Superior oblique	Trochlear (CN IV)	Depresses eye and turns it laterally, away from the midline.
Inferior oblique	Oculomotor (CN III)	Elevates eye and turns it laterally, away from the midline.
Intrinsic (Smooth) Muscles		
Ciliary	Oculomotor (CN III); parasympathetic fibers	Causes suspensory ligament to relax, so lens becomes more convex for close vision.
Iris, circular muscles	Oculomotor (CN III); parasympathetic fibers	Decreases the size of the pupil to allow less light to enter the eye.
Iris, radial muscles	Sympathetic fibers from spinal nerves	Increases the size of the pupil to allow more light to enter the eye.

CN, Cranial nerve.

Adapted from Applegate EJ: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2011, Saunders.

Aging-Related Eye Changes

- Subcutaneous fat and tissue elasticity decrease, and the eyes appear to be sunken.
- **Arcus senilis**, an opaque ring outlining the cornea, sometimes results from the deposition of fatty globules ([Figure 25-3](#)).

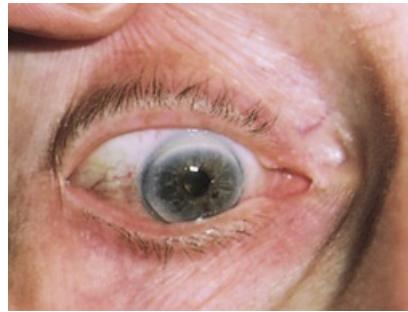


FIGURE 25-3 Arcus senilis, a white ring around the cornea. (From Swartz M: *Textbook of physical diagnosis: History and examination*, ed. 6, Philadelphia, 2009, Saunders.)

- The cornea flattens and develops an irregular curvature after age 65 years, causing astigmatism or making an existing astigmatism worse; vision becomes blurred. Cornea transparency also decreases.
- The sclera develops a yellowish tinge from fatty deposits; thinning of the sclera may cause a bluish tinge.
- The ability of the iris to dilate decreases, causing difficulty for the older person in going from a bright area into a darkened area.
- The lens of the eye changes after age 40 years, gradually losing water and becoming harder. Cataracts may form.
- The ciliary muscle has less ability to allow the eye to accommodate, a process responsible for the gradual extension of distance from the eyes at which an item to be read is held (**presbyopia**). This change usually begins around age 40 years.
- The farthest point at which an object can be identified decreases, and the visual field narrows.
- Pupil size becomes smaller, reducing the ability to see in dim light.
- Color discrimination decreases and may cause problems.
- Moisture secretion decreases, placing the eyes at greater risk for irritation and infection. This is especially common after age 70 years. Repeated episodes of **keratitis** (inflammation of the cornea) may seriously compromise vision and can lead to loss of independence.
- Eversion of the lower lid (**ectropion**) occurs because of loss of muscle tone and elasticity (**Figure 25-4**).



FIGURE 25-4 Ectropion. (From Albert DM, Jakobiec FA: *Principles and practice of ophthalmology*, vol. 3, Philadelphia, 1994, Saunders.)

- Decreased muscle tone and decreased elasticity may cause drooping of the upper lid to a point where it interferes with vision (**ptosis**).

The Eye

Eye Disorders

There are approximately 21 million visually impaired or blind people in the United States. Of those, 5.4 million are older than 65 years ([National Institute on Deafness and Other Communication Disorders \[NIDCD\], 2014](#)). There are two general kinds of patients with impaired vision: those who were born blind, and those who develop some degree of visual impairment later in life. This chapter focuses on the latter type of visually handicapped patient.

Eye disorders are caused by injury or disease or are disorders for which there is a genetic predisposition. Diabetes mellitus and hypertension contribute greatly to visual loss in the United States. Untreated glaucoma causes blindness. Macular degeneration is another major cause of impaired vision. It is now known that smoking has a direct link to the incidence of macular degeneration. Cataracts eventually cause blindness if they are not removed.

There are many new surgical techniques and medical treatments that offer hope for eyesight preservation to increasing numbers of people. Efforts also have been made to educate the public about eye care, prevention of eye disease, and periodic examinations to detect eye disorders in their earliest and treatable stages.

AIDS can cause blindness as a result of opportunistic infections. Ocular problems common in patients with AIDS are discussed in [Chapter 11](#).

Prevention

As health care providers, nurses share responsibility for preserving vision throughout the patient's life span. Three major nursing goals to promote good vision are:

- Health education to inform the general public about basic eye care
- Prevention of accidental injury to the eye
- Prevention of visual loss

Healthy People 2020 goals contain 10 objectives related^E to preventing vision loss and improving vision.

Basic Eye Care

To prevent eye strain, rest the eye muscles periodically when working at the computer, watching television, doing needlework, or performing any activity that demands intensive visual effort. If the eyes tire easily or if there is headache or burning, itching, or redness of the eyes, the eyes should be examined. Good nutrition is important to eye health, and certain nutrients such as lutein and zeaxanthin are especially beneficial to vision.

Nutrition Considerations

Vitamins and Antioxidants Beneficial to Vision

Vitamin A protects against night blindness, slow adaptation to darkness, and glare blindness. The carotenoids are the precursors for vitamin A and are found in green leafy and yellow vegetables. Carrots, greens, spinach, orange juice, sweet potatoes, and cantaloupe are rich sources of the carotenoids (Linus Pauling Institute, 2015). Lutein and zeaxanthin, both antioxidants, may help prevent macular degeneration and cataracts. They are found in yellow fruits and vegetables, red and purple fruits, and greens. Lutein is particularly high in tomatoes, carrots, broccoli, kale, spinach, and romaine lettuce. However, the National Eye Institute has removed beta carotene from its Age-Related Eye Disease Studies (AREDS) formulation, because the National Cancer Institute studies showed beta carotene supplementation may put subjects at a higher risk for lung cancer ([National Eye Institute, 2013](#)). Corn, cornmeal, kale, Japanese persimmons, and turnip greens have large quantities of zeaxanthin; corn contains the highest amount. Many vitamin supplements have added lutein to their formulation ([National Eye Institute, 2013](#)).

Normal secretions of the conjunctiva and tear glands should be sufficient to lubricate the eye and wash away small particles of dust. **Accumulations of purulent material or excessive tearing usually indicate the need for an eye examination.** Dry eye syndrome in people younger than 60 years could be symptomatic of underlying disease.

Older Adult Care Points

Older persons sometimes suffer from “dry eyes” as a result of decreased production of tears. This condition is treated by instilling “replacement tears,” which are commercial preparations or prescriptions of solutions similar in composition to real tears.

Adults with no risk factors should have a baseline eye examination at age 40, every 2 to 4 years from ages 40 to 54, and every 1 to 3 years from ages 55 to 64. After age 65, eyes should be examined by an eye specialist every 1 to 2 years (AAO, 2015). It is particularly important to test for glaucoma, because this disease usually is asymptomatic until damage to vision has occurred. People with a family history of glaucoma should be especially careful to have their eyes tested frequently for increased pressure within the eyeball, because this is the basic pathology of glaucoma, and the disorder tends to be hereditary.

Prevention of Eye Injury

Accidental injury to the eye is a major cause of diminished or total loss of vision. Adults should be cautioned to wear protective eyewear when engaging in sports such as racquetball and squash in which small balls travel at high speeds. Protective eyewear should be worn when using machinery that might cause debris to fly into the eye, such as lawn mowers, weed trimmers, sanders, or power saws.

The rate of occupational accidents has decreased since the establishment and enforcement of rules for wearing goggles and other protective devices by people working in a hazardous environment. The National Institute of Occupational Safety and Health (NIOSH) in Rockville, Maryland, provides information about eye safety and hazards in the workplace.

Cosmetics for the eyelids, eyelashes, and eyebrows can be a source of infection and allergy. Eye makeup should be discarded every 6 months to help prevent infection. Most dyes used for hair on the scalp are not intended for use on the eyelashes and eyebrows.

Saliva should not be used to moisten eye pencils, eye shadow, or mascara, because it may contain organisms that can cause eye infection. Eye cosmetics should be applied with a steady hand to prevent accidentally scratching of the cornea and eyelids. Cosmetics should never be shared, because this can transmit organisms.

Health Promotion

Danger Signals of Eye Disease

- Persistent redness of the eye. Infections and inflammations of the structures of the eye that are not treated may leave scars that can produce loss of vision.
- Continuing pain or discomfort, especially after an injury.
- Disturbance of vision. Although these symptoms may simply indicate a need for eyeglasses, blurred vision, loss of side vision, double vision, and sudden development of many floating spots in the field of vision may be symptomatic of more serious systemic diseases.
- Colored light flashes, or a feeling that a curtain has been pulled across the line of vision or a shade has been pulled down. This can indicate a retinal detachment and requires prompt attention.
- Crossing of the eyes, especially in children.
- Growths on the eye or eyelids or opacities visible in the normally transparent portion of the eye.

- Continuing discharge, crusting, or tearing of the eyes.
- Unequal size of the two pupils or distorted shape.

Prevention of Vision Loss

Diabetes mellitus and hypertension are chronic diseases that—when uncontrolled—may cause vision loss. Patients with these disorders are more susceptible to retinopathy. Nurses should encourage good control over these diseases.

Cultural Considerations

Latinos and Eye Disease

The Los Angeles Latino Eye Study found that Latinos had high rates of diabetic retinopathy and of open-angle glaucoma. The study interviewed and examined 6300 Latinos age 40 years and older from the Los Angeles area. Many of the Latinos involved in the study were found to have previously undiagnosed diabetes. Almost half of the individuals in the study who had diabetes had diabetic retinopathy. Seventy-five percent of Latinos with glaucoma were undiagnosed before participating in the study (National Eye Institute, 2010).

To help prevent infections that might cause corneal scarring and loss of vision, encourage people who experience an accident that causes a corneal abrasion to seek medical attention quickly. Promptly seeking medical attention when the eye is inflamed, is secreting purulent discharge, or is sore assists in treatment of infection that may cause a residual vision loss.

Think Critically

Can you identify four specific ways in which you might help prevent eye disorders among your relatives and patients?

Assessing patients for the presence of cataracts and recommending regular periodic eye examinations should be a part of every nurse's practice. Cataract removal can greatly improve vision. Screening for glaucoma reduces the incidence of blindness from that condition. Free screening clinics often are available in communities. Nurses can inform patients of when and where such screenings are available. The Tono-Pen is often used for such screenings. It is also used in the emergency department when a patient complains of symptoms that might indicate increased intraocular pressure ([Figure 25-5](#)).



FIGURE 25-5 The Tono-Pen is used to check intraocular pressure.

Nurses must be aware that there are many types of vision loss. Some may affect only one area of the field of vision in one eye, whereas others affect parts of the field of vision in both eyes. The degree of visual impairment varies greatly.

Diagnostic Tests and Examinations

Diagnostic tests are performed to test visual acuity, prescribe prescription lenses, inspect the interior of the eye, check intraocular pressure, and assess the health of the retinal blood vessels (Figure 25-6). Computed tomography, optical coherence tomography, and magnetic resonance imaging may also be used to diagnose eye disorders. Table 25-2 provides further information about diagnostic tests.



FIGURE 25-6 Slit-lamp ocular examination.

Table 25-2
Diagnostic Tests for Eye Problems

TEST	PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
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Ophthalmoscopy (retinoscopy)	To inspect the fundus (back portion) of the eyeball to detect abnormalities of the retina, macula, optic disc, and retinal vessels	The examiner uses an ophthalmoscope (see Figure 25-7) to focus light through the pupil onto the fundus.	The room is darkened before the examiner approaches the patient with the ophthalmoscope. Drops may be placed in the eye before this examination to dilate the eye and offer a wider area through which to view the fundus.
Visual acuity	To determine status of vision	The Snellen eye chart is used. It is placed 20 feet from the patient; first one eye is occluded, then the other eye is occluded. The person begins reading lines of letters that decrease in size. Visual acuity is expressed as a fraction for each eye. The numerator (first) figure indicates the distance between the patient and the chart. The denominator (second) figure expresses the distance at which the person with 20/20 vision could read the letters in the line correctly. Visual acuity of 20/20 in each eye is normal; vision of 20/200 (with correction) is legally defined as blindness.	Explain the procedure to the patient. Have the patient hold the occluding card close to the nose so that the entire eye is covered. Start with the third line. If the patient cannot read that, progress upward; if the line is correctly read, go to the next line down. Test the other eye. Record the findings.
Near vision test	To determine status of near vision	The patient is given a Jaeger Test Type card with different sizes of type on it. One eye is occluded while the patient reads the lines of type. Determination of vision status is made on the basis of what a person with normal vision can read.	Explain that this is a simple test of vision to determine whether there are any problems that might require further testing.
Visual fields test (confrontation test)	To examine the patient's visual fields, detecting problems with peripheral vision	The examiner faces the patient and asks her to look directly into his eyes. The examiner covers his right eye, and the patient covers her left eye. Then the examiner's finger is moved from an area outside of the peripheral vision into the line of vision. The patient should detect the finger about the same time as the examiner. The test is repeated with the other eye covered.	Explain the test to the patient and remind her to keep looking directly into your eyes.
Extraocular muscle function test	To test the function of the extraocular muscles	Ask the patient to hold her head still and to move her eyes to follow a small object such as a pen to each of the six cardinal points: right; upward and right; downward and right; left; upward and left; downward and left.	Observe for parallel eye movements and any deviation of movement. Nystagmus is a normal finding for the far lateral gaze. Record your findings.
Color vision test	To determine whether the patient has any color blindness	Use the Ishihara chart book, which shows numbers composed of dots of one color within an area of dots of a different color. Ask the patient what she sees on the page for each chart. Test each eye separately. Reading the numbers correctly indicates normal color vision.	Explain the purpose of the test. Tell the patient to tell you what number appears on the chart. Record your findings.
Refraction	To determine amount of lens correction necessary to restore person's vision to as near normal as possible with glasses	A series of glass lenses are placed in front of the patient's eyes to determine which lens provides the best vision correction. Each eye is tested separately.	A prescription for glasses will be written depending on the findings of the refraction test. The test may be performed for both near and far vision.
Intraocular pressure test	To determine the amount of pressure within the eye; aids in diagnosis of glaucoma	A tonometer is used to measure the pressure. This may be a handheld instrument, but it usually is a device that measures pressure by taking a reading while air is directed at the eye by a pneumotonometer. Another type of tonometer is the applanation tonometer. Normal intraocular pressure is 10-21 mm Hg.	Explain that this is a test to determine whether a patient might have glaucoma. More than one reading on different days is necessary to confirm a diagnosis of glaucoma. If a diagnosis of glaucoma is made, medication can be prescribed to help control the intraocular pressure and preserve vision.
Slit-lamp biomicroscopic examination	To examine the surface of the eye	A beam of light is reduced to a narrow slit that illuminates only a small section of the eye, allowing examination of a thin section of the eye structures at a time.	Explain that this device helps detect "floaters" in the vitreous humor, and abnormalities of the cornea and other structures of the eye. The eyes may be dilated with mydriatic drops for this test.
Topical dye (corneal staining)	To detect abrasions of the cornea or the presence of a foreign body on the cornea	Fluorescein dye drops are administered to the affected eye. The dye remains on the injured tissue or surrounds a foreign body. Such areas usually appear as green spots.	Explain the procedure and the rationale for the test. Warn that the drops may sting slightly for a few minutes. Give the patient a tissue to absorb the excess drops, because they may stain clothing.
Fluorescein angiography (retinal angiography)	To detect tumors of the interior of the eye and to help diagnose and measure the extent of retinopathy	An IV injection of sodium fluorescein is given. A short time later, photographs of the fundus are taken with a special camera.	An IV injection is necessary. A signed consent form is required to perform the procedure.
Electroretinography	To test the functional integrity of the retina; evaluates degeneration of the photoreceptor cells	Electrodes embedded into a contact lens are placed directly on the anesthetized eye. A light stimulus is introduced. The change in electrical potential of the eye caused by the flash of light is measured.	Instruct the patient that she must fixate on the target and not move her eyes during the test.
Optical coherence tomography (OCT)	To record images of retinal structures. To differentiate the anatomic layers within the retina and allow measurement of retinal thickness. To detect macular holes, epiretinal membranes, cystoid macular edema, and other pathologies	Focused beams of light are directed into the eye that scan the structural features of the retina. A cross-sectional image similar to a topographic map is produced.	The patient's eyes must be dilated. Tell the patient that she will be looking into a machine. The test takes 10-20 min.
Amsler grid test	To detect macular degeneration	Using a handheld card printed with a grid of black lines similar to graph paper, the patient fixates on a center dot and records abnormalities of the grid lines.	Test should be performed every week or two. Instruct the patient to record seeing wavy or missing lines or distorted areas.
Ultrasonography	To evaluate the characteristics of a lesion and its size and growth over time, or to determine the presence of a foreign body	A probe is placed directly on the eyeball. Sound waves are transmitted into the eye, bounce back off the various tissues, and are collected by a receiver and amplified on an oscilloscope screen.	Explain the procedure to the patient.

IV, Intravenous.

❖Nursing Management of Eye Problems

The nursing care of patients with severe visual handicaps demands a special awareness of the unique problems encountered by someone who has either a partial or a total loss of vision. You must be sensitive to these patients' special needs. Patient education is especially important to these patients' acceptance of their visual disorder, their participation in diagnostic and therapeutic measures, and their adjustment to their new surroundings when they are hospitalized or admitted to a long-term care facility.

■ Assessment (Data Collection)

All nurses should be able to perform a basic eye examination, inspecting the eye for signs of redness or discharge and checking visual acuity with a Snellen eye chart. Only nurses who have had special training are qualified to conduct a complete eye assessment (Figure 25-7). Significant data can be obtained by nurses who lack specialized education by taking an adequate history.

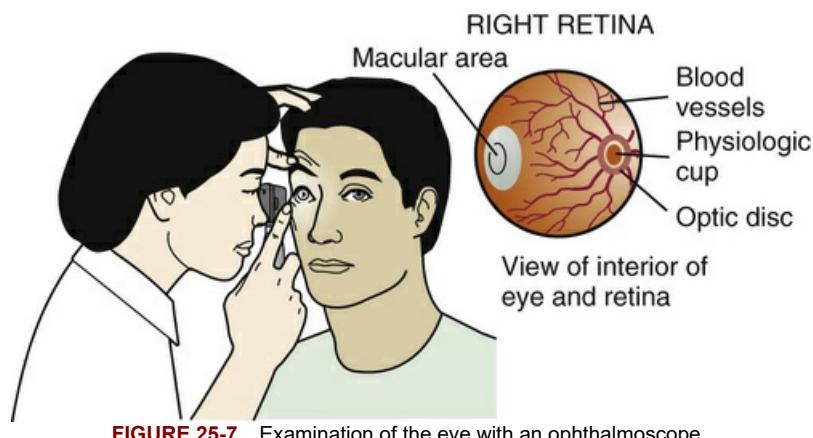


FIGURE 25-7 Examination of the eye with an ophthalmoscope.

History Taking

Many systemic diseases, including AIDS, hypertension, and diabetes mellitus, secondarily affect the eye and its functions. In the general assessment of any patient, you should be aware of the more obvious indications of an ophthalmic pathology, whether it is primary or secondary.

A history of neurologic disorders should be noted. Neuromuscular diseases are especially likely to cause diplopia, blurred vision, or inability to move the eyes. Endocrine disorders that secondarily affect the eyes include thyroid disease and diabetes mellitus. Acute hyperglycemia can alter the shape of the lens and temporarily cause blurred vision. **Prolonged hyperglycemia can adversely affect the blood vessels of the retina, causing bleeding and leading to loss of vision.** Liver and kidney failure can produce pathologic changes in both neural and vascular structures within the eye. Retinal changes also can be caused by hypertension and atherosclerosis.

Some drugs are capable of producing either transient or permanent ocular changes that lead to disturbances in color vision and visual acuity and to the formation of cataracts, retinopathy, and glaucoma. Among common drugs that have possible ocular side effects are digitalis leaf, corticosteroids, indomethacin (Indocin), and sulfisoxazole (Gantrisin).

A family history of eye disorders can be significant, because disorders such as strabismus, retinitis pigmentosa, glaucoma, and cataracts tend to run in families, or follow a pattern of inheritance.

▣ Focused Assessment

Data Collection for Eye Disorders

The following questions should be asked when gathering history regarding an eye disorder:

- Have you noticed a change in your vision?
- Do you have any pain or discomfort in the eyes? Itching? Burning? Stinging? Excessive tearing or watering?
- Have you had any episodes of blurred vision? Double vision? A loss in the field of vision? Blind spots? Floating spots?
- Do you have difficulty with vision at night?

- Is there any pain in your eyes when you are in bright light?
- Do you have headaches in the brow area?
- Do you see halos around lights?
- Have you ever injured an eye in any way?
- Do you experience frequent reddening of the eye (conjunctivitis)?
- Do you ever experience discharge or sticky matter in the eye?
- Do you find that your lids are crusty when you awaken?
- Do your eyes feel dry? Do you frequently use eyedrops?
- Do you wear contact lenses? Use glasses?
- What medications do you take regularly?
- Is there any history of glaucoma in your family?
- Have you ever been told you have diabetes? Hypertension?
- When did you have your last eye examination?
- **For those patients who have a previous visual loss:** How do you cope with your loss of vision?

Sometimes patients are not aware of gradual changes in vision, but have noticed that they have had more minor accidents lately, seem to be more easily fatigued, or are less interested in doing things that once gave them pleasure, such as sewing or some other hobby.

Physical Examination

Observe the patient's eyes and eye area for redness of the conjunctiva, swelling of the eyelids or in the periorbital space, excessive tearing, change in visual acuity, secretions and encrustations on the eyelids, abnormal position of the eyelid, and **exophthalmos** (protrusion of the eyeball).

Abnormalities of lid position are described in [Table 25-3. Xanthelasma](#), or soft, raised, yellow areas, sometimes appear on the eyelid after age 50 years ([Figure 25-8](#)). Signs and symptoms of selected eye diseases are listed in [Table 25-4](#). In addition to the more obvious signs of eye disease, visual impairment also can be assessed by noting the patient's head, hand, and eye movements. Tilting the head to one side to improve vision could mean that the patient has double vision or that one eye is much stronger than the other. Squinting could mean poor vision. Shading the eyes with the hands may indicate an increased sensitivity to light (**photophobia**).

Table 25-3
Abnormalities of Lid Position

ABNORMALITY	CAUSES	SYMPTOMS	TREATMENT
Entropion: Inversion of lid margin; eyelids are turned inward toward eyeball so that lashes rub against eyeball	Scarring and contraction of skin near eyelid (cicatricial entropion) or aging of skin with laxness of tissues supporting the lid and contraction of orbicularis muscle (spastic entropion)	Pain, tearing, redness, and corneal ulceration caused by lid margin and eyelashes rubbing against cornea	Splinting the lid, using a pressure patch, or taping lid into everted (turned outward) position Surgical correction by tightening musculature and evertting lid margin
Ectropion: Eversion or outward turning of the lower lid	Aging and laxness of skin and muscle tissues, facial paralysis, edema of conjunctiva lining the lid, or contraction of scar tissue	Irritation of palpebral conjunctiva, spilling of tears down the cheeks because of a blocked outlet, irritation of skin of cheeks, symptoms of conjunctivitis	Usually responds to patching of the eye Surgical correction necessary if paralysis of orbicularis muscle is permanent or if there is severe scarring and contraction of skin near the lid
Ptosis: Drooping of the eyelid so that it partially or completely covers the cornea	Congenital weakness of the levator superioris muscle or long-term presence of foreign body; one of first signs of myasthenia gravis	Obvious drooping of eyelid If not corrected in infants, can lead to blindness because light rays cannot enter and stimulate development of the eye Patient may be observed tilting head back or raising eyebrows in an effort to see from under eyelids	Surgical correction Removal of foreign body, if that is the cause



FIGURE 25-8 Xanthelasma. (From Bolognia JL, Schaffer JV, Duncan KO, Ko CJ: *Dermatology essentials*, St. Louis, 2014, Saunders.)

Table 25-4

Clinical Signs and Symptoms of Selected Eye Diseases, Medical Treatment, and Nursing Interventions

DISEASE	SIGNS AND SYMPTOMS	MEDICAL TREATMENT AND NURSING INTERVENTIONS
Blepharitis: Infection of glands and lash follicles along lid margin	Itching, burning, sensitivity to light Mucus discharge and scaling; eyelids crusted, glued shut, especially on awakening Loss of eyelashes	Warm compresses to soften secretions; scrub eyelids with baby shampoo; stroke sideways to remove exudate and scales. Antibiotic eyedrops; systemic and topical antibiotics if skin is infected.
Chalazion: Internal stye; infection of meibomian gland	Astigmatism or distorted vision, depending on size and location of chalazion Small, hard tumor on eyelid	Chalazion may require surgical excision and antibiotics to prevent chronic state and cyst formation.
Hordeolum: External stye; infected swelling near the lid margin on inside	Sharp pain that becomes dull and throbbing Rupture and drainage of pus bring relief Localized redness and swelling of lid	Hordeolum usually resolves spontaneously. Warm compresses qid for 10-15 min to bring stye to a head and hasten rupture. Caution patient never to squeeze swelling, because this could spread infection; poor health status can predispose a person to recurrence of styes.
Conjunctivitis: Inflammation of the conjunctiva; "pink eye" is a specific type caused by chemical irritants, bacteria, or virus	Varying degrees of pain and discomfort Increased tearing and mucus production Itching; sensation of a foreign body in the eye	Depends on type of infecting organism; antibiotic eyedrops and ointments. Special care when handling infective material.
Keratitis: Inflammation of the cornea	Varying degrees of pain and discomfort Photophobia; blurred vision if center of cornea is affected	Depends on specific causes; could be allergy, microbes, ischemia, or decreased lacrimation. Most superficial lesions are self-healing. Antibiotic eyedrops or ointment used for bacterial infections. Steroids can reduce inflammation and discomfort; however, herpes infection can rapidly worsen keratitis unless an antiviral agent is given simultaneously. Patient is encouraged to use good personal hygiene, frequent hand hygiene.
Corneal abrasion or ulceration	Moderate to severe pain and discomfort aggravated by blinking History of trauma, contact lens wear	Change or discontinue use of contact lens. Teach patient proper way to insert, remove, and care for contact lens. Caution patient not to moisten lens with saliva.

qid, Four times daily.

Observation of the patient's ability to move the eyebrows and eyes can be helpful in diagnosing nerve damage. Inability to raise the eyebrows indicates damage to the facial nerve. Movement of the eyeball to direct the gaze is controlled by six muscles, which are controlled by three cranial nerves: the oculomotor nerve (third cranial), the trochlear nerve (fourth cranial), and the abducens nerve (sixth cranial) (see Table 25-1).

Nursing Diagnosis

Problem statements/nursing diagnoses are based on the data obtained from assessment. The LPN/LVN collaborates with the RN in formulating the nursing care plan and selecting the problem statements. Problem statements commonly used for patients with eye disease are:

- Potential for injury due to decreased visual field.
- Fear due to visual loss.
- Inadequate home maintenance ability due to impaired or lost vision.
- Potential altered activity due to visual limitation.
- Insufficient knowledge for instilling eyedrops properly.

Specific NANDA-I nursing diagnoses may be chosen from the NANDA-I list (see inside back cover).

■ Planning

Expected outcomes for these problem statements might be:

- Patient will compensate for decreased visual acuity and not suffer sensory deprivation.
- Patient will not experience injury.
- Patient will verbalize decreased fear as treatment begins to help condition.
- Patient will seek assistance with home maintenance within 7 days.
- Patient will explore other means of diversion than reading and watching television.
- Patient will demonstrate proper instillation of eyedrops and will verbalize the schedule for the eyedrops.

When a patient is visually impaired, plan extra time to assist with personal care, to allow the patient to perform as much self-care as possible. The instillation of preoperative eyedrops is a very time-consuming nursing task (Box 25-1). Plan for this when creating the work plan for the shift. Hands must be washed before and after instilling eyedrops. Often an eye patch must be removed and a new one placed after instilling eye medication. Planning also must incorporate patient teaching on the administration of medication, self-care instructions for a patient with glaucoma, and postoperative instructions.

Box 25-1

Instillation of Eyedrops and Eye Ointment

Check the medication label and be certain which eye is to receive the medication. Follow the “Six Rights” of medication administration. Perform hand hygiene and apply gloves.

Eyedrops

- Remove the cap and place it on the table on its side or upside down.
- With the patient sitting or reclining, ask the patient to look up at the ceiling and tilt the head slightly toward the eye receiving the drop.
- With a tissue beneath the fingers, retract the lower lid downward, exposing the conjunctival sac.
- Stabilize the eyedrop container above the eye and drop the designated number of drops directly into the conjunctival sac. Do not place drops on the cornea. Block the entrance to the lacrimal gland by placing a finger over it.
- Carefully replace the cap on the container without contaminating the dropper tip.
- Ask the patient to close the eyelids gently and move the eyes from side to side under the lids to distribute the medication.

Eye Ointment

Ointment is sometimes used rather than drops to aid in the process of treating rough, dry eyes and introduce moisture to the surface of the eye. Also, ointment may include antibiotics.

- Remove the cap from the tube and set it down on the table upside down.
- Expose the conjunctival sac.
- Apply a thin ribbon of ointment along the entire length of the conjunctival sac.
- To end the ribbon, twist the tube with a lateral movement of the wrist without touching the eye.
- Recap the tube.
- Ask the patient to gently close the eyelids and roll the eyes around under the lids to distribute the medication.

■ Implementation

Many eye problems require eyedrops or ophthalmic ointment applied to the eye several times a day. A new contact lens delivery system is being tested to dispense a glaucoma drug directly to the surface of eye in a time-release manner. The lens stays on the eye for 1 month. A prototype is in trials (Ciolino et al, 2014).

Nursing Interventions for Visually Impaired Patients

Individuals with impaired sight must make considerable adjustments. People who have lost their eyesight may experience hopelessness and despair. Patients who are visually impaired go through stages of grief in much the same way a dying person does. A different lifestyle must be learned, but it is not necessarily less meaningful.

When communicating with these patients, remember that the person has a vision impairment; she is not deaf. Speak normally. Speak to the person and identify yourself as you enter the room, and do not touch her until after you have spoken to her—this prevents startling or frightening the patient if she did not hear you enter the room. Ensure that she is oriented to the room and can easily locate the call bell.

Prevention of accidents is an important part of the care of a blind person. Aside from the physical effects of bumping into objects or falling over them, a person who is visually impaired also may experience a loss of self-confidence and security if movement is not safe and independent. Doors should be kept closed or left completely open. They must never be left ajar. Always return things to their places when working in the room. If it is necessary to move any object in the room, ask for the patient's consent, and state the object's new location. When you leave the room, tell the patient that you are going. This will prevent her from becoming frustrated by resuming a conversation, only to find that no one is there. When ambulating with a patient with a visual impairment, lead with the patient holding your arm as she follows.

Pity is neither expected nor appreciated by people with visual impairments. They want to be treated as other people and would prefer to ask for your help when they need it rather than have you do everything for them. If you are assigned to the care of a patient with a visual impairment, determine the amount of assistance the patient needs and wants by asking. Do not assume that the person is helpless, but do not neglect the patient when help is needed.

When a patient who is visually impaired is admitted, she will require special orientation to the room and surroundings. If there is total blindness, describe the size of the room and the placement of furniture, using the bed as the focal point. An ambulatory patient can be walked around the room and to the bathroom to develop familiarity with the location of the commode, bath, and sink. As with any patient, explain how to locate and use the call system, the radio, and the telephone (if there is one at the bedside).

Most patients prefer to feed themselves, if at all possible. However, it usually is necessary to set up the meal tray of patients who are visually impaired, using the "clock" method for placement of food on the plate. The patient is told what food is in which area (e.g., "The potatoes are at 2 o'clock."). Setting up the meal tray includes opening containers of milk and juice, pouring coffee or tea, and cutting meat into bite-sized pieces, unless the patient is accustomed to doing these things.

■ Assignment Considerations

Assisting Visually Impaired Patients

If a CNA or UAP is assigned to help feed, ambulate, or care for a patient who is visually impaired, be certain that the person understands what the visual impairment is and whether one or both eyes are affected. Ask that the aide announce his presence with a knock on the door and speak before touching the patient. Review how to feed a blind patient and how to assist with ambulation. Gently remind the CNA or UAP that the patient is blind and not deaf, unless deafness is also a patient problem.

Do not give a person who is visually impaired a straw or drinking tube unless you are asked to, because it may be awkward to use. If you must feed the patient all of a meal, work slowly and calmly. Indicate about hot and cold foods on the tray, and alternate dishes rather than feeding all of one thing before offering another. Avoid talking too much, thus forcing the patient to either stop

eating or answer you with a mouth full of food. Whenever possible, help the patient select finger foods such as sandwiches and raw fruit or vegetables from the menu. The goal is to help the patient maintain dignity and self-respect while meeting her personal needs.

If a guide dog is present, do not interfere with it or pet it while it is working. Do not feed the dog; let the patient feed it at the appropriate time. Be sure the dog is near the bed on its own mat. Ask if the mat may be on the side of the bed that the staff are less likely to use.

Think Critically

Can you think of three specific ways in which you can assist a blind patient who is admitted to the hospital to maintain as much independence in this setting as possible?

Evaluation

Evaluation is based on reassessing data and determining whether expected outcomes have been met. This is an ongoing process. Some questions to be asked when gathering data for evaluation include: Is the patient compliant with the use of eye medications? Is an infection resolving? Is vision improving? If interventions have not been effective in helping the patient achieve expected outcomes, the plan of care should be altered.

Community Care

Nurses in all settings should be conscious of eye safety for themselves and those around them. Public education about using sunhats, visors, and dark glasses when outdoors to protect the eyes from ultraviolet A and B (UVA and UVB) rays is another function of all nurses.

Nurses working in home care often find that patients have not had eye care in many years; prescriptions have not been changed, and their quality of vision has decreased. Arrange for referral to an appropriate agency to set up an eye examination when the patient cannot. Glaucoma testing should be encouraged every 2 to 3 years for all adults older than 40 years.

Anatomy and Physiology of the Ear

Structures of the Ear

- The external ear consists of the pinna (auricle) and the canal (auditory meatus). The pinna is the fleshy part of the ear situated on the side of the head (Figure 25-9).

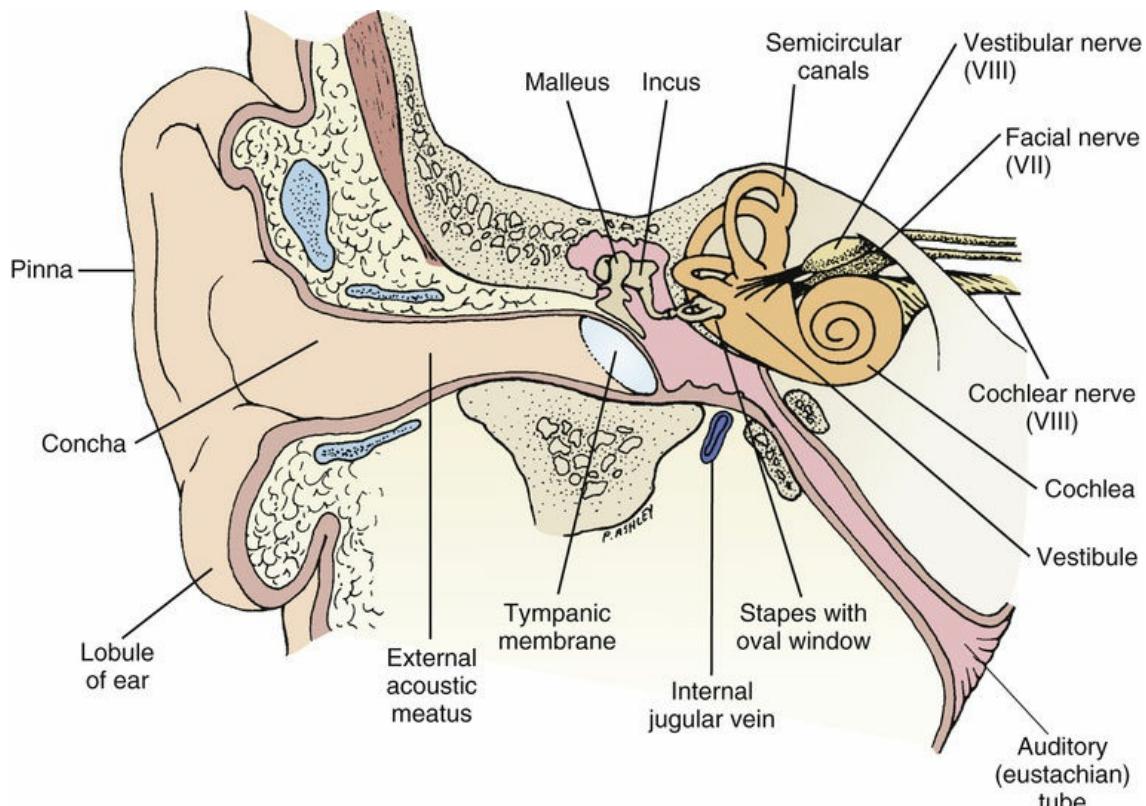


FIGURE 25-9 Structures of the ear.

- The auditory meatus is a tube approximately 2.5 cm long that extends from the pinna to the tympanic membrane.
- The meatus is lined with numerous hairs and glands that secrete a waxy substance called **cerumen** (earwax).
- The middle ear contains the auditory bones (ossicles) and opens into the eustachian tube.
- The auditory ossicles are three small bones: the malleus (hammer), the incus (anvil), and the stapes (stirrup).
- The malleus attaches to the tympanic membrane.
- The stapes attaches to the oval window.
- The incus links the malleus and the stapes.
- The tympanic membrane (eardrum) separates the middle ear from the external ear.
- The eustachian tube connects the middle ear with the throat.
- The oval window and the round window connect the middle ear to the inner ear.
- The inner ear is divided into the vestibule, the semicircular canals, and the cochlea.
- The inner ear contains a bony labyrinth with a membranous labyrinth lining; the inner ear is located in the temporal bone of the skull.
- A clear fluid, endolymph, fills the membranous labyrinth.
- The cochlea contains the organ of Corti, which is composed of sound receptors.

Functions of the Ear Structures

- The pinna collects sound waves and channels them into the auditory meatus.
- The hairs and cerumen in the canal help prevent foreign objects from reaching the tympanic membrane.
- The tympanic membrane vibrates when sound waves hit it; the sound vibrations are conducted to the malleus.
- The bones of the middle ear transmit the sound vibrations to the inner ear. The malleus transmits them to the incus, and the incus transmits sound vibrations to the stapes. The stapes transmits the sound vibrations to the oval window, which transfers the motion to the fluid in the inner ear.
- Fluid motion in the inner ear stimulates the sound receptors in the cochlea and the organ of Corti.
- The organ of Corti transmits impulses to the cochlear branch of the vestibulocochlear nerve (cranial nerve VIII). This nerve carries the impulses to the medulla oblongata, the thalamus, and then to the temporal lobe of the brain, which contains the auditory cortex.
- The eustachian tube helps equalize pressure in the middle ear.
- Receptors responsible for equilibrium (balance) are located in the inner ear, within the bony vestibule and at the base of the semicircular canals.
- Impulses from the equilibrium receptors are transmitted to the brain via the vestibular branch of the vestibulocochlear nerve (cranial nerve VIII). The cerebellum is important in mediating the sense of equilibrium and balance.

Age-Related Changes in the Ear

- Cerumen becomes harder, containing less moisture, and its buildup within the ear may contribute to a hearing loss in the low-frequency range.
- The tympanic membrane loses elasticity.
- The joints between the auditory bones become stiffer; the stiffness interferes with the transmission of sound waves but is not clinically significant by itself.
- There is a gradual loss of the receptor cells in the organ of Corti after age 40 years.
- The number of nerve fibers in the vestibulocochlear nerve decreases, contributing to hearing loss and sometimes affecting balance and equilibrium.

The Ear

Approximately 36 million adults in the United States have some degree of hearing loss ([National Institute on Deafness and Other Communication Disorders, 2014](#)). The number has risen dramatically in the past three decades. Approximately 15% (26 million) of Americans between the ages of 20 and 69 years have high-frequency hearing loss caused by exposure to loud sounds. Social withdrawal is common when hearing becomes severely impaired. The inability to hear causes difficulty with communication. Approximately 2 in 1000 babies born in the United States have some form of congenital hearing problem. After age 75 years, about 47% of the population has some degree of hearing loss. It is believed that the trend of playing very loud music—causing damage to the acoustic nerve—will result in considerably more hearing loss in the coming decades.

Health Promotion

Coping With Hearing Loss

The sooner a person with a hearing loss obtains and learns to use a hearing aid, the greater the hearing improvement. The brain is better able to integrate the hearing aid transmissions when hearing has not been impaired for a very long time. Encourage individuals with any hearing loss to be tested and to try a hearing aid if one is recommended. The person should be told that there is an adjustment curve with new hearing aid use, and it often takes several trips back to the hearing aid center for minor adjustments to the instrument to be made. It also takes practice in using the aid to achieve better hearing.

There are two types of hearing loss related to problems in the ear: **sensorineural** and **conductive**. Approximately 80% of hearing loss is caused by a disorder of the hearing nerve (**sensorineural loss**). Conductive hearing loss is caused by a problem transmitting sound impulses through the auditory canal, the tympanic membrane, or the bones of the middle ear. Causes of sensorineural and conductive hearing impairment are listed in [Box 25-2](#).

Box 25-2

Common Causes of Sensorineural and Conductive Hearing Loss

Conductive Loss

- Obstruction by impacted cerumen
- Infection with labyrinthitis
- Otosclerosis
- Trauma and scarring of the tympanic membrane
- Congenital malformation of the outer or middle ear

Sensorineural Loss

- Presbycusis
- Heredity with congenital loss
- Ototoxic drugs
- Loud noise exposure

- Tumor (acoustic neuroma)
- Ménière disease
- Severe infection such as measles, mumps, or meningitis
- Rubella in utero

Arteriosclerosis can cause decreased blood flow to the otic nerve (eighth cranial nerve), resulting in sensorineural hearing loss. This often contributes to hearing loss in older adults.

A loss of hearing—like a loss of sight—burdens its victims with physical, emotional, psychosocial, and financial problems. Hearing allows for communication with others in everyday conversations, in the classroom, and in business transactions. Without the ability to hear, one can be deprived of many of the joys and pleasures of life: music, drama, exchange of ideas, and the thousands of sounds in one's environment. Because hearing warns one of danger, an inability to hear can cause anxiety and fear. Adults who have a hearing deficiency might lose jobs and alienate friends because of their communication handicap. Nurses must learn ways to help prevent hearing loss and to assist patients who already have such a loss.

Inner ear disorders can cause problems with balance. Dizziness, vertigo, and ataxia can greatly interfere with an individual's ability to work or to perform usual activities of daily living.

Accidental injury and fractures from falls may occur.

To understand the problems affecting the ear, it is necessary to recall the ear's normal structure and functions.

Hearing Loss

Causes and Prevention

A glance at the causes of hearing loss listed in [Box 25-2](#) will help identify some of the ways nurses can help prevent hearing loss. Not all cases of hearing disability can be prevented, but education of the general public about causes of hearing loss can reduce its incidence. *Healthy People 2020* includes many objectives to prevent hearing loss and improve hearing among the American public. Adequate treatment of severe ear infections helps preserve hearing. Loud noise is a major cause of sensorineural hearing loss, and the use of headphones or earbuds contributes considerably to hearing damage ([Table 25-5](#)) (National Institute on Deafness and Other Communication Disorders, 2010b). A large amount of hearing loss is the result of employment-related exposure to loud and continuous noise. Active and retired military personnel are experiencing hearing loss from exposure to loud noises. Veterans are 30% more likely to have severe hearing impairment (SHI) than nonveterans ([MMWR, 2010](#)).

Table 25-5
Range of Sounds Audible and Hazardous to the Ear

LEVEL IN DECIBELS (dB)	EXAMPLE
0	Lowest sound audible to the human ear
30	Quiet library, soft whisper
40	Living room, quiet office, bedroom away from traffic
50	Light traffic at a distance, refrigerator, gentle breeze
60	Air conditioner at 20 feet, conversation, sewing machine
70	Busy traffic, noisy restaurant; at this decibel level, noise may begin to affect hearing if exposure is constant
Hazardous Zone for Hearing Loss	
80	Subway, heavy city traffic, alarm clock at 2 feet, factory noise; these noises are dangerous if exposure to them lasts for more than 8 hr
90	Truck traffic, noisy home appliances, shop tools, lawn mower; as loudness increases, the "safe" time exposure decreases; damage can occur in 8 hr
100	Chain saw, stereo headphones, pneumatic drill; even 2 hr of exposure can be dangerous at this decibel level; with each 5-dB increase, the safe time is cut in half
120	Rock band concert in front of speakers, sandblasting, thunderclap; the danger is immediate; exposure of 120 dB can injure ears
140	Gunshot blast, jet plane; any length of exposure time is dangerous; noise at this level may cause actual pain in the ear
160	Rocket launching pad; without ear protection, noise at this level causes irreversible damage; hearing loss is inevitable

Adapted from Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problem*, ed. 8, St. Louis, 2011, Mosby.

Hairpins, the ends of pencils, and other objects should never be used to relieve tickling or itching in the ear or to remove cerumen. Earwax normally moves on its own out of the ear canal to the outer ear, where it can be removed without danger of damaging the delicate lining of the ear canal or the tympanic membrane (eardrum). Obstructive cerumen should be removed by using drops

that dissolve it or by a provider or nurse skilled in removing impacted cerumen. Foreign objects, such as beans, peas, and other organic substances, also should be removed by someone who is experienced and aware of the potential for ear damage.

Conductive hearing loss most often occurs from stiffening of the bones of the middle ear or from scarring of the tympanic membrane. Continued exposure to excessively high levels of sound can produce sensorineural loss called *noise-induced hearing impairment*. This condition is particularly likely to occur in industrial settings where machinery operation creates loud noise. The standards of the Occupational Safety and Health Administration (OSHA) require the wearing of ear protectors in such settings.

A more recent phenomenon is the potential damage to the inner ear caused by amplified music. **Sustained exposure to noise levels of 90 to 95 dB may result in hearing loss.**

Many drugs can be toxic to the inner ear. This is especially true if a very high dose of the drug is given or if it is given incorrectly. Commonly administered drugs that can be ototoxic are many of the antibiotics, nonsteroidal anti-inflammatory drugs, chemotherapy agents, and potent diuretics, such as furosemide (Lasix) (Box 25-3). Aspirin and other salicylates can produce loss of hearing of high frequencies and ringing in the ears (**tinnitus**).

Box 25-3

Ototoxic Drugs and Environmental Chemicals

Ototoxicity (ear poisoning) is caused by drugs or chemicals that damage the inner ear or the vestibulocochlear nerve. There are more than 200 drugs that cause toxicity. The vestibulocochlear nerve sends balance and hearing information from the inner ear to the brain. Ototoxicity may result in temporary or permanent disturbances of hearing, balance, or both. Environmental chemicals can be toxic from inhalation of fumes or powder residue or from skin contamination.

Drugs That May Cause Ototoxicity

Antibiotics

(Family history may increase susceptibility; may cause permanent damage.)

- Tobramycin
- Gentamicin
- Streptomycin
- Kanamycin
- Amikacin
- Neomycin
- Netilmicin
- Dihydrostreptomycin
- Erythromycin (IV)
- Vancomycin
- Chloramphenicol
- Minocycline
- Capreomycin
- Dibekacin
- Etiomycin

Antineoplastic Drugs

(May cause permanent damage.)

- Cisplatin
- Carboplatin
- Bleomycin
- Nitrogen mustard

Loop Diuretics (IV)

(Usually temporary damage.)

- Furosemide
- Torsemide
- Bumetanide
- Ethacrynic acid

Salicylates

(Usually temporary damage.)

- Aspirin

Nonsteroidal Anti-inflammatory Drugs

(Usually temporary damage.)

- Ibuprofen
- Naproxen sodium

Quinidine Derivatives

(Usually temporary damage.)

- Quinidex
- Atabrine
- Plaquenil
- Quinine sulfate
- Mefloquine
- Chloroquine

Environmental Chemicals

- Metals (lead, mercury, gold, arsenic)
- Aniline dyes
- Toluene
- Carbon monoxide
- Trichloroethylene

- Xylene
- Povidone-iodine
- Nicotine
- Potassium bromate

IV, Intravenous.

Nurses should be aware of the potential for damage to the ear by potent drugs. Nonsteroidal anti-inflammatory drugs are more toxic in older adults and when used at maximum dosages over an extended period.

Older Adult Care Points

The older the patient, the greater the chance of ototoxicity occurring from analgesic medications, because many older patients have chronic conditions that cause chronic pain. Older adults' liver and kidneys generally have decreased function because of aging, so they cannot degrade and eliminate drugs as easily as those of younger people. This can cause drugs and drug metabolites to build up to toxic levels when medication is taken on a continuing basis.

Safety Alert

Dangers of Ototoxic Drugs

Know the toxic effects of the drugs you administer. Patients should be assessed frequently while receiving a potentially ototoxic drug. Any signs of ototoxicity, such as ringing in the ears, subtle changes in hearing ability, and difficulty in hearing, should be reported immediately. Ototoxicity commonly occurs because patients are taking more than one drug that can be toxic to the ear. Teach patients who are taking daily doses of aspirin or nonsteroidal anti-inflammatory drugs for arthritis or other chronic pain conditions to immediately report the signs of ototoxicity.

Diagnostic Tests and Examinations

Visual examination of the ear.

The two instruments most commonly used to examine the ear canal and tympanic membrane are the otoscope and the aural speculum. The otoscope is fitted with a light and a magnifying lens to facilitate inspection (Figure 25-10). The aural speculum is used with a special circular, slightly concave head mirror that has a hole in its middle. The head mirror is positioned so that the central hole lies in front of the examiner's eye. A source of light, such as a lamp, is placed behind the examiner so that it shines on the head mirror and is reflected into the ear.

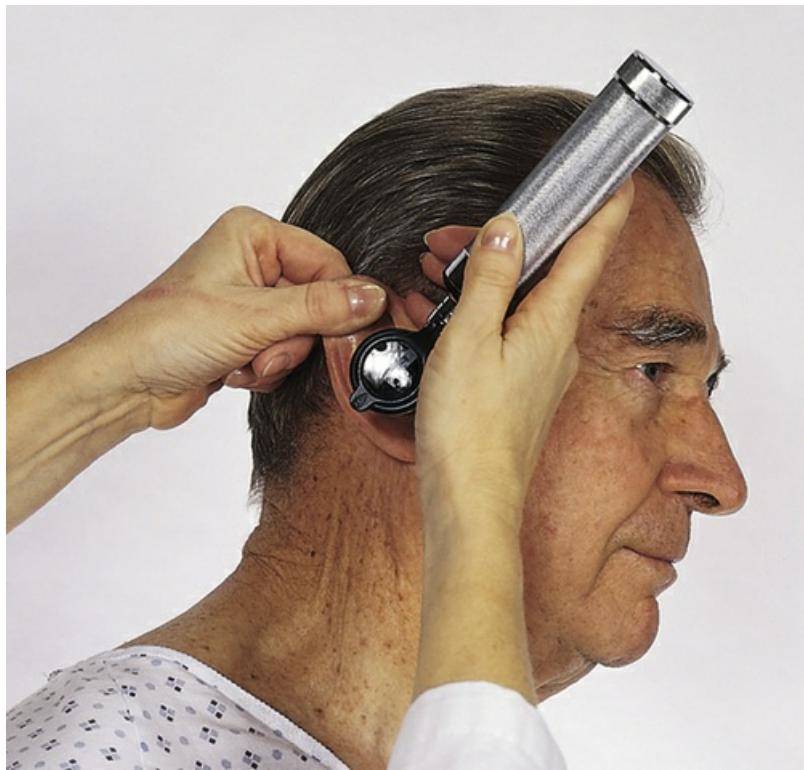


FIGURE 25-10 Examination of the ear with an otoscope. (From Jarvis C: *Physical examination and health assessment*, ed. 6, St. Louis, 2012, Saunders.)

The simple speculum can be modified by attaching a special tube and inflatable bag (pneumatic otoscope), thereby creating an airtight system. This allows the examiner to determine whether the tympanic membrane responds to positive and negative pressure. The normal eardrum moves in response to pressure. Healed perforations and scars on the eardrum can be seen when the tympanic membrane is moved.

A simple hearing test is the **whisper test**. The examiner stands behind the patient and whispers a question to the patient. If the patient hears the question, an answer is forthcoming. The examiner backs up a step and whispers another question, and so on.

Tuning fork tests.

Tuning forks measure hearing by air conduction or by bone conduction (Weber test and Rinne test). A tuning fork is activated by holding it by the stem and striking the tines softly on the back of the hand ([Table 25-6](#)).

Table 25-6
Diagnostic Tests for Ear Problems

TEST	PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
Weber test	To determine loss of hearing in one ear or both	Tuning fork is struck, and then the handle is placed on the patient's forehead. Normal hearing or equal loss in both ears is demonstrated by hearing the sound in the middle of the head.	Explain purpose and procedure to patient.
Rinne test	To determine whether hearing loss is sensorineural or conductive	Tuning fork is struck, and then the handle is placed on the mastoid bone; the fork is removed and struck again and held beside the ear. The patient is asked in which position she heard the sound better or longer.	Explain procedure to patient.
Audiometry	To determine degree of hearing loss in each ear	Earphones are placed on the patient's ears and, with the use of an audiometry machine, the audiologist channels sounds of different decibels and pitch into one ear and then the other. The patient signals when she hears the tone.	Explain procedure to patient.
Caloric test	To check for alteration in vestibular function in each ear	With patient in a seated or supine position, each ear is separately irrigated with a cold and then a warm solution to determine vestibular response. Normal response is nystagmus, vertigo, nausea, vomiting, falling; decreased response indicates abnormality.	Explain procedure to patient; tell patient she may experience nystagmus, vertigo, nausea, and vomiting, but these will indicate a normal response.
Electronystagmography (ENG)	To assess for disease of vestibular system	Electrodes are placed near the patient's eyes. Caloric test is performed; movement of the eyes is recorded on a graph. Decreased response is abnormal.	Explain procedure and equipment to patient. Tell her that nausea, vertigo, etc. indicate a normal response.
Evoked-response audiometry (ERA); auditory brainstem response (ABR)	To determine abnormality of nerve pathways between eighth cranial nerve and brainstem	Electrodes are attached to the client's head in a darkened room; similar to EEG. Auditory stimuli are directed to the patient, and a computer is used to track and separate the auditory electrical activity of the brain from other brain waves.	Explain procedure and equipment to patient. Tell her the room will be darkened.
Magnetic resonance imaging (MRI)	To detect tumor of the eighth cranial nerve, acoustic neuroma	Huge electromagnet is used to detect radiofrequency pulses from the alignment of hydrogen protons in the magnetic field. A computer translates the pulses into cross-sectional images. Provides high-contrast views of soft tissue.	Explain to patient that her head will be placed in a machine that looks like a large tube. She will need to lie very still during the test; all metal must be removed before the test.
FTA-ABS blood test	To test for syphilis	Blood is drawn and sent to the laboratory for determination of presence of	Explain that a blood sample is needed.

| syphilis. Syphilis can cause problems with nerve transmission from the ear. |

EEG, Electroencephalography; FTA-ABS, fluorescent treponemal antibody absorption.

Test for nystagmus.

To test for **nystagmus** (involuntary rhythmic jerking of the eyes), hold a finger directly in front of the patient at eye level. The patient is asked to follow the finger without moving the head. Move the finger slowly from the midline toward the right ear about 30 degrees. Then the finger is moved back to the midline and then slowly toward the left ear about 30 degrees. The patient's eyes are watched for any jerking movements. Nystagmus other than at the extremes of lateral gaze is abnormal and may indicate an inner ear problem, intracranial tumor, or paralysis of an eye muscle.

Romberg test.

The Romberg test is a test of equilibrium. The patient stands with the feet together, the arms out to the sides, and the eyes open. Note the ability to maintain an upright posture without swaying. The patient is then asked to close the eyes, and posture is observed again. If the patient loses balance, it may indicate a problem with the inner ear or the cerebellum.

❖Nursing Management

■ Assessment (Data Collection)

Patients older than 60 years should always be assessed for hearing loss. If a patient has a known hearing impairment, Assess how the patient is coping with it. Hearing and balance are subjective problems and require a good history from the patient.

▣ Focused Assessment

Data Collection for Ear Disorders

Ask the following questions:

- Have you had any pain in the ear?
- Have you had a recent temperature elevation?
- Do you suffer from allergies?
- Do you have frequent upper respiratory infections?
- Have you ever been exposed to very loud noise? Do you work in an area that is noisy? Do you listen to loud music?
- Have you ever had a head injury?
- Do you scuba dive, hunt or shoot skeet, or fly in small airplanes?
- Do you ever have ringing, buzzing, or odd sounds in the ears?
- Do you feel your hearing ability has decreased? Do people you live with think that you do not hear as well as you used to hear? Do you frequently have to ask people to repeat things that have been said to you?
- Is there a history of hearing loss in your family?
- Have you ever had a really high fever?
- What medications are you taking regularly? Are there other medications that you have taken for an extended period in the past? Do you take aspirin?

- How do you clean your ears?
- Do you ever experience dizziness, vertigo, or loss of balance?

Diagnosis of infection requires an otoscopic examination. It should be noted that the color, texture, and amount of cerumen varies among individuals. In whites and African Americans cerumen tends to be moist and rust-brown colored. Native Americans and Asians have cerumen that is lighter in color and drier. Normally, the top of each pinna is aligned with the corner of the eye on each side of the head. Lesions on the pinna may indicate skin cancer, particularly in older adult patients. There should be no secretions other than cerumen from the ear. Ear pain may be referred from other parts of the head and neck and may occur from sinusitis, dental problems, or temporomandibular joint syndrome.

Focused Assessment

Physical Assessment of the Ear

- Compare the pinna from one side to the other for symmetry and placement.
- Palpate the pinna for the presence of nodules.
- Observe for the presence of lesions on the pinna.
- Check for drainage (**otorrhea**) from the ear; note color and odor.
- Observe the gait to detect any problem with balance.
- Observe for wavering when arising from a supine or seated position that might indicate dizziness or equilibrium problems.
- Observe for signs of bruising on the body from falls that may indicate problems with balance.
- Observe whether the person speaks in a voice louder than necessary.
- Observe whether facial expression indicates difficulty in understanding what is being said.
- Determine whether responses to statements are inappropriate.

Note: Someone qualified and experienced in using an otoscope should inspect the auditory meatus and the tympanic membrane.

The ears of older adults in long-term care facilities should be checked with an otoscope at regular intervals for cerumen. Many long-term care residents have a correctable hearing loss related to impacted cerumen. Cerumen can be removed by using cerumen softener drops, and then irrigating the external ear canal ([Figure 25-11](#)).

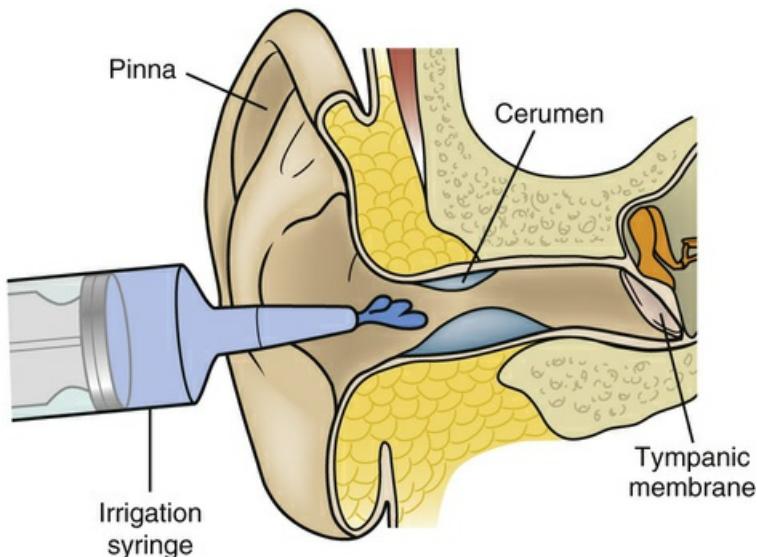


FIGURE 25-11 Irrigating the external ear canal. Warm water is used to remove cerumen and debris from the canal. Aim the stream of water above or below the impaction to allow back pressure to push it out rather than farther down the canal.

Nursing Diagnosis and Planning

Problem statements/nursing diagnoses are chosen considering the assessment data (Table 25-7). Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover). General goals for a patient with problems of the ear or hearing are:

- Promote knowledge to protect hearing
- Prevent infection and injury
- Promote effective communication
- Promote coping with hearing loss

Table 25-7

Common Problem Statements, Expected Outcomes, and Nursing Interventions for Patients With Ear Disorders

PROBLEM STATEMENTS	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Insufficient knowledge about preventing hearing loss	Patient will verbalize ways to prevent further hearing loss. Patient will be free of ear infection within 10 days.	If cerumen is obstructing the auditory canal, irrigate as ordered; warm the irrigation solution to body temperature. If infection is present, instruct regarding antibiotic medication and encourage to take entire prescription. Instruct in use of hearing aid if one is prescribed. Advise of ways to prevent further hearing loss: avoid loud noise or wear ear protectors; seek treatment immediately for signs of ear infection.
Pain due to ear inflammation	Pain will be controlled with analgesia within 8 hr. Pain will be resolved within 7 days.	Administer analgesics as ordered as needed. Warm analgesic eardrops to room temperature before administration. Have patient rest head on heating pad turned on "low" setting if this seems to decrease pain.
Altered communication ability due to hearing loss	Patient will assist in choice of methods to improve ability to communicate. Patient will try hearing aid for 2 wk if there is an indication that this device would help hearing.	Plan with patient the best way to communicate so that instructions and information are comprehended; explore tone of voice, level of volume, distance from patient when speaking, writing out communication, etc. Establish a routine procedure to confirm patient's understanding. Refer for evaluation by audiologist. Encourage daily use of hearing aid if one is prescribed. Explain that time and adjustments are necessary to obtain the optimum result. Give praise for efforts to use hearing aid.
Anxiety due to impaired safety or inability to perform well at work because of hearing loss	Patient will explore methods of maintaining safety within 2 wk. Patient will verbalize ways in which assisted hearing devices might assist in performance in the work environment.	Encourage verbalization of fears. Use means to enhance communication. Advise of assisted-hearing devices, hearing aids, and availability of "hearing ear" dogs. Introduce means of learning alternative communication methods, such as sign language and speech reading. Explore methods of enhancing attention to visual cues of dangers in the environment (e.g., close attention to signal lights or observing others at street crossings). Discuss problems of communication in social settings and explore possible solutions (e.g., masking devices for use in crowds, having interaction with only one or two people at a time, avoiding noisy restaurants, or using hearing aid).
Potential for injury due to impaired equilibrium	Patient will verbalize methods to ensure safety within 3 days. Patient will not experience a fall or injury.	Administer medication for vertigo as ordered. Encourage a low-sodium diet. Instruct to change positions very slowly. Encourage to hold on to something solid or to someone when rising from a sitting to a standing position. If vertigo is present, instruct to not ambulate without assistance. Teach or reinforce vestibular/balance exercises as prescribed. Assist to identify any aura (presence of symptoms that precede an attack). Instruct to lie down and keep the eyes open and focused straight ahead when experiencing vertigo.
Altered self-care ability	Patient will verbalize ways to enhance safe self-care within 2 wk.	Describe measures to assist the person to adapt; refer to support groups and sources for information. Refer to community agencies and resources for the hearing impaired.

Potential for social isolation due to difficulty in communicating	Patient will establish an adequate social network within 2 mo.	Assist patient to consider possibilities for social contact despite hearing problems. Help patient obtain a telephone for hearing-impaired people. Encourage the use of e-mail, texting, and other social media for contact with friends and family and social interaction with others.
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Expected outcomes are written for each problem chosen for the patient's care plan. The outcomes should be written in collaboration with the patient and other health team members. In addition to the nurse and provider, an audiologist, hearing aid specialist, and speech therapist may be involved in the patient's care. Both long- and short-term goals for the patient should be considered.

When a patient is severely hearing impaired, communication with the patient for treatments and activities of daily living may take longer than with patients who hear normally. Take this into consideration when creating the daily work plan. If the patient does not have adequate aids for hearing, Devise an acceptable method of two-way communication with the patient.

■ Implementation

Interventions for patients with a hearing or balance problem are geared toward patient education, treatment of infection, preoperative and postoperative care and instructions, measures for communication (Box 25-4), and referral to resources. The hearing aid must be cared for properly (Box 25-5).

Box 25-4

Communicating With a Person Who Is Hearing Impaired

- If the person uses a hearing aid, encourage its use and see that it is situated, turned on, and adjusted before beginning speaking.
- Be certain you have the person's attention before beginning speaking.
- Sit facing the person with the light on your face rather than from behind you.
- Ask permission to turn down the volume of or turn off the television or radio.
- The best distance for speaking to a hearing-impaired person is $2\frac{1}{2}$ to 4 feet. Place yourself on eye level with the person. Do not speak directly into the person's ear, because this prevents the person from obtaining visual cues while you are speaking.
- Do not smile, chew gum, or cover your mouth while speaking.
- Use short, simple sentences. If the patient does not appear to understand or responds inappropriately, state the message again using different words. Try to limit each sentence to one subject and one verb.
- Give the person time to respond to questions.
- Ask for oral or written feedback to make certain your message is understood.
- Avoid using the intercom system, because it may distort sound.

Box 25-5

Caring for a Hearing Aid

When a hearing aid does not work:

- Check that the switch is "on."
- Examine the ear mold for attached wax or dirt; clean the sound hole.
- Check the battery to see that it is inserted correctly.
- Check the connection between the ear mold and the receiver.

- Replace the battery. Batteries last an average of 12 to 14 days depending on type of aid.
 - Check placement of the ear mold in the ear; it should fit snugly.
 - Adjust the volume.
 - If all else fails, take the hearing aid to an authorized service center for repair.
- To clean the hearing aid:
- Turn the hearing aid off.
 - Wash the ear mold with mild soap and warm water; do not submerge in water.
 - Use a pipe cleaner or toothpick to gently cleanse the opening or short tube that fits into the ear.
 - Dry the mold completely before turning on the aid or before reattaching it to the hearing aid (if it is separate).

Instillation of Ear Medication

Eardrops may be prescribed to dissolve cerumen, relieve pain, or combat infection in the auditory meatus. The patient should be positioned in a supine lateral position so that the affected ear is uppermost. The medication should be at room temperature. Cold eardrops may cause discomfort or dizziness. For adults and children 3 years of age and older, the ear canal is straightened by drawing the pinna upward and toward the back of the head ([Figure 25-12](#)). For a child younger than 3 years, the pinna is pulled down and back. Following the “Six Rights” of medication administration, draw up the correct amount of medication. Insert the tip of the dropper into the external ear canal and instill the medication ([Box 25-6](#)). Place cotton in the external meatus to prevent the medication from escaping. Have the patient remain in the lateral position for 5 to 10 minutes.



FIGURE 25-12 Straightening the ear canal to instill eardrops.

Box 25-6

Instilling Otic Medication

- Follow the “Six Rights” of medication administration.
- Read the order carefully to determine which ear is to receive the medication.
- Position the patient supine and in the lateral position so that the affected ear is uppermost.
- Draw medication into the medicine dropper by depressing the bulb and letting it go.
- Straighten the ear canal by drawing the pinna upward and toward the back of the head. For children younger than 3 years, draw the earlobe slightly down and back.

- Insert the tip of the medicine dropper into the external ear canal and depress the bulb to dispense the medication. Withdraw the dropper.
- Place cotton in the external meatus to prevent the medication from escaping.
- Have the patient remain in the lateral position for 5 to 10 minutes.

Communicating With a Patient Who Is Hearing Impaired

A patient who is hearing impaired has unique problems of communication when in the hospital or long-term care facility. If she cannot hear well and misunderstands or misinterprets the voices and sounds in the unfamiliar surroundings, she is likely to be frustrated, fearful, and anxious. Unless a special effort is made to have frequent contact with the patient, social isolation may occur.

When speaking to a patient who is hearing impaired, sit at eye level facing the patient. Gain eye contact and speak slowly and enunciate clearly. When trying to communicate with a person who is hearing impaired, bear in mind that attempts to answer questions without fully understanding what is asked may occur. Past experience has taught many people with hearing loss that to ask for repetition of questions irritates people and causes them to think the person is stupid. **For this reason, many people who cannot hear well commonly smile and say “Yes,” when such an answer is either incorrect or inappropriate.** Another problem is that the individual may fill in parts of sentences with similar-sounding words. For example, the words “Knott’s Berry Farm” may be interpreted as “not very far.” Some guidelines to help patients who are hearing impaired and improve nurses’ ability to communicate are given in **Box 25-4**.

Think Critically

What three techniques of communication with a patient who is hearing impaired do you think would be the most helpful?

A piece of tape or note should be placed over the terminal on the intercom system that designates the room of a patient who is hearing impaired. This serves to remind the person answering the light to go to the patient’s room rather than try to talk over the intercom system.

Evaluation

Evaluation involves reassessment to determine whether the expected outcomes are being met. Determining whether hearing has improved is the criterion by which effectiveness of treatment is evaluated. Improvement is verified by audiology. Fading or resolution of dizziness and vertigo indicate that actions and treatments for these problems have been effective. Resolution of infection is determined by the appearance of the eardrum, absence of pain, and normal temperature.

Common Problems of Patients With Ear Disorders

Hearing Impairment

Hearing impairment ranges from difficulty in hearing certain ranges of tones or in understanding certain words to total deafness. Persons with sensorineural hearing loss typically have more difficulty hearing high-pitched tones than low-pitched ones; thus they commonly can understand the speech of men better than that of women. Another characteristic of sensorineural hearing loss is difficulty hearing softly spoken and poorly enunciated words. Speaking slightly louder to a person with sensorineural hearing loss may help, but it is especially important to speak slowly and clearly and to face the person when communicating with her. Because people with sensorineural hearing loss do not hear their own voices as well as a person with normal hearing, they tend to speak louder than necessary.

Assignment Considerations

Caring for a Patient Who Is Hearing Impaired

When assigning tasks for a patient who is hearing impaired to UAP and CNAs, remind them how

to effectively communicate with the patient: face the patient and obtain the patient's attention before speaking; speak slowly and enunciate clearly in a normal voice. If the patient wears a hearing aid, it should be in the ear and the patient should be reminded to turn it on before communication begins.

Hearing aids help some people with sensorineural hearing loss. Aids designed to amplify some pitches and block out others that do not need amplification are most helpful. Hearing aids are not always the answer to a problem of hearing loss, and for some people the most effective therapy is focused on rehabilitation to facilitate acceptance of the loss and learning of new ways to communicate despite some degree of deafness. Most hearing aid professionals and companies will offer a 30-day money-back guarantee on any hearing aid so that the patient can try it.

Clinical Cues

When a patient can benefit from a hearing aid, then the earlier it is obtained and used, the better the brain will adjust and the better the quality that can be achieved (Tonkin, 2014).

Central hearing loss occurs in the brain as a result of a pathologic condition above the junction of the eighth cranial nerve and the brainstem. Central hearing loss can result from a problem of transmission of stimuli in the brain, an inability to decode and sort signals received from one or both ears, or a failure in the transmission of sounds from one hemisphere of the brain to the other. Causes include brain tumors, vascular changes that suddenly deprive the middle ear of its blood supply, and cerebrovascular accidents.

Many people have a combination of two or more types of hearing impairment. Often there is a combination of sensorineural and conductive loss.

Think Critically

How would you work with a patient who is hearing impaired and is a candidate for a hearing aid, but adamantly refuses to consider trying one?

Dizziness and Vertigo

The sense of balance and equilibrium is governed by the vestibular system in the inner ear. Increases in fluid pressure in the inner ear, inflammations, and vascular disorders that interrupt blood supply to the cochlea can produce dizziness, loss of balance, and nausea and vomiting. These symptoms can range from mildly annoying to completely incapacitating and should always be assessed whenever a person has an ear disorder and loss of hearing. Ménière disease and labyrinthitis cause vertigo.

A patient who experiences dizziness and positional vertigo should be cautioned to avoid suddenly turning her head or making other movements that aggravate the vertigo. She should be told to call for assistance whenever she needs to move from her bed or chair. When helping the patient to her feet, move slowly and give her time to stand for a moment before beginning to walk. **Typically, patients with this kind of vertigo feel that the room is spinning around during an attack, and any motion exacerbates the sensation.** While the patient is having an attack of vertigo, she should lie in bed and remain as motionless as possible. Stabilizing her head with a pillow on either side may encourage immobility. Attacks can last from a few minutes to hours.

Medications to reduce motion sickness and nausea should be given precisely as prescribed. These are usually given every 3 to 4 hours or on a preventive basis **before** the patient's symptoms become severe. A series of head movements called *Epley maneuvers* or *Brandt-Daroff exercises* can be helpful.

When increased fluid pressure in the inner ear is suspected as the cause of dizziness, the provider may order a low-sodium diet and limit fluid intake. Patients with recurrent attacks of vertigo are encouraged to stop smoking if they are habitual tobacco smokers. Tobacco is vasoconstrictive and can affect the blood supply to the inner ear and nerves. **Stress may affect the frequency of attacks of vertigo in patients with inner ear disorders.** Teaching the patient effective coping mechanisms to handle stress or adding rest periods into the work schedule may be helpful.

Tinnitus

Ringing, buzzing, or other continuous noise in the ear (**tinnitus**) can be mildly annoying or so severe that it interferes with activities of daily living and prevents the patient from getting sufficient sleep and rest. Common causes of tinnitus include **presbycusis** (hearing loss associated with aging), constant exposure to loud environmental noise, inflammation and infection in the ear, otosclerosis, Ménière disease, and labyrinthitis. Systemic disorders such as hypertension and other cardiovascular disorders, neurologic disease (including head injury), and hyperthyroidism and hypothyroidism also can cause ringing in the ears. **Tinnitus may be one of the first symptoms produced by an ototoxic drug.** Symptoms of tinnitus are subjective, and diagnosis is by patient history.

Clinical Cues

Because of the overload of sensory input to the brain, a patient with tinnitus will become more fatigued than others when in a noisy location such as a social gathering or a restaurant. Family and friends should be informed of this situation.

Medical treatment begins with efforts to determine the underlying cause and treat it. When the cause cannot be found, symptomatic relief is tried. However, some cases of intractable tinnitus resist all modes of conventional therapy. Less traditional measures that have varying degrees of success include biofeedback training and "masking." Sometimes substances that increase circulation are helpful (Niacin). Benzodiazepines, such as diazepam (Valium) or chlordiazepoxide (Librium), seem to help some people. Oral Lipo-Flavonoid has provided relief for many patients with tinnitus.

Biofeedback training is especially helpful in those cases in which emotional stress and anxiety are believed to be the underlying causes of tinnitus. Through visual or auditory signals, the person learns to relax and exert some degree of control over her autonomic nervous system. This can lower blood pressure and pulse rate and relax muscles that are very tense.

Masking simply provides a low-level noise to block out, or "mask," the head noise heard by the person complaining of tinnitus. Some examples include playing soft music or a tape of sounds of nature, such as a waterfall, while the person is resting or sleeping; providing "white noise" in the working environment, using a hearing aid to amplify sound from the outside and overcome head noise; and wearing a special tinnitus instrument, which is a combination hearing aid and tinnitus masker for people who have both hearing loss and tinnitus. The therapeutic effect of masking is highly individualized. Some people find instant relief, some have partial abatement of the head noise, and some do not benefit from attempts to mask the sounds of tinnitus. Earplugs or ear protection should be worn when noise exposure cannot be avoided.

Rehabilitation for Hearing Loss

Specific measures to rehabilitate a patient with hearing loss depend on the age and aptitude of the patient. Adults who have acquired the skills of speech and language before their loss of hearing occurred are better able to pick up language cues and understand what is being said to them, and therefore should have fewer problems with communication by language.

Lip-Reading (Speech Reading)

Instruction in reading lips is one mode of therapy for patients who are hearing impaired, but it is not a remedy for all difficulties. Only about 60% of the sounds in the English language can be identified by watching the lips. Most experienced lip-readers do not catch more than half of the words spoken to them. Communication by lip-reading is enhanced by other nonverbal clues, such as facial expressions and hand gestures. Learning to lip-read is difficult. It requires at least average intelligence, exceptional language skills, excellent eyesight, and much persistence and patience.

Sign Language

Many people who are deaf learn to communicate with sign language. American Sign Language (ASL) is the third most commonly used language in the United States. There are online dictionaries for ASL and several websites that provide tutorials (see Online Resources). Most major hospitals have someone on staff who can act as an interpreter for ASL.

Hearing Aids

An evaluation by a reputable audiologist can lead to a prescription for a hearing aid designed to provide the best possible improvement of hearing. Hearing aids can improve hearing for a variety of types of hearing loss. For people who do not have a defect in the middle ear, a hearing aid can transmit amplified sound from the receiver through the eardrum to the inner ear. This is accomplished by amplifying sound waves transmitted by air conduction and bone conduction. There are many types of hearing aids on the market. Newer digital types can amplify the tones needed while masking other levels of noise. It takes time to adapt to the use of a hearing aid, and the audiologist must make repeated adjustments to the device to achieve optimum function.

The design of a hearing aid varies. Some are worn in the ear, others behind the ear, and still others are built into the frame of eyeglasses. Persons with binaural hearing loss (both ears are affected) must wear a hearing aid in each ear. Regardless of the type of hearing aid, it will have a microphone, an amplifier, a receiver, and a battery (Figure 25-13).

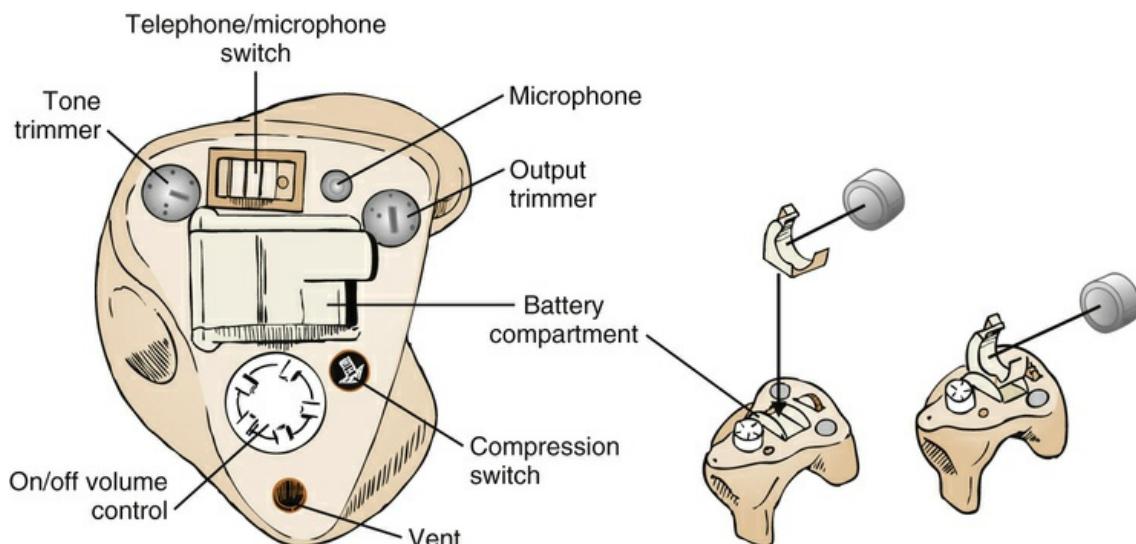


FIGURE 25-13 Parts of a typical in-the-ear hearing aid. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 7, Philadelphia, 2005, Saunders.)

The hearing aid should not be handled roughly or dropped. The ear mold can be cleaned with soap and water, but the other parts of the aid should not get wet (see Box 25-5). Hair spray can damage the microphone of a hearing aid. Regular servicing by a dealer can keep the aid in good working order. When an incapacitated patient has a hearing aid, you are responsible for the security of the hearing aid.

Recently implantable middle-ear devices have become available for those who have limited success with conventional hearing aids and have severe sensorineural hearing loss (Shohet, 2012). These are indicated for adults 18 years or older.

Cochlear Implant

Cochlear implants are now available for some patients who have no hearing at all. The device is a small computer that changes spoken words into electrical impulses that are transmitted via an implanted coil to the nerve endings in the cochlea. Success with the surgical implant varies considerably from one person to the next (Figure 25-14). Bone hearing devices and semi-implanted devices are under development. A speech therapist works with the patient once the cochlear implant is in place. Rush Limbaugh is one celebrity who has a cochlear implant in each ear.

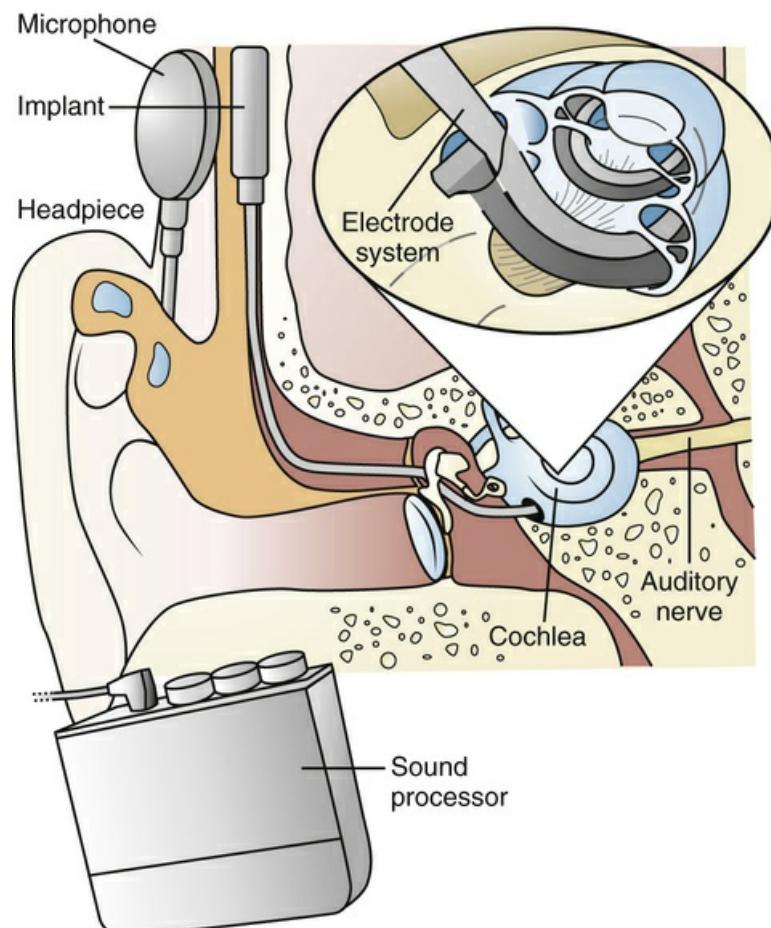


FIGURE 25-14 Cochlear implant.

Hearing-Assistive Devices

Many devices on the market use hearing aid technology. These devices assist people to hear telephone conversations, television, and sound systems, such as those in church or the theater. A telecommunication device for the deaf (TDD) is available. It is a combination typewriter and telephone and can be used to communicate with someone else who has a TDD or can be used to call a relay center that then communicates the message to the intended person. There are alarm clocks that activate a flashing light, smoke detectors that flash light, and doorbells and telephones that flash a light when a sound is produced. "Hearing ear" dogs are trained to alert their owners to particular sounds and to keep their owners safe when around traffic.

Community Care

Public education about the dangers of loud noise and music could do much to prevent thousands of people from becoming hearing impaired. Teaching people to seek prompt medical attention for symptoms of otitis media prevents damage to the tympanic membrane and preserves hearing ability.

Encouraging those with hearing impairment to have a thorough evaluation and to try a hearing aid could do much to improve the quality of their lives. There is little economic reason for refusing to **try** a hearing aid. Veterans should be told that the Veteran's Administration Health Clinics will perform hearing tests and supply a hearing aid. The Office of Vocational Rehabilitation may provide this service as well. Nurses in home care and in long-term care settings should frequently assess the function of the patient's hearing aid.

Older adults with arthritis or poor vision may have difficulty properly inserting the battery into a hearing aid. If the aid is not working, it may be that the battery simply is not inserted correctly.

Get Ready for the NCLEX® Examination!

Key Points

- Eye disorders are caused by injury, disease, or genetic predisposition.
- Everyone older than 40 years should have a complete eye examination.
- After age 65 years, an eye examination is recommended every 1 to 2 years.
- Control of diabetes mellitus and hypertension can help preserve vision.
- Obtaining a good history is important to data collection regarding vision.
- The tympanic membrane must be able to vibrate when sound is received for the sound waves to be transmitted to the middle ear.
- The bones of the middle ear transmit the sound waves to the inner ear.
- Sound is transmitted from the inner ear to cranial nerve VIII.
- Changes in the ear structures with aging may cause hearing impairment.
- Exposure to loud noise causes sensorineural hearing loss.
- A variety of drugs are ototoxic (see [Box 25-3](#)).
- There are several diagnostic tests and examinations for problems of the ear (see [Table 25-6](#)).
- Learning to communicate with people who are hearing impaired is important for nurses (see [Box 25-4](#)).
- Labyrinthitis and Ménière disease cause dizziness and vertigo.
- Decreasing stress often decreases dizziness and vertigo.
- Tinnitus is common with a variety of ear disorders.
- A variety of treatments are available to help patients with tinnitus; biofeedback and masking help many people.
- Lip-reading or speech reading is helpful to people with hearing impairments but is difficult to learn.
- Various types of hearing aids are available, but using one takes practice.
- Cochlear implants are available for patients who are totally deaf.
- Nurses should actively educate in the community about ways to prevent hearing loss.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- American Foundation for the Blind, www.afb.org
- American Sign Language, www.lifeprint.com; www.ddeafworld.com
- American Speech-Language-Hearing Association, www.asha.org
- Association for Education and Rehabilitation of the Blind and Visually Impaired, www.aerbvi.org
- Bookshare, www.bookshare.org
- Exercises for vertigo, <https://www.activator.com/wp-content/uploads/Home%20Epley%20Handouts.pdf>
- Guide Dogs for the Blind, Inc., www.guidedogs.com
- Hearing Loss Association of America, www.shhh.org
- International Hearing Dog, Inc., www.ihdi.org
- National Association of the Deaf, www.nad.org
- National Braille Association, www.nationalbraille.org
- National Institute on Deafness and Other Communication Disorders, www.nidcd.nih.gov

Review Questions for the NCLEX® Examination

1. A nurse evaluates the visual acuity of a patient using the Snellen chart. Which statement is true regarding the use of the Snellen chart?

1. The chart is placed 40 feet away from the patient.
2. The patient reads the letters using one eye at a time.
3. The numerator (top number) indicates the smallest line that the patient could read.
4. The denominator (bottom number) refers to the patient's distance from the chart.

NCLEX Client Need: Health Promotion and Maintenance, Disease Prevention

2. While looking at a card with a geometric grid of identical squares, a patient is asked to focus on a central dot and to describe any distortions of the surrounding boxes. Which patient statement indicates a need for further diagnostic testing?

1. "I get dizzy staring at these boxes for so long."
2. "I am beginning to see color differences in the squares."
3. "I can see all the boxes surrounding the dot."
4. "There are wavy lines around the central dot."

NCLEX Client Need: Physiological Integrity, Reduction of Risk Potential

3. During a provider visit, a 65-year-old man complains of pain in his right eye associated with excessive tearing. The nurse notes that the eye is red with lashes rubbing against the cornea. A likely condition would be:

1. ptosis.
2. ectropion.
3. hordeolum.
4. entropion.

NCLEX Client Need: Physiological Integrity, Physiological Adaptation

4. Which nursing action(s) demonstrate(s) appropriate care of a patient who is visually impaired?
(Select all that apply.)

1. Introduce self before touching.
2. Speak slowly with a loud voice.
3. Keep the door ajar.
4. Ensure ready access to the call button for assistance.
5. Assist with feeding using the clock method.

NCLEX Client Need: Psychosocial Integrity, Sensory/Perceptual Alterations

5. When a patient is receiving Lasix for a problem with edema, which assessment relative to this drug is important to the patient's health?

1. Measuring the blood pressure
2. Determining whether the patient is nauseated
3. Inquiring about constipation
4. Checking for hearing loss

NCLEX Client Need: Physiological Integrity, Pharmacological Therapies

6. A nurse applies a vibrating tuning fork to the middle of a patient's forehead. What response would indicate normal hearing?

1. Hearing the sound in the back of the head.
2. Feeling a vibration but hearing no sound.
3. Hearing the sound in the middle of the head.
4. Feeling a vibration and hearing a sound in the temporal area.

NCLEX Client Need: Physiological Integrity, Physiological Adaptation

7. When administering eardrops to an adult, the nurse would:

1. draw the pinna upward and toward the front of the head.
2. draw the pinna upward and toward the back of the head.
3. pull the pinna downward and toward the front of the head.

4. pull the pinna downward and toward the back of the head.

NCLEX Client Need: Physiological Integrity, Basic Care

8. A patient returns 1 week after receiving hearing aids and states, "I guess I may as well return these—I just cannot get used to them." What is an appropriate nursing response? (*Select all that apply.*)

1. "Maybe a different type of hearing aid would be better for you."
2. "You have not been able to hear well for a long time. Adjusting to the way you hear the sound through a hearing aid may take quite a bit of time, but it will be worth it!"
3. "In order to adjust to the hearing aids, you must wear them most of the time. Are you able to keep them in most of the time, or do you spend most of your time without them?"
4. "My daughter adjusted to hers in just a few days. Something is not right here."

NCLEX Client Need: Psychosocial Integrity, Coping Mechanisms

9. When communicating with a patient who is hearing impaired, the nurse should: (*Select all that apply.*)

1. sit at eye level facing the patient.
2. use a slightly higher tone than usual.
3. enunciate clearly.
4. speak directly into the patient's ear.
5. use simple, short sentences.

NCLEX Client Need: Psychosocial Integrity, Therapeutic Communication

10. While ambulating, a patient with Ménière disease complains of dizziness and vertigo. An immediate nursing action would be to:

1. provide oxygen.
2. assist the patient to supine position.

3. administer nausea medication.

4. notify the provider.

NCLEX Client Need: Physiological Integrity, Physiological Adaptation

Critical Thinking Questions

Scenario A

Mr. Hartman comes to the ambulatory clinic because he “got something in my eye” while using the weed trimmer.

1. What type of examinations would you expect the health care provider to perform?
2. What would you teach Mr. Hartman about eye safety before he leaves?
3. What questions would you ask him about basic eye care while you are interviewing him before the provider sees him?

Scenario B

Mrs. Como is admitted to the hospital for management of her hypertension. She has had sensorineural deafness for several years, and it is much worse in her left ear than in her right. Her inability to hear well causes additional stress for Mrs. Como, and she is especially anxious about being in the hospital among strangers. Mrs. Como also suffers from tinnitus, which adds to her stress and inability to relax and rest. Tinnitus and the stress of not being able to hear adversely affect Mrs. Como's hypertension.

1. What evidence would you expect to find that would indicate that Mrs. Como has a hearing impairment?
2. What can the nurses do to improve communication with Mrs. Como and help allay her anxiety about being in the hospital?
3. Why could her hearing problem make her blood pressure rise?

Scenario C

Mrs. Martinez is scheduled for a cochlear implant and states that she “really doesn't understand” how the device works.

1. What should she be told?
2. What should she expect she will need to do after the cochlear implant surgery?

CHAPTER 26

Care of Patients With Disorders of the Eyes and Ears

Objectives

Theory

1. Review errors of refraction and their treatment.
2. Devise nursing care for a patient who is undergoing a corneal transplant.
3. Compare measures used to provide assistance after a chemical eye burn with measures for an eye injury with a foreign object.
4. Summarize the signs and symptoms of selected disorders of the eye and appropriate medical treatment and nursing interventions for each.
5. Plan nursing interventions for a patient having a scleral buckle or a cataract extraction.
6. Present aids and resources for people with vision loss.
7. Explore the effects of hearing or vision loss on an individual and his family.
8. Explain the signs and symptoms of selected disorders of the ear, appropriate medical or surgical treatment, and nursing interventions for each.
9. Compile aids and resources for people with impaired hearing or tinnitus.

Clinical Practice

10. Teach a patient with tinnitus or vertigo measures that may decrease the symptoms.
11. Provide appropriate preoperative care for a patient who is having eye surgery.
12. Properly administer eye medications to patients.
13. Teach a patient to properly administer ear medication.
14. Provide appropriate care for a patient after ear surgery.
15. Assist a patient to find resources for low-vision assistance.

KEY TERMS

- accommodation (ă-kōm-ō-DĀ-shūn, p. 597)**
astigmatism (ă-STIG-mă-tĭsm, p. 598)
drusen (drū-zĕn, p. 613)
enucleation (ē-nū-klē-Ā-shūn, p. 601)
exophthalmos (ěk-sōf-THÄL-mös, p. 599)
hyperopia (hī-pěr-Ö-pě-ă, p. 597)

myopia (mī-ō-pē-ă, p. 597)

nystagmus (nīs-tāg-mūs, p. 617)

photodynamic therapy (fō-tō-dī-nām-īk thēr-ě-pē, p. 613)

photophobia (fō-tō-fō-bē-ă, p. 602)

presbyopia (prēz-bē-ō-pē-ă, p. 597)

tympanoplasty (tīm-pă-nō-plăs-tē, p. 616)

Common Disorders of the Eye

Errors of Refraction

The most common visual defects are those of refraction. This means that light rays entering the eye are not “refracted,” or bent, at the correct angle ([Figure 26-1, A](#)) and therefore do not focus on the retina. Errors of refraction may be caused by a number of structural defects within the eyeball itself. For example, if the distance between the lens and retina is too short, the light rays focus behind the retina. This causes difficulty in seeing objects close at hand and is called *farsightedness* ([hyperopia](#)) ([Figure 26-1, B](#)).

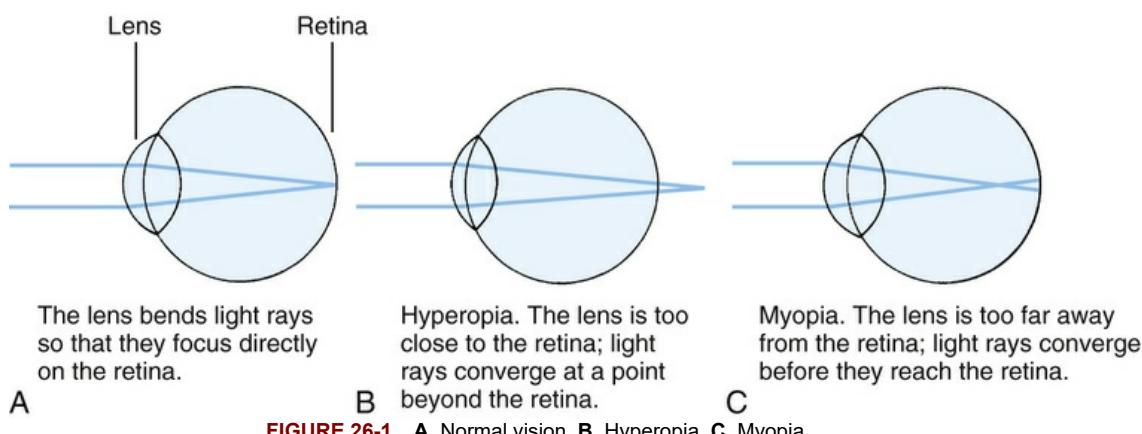


FIGURE 26-1 **A**, Normal vision. **B**, Hyperopia. **C**, Myopia.

If the opposite is true, and the eyeball is too elongated, the light rays will converge and focus in front of the retina. The individual then has difficulty seeing objects at a distance and is referred to as being *nearsighted*. *Nearsightedness* is called [myopia](#) ([Figure 26-1, C](#)).

Light rays from distant objects do not enter the eye at the same angle as light rays from near objects. When looking off into the distance and then quickly looking down at a book, the eyes must make an adjustment to the difference in the light rays entering the eye. This adjustment, which is called [accommodation](#), is accomplished by ciliary muscles and ligaments that change the shape of the lens, making it more rounded or flatter, thereby allowing light rays to fall on the retina ([Figure 26-2](#)).

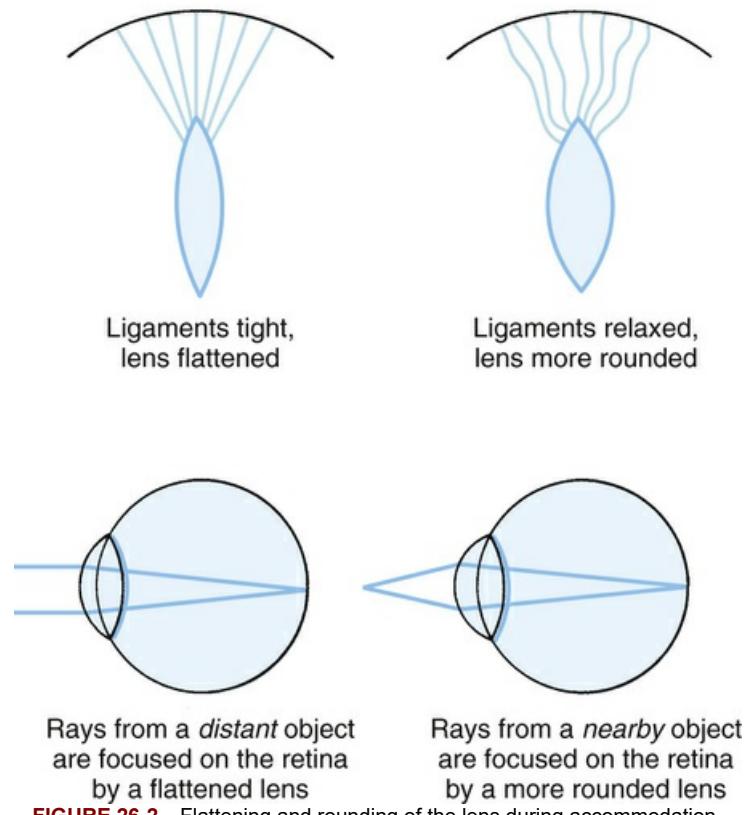


FIGURE 26-2 Flattening and rounding of the lens during accommodation.

With increasing age, the ciliary muscles become less elastic and cannot readily accommodate the needs of distant and near vision. Hardening of the ciliary muscles occurs in many people older than 40 years and is known as **presbyopia**. Bifocal glasses are usually prescribed for this condition because they allow for two sets of lenses in one pair of glasses, one for viewing distant objects and one for seeing close objects.

Astigmatism is a visual defect that results from a warped lens or an irregular curvature of the cornea; either condition will prevent the horizontal and vertical rays from focusing at the same point on the retina. Actually, very few people have perfectly shaped eyeballs, and thus there are very few who do not have some degree of astigmatism. If the astigmatism is very slight, the eye can accommodate for its imperfection by changing the shape of the lens. If there is a serious error of refraction, the eyes will tire very easily or the person will have defective vision because the eyes cannot change the shape of the lens enough to compensate for the abnormality.

Serious errors of refraction are treated with prescription eyeglasses or contact lenses that are fitted so that the light rays are brought into proper focus on the retina. In recent years, advances have been made in refractive surgery that permit correction of refraction problems for some people. Those who are nearsighted (myopic) can undergo one of three procedures. In photorefractive keratectomy (PRK), an excimer laser is used to remove a thin layer of tissue from the cornea. This corrects the excessive curvature of the cornea that is interfering with the proper focus of light rays through the lens. The preparation takes 30 minutes and the actual procedure takes less than a minute to perform; visual improvement is apparent within 3 to 5 days. Laser in situ keratomileusis (LASIK) is the most common procedure for nearsightedness in the United States. The middle layer of the cornea is reshaped with a laser after a very thin outer layer of the cornea is peeled back. The outer layer is replaced. Postoperative recovery is very rapid with little discomfort. The procedure takes about 10 to 15 minutes per eye and is performed as an outpatient procedure.

Radial keratotomy is used to correct both nearsightedness and astigmatism. Tiny cuts are made in the cornea that flatten it. It is another outpatient procedure. LASIK and PRK have mostly replaced this procedure.

Uveitis

The uveal tract consists of the iris, the ciliary body, and the choroid. Uveitis is inflammation of the

uveal tract. The cause is unknown; uveitis may result from allergens, trauma, infectious agents, or systemic disease (rheumatoid arthritis, herpes simplex, herpes zoster, or bacterial infection). Signs and symptoms are tearing; blurred vision; photophobia; aching around the eye; a bloodshot sclera; or a small, nonreactive, irregular pupil. Treatment involves resting the ciliary body with a cycloplegic drug. The pupil is dilated to prevent adhesions of the involved structures. Analgesics, antibiotics, and ocular steroid injections may be used. Cool or warm compresses are used for discomfort. Sunglasses should be worn to reduce photophobia. Low light indoors is advisable.

Dry Eye

Dry eye is a common condition in people over 40, especially in women after menopause. Because our population of older adults is growing, the incidence of dry eye is becoming more common. The symptoms of dry eye include tearing, soreness, and a gritty feeling in the eye. These symptoms can be treated with lubricating eye drops, but if the condition is left untreated it may lead to corneal ulcers.

Dry eye may be caused by a deficiency of tears, such as seen in Sjögren's disease (see [Table 12-2](#)), or it may be caused by evaporation, resulting from a dysfunction of meibomian glands that can be exacerbated by environmental conditions such as dust and wind ([Miller, 2013](#)).

Dry eye is managed by treating the underlying cause, such as meibomian gland dysfunction, and keeping the tear layer of the eye moist and functional. Patients with insufficient tears should use a solution of artificial tears that is most appropriate for their condition, including those containing sodium hyaluronate, which increases the stability of the tear film, and/or carbomer-based products that adhere to the ocular surface for an extended time. Studies have shown that carbomer-based products are more effective than artificial tears containing polyvinyl alcohol (PVA) ([Miller, 2013](#)).

Corneal Disorders

Keratitis

Keratitis is an inflammation of the cornea caused by irritation or infection. Patients who have had a stroke may develop irritation of the cornea because the eyelid does not close normally. Keratitis may occur in a comatose patient who is not receiving proper eye care. Some people with [exophthalmos](#) (protruding eyeballs) develop this disorder. Infection is common among those who wear contact lenses. The infecting agent may be in home-prepared saline solution used for cleaning the lenses. The eye becomes reddened, and there may be tearing, along with a feeling of grittiness or pain. Discharge from the eye may occur. Treatment of irritation is instillation of artificial tears. Infection is treated by a medication to kill the organism. Drugs may be given topically, subconjunctivally, or by intravenous (IV) infusion.

Corneal Ulcer

A corneal ulcer may occur from irritation, infection, or injury. The ulcer is cultured to determine whether there is a causative organism when there is no history of injury. Antibiotic medication is usually prescribed. Scarring from corneal ulcers or severe infection is treated by keratoplasty.

Corneal Transplantation (Keratoplasty)

Corneal transplants replace corneas that have been damaged by genetic disorders, trauma, ulcers, or disease such as keratitis (inflammation of the cornea); transplants help restore corneal clarity. Two types of procedures are available: a full-thickness keratoplasty (corneal transplant) and a lamellar keratoplasty, which replaces only a superficial layer of corneal tissue. The full-thickness keratoplasty restores vision in approximately 95% of patients ([Figure 26-3, A](#)). Corneas for transplantation are harvested from donor cadavers soon after death. The transplantation is performed with regional anesthesia. A new procedure, Descemet stripping endothelial keratoplasty (DSEK), replaces only the inside lining of corneal cells through a tiny incision. There are no sutures and the cells are held in place for the first 24 hours by an air bubble. Vision is improved in a matter of weeks. DSEK is used only when disease is limited to the endothelial surface. Artificial cornea transplantation studies are showing success in both adults and children; this procedure reduces the chance of rejection of human tissue.

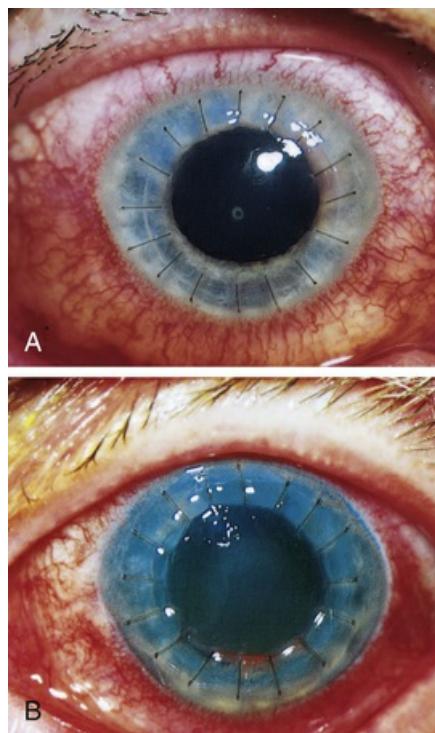


FIGURE 26-3 **A**, Keratoplasty (corneal transplant). **B**, Acute transplant rejection. (Courtesy Ophthalmic Photography at the University of Michigan, W.K. Kellogg Eye Center, Ann Arbor, Michigan.)

The patient must be “on call” to come for the transplantation, as it is unpredictable when a donor cornea will become available. The surgery is an outpatient procedure. The patient must realize beforehand that it takes 1 to 2 weeks before any improvement in vision is noticeable and that improvement will continue for several months. Because the cornea does not have an abundant blood supply, healing is very slow and is not complete for about 1 year. **Prevention of infection is extremely important.** Preoperative care is much the same as for other eye surgeries.

Safety Alert

Correctly Mark the Surgical Site

As part of the preoperative preparation, clearly mark the operative site, verifying verbally with the patient that the site is correct. Document that this was done in the medical record.

After surgery, the patient remains in recovery for 1 to 2 hours and then is discharged home. A pressure dressing and eye shield are applied in the surgical suite after the procedure and should be removed only by the provider the next day. The shield is then worn at night and when around small children or pets for at least a month. The pressure dressing helps keep the donor tissue in contact with the eyeball. Nursing actions focus on caring for the patient's disturbed visual sensory perception. Instructions regarding safety are provided before discharge. The patient may lie only on his back and nonoperative side postoperatively. Graft rejection is a possibility and is heralded by inflammation beginning near the graft edges (see *Figure 26-3, B*). This finding must be reported promptly. Should the first transplant fail, the procedure can be redone.

Sometimes an eye excimer laser is used to polish the cornea, restoring vision. A scleral lens has been developed. It is like an oversized contact lens that arches over the cornea. The space between the lens and the cornea is filled with artificial tears, providing lubrication, and thus the scleral lens fulfills the optical functions of the damaged cornea. These innovations may eventually make corneal transplants unnecessary for many people.

Older Adult Care Points

An older adult patient who is temporarily or permanently visually impaired may experience a loss of independence and a change in self-perception. This patient will need specific suggestions on ways to maintain independence. After an outpatient eye surgery, the person will need someone to help at home for a few days, at least.

Eye Trauma

Eye trauma occurs from accidents and from debris in the air. Not using safety goggles or glasses when sanding or operating weed trimmers and various types of power equipment accounts for most incidents of foreign bodies landing in the eyes ([Bashour, 2014](#)).

Removal of Foreign Bodies From the Eye

If the foreign body is not deeply embedded in the tissues of the eye, it can easily be removed by irrigation. Irrigation with clear, lukewarm water or sterile water or saline is used to remove a foreign body sticking to the cornea. Continuous irrigation can be done with small tubing, and a bottle of solution or an irrigating syringe or bottle can be used. Be very careful not to touch the eye with the tip of the irrigating device. Sometimes a speck of foreign matter on the cornea can be removed with a moistened, sterile cotton swab. Have the patient tilt the head back. Hold the eyelids open to prevent blinking ([Cao, 2013](#)).

If a foreign body is sticking out of the eye, no attempt to remove it should be made. Both eyes should be patched to prevent further eye movement, and the patient should be transported to the emergency department or to an ophthalmologist. If the patient continues to complain of a sensation that a foreign body is still in the eye after it appears to have been removed by irrigation, or complains of continuing pain, refer to a provider immediately, because there may be a corneal abrasion.

The provider will apply a stain to the eye to assess whether the cornea is abraded. If there is an abrasion, medicated ointment will be prescribed, and the eye will be patched ([Box 26-1](#)). The patient must be given instructions on how to instill the ointment. A thin line of eye ointment is applied from the inner canthus to the outer canthus along the lower eyelid inside the conjunctival sac ([Figure 26-4](#)). The patient closes the eyelid and moves the eyeball around in the socket to distribute the ointment. Excess medication is gently wiped away with a tissue, moving from the inner to the outer canthus. If an eye patch is not applied, the patient is warned that the ointment may blur vision for a while. A corneal abrasion is painful; a nonsteroidal anti-inflammatory drug may be used for discomfort.

Box 26-1

Applying an Eye Patch

- Perform hand hygiene, and cleanse the skin of the patient's forehead and cheek with a skin preparation solution or pad.
- Prepare strips of nonallergenic paper or other tape to secure the patch.
- Ask the patient to close both eyes and position the pad over the lid of the eye to be patched.
- Secure the patch by placing strips of tape diagonally over the patch from the cheek to the forehead. Use several strips of tape to ensure adhesiveness.
- After surgery, the shield is used for 2 to 6 weeks, depending on the surgeon's instructions.

For a Pressure Patch

- Use two eye patches. Fold the first one in half; place it over the closed lid and then place the other patch on top of the folded one. Apply tape as instructed previously.

For Sleeping

- A plastic or metal eye shield may be placed over the eye and secured to further protect the eye. In many cases, the patch can be left off when the shield is placed for sleeping.

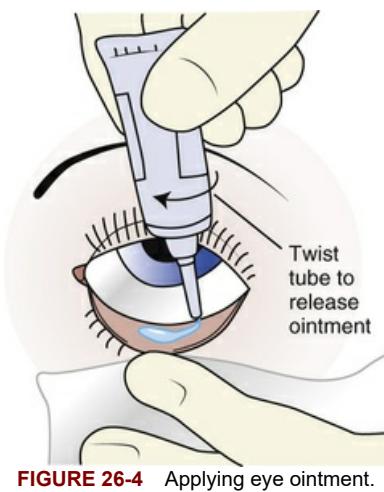


FIGURE 26-4 Applying eye ointment.

Chemical Burns

Chemical burns should be treated by lengthy, continuous irrigation. If available, an IV bag of normal saline is the preferred solution; otherwise, tap water will suffice. Place the patient supine with his head turned to the affected side. With gloves on, direct the stream of fluid to the inner canthus so that the stream flows across the cornea to the outer canthus, holding the lids apart with your thumb and index finger. Water should be lukewarm. At intervals, stop and have the patient close his eyes to move secretions and particles from the upper eye to the lower conjunctival sac; then begin again. Continue for 15 to 30 minutes. The patient should be seen by a provider as soon as possible. All commercial businesses where exposure to chemicals is a possibility must comply with Occupational Safety and Health Administration (OSHA) standards and have an eyewash station within the facility as close as possible to the area where chemicals are likely to be used (Randleman, 2013).

Enucleation

If the eye is too damaged by trauma to be salvaged or is irreparably damaged by disease or tumor, **enucleation** (removal of the eye) is performed. An implant is created to maintain the orbital anatomy while a matching artificial eye is created. The implant is sutured to the muscle structures. When the artificial eye is placed, the muscle attachments allow for coordinated eye movement.

Postoperatively, observe for signs of complications such as excessive bleeding, swelling, increased pain, elevated temperature, or displacement of the implant. Losing an eye is a devastating experience even when there has been a long period of painful blindness preoperatively. Understanding of the emotional effects and support of the patient are primary nursing responsibilities. The permanent prosthesis is placed about 6 weeks after the surgery.

Care of an artificial eye.

The procedure for cleansing and caring for an artificial eye is similar in many ways to the care of dentures. Both require basic principles of cleanliness, careful handling, and proper storage. An artificial eye is very expensive and must be handled very carefully.

The artificial eye is cleansed by hand (no cloth used) with gentle soap (mild hand soap or baby shampoo) and water, unless the patient, his family, or the provider directs otherwise. Keep it in a safe place to prevent damage. When the eye is to be reinserted, it should be cleansed again with soap and water and remain wet with water or contact lens solution. When inserting or removing the prosthesis, have the head over a padded surface. The patient's upper lid is lifted, and the eye is inserted with the notched end toward the nose. After the prosthesis is placed as far as possible under the upper lid, the lower lid is depressed, allowing the eye to slip into place.

Cataract

A **cataract** is opacity of the lens that produces an effect similar to one a person would experience when looking through a sheet of falling water (Figure 26-5). A cataract causes a blurring of vision because the lens, which is normally transparent, becomes cloudy and opaque.



FIGURE 26-5 Cloudy appearance of eye with cataract. (Courtesy Ophthalmic Photography at the University of Michigan, W.K. Kellogg Eye Center, Ann Arbor, Michigan.)

Etiology and Pathophysiology

Congenital cataracts are most commonly caused by maternal infection with rubella or *Toxoplasma gondii*. Cataracts typically occur as a result of aging and are found in people older than 50 years (adult-onset [senile] cataracts).

Traumatic cataracts may occur from a physical blow, extreme heat, or chemical toxins. Cigarette smoking increases the risk of developing cataracts. Heavy drinking also is implicated. Chronic use of corticosteroids predisposes to the development of cataracts.

Health Promotion

Cataract Prevention

Encouraging the habit of wearing sunglasses that protect from ultraviolet light and a hat when outdoors can help prevent the development of cataracts. Cumulative exposure to ultraviolet light is the greatest risk factor for cataracts ([UMM, 2014](#)).

Think Critically

What would you teach a person with rheumatoid arthritis about eye care, if that person is on corticosteroids most of the time?

Signs, Symptoms, and Diagnosis

In addition to the blurred vision that is typical of opacity of the lens, with cataracts there may be decreased color perception. Uncomplicated cataracts are usually painless, but the patient may have **photophobia** (intolerance of light). Assessment may reveal the following symptoms:

- Hazy, blurred, or double vision (**diplopia**)
- Increasing complaints about glare
- Increasing nearsightedness
- Complaints that colors are faded or appear yellowish or brownish
- Desire for increased light by which to read
- Difficulty with night vision
- Frequent need for eyeglass prescription change

The loss of vision associated with cataracts is progressive and sometimes is partially caused by secondary glaucoma. As an untreated cataract progresses, the lens of the eye becomes cloudy or milky white, then may turn yellow, and eventually may become brown or black (see [Figure 26-5](#)).

Diagnosis of a cataract is confirmed by examining the dilated pupil with a slit lamp, which enables the examiner to see opacities more clearly. Glaucoma should first be ruled out as a possible cause of the symptoms. Tonometry is used to determine intraocular pressure (IOP), or the fluid pressure within the eye. The Tono-Pen may be used for screening purposes.

Treatment

Cataract surgery is performed when the loss of vision greatly affects the quality of the person's life. The only effective method of treating cataracts is surgical removal of the affected lens with clear lens implantation; cataract surgery is the most commonly performed surgical procedure in the United States. Surgical techniques are (1) **extracapsular extraction**, in which the lens is removed along with the anterior portion of the lens capsule; and (2) **intracapsular extraction**, in which both the capsule and the lens are removed. Extracapsular extraction is most common because it allows an intraocular lens to be inserted inside the remaining capsule. Lenses are now available that allow for multifocal vision rather than monovision, in which vision is good at only one distance without glasses. One type of lens is hinged to the ciliary muscle, allowing for accommodation of vision for various distances ([Harvard Eye Associates, 2010](#)). If a monovision lens is chosen, vision is corrected for nearsightedness or farsightedness by the lens implant, and further correction of vision is achieved with regular eyeglasses or contact lenses. Vision is improved within 2 weeks and is usually fully recovered within 3 months of surgery ([Nursing Care Plan 26-1](#)).

Nursing Care Plan 26-1

Care of a Patient Undergoing a Cataract Extraction

Scenario

Mrs. Fort, age 79 years, is admitted to the outpatient surgery unit for extraction of a cataract of the left eye with lens implant. The vision in her right eye also is affected by a cataract, but the visual loss is not as severe in that eye. Mrs. Fort suffers from a crippling osteoarthritis of the hands, but her general health is good. She is well oriented, outgoing, and physically active. She lives alone in an apartment building for retired senior citizens. Her daughter and son-in-law live nearby and are in daily contact with her. Mrs. Fort has not been hospitalized since she was treated for pneumonia 20 years ago and she is concerned about what to expect preoperatively and postoperatively.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/Deficient knowledge related to preoperative and postoperative procedures and care.

Supporting Assessment Data

Subjective: "I have never had surgery before."

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize preoperative routine activities and postoperative procedures and expectations.	Teach patient and daughter about eye medications to be used at home and how to instill them; how to dress and shield eye properly; how to remove bandage without contaminating eye.	To comply with instructions, teaching must occur on how to instill drops and how to dress and shield the eye and perform care needed.	Provided teaching for patient and daughter. Will ask for return demonstration before discharge. Left printed instructions.

Problem Statement/Nursing Diagnosis

Potential for injury/Risk for injury related to postoperative complications such as hemorrhage and increased intraocular pressure.

Supporting Assessment Data

Objective: Undergoing cataract extraction; hemorrhage and increased intraocular pressure are potential complications.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Intraocular hemorrhage will not	Teach signs and symptoms of complications that are to be reported to	Patient must know what to look for	Gave instructions and left printed list.

occur, and there will not be an increase in intraocular pressure.	provider immediately: increasing eye pain, purulent discharge, decreasing vision, fever or chills, increasing brow headache. Instruct to refrain from straining at stool; encourage to use milk of magnesia or stool softener to prevent straining as needed.	to report complications. Preventing the Valsalva maneuver will help prevent an increase in intraocular pressure.	Will ask for feedback before discharge. Verbalizes the ways to prevent raising intraocular pressure.
	Perform hand hygiene thoroughly before instilling eye medications or changing dressing; teach patient and daughter to wash hands before approaching eye area.	Aseptic techniques help prevent infection. Maintaining asepsis aids in protecting the surgical site from infection and prevents complications.	Patient and daughter state that they understand hand hygiene and aseptic techniques for postoperative eye care.
	Demonstrate how to put on eye shield for sleep.	Wearing a protective eye shield will protect the eye from bumps or scratches.	Instructed to clean the eye shield daily with 70% isopropyl alcohol.
	Instruct patient to avoid rapid or sudden movements and bending from the waist.	Bending from the waist increases intraocular pressure.	Instructed to crouch rather than bend at the waist and to avoid sudden movements.
	Instruct patient to take medication immediately for nausea and vomiting.	Quickly medicating for nausea may avert vomiting.	Instructions given and a written instruction sheet at bedside.
	Remind patient not to lie on affected side.	Sleeping on the affected side creates too much pressure on the eye.	Instruct to avoid sleeping on the operated side for at least 2 weeks.
	Encourage patient to seek assistance with ambulation while vision is blurred.	Walking alone with blurred vision increases risk for falls.	Instruct to seek assistance for ambulation.

Problem Statement/Nursing Diagnosis

Limited self-care ability/*Ineffective self-health management related to disabilities imposed by osteoarthritis.*

Supporting Assessment Data

Objective: Severe osteoarthritis of the hands with limited dexterity.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Assistance with administration of postoperative eye medications and eye care will be given by daughter.	Teach daughter techniques needed for postoperative eye care and give her a written schedule for that care.	Written instructions and a schedule reinforce the teaching and help care to occur on time.	Daughter observed care and administration of eye medications today; will demonstrate postoperative eye care when meds are next due.

Critical Thinking Questions

1. Why should one wait 5 minutes between instilling one type of eyedrop and the next type of eyedrop?
2. What is one of the most important things to teach someone who is to instill eyedrops or ointment postoperatively?

One technique for intracapsular cataract extraction (ICCE) uses **cryosurgery**, in which the lens is frozen by a supercooled probe and then removed.

Phacoemulsification, in which the tissue is pulverized and the debris is removed by suction, is often used for extracapsular cataract extraction (ECCE). These outpatient surgical procedures are performed under procedural sedation and local anesthesia. An intraocular lens implant is placed after cataract extraction. Postoperative care is covered later in this chapter.

Patient Teaching

General Care After Eye Surgery

Instructions for the patient and/or family caregiver:

- Always wash hands before instilling medication. Check the label of the container to be certain it is the right medication. Do not contaminate the applicator tip of the medication.
- Instill only the number of drops ordered; apply pressure at the inner canthus to prevent systemic absorption; close the eye gently (do not squeeze the eye shut).
- Change the eye patch dressing at least once a day; change as needed to keep the area clean.
- Follow the medication schedule prescribed by the provider exactly. (Send home a written schedule.)
- Maintain designated head position and activity restrictions.

- Report signs of complications: sudden, increasing pain in the eye, which can indicate hemorrhage; purulent drainage; decreasing vision; or signs of increased IOP, such as brow headache.
- Keep the follow-up appointment with the surgeon.
- Use caution to prevent getting water in the eye.
- Protect the eye during the day with glasses; use sunglasses for outside wear; wear a protective eye shield at night.

Nursing Management

The patient must be told that there is a period of visual adjustment after cataract surgery. The surgeon may prescribe miotic eyedrops after surgery to constrict the pupil and decrease the danger of lens dislocation. **Patient adherence to the schedule for postoperative medications is critical to prevent complications and promote healing.**

Think Critically

Can you identify patients who should be carefully assessed for signs and symptoms of cataract?

Glaucoma

Etiology

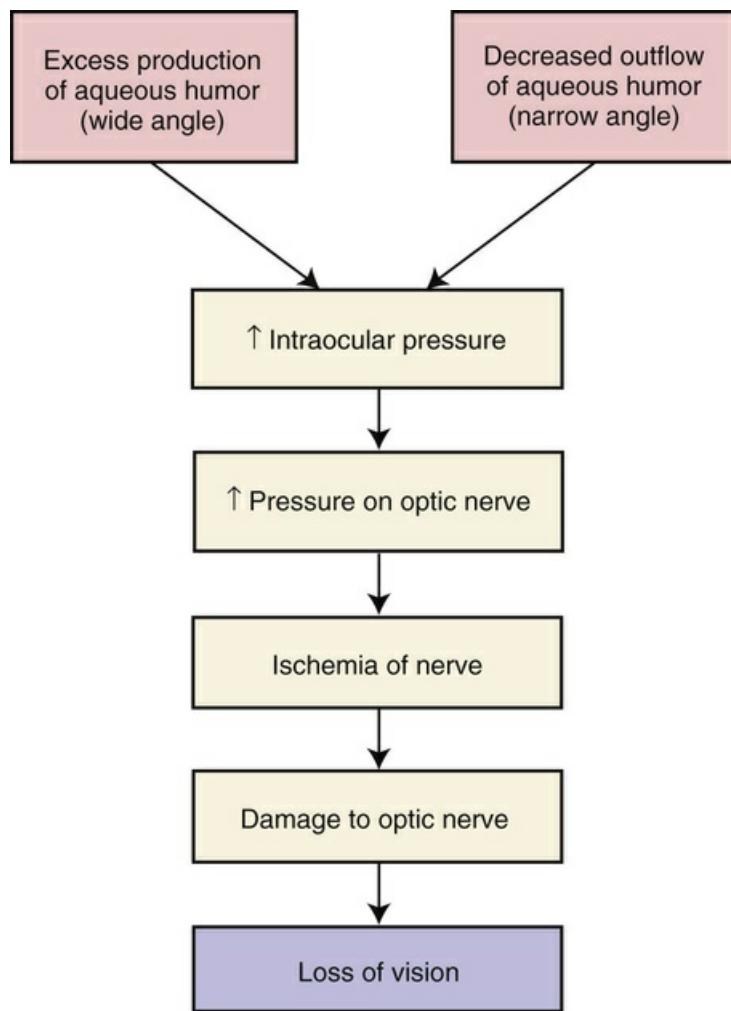
The term *glaucoma* comprises a complex group of disorders that involve many different pathologic changes and symptoms but have in common an optic neuropathy that damages the optic disc, causing atrophy and loss of peripheral vision. The neuropathy often is caused by increased IOP ([National Eye Institute, 2013](#)). Glaucoma may come on slowly and cause irreversible vision loss without presenting any other noticeable symptoms, or it may appear abruptly and produce blindness in a matter of hours. Glaucoma can be present at birth or can develop at any age. It can result from genetic predisposition, trauma, or another disorder of the eye. Glaucoma is commonly a manifestation of diseases and pathologies in other body systems. The amount of increased IOP that causes damage differs from one person's eye to another. **Blindness is preventable if the disorder is treated early.**

Think Critically

How can you include inquiries about family history or predisposing risk factors for glaucoma into your patient care?

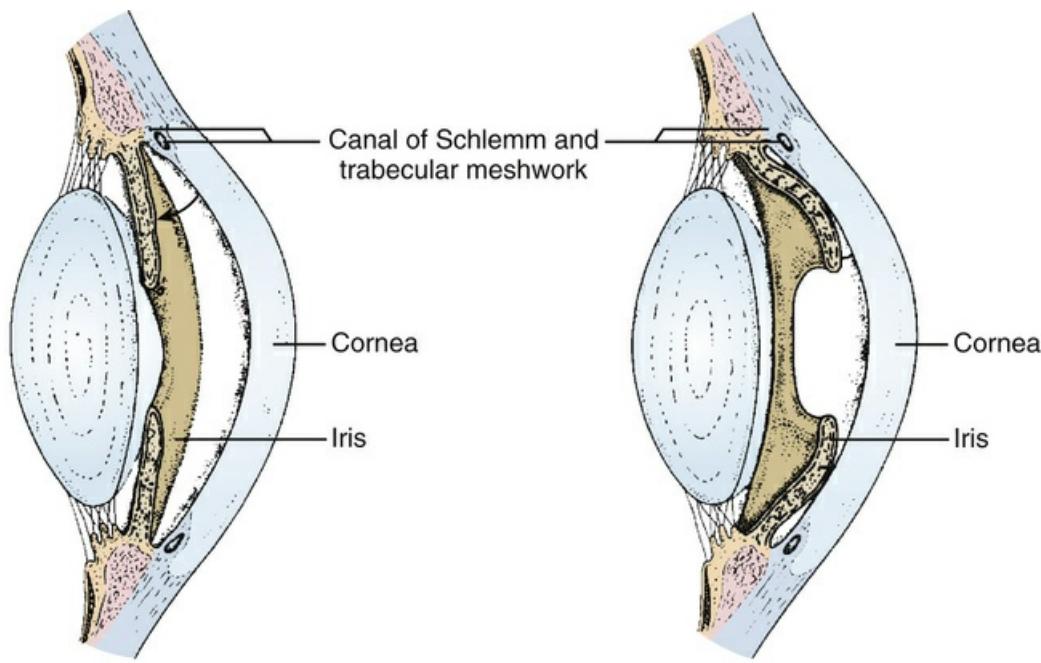
Pathophysiology

The IOP is determined by the rate of **aqueous humor** production and the outflow of the aqueous humor from the eye. Aqueous humor is produced in the ciliary body and flows out of the eye through the canal of Schlemm into the venous system ([Concept Map 26-1](#)). An imbalance may occur from overproduction by the ciliary body or by obstruction of outflow. Increased IOP greater than 22 mm Hg requires thorough evaluation. Increased IOP restricts the blood flow to the optic nerve and the retina. Ischemia causes these structures to lose their function gradually. **The vision impairment from damage to the optic nerve or retina is permanent.** Glaucoma may be secondary to eye infection, trauma, eye surgery, or ocular tumor.



CONCEPT MAP 26-1 Pathophysiology of glaucoma.

There are three types of glaucoma: narrow-angle or angle-closure (acute) glaucoma, open-angle (chronic) glaucoma (Figure 26-6), and associated or secondary glaucoma. The terms *narrow angle* (angle closure) and *open angle* refer to the angle width between the cornea and the iris. *Acute* and *chronic* refer to either the onset or duration of the problem. These two major types differ in their clinical signs and symptoms, treatment, and effects on vision. **Associated glaucoma** may occur with diabetes mellitus, hypertension, or extreme myopia or after retinal detachment.



Open-angle glaucoma
The angle between the iris and cornea is open, allowing outflow of aqueous humor through the canal of Schlemm and the trabecular meshwork

Narrow-angle glaucoma
The angle between the iris and cornea is constricted, blocking outflow of aqueous humor

FIGURE 26-6 Comparison of open-angle (wide, chronic) and narrow-angle (closed, acute) glaucoma. (From Lehne RA: *Pharmacology for nursing care*, ed. 5, Philadelphia, 2004, Saunders.)

Open-Angle Glaucoma

Signs and Symptoms

Open-angle, or chronic, glaucoma, in which there is no angle closure, is much more insidious and more common, occurring in about 90% of people with glaucoma. It often is an inherited disorder that causes degenerative changes in the aqueous humor outflow tracts. It may be caused by a mixture of factors of overproduction of aqueous humor and anatomic problems within the eye. It usually is bilateral and can progress to complete blindness without ever producing an acute attack. Its symptoms are relatively mild, and many patients are not aware that anything is wrong until vision has been seriously impaired.

Health Promotion

Danger Signals of Glaucoma

The National Society for the Prevention of Blindness lists the following symptoms as danger signals of open-angle glaucoma:

- Glasses, even new ones, that do not seem to clarify vision
- Blurred or hazy vision that clears up after a while
- Difficulty adjusting to darkened rooms, such as in movie theaters
- Seeing rainbow-colored rings around lights
- Narrowing of vision at the sides of one or both eyes

Encourage a complete eye examination if any of these signs is present.

Diagnosis

People at normal risk for glaucoma should be screened every 2 to 4 years before age 40, every 1 to 3 years from age 40 to 54, every 1 to 2 years from age 55 to 64, and every 6 to 12 months after age 65 (glaucoma.org, 2013). Those with high risk factors should be screened every 1 to 2 years after age 35.

People at high risk for glaucoma are:

- Those with diabetes
- African Americans (at least four times as many African Americans as non–African Americans have glaucoma-related blindness)
- Individuals with a family history of glaucoma

A commonly used screening technique for early detection of glaucoma is to measure IOP with an air tonometer. A puff of air is directed at the cornea, which causes a momentary indentation while a pressure reading is taken ([National Eye Health Education Program \[NEHEP\], 2014](http://National Eye Health Education Program [NEHEP], 2014)). The test is painless, and nothing but the air touches the eye. Verification of the diagnosis of glaucoma may require the use of a more complex instrument called an *applanation tonometer* (Figure 26-7). The cornea is flattened, and pressure is measured with a slit-lamp biomicroscope.



FIGURE 26-7 Applanation tonometer. (From Phipps WF, Monahan FD, Sands JK, et al: *Medical-surgical nursing: Health and illness perspective*, ed. 7, St. Louis, 2003, Mosby.)

Treatment

The initial treatment of choice for chronic (open-angle) glaucoma is medication rather than surgery. If drugs are not effective, or if they produce worrisome side effects, surgery is performed.

Drug therapy is intended to enhance aqueous humor outflow, decrease its production, or both by constricting the pupil (miotics) or by inhibiting the formation of aqueous humor (Table 26-1). Miotics cause blurred vision for 1 to 2 hours after use. Adjustment to dark rooms is difficult because of pupil constriction. Pilocarpine is available in an eye medication disk that resembles a contact lens. The disk is inserted into the conjunctival sac in a patient's lower eyelid, where it can remain for up to 7 days. The medication is slowly released. Use of the disk does not prevent the wearing of contact lenses. Diuretics may be prescribed to reduce the production of aqueous humor fluid. Not all diuretics reduce IOP, and a substitute should not be used for the specific drug prescribed.

Table 26-1**Drugs Commonly Used to Treat Eye Disorders**

CLASSIFICATION	EXAMPLES	ACTION/NURSING IMPLICATIONS
Drugs Used for Glaucoma		
Miotics	<i>Prostaglandin analogs:</i> latanoprost (Xalatan), bimatoprost (Lumigan), travoprost (Travatan)	Increase outflow of aqueous fluid through the ciliary muscle by relaxation of the muscle.
	<i>Unoprostone isopropyl (Rescula)</i>	
	<i>Cholinergics:</i> pilocarpine HCl (Isoptic Carpine), pilocarpine nitrate (Ocusert Pilo-20, Ocusert Pilo-40), carbachol (Miostat)	Constrict the pupil, promote outflow of aqueous humor, and reduce intraocular pressure. Reduce visual acuity in dim light; advise patient to avoid driving at night. Ocusert is placed in conjunctival sac and replaced weekly.
	<i>Cholinesterase inhibitors:</i> echothiopate iodide (Phospholine iodide), demecarium bromide (Humorsol)	Produce miosis, increase aqueous humor outflow, and decrease intraocular pressure. Avoid touching tip of bottle to eye; moisture may interfere with drug potency.
Carbonic anhydrase inhibitors	<i>Beta-adrenergic blockers:</i> timolol maleate (Timoptic), betaxolol (Betoptic), levobunolol (Betagan), metipranolol (OptiPranol), carteolol (Occupress)	Reduce production of aqueous humor, thereby reducing intraocular pressure. Betaxolol reduces intraocular hypertension. Monitor pulse and blood pressure during initiation of therapy. Blurred vision decreases with continued use. Use beta blockers cautiously in patients with a history of asthma.
	Acetazolamide (Diamox), dorzolamide (Trusopt), brinzolamide (Azopt)	Interfere with carbonic acid production, thereby decreasing aqueous humor formation and decreasing intraocular pressure. Taken orally or as eyedrops (Trusopt). When taken orally, these drugs have a diuretic action; observe for dehydration and postural hypotension. Monitor electrolytes. Confusion may occur in older adults. Check for interaction with other drugs patient is receiving.
Sympathomimetics	Epinephrine (Epifrin), dipivefrin (Propine), apraclonidine (Iopidine)	Reduce intraocular pressure by increasing aqueous outflow. May cause brow headache, headache, eye irritation, and blurred vision. Used for open-angle glaucoma only. May cause tachycardia and rise in blood pressure.
Alpha ₂ adrenergic agonist	Brimonidine ophthalmic (Alphagan) P	Acts on alpha receptors in the blood vessels, decreasing the production of aqueous humor. Do not use with soft contact lenses. Contraindicated in heart disease.
Anti-inflammatories	<i>Corticosteroids:</i> Pred Forte, Ocu-Pred, Ophtho-Tate <i>NSAIDs:</i> ketorolac (Acular), flurbiprofen (Ocufen) <i>Prostaglandin analog:</i> latanoprost (Xalatan)	Decrease inflammation and swelling; reduce miosis. Interact with contact lens materials.
Drugs Used to Facilitate Diagnosis and Surgery of the Eye		
Cycloplegic and mydriatic anticholinergic agents	Atropine (Atropisol), cyclopentolate (Cyclogyl), homatropine (Ispto Homatropine), scopolamine (Ispto Hyoscine), tropicamide (Mydriacyl)	Dilate the pupils and paralyze the muscles of accommodation, causing mydriasis and cycloplegia. Mydriasis facilitates observation of the eye's interior during an examination. Cycloplegia prevents movement of the lens during assessment of the eye.
Adrenergic agonist	Phenylephrine (Ocu-Phrin)	Induces mydriasis by action on the muscle of the iris. Causes blurred vision. Photophobia may be eased by using dark glasses.
Staining solution	Fluorescein	Turns corneal scratches bright green; a green ring surrounds foreign bodies. Dye will filter through the lacrimal duct into the nasal secretions.
Topical anesthetics	Proparacaine (Alcaine, AK-Taine), tetracaine (Pontocaine)	Anesthetize the eye. Caution patient not to rub the eye while it is anesthetized. Patch eye when patient leaves the office if medication is still in effect.
Anti-infective Optic Medications		
Antibiotics	Gentamicin sulfate (Garamycin ophthalmic), erythromycin (Eryc), polymyxin B sulfate, neomycin sulfate, bacitracin, sulfonamides (Sodium Sulamyd, Gantrisin), ciprofloxacin (Ciloxan), chlortetracycline (Aureomycin), ofloxacin (Ocuflox)	Used to treat infection or for prophylaxis. Caution patient to use a clean washcloth and towel on the face each time to prevent reinfection.
Antifungal	Natamycin (Natacyn ophthalmic)	To treat <i>Fusarium</i> . Caution as for antibiotics.
Antivirals	Idoxuridine (IDV, Stoxil, Herplex), trifluridine (Viroptic)	Store in refrigerator. Do not use with boric acid. If no improvement, discontinue after 1 wk.
	Vidarabine (Vira-A ophthalmic)	Effective against DNA viruses; used for keratoconjunctivitis.

Whenever glaucoma is being managed by medication, the patient must continue the eyedrops and oral medications on an uninterrupted basis. Patients admitted to the hospital for disorders other than glaucoma often are allowed to keep their glaucoma medication at the bedside if they are able to administer it themselves.

Clinical Cues

When admitting a patient with a history of glaucoma, check to see that he has his eye medication with him and that there is an order on the chart for leaving it at the bedside. Otherwise, verify that there is an order on the chart for his usual glaucoma medications. If there is no order, call the provider for one.

When drugs do not control glaucoma and increased IOP persists, surgery is an alternative. The goal is to create openings so that excess fluid can escape. A laser is used to create evenly spaced openings in the collecting meshwork (**trabeculoplasty**) to facilitate aqueous humor drainage in open-angle or chronic glaucoma. Microsurgery filtering procedures create a drainage hole in the iris between the anterior and posterior chambers. A tiny shunt may be placed to drain excess aqueous humor if other surgeries do not produce the desired result. When surgical procedures fail, the ciliary body may be treated by applying a freezing probe tip (**cryotherapy**). This permanently damages cells in the ciliary body and decreases the production of aqueous humor.

Laser surgery is performed with procedural sedation. The patient may experience a mild headache and blurring of vision during the first 24 hours. There is a possibility that IOP may increase because of an inflammatory response. **Increasing pain in the eye should be reported to the ophthalmologist immediately.** The patient should be instructed to prevent increasing the venous pressure in the head, neck, and eyes by avoiding the Valsalva maneuver (straining with a closed glottis), not bending over, keeping the head up, and not making any sudden movements. A stool softener is given to prevent constipation. Strenuous exercise should be avoided for 3 weeks. The head of the bed should be elevated 15 to 20 degrees to decrease pressure within the eyes during sleep. Elevated IOP will persist for a week or so in some patients. Glaucoma medications are continued to meet the patient's individual needs. The patient must understand the importance of

frequent checkups and the necessity of consistently following instructions; the surgical procedure does not always eliminate the need for medication.

Nursing Management

Education of the patient and his family is a major aspect of care. Failure to follow the prescribed treatment regimen to control glaucoma and neglecting to maintain regular follow-ups with the provider can result in progressive loss of vision and eventual blindness ([Figure 26-8](#)).

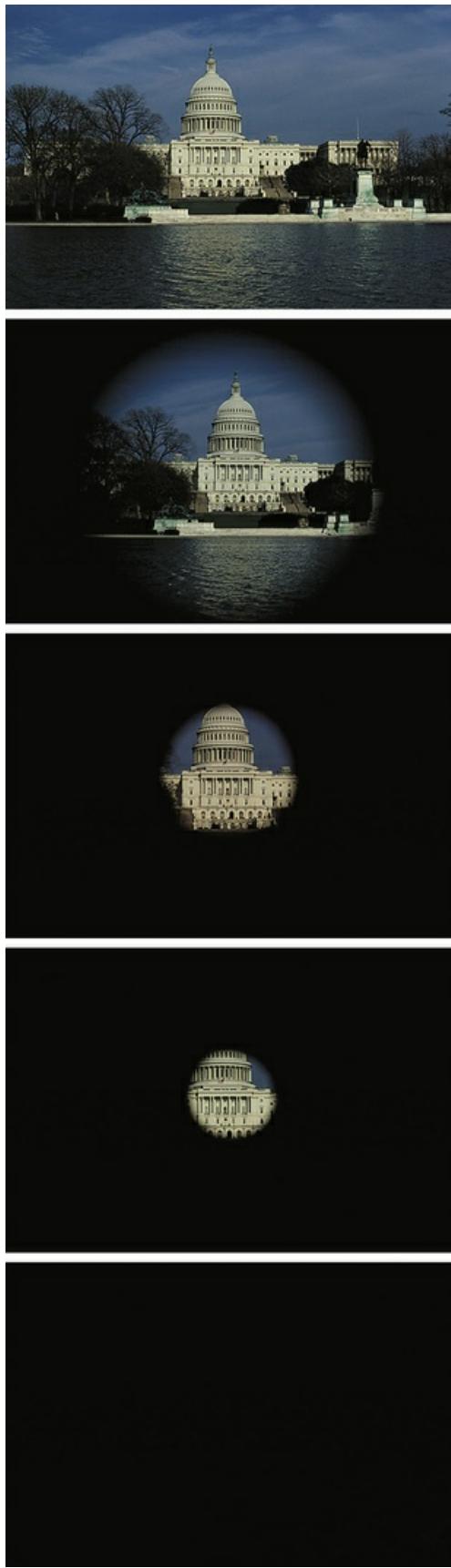


FIGURE 26-8 Glaucoma causes a progressive loss of peripheral vision. (From Monahan FD, Neighbors M, Sands JK, et al: *Phipps' medical-surgical nursing: Health and illness perspectives*, ed. 8, St. Louis, 2007, Mosby.)

Patients who have glaucoma need to be fully informed about the nature of this disorder, how it

can affect vision, the treatments available, and the expected result of those treatments. An analogy that can be used to explain the nature of the disorder is to compare the eye to a sink with an open faucet (the ciliary processes), a drain (angle), and pipes (trabecular structures). As long as water flows into and out of the sink at the same rate, there is no problem. If something blocks the drain or the pipes, the water will fill the sink beyond its holding capacity. Treatment with miotics helps keep the pipes open so that drainage is possible; beta blockers and diuretics can slow down the rate at which water flows from the tap. If the medications do not work, or if the sink suddenly is blocked by a clogged pipe, it may be necessary for the surgeon to clear the drainage system so that the water can drain from the sink.

In addition to learning about the nature of glaucoma and the expected results of prescribed treatments, the patient also must be made aware of the possibility of vision loss if the condition is not managed. **Teaching should emphasize that glaucoma medications prevent further vision loss, but medications cannot restore vision.** Teaching must be done with tact and sensitivity for the patient's feelings. The information should never be presented in such a way that the patient feels threatened or becomes so fearful that he is unable to participate in the management of his disorder.

Patient Teaching

Points to Cover in the Glaucoma Teaching Plan

- Signs of IOP include pain in the eye, redness, tearing, blurred vision, halos around lights, and frequent need for change in eyeglasses.
- Measures to prevent increase in IOP include low-sodium (Furstenberg) diet, little caffeine intake, preventing constipation and Valsalva maneuver, and decreasing stress.
- Taking prescribed medications and refraining from taking over-the-counter or other medications without the provider's knowledge are important. Glaucoma medication must be taken regularly for life.
- Use good aseptic technique when instilling eye medication.
- Wear an ID tag or bracelet stating "Glaucoma," and carry a card in the wallet that states what medications are being taken.
- Keep an extra bottle of eye medication on hand. Carry eyedrops.
- Maintain close medical follow-up with provider.
- Practice safety habits; avoid night driving if possible.

ID, Identification; *IOP*, intraocular pressure.

Narrow-Angle (Angle-Closure) Glaucoma

Signs, Symptoms, and Diagnosis

Narrow-angle, or acute, glaucoma is a medical emergency in which there is severe pain in the eye accompanied by the appearance of colored halos around lights, blurred vision, and pain in and around the eye. Nausea and vomiting may occur. The cause of narrow-angle glaucoma is the position of the iris, which lies too close to the drainage canal and bulges forward against the cornea, blocking the drainage of aqueous humor (see [Figure 26-6](#)). The IOP rises suddenly, sometimes reaching a pressure of 50 to 70 mm Hg. Relief of the situation must be prompt, or damage to the optic nerve will cause blindness in the affected eye. Diagnosis is by history, testing of IOP, and dilated eye examination.

Treatment and Nursing Management

Emergency treatment in narrow-angle glaucoma consists of measures to reduce IOP as quickly as

possible. During the attack, drugs such as pilocarpine, topical epinephrine, and IV acetazolamide are used. Surgery is performed as soon as inflammation subsides to relieve pressure against the optic nerve endings. **Laser iridotomy**, **trabeculectomy**, **laser trabeculoplasty**, or other procedures that allow filtering of the aqueous humor from the anterior chamber into the subconjunctival space are performed. If these procedures fail, sometimes **cryotherapy** (the application of a freezing tip) may be used on the ciliary body to decrease the aqueous production.

Nursing management is the same as for other eye surgeries: teaching about activity precautions during healing, schedule for eyedrops, symptoms to report to the surgeon, and aseptic handling of the eyedrops and eye shield.

Retinal Detachment

Etiology

Retinal detachments often are classified as either primary or secondary. Primary retinal detachment is the result of spontaneous or degenerative changes in the retina or the vitreous humor. Secondary retinal detachment is associated with mechanical trauma, inflammation within the eye, or some other ophthalmic disorder, such as diabetic or hypertensive retinopathy. Retinal detachments commonly occur in people with a high degree of myopia. The incidence of retinal detachment increases dramatically after 40 years of age and is most common between ages 40 and 70 years. Fifteen percent of people with retinal detachment in one eye develop detachment in the other eye.

Cultural Considerations

Incidence of Retinal Detachment in People of Jewish Descent

Retinal detachment is more common in people of Jewish ethnicity. The condition is relatively uncommon in African Americans. The reason may be that the Jewish population has more incidence of myopia, and that condition tends to be inherited. Severe myopia is a risk factor for retinal detachment.

Pathophysiology

Retinal detachment is actually not a detachment of the whole retina, but a separation of the sensory layers of the retina from the pigmented epithelial layer, the choroid. Retinal detachment can cause vitreous fluid to leak under the retina, separating a portion of it from the vascular wall and thereby depriving the retina of its blood supply ([Figure 26-9](#)).

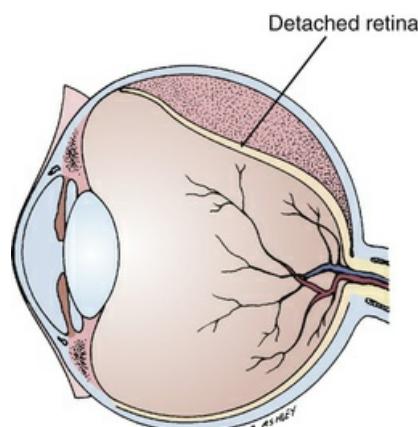


FIGURE 26-9 Retinal detachment.

Signs, Symptoms, and Diagnosis

Onset can be either gradual or sudden, depending on the cause and extent of the detachment and

the location of the area involved. The patient may see flashes of colored light accompanied by showers of floaters (black spots) or may feel as if a curtain has been drawn over a portion of the visual field. Later, cloudy vision or loss of central vision is noticed. In severe cases, there may be complete loss of vision.

Think Critically

What would you say to your friend if you were having a meal together in a restaurant and he commented that he was seeing flashes of colored light in his left eye? What would you tell him to do?

Diagnosis of detached retina can be made with a direct ophthalmoscope, but diagnosis is greatly simplified by a stereoscopic indirect ophthalmoscope. This instrument permits visualization of the entire retina and produces an image of the retina with less magnification and distortion than the direct ophthalmoscope. Ultrasound can be used to detect retinal detachment when the eye is clouded by opacity from cataract or hemorrhage.

Treatment

Retinal holes and tears sometimes can be repaired on an outpatient basis with laser therapy that creates an inflammatory reaction, causing the layers to adhere during healing. Tears located in the posterior fundus can be coagulated and sealed with a laser beam or photocoagulator. Peripheral retinal holes through which no fluid has leaked can be closed by applying a freezing probe tip (cryotherapy). The frozen area scars over in a few days, and the hole is thus sealed. A third procedure, called *scleral buckling*, requires more extensive surgery. In effect, scleral buckling places the retinal breaks in contact with the pigmented epithelial layer. Adhesions are formed that bind the sensory and epithelial layers and the choroid together. Before the procedure, gas may be injected into the eye to apply pressure on the retina from the interior of the eye. This application of pressure helps hold the layers together during healing.

If hemorrhage into the vitreous is obstructing vision, the surgeon may perform a closed vitrectomy during retinal repair. The purpose of the vitrectomy is to remove the cloudy vitreous humor and stabilize the retina against the choroid. Inert gas or oil is used to fill the space until aqueous humor eventually refills the area (Comer, 2014).

Nursing Management

Positioning of the patient and the level of activity allowed after surgery are prescribed by the surgeon. The head is positioned so that the area repaired is dependent, preventing the pull of gravity from disrupting the surgical site. The designated position for the head also is calculated to position the oil or gas bubble—if one was used—in the best place to apply pressure to the retina. Position the patient according to the provider's orders. IOP is monitored closely for at least 24 hours. Vision does not return immediately because of postoperative swelling and the effects of the dilating drops. Vision improves on a gradual basis over several weeks to months. The eyes may both be patched, or just the operative one may be patched. Eye patches are changed at least once a day (see Box 26-1). A shield is worn when napping and at night. Several types of eyedrops may be prescribed for postoperative use, as well as an antibiotic ointment. Strict asepsis must be observed when instilling eyedrops and ointment.

There usually is some degree of pain after all types of retinal surgery. Acetaminophen with oxycodone or codeine typically is prescribed for pain. If the patient is allergic to these medications, extra-strength Tylenol may be sufficient to control the pain.

Flashing lights are common for the first few weeks after retinal surgery. These decrease over 2 to 6 months; if they worsen within several weeks of surgery, the provider should be notified. Light sensitivity is common in both eyes after surgery and may cause tearing. This gradually lessens over a period of 4 to 6 weeks. Wearing dark sunglasses when outdoors helps eliminate this problem. A moderate amount of discharge from the eye is not unusual; it should be yellowish or pink-tinged. If the amount of discharge increases markedly or is accompanied by severe pain, or if discharge has a foul smell or a greenish tinge, infection may be present; notify the surgeon. Cleanse the eyelid with a gauze pad or cotton ball moistened with irrigating solution or tap water. Wipe from the inner to the outer area of the eye. A separate clean pad or cotton ball should be used for each eye.

The patient is allowed to sponge-bathe, brush the teeth, shave, and comb the hair as long as care is taken not to get water in the affected eye (see discussion later in this chapter).

At discharge, the patient is cautioned to avoid heavy lifting, straining at stool, and vigorous activity for several weeks. Eyeglasses are worn during the day for protection, and the eye shield is worn at night after an eye patch is no longer necessary.

Home Care Considerations

Home Care Instructions for Retinal Surgery or Vitrectomy

Instructions will vary if the patient has a gas bubble that was injected intraocularly. Positioning and activity are more restricted for these patients.

Activity

- Restrict activity according to the provider's instructions. Bed rest with bathroom privileges for the first few days is common. The head may need to be positioned to the left or right most of the time. A head-down or semiprone position to the right or left will be required for most of the time if a gas bubble was injected into the eye.
- The following activities are allowed immediately after discharge unless a gas bubble has been injected into the eye as part of the procedure:
 - Watching television from a distance of at least 10 feet.
 - Tub bath or shower, using extreme care not to get soap or water into the eyes. Take care to prevent a fall.
 - Walking outdoors with the guidance of a companion.
 - Reading for brief periods.
 - Gentle shampooing of hair with head tilted backward and care not to get soap or water into the eyes.
 - Riding in a car as a passenger.

Eye Care

- The operated eye is to be patched at all times and protected by an eye shield or glasses until you are told you may leave the eye uncovered. A patch or shield may still be recommended for use while sleeping. The eye patch is removed only to administer eyedrops or ointment. The eyelid may be cleansed with cotton or gauze moistened with irrigating solution. Each time the patch is changed, check the movement of the eyeballs under the lids. Gently retract the upper lid, and look down as far as possible. Next, look up while retracting the lower lid. This helps break adhesions of the eyeball to the lids.
- The following are expected and should not cause alarm: tearing, a small amount of blood on the eye patch, a scratchy sensation, blurred vision, unusual visual images, a few light flashes, and floaters. Call the provider if these symptoms **significantly** increase after discharge.
- Have someone else administer the eye medications. Assume a reclining position for eyedrop or eye ointment placement. Pull down the lower lid and, with the patient looking up, place the correct number of drops into the center of the conjunctival sac. Let the lid gently close. The

patient should try not to squeeze the eye shut or blink excessively. Wait 3 to 5 minutes between types of eyedrops so that they do not wash each other out and dilute the intended effect. Patch the eye after each set of drops or ointment is administered. If a shield is to be used, it is placed on top of the taped-down eye pad.

Comfort

- Take a prescribed analgesic or extra-strength acetaminophen to relieve pain. A cool washcloth or ice pack to the forehead may provide comfort. Report pain that grows markedly worse or is accompanied by nausea and vomiting.

Precautions

- In case of cough, take cough syrup. Do not try to hold back sneezes. Do not strain at stool; take a stool softener or milk of magnesia if needed to prevent this.

Restrictions

- Avoid driving a car until visual acuity is 20/40 or better; your provider will tell you when you may resume driving.
- Avoid lifting heavy objects (those over 20 lb) for at least 4 months.
- Refrain from work for 2 to 6 weeks (depending on type of work); your provider will tell you when you may return to work. Light housework that does not require bending over or vigorous scrubbing may be resumed within 1 to 2 weeks depending on the type of surgery performed.
- Avoid vigorous or strenuous activity for 4 months.
- Do not bend with your head down; keep the head upright, and bend at the knees.
- Avoid sports for 3 to 4 months.

Think Critically

How do the signs and symptoms of glaucoma and cataract differ?

Retinopathy

Etiology

The two major causes of retinopathy are diabetes mellitus and hypertension. Years of elevated blood pressure cause retinal vasospasm, which damages and narrows the retinal arterioles, thereby decreasing the blood supply to the retina. Contributing factors are excessive use of nicotine and caffeine and high stress levels.

Pathophysiology

Diabetic patients experience two different forms of retinopathy: proliferative and nonproliferative retinopathy. In the nonproliferative type of retinopathy, microaneurysms develop on the retinal blood vessels. These eventually swell and rupture, causing hemorrhage into the vitreous humor, which interferes with vision. The proliferative form of retinopathy occurs later in the course of diabetes. New blood vessels grow from the existing retinal vessels in a process called *neovascularization*. The new vessels are thinner and rupture more easily, causing hemorrhage. The blood from the hemorrhage causes scarring, which also interferes with vision. High blood pressure creates blockages in retinal blood vessels. Retinal hemorrhages and macular swelling may cause vision impairment.

Signs, Symptoms, and Diagnosis

It is important that patients with diabetes have regular, frequent eye examinations, because the

early stages of retinopathy present no symptoms. As the retinopathy progresses, there are alterations in vision such as blurring, missing areas in the field of vision, and seeing red or black lines or spots. These signs can be observed on ophthalmologic examination of the retina and by fluorescein angiography. When the macula is involved, there is a loss of vision that may progress to blindness. Retinal detachment may occur as a result of proliferative retinopathy.

Treatment

Tight control of blood glucose levels (100 to 115 mg/dL) is very important to prevent excessive diabetic retinopathy. There is no other known way to halt the process. The microaneurysms and the neovascularized vessels are treated with laser photocoagulation therapy to prevent hemorrhage and the consequent scarring and loss of vision. Vitrectomy also can be done if hemorrhage has caused serious impairment of vision. Hypertension must be kept under good control.

Research is under way to determine whether a deficiency of insulin-like growth factor (IGF)—a hormone that helps maintain nerve function—rather than uncontrolled glucose levels is the cause of diabetic retinopathy. If so, IGF injections may prevent the problem.

Nursing Management

Within 15 years of developing diabetes, nearly all patients with type 1 diabetes and 80% of patients with type 2 diabetes develop some retinopathy; therefore you can be instrumental in promoting glucose control and regular eye examinations. Nurses must encourage glucose testing in patients who have a family history of diabetes or who are in a high-risk category, so that the disease may be discovered early before vascular effects have occurred.

Think Critically

What would you teach a patient with diabetes about the prevention of retinopathy? What factors affect the development of retinopathy?

Macular Degeneration

Etiology

Between 2000 and 2012, the incidence of age-related macular degeneration (AMD) in people age 50 years or older has escalated by 25%, to 2,069,403 (Friedman, 2012). The macular region of the retina provides color vision, acute vision, and central vision. Macular degeneration, or AMD, occurs with aging and is the most common cause of visual loss in older adults. Inflammation may be a factor; *Chlamydia pneumoniae* has been found in the eye tissue of some people with the wet form of AMD. There is a genetic tendency for the disease, and diabetes and hypertension are associated risk factors. Wearing sunglasses regularly when outdoors may help protect against AMD. Certain vitamins, minerals, and antioxidants seem to help prevent or slow AMD.

Health Promotion

Tobacco and Alcohol and Macular Degeneration

Teaching people to quit smoking and to abstain from immoderate drinking (four or more alcoholic drinks a day) can decrease the incidence of AMD. Smoking is believed to double the risk of AMD (National Eye Institute, 2015). In Britain there is a movement to add the warning about the risk of vision loss to the other warnings on cigarette packages.

Complementary and Alternative Therapies

Preventing or Slowing Progression of Macular Degeneration

The antioxidants acetyl-L-carnitine, concentrated omega-3, and coenzyme Q-10 have been shown to improve vision in patients with AMD in a recent Italian study (UMM, 2014). The combination is available in a supplement called Ocuvite PreserVision. Fish oil, which acts as an anti-inflammatory,

may protect the retina from AMD. If patients are on blood thinners, such as warfarin or aspirin, fish oil may increase the risk of bleeding.

A new genetic test performed on saliva, Macula Risk, is available for patients at increased risk of macular degeneration.

Pathophysiology

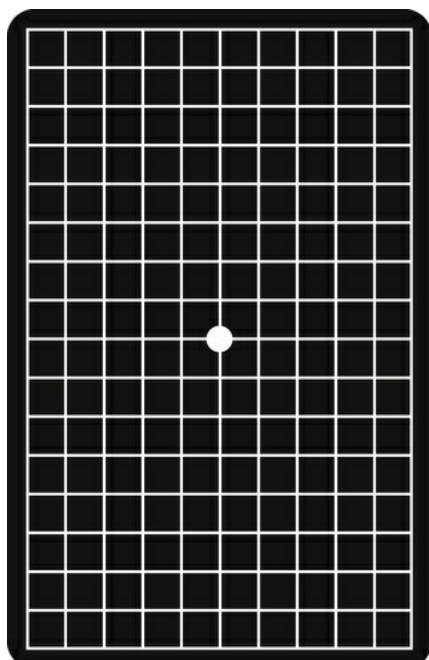
There are two types of atrophic macular degeneration: dry and wet. Exudative macular degeneration may occur at any age. In the dry form, gradual blockage in the retinal capillaries leads to death of rod and cone photoreceptors in the macula of the retina. This form accounts for 85% to 90% of cases. Dry AMD may progress to wet AMD. In the wet form, abnormal vessels develop in or near the macula. Central vision is affected. The fragile vessel network grows into the subretinal space and may bleed into the macular region, causing central visual impairment. Exudative macular degeneration is caused by a serous detachment of pigment epithelium in the macula. Sudden central vision loss occurs.

Signs and Symptoms

AMD is bilateral and progressive. Early symptoms may be an inability to see the vividness of colors or to see details. Blurred vision, presence of scotomas, or distortion of vision gradually occurs. Objects may appear to be the wrong size or shape, or straight lines may appear crooked or wavy. As central vision deteriorates, there may be a large dark spot or empty place over the center of what is viewed. The patient retains peripheral vision and can walk, dress, cook, and sometimes drive if impairment is minimal but cannot read when the disorder becomes severe. Exudative MD may occur in only one eye.

Diagnosis

Ophthalmologic examination of the retina and macula is the first step in diagnosis. In dry AMD yellow exudates called **drusen** are found beneath the retinal pigment epithelium. Drusen represent extracellular debris. In wet AMD fluid and blood are detected by the examination. Patients at risk for macular degeneration, or extension of the problem, are taught to use an Amsler grid (a small card with lines in a grid formation) at home to assess for progression of the disorder (Figure 26-10). If macular degeneration is occurring, the lines appear wavy. Fluorescein angiography or optical coherence tomography shows the specific areas of the retina involved.



USE ONLY AS INSTRUCTED BY YOUR OPHTHALMOLOGIST

REMINDERS:

- Cover one eye—Hold card directly in front of the uncovered eye
- Look at center spot
- Note any irregularities (e.g., wavy, gray, fuzzy)
- Rotate 90 degrees and repeat
- Test other eye

Contact your ophthalmologist as instructed, if necessary

Name _____

Address _____

Phone _____

The Yannuzzi Card (Modified Amsler Grid)
Copyright © 1981 BMI, A service from The Macula Foundation, Inc.

FIGURE 26-10 Amsler grid used to check for macular degeneration. (Courtesy Macula Foundation, Inc., New

Treatment

There is no specific treatment for dry AMD that restores vision, but a novel inhibitor of a protein involved in inflammation that contributes to vision loss is being developed and is in phase I trials. A combination of vitamins, minerals, and antioxidants is recommended to slow the progression of the disease. Several trials to slow or halt the progression of the dry AMD are under way ([AMD.org, 2014](#)). For wet AMD, prompt laser treatment to destroy the fragile blood vessels can sometimes prevent further bleeding and visual deterioration. **Photodynamic therapy** using IV verteporfin (Visudyne), followed by a low-light-level laser that destroys only the cells that absorbed the dye, is another therapy. This therapy destroys abnormal blood vessels, without permanent damage to the photoreceptor cells and the retinal pigment epithelium. Because direct exposure to sunlight or other intense forms of light can activate the dye in the cells, the patient must avoid those forms of light for 5 days, after which the remaining dye will have been fully excreted.

Pegaptanib sodium injection (Macugen) has received Food and Drug Administration (FDA) approval for the treatment of wet AMD. It is injected into the eye under local anesthesia once every 6 weeks. During clinical studies, this drug has limited the progression to legal blindness by 50% compared with controls. Researchers are testing the efficacy of certain drugs for use as eye drops to replace these injections.

Ranibizumab (Lucentis) has been approved by the FDA for wet AMD, but it is very expensive. Intravitreal injections are necessary monthly with Lucentis. A new drug, aflibercept (sold under brand name Eylea), which also binds and inhibits vascular endothelial growth factor (VEGF), has been approved by the FDA to treat macular degeneration. This treatment is expensive, but at \$1850 per treatment it is less expensive than Lucentis and requires fewer treatments ([Weinberg, 2013](#)).

A technique under investigation is transplantation of healthy cells of retinal pigment epithelium to replace or enhance degenerating epithelium. It is hoped that transplantation of such cells before vision has greatly deteriorated will slow or eliminate the progression of AMD.

A device called the *ForeseeHome Monitor* is available to monitor vision changes at home for those with dry macular degeneration. Treatment is most effective when changes in vision are detected early.

Nursing Management

Help patients with permanent vision loss learn to use low-vision aids. A referral to a low-vision device specialist and low-vision support group commonly is needed. Devices are available to illuminate and magnify reading material. Books with large print are easier to read. Learning to turn the head and move the eyeballs to work around the central scotoma may help. A closed-circuit television system that magnifies a printed page on screen can be used for reading or doing crossword puzzles. Telescopic lenses can help for watching movies, attending the theater, reading street signs, and seeing traffic lights. A head-mounted low-vision enhancement system provides both distance and close-up enhancement. Easy-to-read watches with large numerals, television screen magnifiers, and guides that fit over checkbooks to assist with writing on them are some of the less expensive low-vision aids that are available.

Nursing Care of Patients Having Eye Surgery

Preoperative Care

Most eye surgery procedures are done on an outpatient basis, unless the patient has other serious disorders such as cardiac dysrhythmias, severe diabetes, or a chronic disability. Therefore a large part of nursing care is directed at discharge teaching for home care. One surgery that is performed as an inpatient procedure is a scleral buckle for retinal detachment (see [Retinal Detachment](#)).

Stool softeners may be started a day or two before surgery to prevent constipation and the Valsalva maneuver postoperatively. The Valsalva maneuver can increase IOP. Some providers direct the patient to wash the face with surgical soap several times the evening and morning before surgery. The patient may be given instructions on the administration of eyedrops the night before and the morning of surgery.

After admission, the patient is fully oriented to the outpatient surgery unit and given instructions about the layout of the room and area and the ways in which help can be summoned. Side rails are usually necessary to prevent falls, and the patient should be cautioned against getting up without assistance. Preoperative eyedrops and medications are instilled in the outpatient surgery center the morning of surgery. Drugs must be given with extreme care and accuracy, especially if only one eye is affected. **Be sure that the medication is applied to the correct eye.**

Preoperative dilating (**mydriatic**) eyedrops often are administered every 5 minutes for six doses. Other eyedrops may be administered in between these doses. An IV infusion is started shortly before surgery.

Because most patients undergoing eye operations are older adults and therefore are likely to have some additional chronic disease, remember to apply the principles of geriatric nursing in administering care. Fear, anxiety over surgery, and confusion about the expected results of the surgery are all factors to be considered when preparing the patient for the operation. Instructions and information should be given both verbally and in writing. Measures to ensure patient safety are very important both preoperatively and postoperatively because the vision is impaired.

Safety Alert

Prevent Falls From Impaired Vision

An older adult who has a patched eye, has low vision, and is in a strange environment is subject to falls. The patient may need to be reoriented to place, time, and surroundings frequently to decrease confusion and agitation.

Postoperative Care

In caring for a patient undergoing any type of eye surgery, the key word is **gentleness**. The patient's head should not be jarred when transferring from the operating table or stretcher to the bed. Remember to speak before touching a patient who is blind or who is wearing bandages over the eyes.

Patients are usually kept in the recovery area of the outpatient surgery department for 2 to 3 hours postoperatively. Nausea and subsequent vomiting can wreak havoc with delicate suture lines in the eye. **If the patient becomes nauseated, antiemetic medication should be administered immediately and all food and liquids withheld.**

An eye patch is often placed over the eye that was operated on ([Figure 26-11](#)). If it is necessary to restrict movement of the eyes, both eyes are patched.



FIGURE 26-11 Patient with eye patch to protect surgical site and prevent eye movement. The head is kept elevated in the immediate postoperative period.

Instructions regarding postoperative medications and how they are to be instilled are given before discharge (Figure 26-12). Different types of eyedrop medications come with color-coded tops for easy identification. Eyedrop bottles also can be “labeled” by wrapping one, two, or three rubber bands around them so that patients with a visual impairment can differentiate one type of drop from another.



FIGURE 26-12 Instilling eyedrops.

Should the patient need to stay in the hospital because of other problems, you must be thoroughly familiar with his individual care needs. It should be known whether the patient can be turned on one or both sides or must remain flat on the back, whether pillows are allowed under the head, and how high the head of the bed may be raised. For certain types of retinal surgery, the head may need to be raised and positioned toward a particular side. If a gas bubble has been injected intraocularly, the patient is positioned prone or supine with the head toward one side or the other, according to orders. If the patient is allowed out of bed, care must be taken not to jar the head or move too suddenly.

Sexual activity can usually be resumed in 1 to 8 weeks postoperatively, depending on the procedure performed. The surgeon will explain this to the patient. Ensure that the patient understands the time of the next appointment with the ophthalmologist. The patient and family should be encouraged to follow the provider's directions faithfully during the healing period at home so that nothing will jeopardize the success of the surgery.

Discharge planning is of utmost importance. Refer to the earlier Home Care Considerations box for home care of a patient after retinal surgery or vitrectomy.

Community Care

Resources for People Who Are Vision Impaired

Loss of vision need not be devastating for a person if support and encouragement are given for coping with the impairment. There are resources to help those with visual impairments learn to care for themselves, find employment, and enjoy educational and recreational activities. Many colleges provide special funds to enable blind students to hire readers and tape recorders to help them with their studies.

Both home care nurses and those working in long-term care should be alert to signs of progressing macular degeneration. The Amsler grid can assist in identifying this problem. Patients with known eye disorders should be periodically assessed to see how much vision has deteriorated and how much the patient's ability to perform activities of daily living and partake in usual hobbies is affected. Nurses should be instrumental in helping patients obtain low-vision aids.

All nurses should encourage the donation of corneas at death. Signing a donor card for organ harvest should be a consideration for all, as well as indicating "tissue donor" on the driver's license. The nurse may be the person to approach a terminal patient or his family about the possibility of donating corneas after death and giving the gift of sight to another. The Library of Congress in Washington, D.C., lends records and recording machines without charge to people who are blind and maintains a wide selection of recordings. Recordings of required textbooks may be obtained free of charge from Recording for the Blind and Dyslexic (see Online Resources).

Common Disorders of the Ear

External Otitis

Etiology and Pathophysiology

Infection of the external ear is common and often occurs in swimmers. It is caused by either bacterial or fungal pathogens, with staphylococci being the most common cause. Other infections of the skin may affect the external ear (see [Chapter 42](#)). A moist environment or disruption of the skin from trauma provides a place for pathogens to grow.

Signs and Symptoms

Pain occurs with the infection. An early sign may be pulling at the pinna or itching in the canal. If swelling occurs in the ear canal, hearing may be impaired, because sound waves cannot reach the tympanic membrane.

Diagnosis, Treatment, and Nursing Management

Redness is evident on otoscopic examination, and there may be drainage. A culture of the drainage may be performed. Antibiotic or fungal eardrops and ointments are the usual treatment. A severe infection may require oral antibiotics as well. Teaching patients to use drops of an alcohol solution in the ears after drying them helps to prevent external otitis. A mild analgesic may help decrease the discomfort during healing.

Impacted Cerumen and Foreign Bodies

Normally the ear canal is self-cleaning, but cerumen may occasionally become impacted. Foreign objects such as insects or organic matter may obstruct the canal. A feeling of fullness in the ear combined with a hearing loss can indicate that obstruction has blocked the canal, preventing sound waves from reaching the tympanic membrane. If otoscopic examination reveals hardened cerumen blocking the canal, irrigation of the canal is performed to remove it.

Older Adult Care Points

With increased age, the auditory canal narrows and the hairs become coarser and stiffer. The cerumen glands atrophy, causing cerumen to be drier. This combination may result in impaction of cerumen that causes a conductive hearing loss and tinnitus. Older adults with this problem should be taught to use cerumen softening drops and an ear syringe to wash out the cerumen periodically. Those who are unable to cleanse the ears themselves should have regular ear checks by their health care provider.

Clinical Cues

When irrigating an ear canal, the water should be tepid. Cold water and too much irrigation pressure can cause dizziness and nausea as well as pain. Check the temperature of the water each time the syringe or irrigation container is refilled. Drape the patient so that the clothing does not become wet.

Otitis Media

Etiology

This condition is an inflammation of the middle ear caused by various types of bacteria or viruses. Although it is mostly seen in infants and young children, it does occur in adults. It results in the accumulation of fluid behind the eardrum and some temporary impairment of hearing.

Pathophysiology

The inflammation of otitis media usually follows an upper respiratory tract infection or trauma to

the ear. It is usually viral in origin but may be complicated by bacteria. Obstruction of the eustachian tube usually precedes the disorder and is caused by an upper respiratory infection or allergy. Middle ear inflammation occurs when the eustachian tube that usually drains that area becomes blocked. The obstruction changes the pressure within the middle ear. The inflammation may provide an environment for *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, *Streptococcus pyogenes*, or other pathogens to invade the tissue.

When the infection is sudden in onset and of short duration, it is termed *acute otitis media*. The eardrum is retracted inward because of negative pressure from a closed eustachian tube. The pain can be severe. When the infection is repeated, often causing perforation of the eardrum and drainage, it is called *chronic otitis media*.

Otitis media sometimes is accompanied by an allergy and may be aggravated by enlarged adenoids. Fluid may build up in the middle ear. This disorder is called *serous otitis media*.

Signs, Symptoms, and Diagnosis

Symptoms may be mild and may consist only of a feeling of fullness in the ear and evidence of impaired hearing and tinnitus. There may be pain in the infected ear, headache, fever, and pulling on the ear. If the fluid remains over an extended time, it causes tympanic membrane contraction and can permanently impair its movement.

Depending on the stage of infection, otoscopic examination may show retraction of the eardrum, redness and bulging, or pus behind the eardrum. Perforation may occur with drainage of the pus. This type is termed *suppurative otitis media*.

Treatment

There is great controversy about using antimicrobials for otitis media because so many strains of pathogens are becoming antimicrobial resistant. If there is otitis media with fluid behind the eardrum and no acute systemic or local evidence of severe infection, antimicrobials are withheld. The condition is treated conservatively with antihistamines and decongestants.

For repeated episodes of otitis with fluid, or when the fluid will not resorb, a **myringotomy** (incision into the eardrum) is done, and a ventilating tube is inserted to drain the excess fluid in the middle ear and to equalize pressure while the eustachian tube is blocked. The tympanic membrane is anesthetized locally. The procedure is painless and takes about 15 minutes. The incision heals within 24 to 72 hours unless a tube is placed in the opening. Tubes remain in place for 6 to 18 months before they are naturally expelled. The hole then heals. If allergy is believed to be responsible for the fluid buildup, antihistamines are prescribed.

Acute otitis media occurs when pus-producing bacteria infect the middle ear. Treatment consists of systemic therapy with antibiotics for at least 5 to 7 days, topical therapy with eardrops, and oral analgesics to reduce pain and fever. With repeated episodes, **tympanoplasty** to repair a ruptured eardrum and damaged ossicles, and, sometimes, mastoidectomy may be needed to eliminate all sources of infection and prevent further degeneration of bone.

Nursing Management

Keeping the patient comfortable at home, encouraging compliance with the medication regimen, and requesting return for an examination when medication is finished are usual nursing actions. Show a family member how to instill eardrops properly. Temperature should be taken each day during the course of acute otitis media to track improvement.

Infections in the middle ear always have the potential for spreading to the meninges, causing meningitis, or to the mastoid bone, causing mastoiditis. With the advent of antibiotics, surgery to scrape and clean infected mastoid bone is performed far less commonly than it was previously. Although otitis media is a fairly common occurrence, it should always be treated immediately.

Labyrinthitis

Etiology and Pathophysiology

Labyrinthitis is an inflammation involving the vestibular portion of the labyrinth in the inner ear. It most commonly occurs from a viral respiratory infection but can be a complication of bacterial meningitis or chronic otitis media.

Signs, Symptoms, and Diagnosis

The symptoms include sensorineural hearing loss in the affected ear, tinnitus, severe dizziness with nausea and vomiting, and **nystagmus** (abnormal jerking movements of the eyes). If the disorder is viral, there usually is no tinnitus and resolution occurs within 7 to 10 days. Diagnosis is made from the symptoms and by ruling out tumor or other disease.

Treatment and Nursing Management

Treatment is aimed at removing the source of infection and controlling symptoms. Meclizine (Antivert, Bonine) or another antihistamine that assists in decreasing vertigo and its associated nausea and vomiting is used. Scopolamine patches behind the ear can be used after the acute phase to control vertigo. Antibiotics may be given in massive doses to control a bacterial infection.

Clinical Cues

Remind the patient to wash his hands again after applying the scopolamine patch. If the eye is touched after touching the patch, severe eye irritation may occur.

Initially the patient is kept on bed rest to prevent falls and injury. The family is cautioned not to let the patient get out of bed without assistance. Nursing management consists of safety measures to prevent falling and instructions about the medications. Attention to hydration is important if the patient is nauseated to the point of repeated vomiting.

Ménière Disease (Ménière Syndrome)

Etiology and Pathophysiology

The exact cause is unknown, but Ménière disease occurs most commonly in people who have had chronic ear disorders and allergic symptoms involving the upper respiratory tract. There is a genetic link, and approximately 50% of those with the disorder have family members who are also afflicted.

An increase of endolymph within the spaces of the labyrinth, with swelling and congestion of the mucous membranes of the cochlea, occurs. Resultant pressure in the labyrinth of the inner ear results in permanent damage to both the cochlear and vestibular structures. The disorder is usually unilateral. Long-term stress may be a factor.

Signs, Symptoms, and Diagnosis

The symptoms include attacks of dizziness, ringing in the ear (tinnitus), and unilateral sensorineural hearing loss. Poor balance makes walking difficult or impossible. **Any sudden movement of the head or eyes during an attack usually produces severe nausea and vomiting.** Diagnosing Ménière disease usually is not difficult, but because these symptoms could indicate a tumor of the auditory mechanism, a **caloric test** (electronystagmogram [ENG]) may be performed, which involves instilling very warm or cold fluid into the auditory canal. A patient with Ménière disease will experience a severe attack; a person without the disease will complain of only slight dizziness. A person with a tumor of the auditory mechanism will have no reaction at all. Tympanometry and audiometry are ordered, and a brainstem-evoked response (BSER) test is performed to rule out an acoustic neuroma or problem in the brain.

Think Critically

How would you check for nystagmus when assessing a patient who has vertigo?

Treatment

Treatment of Ménière disease focuses on relieving symptoms; there is no cure for this condition, although the disorder does disappear spontaneously in some cases. For an acute attack with disabling vertigo, atropine may be given subcutaneously, followed by diazepam (Valium), dimenhydrinate (Dramamine), meclizine (Antivert), or other drugs for motion sickness. To control edema and reduce pressure in the inner ear, the patient may be placed on a low-sodium diet, his

fluid intake may be restricted, and diuretics may be ordered. Anticholinergic drugs, such as propantheline (Pro-Banthine) or glycopyrrolate (Robinul), may be given to help control the vertigo and nausea. To improve circulation in the ear, papaverine (Vasospan) or niacin may be prescribed. Some patients find that *Ginkgo biloba*, which acts as a vasodilator, helps. The patient is kept quiet and in bed to avoid aggravating his symptoms. He may be very irritable and withdrawn and may refuse to eat or drink because of fear of vomiting. Care should be taken to avoid increasing his irritation by jarring the bed, turning on bright overhead lights, or making loud noises.

If attacks continue and are very severe despite medical treatment, the endolymph sac from the inner ear can be removed with microsurgical techniques, but this is reserved for medical treatment failures. When hearing loss is total on the affected side, surgical destruction of the eighth cranial nerve may resolve the symptoms. Although this produces permanent deafness in the affected ear, the severe attacks are eliminated. In most persistent cases of Ménière disease, the patient will eventually suffer a serious or even total loss of hearing regardless of the treatment used.

For those with dizziness and unsteadiness who do not wish to undergo surgery, vestibular rehabilitation therapy, a home-based exercise, may decrease the dizziness and balance problems resulting from inner ear damage. The Meniett low-intensity alternating-pressure generator that is self-administered at home displaces fluid from the inner ear and relieves or prevents symptoms (Medtronic.com, 2014).

Think Critically

What would you teach a patient with Ménière disease about a low-sodium diet?

Nursing Management

Encourage patients who use nicotine products to quit, because nicotine constricts blood vessels and decreases inner ear circulation. If allergy seems to be a factor in the onset of attacks, encourage consultation with an allergist to obtain control of allergens. Decreasing stress is a helpful intervention when there has been a pattern of attacks after particularly stressful times in the patient's life.

Acoustic Neuroma

An acoustic neuroma is a rare benign tumor on the eighth cranial nerve that is usually unilateral. It occurs in 0.7 to 1.0 per 100,000 people. Symptoms are gradual hearing loss and tinnitus. This tumor is usually curable with surgery or stereotactic (gamma knife, Cyberknife) radiotherapy. If untreated it causes deafness. Treatment is surgical, and nursing care is much the same as for other intracranial surgeries, using measures to decrease intracranial pressure.

Otosclerosis and Hearing Loss

Etiology and Pathophysiology

Otosclerosis is a hereditary degeneration of bone in the inner ear. It occurs twice as often in females and begins in the late teens or early 20s. It may become worse during pregnancy. Hearing is decreased if there has been damage to the tympanic membrane (eardrum) from trauma or infection.

The sense of hearing depends in part on the vibration of very small bones of the inner ear. The **stapes**, or stirrup, is particularly important, because it conducts sound waves to the fluid in the semicircular canals in the inner ear. Otosclerosis is a disease process that causes the formation of excess bone. This causes the footplate of the stapes to be fixed so that it no longer vibrates to transmit sound waves received via the tympanic membrane.

Signs, Symptoms, and Diagnosis

The patient often complains of difficulty hearing the voices of others, yet his own voice sounds unusually loud. In response to this, he may lower his voice to the point that he can scarcely be heard by others. Diagnosis is by otoscopic examination, Rinne and Weber tests, and audiogram.

Treatment

The hearing loss of otosclerosis can sometimes be corrected by using a hearing aid. Care for a hearing aid is presented in [Box 25-5](#). Microsurgical intervention can restore air-conductive hearing by providing a new movable pathway for the sound waves. During the operation, called a *stapedectomy*, the stapes is removed and is replaced with a prosthetic device. This device may be a steel wire and fat implant, a wire and a segment of vein, or a vein graft with polyethylene tubing. In any case, the prosthesis is attached to one end of the **incus** (anvil of the middle ear) so that sound can be transmitted to the inner ear. The surgical procedure is extremely delicate and would not be possible without the dissecting binocular microscope and other modern surgical instruments that allow visualization and manipulation of the very small structures of the middle ear. Outpatient surgery with local anesthesia is typical. Hearing improvement may not occur for about 6 weeks.

Tympanoplasty reconstructs the middle ear and improves conductive hearing loss. Tympanoplasty involves the surgical reconstruction of the tympanic membrane and ossicles to restore middle-ear function. There are several types of procedures, ranging from simple closing of a tympanic membrane perforation to extensive repair of the middle-ear structures. The procedure is performed with an operating microscope via the external auditory canal or through a postauricular incision. Although performed as an outpatient procedure, tympanoplasty requires general anesthesia.

Nursing Management

Postoperative care involves keeping the patient quiet and flat in bed for at least 12 hours. The head is turned so that the affected ear is uppermost. When the patient is allowed to move around, he must be warned that dizziness is likely to occur, especially if he turns his head suddenly. Position changes should be accomplished slowly. Coughing and sneezing should be prevented; if unavoidable, they should be accomplished with the mouth open to decrease pressure in the ear ([Nursing Care Plan 26-2](#)).

Nursing Care Plan 26-2

Care of a Patient Having a Tympanoplasty

Scenario

Miss Cook, age 38 years, is a high school teacher who has had progressive hearing impairment as a result of recurrent otitis media of the right ear. She is admitted to outpatient surgery for tympanoplasty. During her initial assessment, the nurse found Miss Cook to be well informed about the nature of her disorder but somewhat anxious about the outcome of surgery. Her physical health status is good; her only previous hospitalization was for an appendectomy when she was 19 years old. Care is for the postoperative period.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to graft displacement.*

Supporting Assessment Data

Objective: Tympanoplasty.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Graft will be successful as evidenced by restored hearing in affected ear.	Position patient side-lying on nonoperative side.	Prevents collection of fluid behind graft and reduces pressure.	Positioned on nonoperative side or back with HOB raised 30 degrees.
	Reinforce preoperative instructions to remain in bed for 4 hr and avoid sudden movements, blowing nose, or sneezing.	These measures help prevent graft disruption.	Compliant with instructions. Continue plan.
	Check vital signs for evidence of infection bid.	Elevation in temperature may indicate beginning infection.	Temperature within normal range. No sign of infection.
	Give analgesic/sedative as ordered.	Analgesic/sedative will promote rest.	Patient resting comfortably; pain at 2/10.
	Provide quiet environment.	A quiet environment will promote rest.	Instruct patient and family to limit activities.

Problem Statement/Nursing Diagnosis

Altered activity tolerance/*Risk for activity intolerance related to vertigo and instability.*

Supporting Assessment Data

Subjective: After tympanoplasty, states she is very dizzy and nauseated.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Falls and head trauma will be prevented.	Up with assistance only. Repeat explanation for safety precautions.	Helps to prevent falls.	Asking for assistance when needs to get up.
	Caution patient to change positions and turn her head very slowly.	Abrupt changes in position are likely to cause vertigo and nausea.	Compliant with instructions.
	Provide well-lit room when ambulating.	Good lighting prevents tripping over obstacles when ambulating.	Room lighting is adequate.
	Administer medication prescribed for vertigo.	Medication can help control vertigo.	Medication for vertigo is effective.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge regarding postoperative care.*

Supporting Assessment Data

Subjective: Asks about restrictions and self-care.

Objective: Cannot verbalize knowledge of medications.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize knowledge of home self-care before discharge.	Instruct to avoid loud noises and pressure changes for 6 mo, especially avoiding flying and diving.	Loud noise and pressure changes can disrupt the graft.	Instructions reviewed verbally, and printed instructions left with patient.
	Stress importance of not blowing her nose for at least 1 wk and preventing upper respiratory infection; if at all possible, protect her ear against cold; and refrain from any activity that might provoke dizziness or disturb the graft (e.g., straining at stool, bending, and heavy lifting).	Preventing pressure changes helps protect the integrity of the graft.	Provided correct feedback on postoperative precautions.
Patient will demonstrate dressing change correctly before discharge.	Teach patient how to change dressing on the external ear.	Will prepare patient for self-care.	Patient has not changed bandage as yet. Continue plan.
	Reiterate importance of taking full course of prescribed antibiotic and reporting to surgeon at scheduled times.	Taking the full course of antibiotics correctly will help prevent infection.	Acknowledges importance of taking antibiotics as directed.
	Reassure patient that because of swelling of tissues and presence of surgical pack, it may be several weeks before she can fully evaluate effectiveness of the surgery.	Inflammation at the surgical site will cause swelling that interferes with hearing initially.	Reassurance given. States she understands that it may be a while before hearing is as good as it will get.

Critical Thinking Questions

1. Why can dizziness and vertigo occur after a tympanoplasty?

2. What level of noise would be considered “too loud”?

bid, Twice daily; *HOB*, head of bed.

Nursing Care of Patients Having Ear Surgery

Most ear surgeries are performed as outpatient procedures. Nursing care is focused on the immediate preoperative and recovery periods and on instructions for home care.

Preoperative Care

Nursing care of patients during the preoperative period is rather routine, except for the administration of eardrops or other special medications. Physical preparation for ear surgery may or may not involve removing some of the hair from the scalp. Male patients should be clean shaven the morning of surgery. The external ear and surrounding skin should be thoroughly cleansed, preferably with a surgical soap. Female patients with long hair should have it braided or pinned back securely so that it will not become soiled by drainage from the ear or serve as a source of infection at the operative site.

Postoperative Care

The patient will often return from major ear surgery with an ear dressing (Figure 26-13). Positioning of the patient after ear surgery depends on specific instructions from the provider. Often the patient is placed flat in bed, and his head is supported so that he does not turn it from side to side. In addition to noting the vital signs, watch for signs of injury to the facial nerve, including inability of the patient to close his eyes, wrinkle his forehead, or pucker his lips. The patient and family are advised to report such symptoms to the surgeon. If they appear later than 12 hours after surgery, they may indicate edema, and the provider may order a loosening of the dressings.



FIGURE 26-13 An ear surgery dressing. The patient is positioned with the head elevated or side-lying on the unaffected side.

Safety precautions, such as raising side rails, should be taken to prevent injuries from dizziness and loss of balance during the recovery period. Balance is temporarily affected as a result of disturbance to the mechanism that maintains equilibrium. When the patient is allowed to get up and move around, assistance should be provided to prevent falls. The patient should arise slowly to a sitting position and sit for a few minutes. Then the patient stands while holding on to something or being supported by another person. Dizziness must pass before the patient attempts walking.

Because the ear is so near the brain, special effort must be made to prevent contamination of the surgical site. Dressings may be reinforced to keep them dry, but excessive drainage must be reported to the surgeon.

The patient should be instructed beforehand about what is to be expected from the surgery. Hearing is usually slightly impaired immediately after surgery because of edema or bandages but is expected to improve in time.

Home Care Considerations

Instructions After Ear Surgery

The following instructions are given to the patient after ear surgery at the time of discharge:

- Sneezing, coughing, and nose blowing are all ways in which the operative site may be disturbed. If necessary, blow the nose gently one side at a time. Cough or sneeze with the mouth open. Continue this for 1 week after surgery.
- Do not drink through a straw for 2 to 3 weeks. Avoid drinking directly from the mouth of a plastic bottle, because negative pressure occurs if the bottle opening is sealed.
- Limit physical activity for 1 week after surgery. Refrain from exercising and sports for 3 weeks or until the surgeon discharges you.
- Avoid heavy lifting for 3 weeks. Avoid bending over from the waist or moving the head rapidly for 3 weeks.
- Keep the ear dry for 4 to 6 weeks after surgery by placing a cotton ball covered with petroleum jelly (such as Vaseline) in the ear canal; refrain from shampooing hair with water for 1 week after surgery.
- After the initial dressing is removed, place a cotton ball loosely in the ear to keep it dry and protected; change the cotton ball daily.
- Avoid people with colds.
- Do not fly until the surgeon allows it.
- Wear ear protectors when exposed to a loud environment.
- A return to work is usually allowed after 3 to 7 days; strenuous work may not be resumed for 3 weeks.

The surgeon will explain the specific time limitations for each activity based on the type of surgery.

Myringotomy (incision of the eardrum) with placement of tubes is a lesser outpatient procedure, and the only dressing may be a cotton ball in the ear. There is less occurrence of dizziness or nausea with this surgery.

Community Care

Cautioning people about the dangers of listening to loud music through earpieces can help curb hearing loss. Teaching adults to seek prompt medical attention for symptoms of otitis media prevents damage to the tympanic membrane and preserves hearing ability.

A hearing assessment should be part of any thorough health assessment. Encouraging those who have any difficulty with hearing to have a thorough evaluation and to try a hearing aid, if the need is indicated, could help improve the quality of their lives. Nurses in home and long-term care settings should frequently assess the function of the patient's hearing aid.

Various accommodations are available for individuals who are hearing impaired. Assistance dogs can help keep a person with a hearing impairment safe both in the home and on the streets.

Get Ready for the NCLEX® Examination!

Key Points

- A problem with refraction is the most common eye disorder.
- Cataracts cause a blurring or loss of vision and usually develop slowly.
- Cataract surgery with lens implant usually restores vision.
- The increase in IOP that occurs with glaucoma will eventually cause blindness if untreated.
- Glaucoma medication typically must be used for the rest of the patient's life.
- Acute narrow-angle glaucoma is a medical emergency.
- Symptoms of retinal detachment include flashing colored lights followed by the appearance of "floaters."
- Unless treated quickly and successfully, retinal detachment causes vision loss.
- Positioning and restriction of amount of movement are crucial after eye surgery.
- Retinopathy is a disorder that occurs most commonly in people with diabetes or hypertension.
- Tight glucose control helps prevent diabetic retinopathy.
- Retinopathy is commonly treated by laser.
- Keratoplasty may be performed to repair damaged corneas.
- Macular degeneration is a common problem in older adults but can occur at an earlier age.
- There is presently no cure for macular degeneration, but new drugs and treatments may be able to slow it or reverse some of the vision loss.
- Eye trauma should be treated by a health care provider promptly.
- Keep patients who have had eye surgery still, and treat nausea immediately.
- Otitis media is a common malady that may be induced by allergy or upper respiratory infection.
- Impacted cerumen or foreign bodies in the ear interfere with hearing.
- Otosclerosis is generally hereditary.
- Tympanoplasty may be performed for otosclerosis or for tympanic membrane dysfunction.
- Labyrinthitis and Ménière disease cause vertigo and tinnitus.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- American Foundation for the Blind, www.afb.org
- American Printing House for the Blind, Inc., www.aph.org
- American Tinnitus Association, www.ata.org
- Better Hearing Institute, www.betterhearing.org
- The Center for the Partially Sighted, <http://low-vision.org>
- Hearing Loss Association of America, www.hearingloss.org
- Helen Keller International, www.hki.org
- Lighthouse International, <http://lighthouse.org>
- Macular Degeneration Foundation, www.eyesight.org
- National Eye Institute, www.nei.nih.gov
- National Library Service for the Blind and Physically Handicapped (NLS), <http://www.loc.gov/nls>
- Recording for the Blind & Dyslexic, <http://ddtp.cpuc.ca.gov/default1.aspx?id=490>

Review Questions for the NCLEX® Examination

1. A male patient was informed that he would need to wear a pair of corrective lenses for

astigmatism. When asked about the condition, the patient demonstrates understanding when he states that:

1. "Astigmatism is hardening of the ciliary muscles."
2. "Astigmatism is an irregular curvature of the cornea."
3. "Astigmatism enables focusing of light in front of the retina."
4. "Astigmatism is an increased opacity of the lens."

NCLEX Client Need: Health Promotion and Maintenance, Self-Care

2. Which instruction must be included in the discharge teaching of a patient who has undergone corneal transplant?

1. Increase physical activity.
2. Wear an eye shield when in close contact with children or pets.
3. Remove pressure dressing as needed.
4. Lie only on the operative side.

NCLEX Client Need: Health Promotion and Maintenance, Self-Care

3. An older adult is admitted for cataract extraction. Which sign or symptom is associated with this condition?

1. Increased tearing
2. Increasing farsightedness
3. Increasing complaints about glare
4. Bluish discolorations

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

4. People with diabetes may face several eye problems and diseases as a complication of their illness. Which of the following can cause severe vision loss or blindness in a person with diabetes? (Select all that apply.)

1. Glaucoma
2. Retinopathy

3. Presbyopia

4. Glaucoma

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

5. After eye surgery, a patient is instructed to avoid movements that increase the venous pressure in the head, neck, and eyes. Which movement(s) increase(s) venous pressure? (*Select all that apply.*)

1. Straining

2. Bending over

3. Keeping the head up

4. Sudden head movements

5. Strenuous exercises

NCLEX Client Need: Safe and Effective Care Environment, Safety and Infection Control

6. A woman complains of eye itching, tearing, halos around lights, and decreased central vision. Which symptom most clearly relates to macular degeneration?

1. Eye itching

2. Tearing

3. Halos around lights

4. Decreased central vision

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

7. Before eye surgery, a patient is instructed to take stool softeners. When asked about the rationale for taking the stool softener, an appropriate response would be:

1. “The medication reduces the possibility of straining at stool postoperatively.”

2. “The medication prevents constipation caused by anesthetic agents.”

3. “The medication cleanses the gastrointestinal tract.”

4. "The medication enhances surgical recovery."

NCLEX Client Need: Physiological Integrity, Pharmacological Therapies

8. Older adults are more prone to conductive hearing loss and tinnitus because of:

1. hypertrophy of the cerumen glands.
2. hardened cerumen.
3. widening of the auditory canal.
4. hair loss in the auditory canal.

NCLEX Client Need: Physiological Integrity, Basic Pathophysiology

9. The nurse emphasizes safety precautions to a 60-year-old female Hispanic patient with Ménière disease. An appropriate nursing approach would be to:

1. use the patient's first name when addressing her.
2. include family members in instructions.
3. address decision making to the patient.
4. set a specific schedule for providing instructions.

NCLEX Client Need: Safe and Effective Environment, Safety and Infection Control

10. What advice may you give an aging adult to help prevent macular degeneration? (*Select all that apply.*)

1. Do not smoke, or quit if you do.
2. Maintain a healthy weight; especially do not carry weight around the waist.
3. Avoid bending or heavy lifting.
4. Drink with a straw.

NCLEX Client Need: Health Promotion and Maintenance, Disease Prevention

Critical Thinking Questions

Scenario A

Mr. Lavant, age 52 years, and his wife, who has diabetes, have heard about a glaucoma screening clinic being held in their community. They are interested in attending the clinic but are very apprehensive about the kind of tests that will be done. They ask you about the tests and whether you think they should go to the screening clinic when they have no symptoms of glaucoma or any other eye disease.

1. How would you explain a test with a tonometer?
2. How would you explain glaucoma in terms Mr. and Mrs. Lavant could understand?
3. Who are among the people at high risk for glaucoma?
4. What is the usual treatment for chronic, open-angle glaucoma?

Scenario B

Mr. Wilson, age 78 years, is scheduled for a right cataract extraction and intraocular lens implant. He has bilateral cataracts that have made him legally blind for years. He did not consult a provider until recently, because he had always heard that cataracts had to be "ripe" before they could be treated, and he felt he could not afford frequent trips to a provider when nothing could be done for his condition. Mr. Wilson enters the outpatient surgery area, and you are assigned as his nurse.

1. How would you approach and orient Mr. Wilson to his surroundings?
2. What would you tell Mr. Wilson about the preoperative routine and medications at this time?
3. What problem statements would be appropriate for Mr. Wilson at this time?
4. What are the advantages of intraocular lens implants over cataract glasses and/or contact lenses?

Scenario C

Mr. Thompson is suffering from a severe attack of Ménière disease and vertigo. He is severely nauseated, and his vertigo prevents him from getting out of bed. The provider wants to rule out the possibility of tumor as a cause of Mr. Thompson's vertigo, so he is scheduled for an ENG with a caloric test and a MRI scan.

1. What nursing actions would be appropriate for him?
2. How would you explain this disorder to Mr. Thompson?
3. How would you explain these tests to Mr. Thompson?

UNIT IX

Gastrointestinal System

OUTLINE

Chapter 27 The Gastrointestinal System

Chapter 28 Care of Patients With Disorders of the Upper Gastrointestinal System

Chapter 29 Care of Patients With Disorders of the Lower Gastrointestinal System

Chapter 30 Care of Patients With Disorders of the Gallbladder, Liver, and Pancreas

CHAPTER 27

The Gastrointestinal System

Objectives

Theory

1. Explain the various functions of the gastrointestinal system.
2. Distinguish major causative factors in the development of disorders of the gastrointestinal system.
3. Summarize measures to prevent disorders of the gastrointestinal system.
4. Determine nursing responsibilities in the pretest and post-test care of patients undergoing diagnostic tests for disorders of the gastrointestinal system.
5. Develop a nursing care plan for a patient with diarrhea.
6. Correlate changes that occur with aging with alterations in gastrointestinal function.

Clinical Practice

7. Perform an assessment of gastrointestinal status.
8. Provide pretest and post-test care of patients undergoing tests of the liver, gallbladder, and pancreas.
9. Provide care for a patient who is experiencing vomiting.
10. Teach a patient strategies to alleviate constipation.

KEY TERMS

- absorption** (äb-sörp-shün, p. 627)
- adhesions** (äd-HĒ-shünz, p. 627)
- anabolism** (ä-NĀB-ō-līzm, p. 627)
- anorexia** (än-ö-RĒK-sē-ä, p. 637)
- ascites** (ä-Sī-tēz, p. 636)
- catabolism** (kă-TĀB-ō-līzm, p. 627)
- chyme** (KĪM, p. 625)
- flatus** (FLĀ-tūs, p. 639)
- mastication** (măs-tă-KĀ-shün, p. 624)
- metabolism** (mĕ-TĀ-bō-līzm, p. 627)
- pancreatitis** (păn-krē-Ä-Tī-tīs, p. 629)
- peristalsis** (pĕr-ēs-TĀL-sīs, p. 627)

Anatomy and Physiology of the Gastrointestinal System

• Organs and Structures of the Gastrointestinal System

- The organs of the gastrointestinal (GI) system are the mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum, and anus ([Figure 27-1](#)).

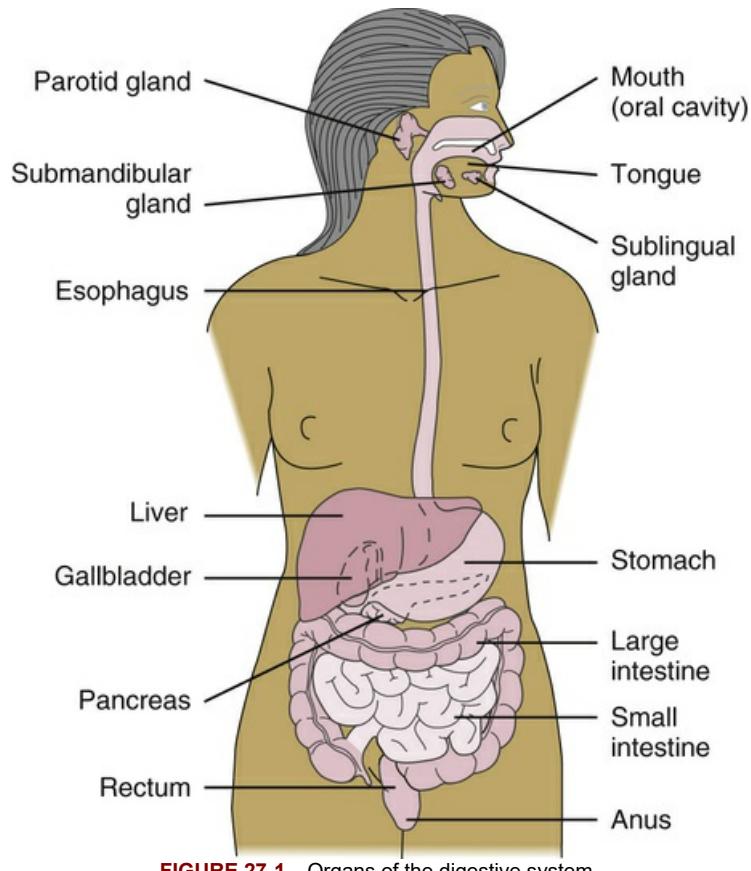


FIGURE 27-1 Organs of the digestive system.

- The accessory organs are the liver, gallbladder, and pancreas ([Figure 27-2](#)).

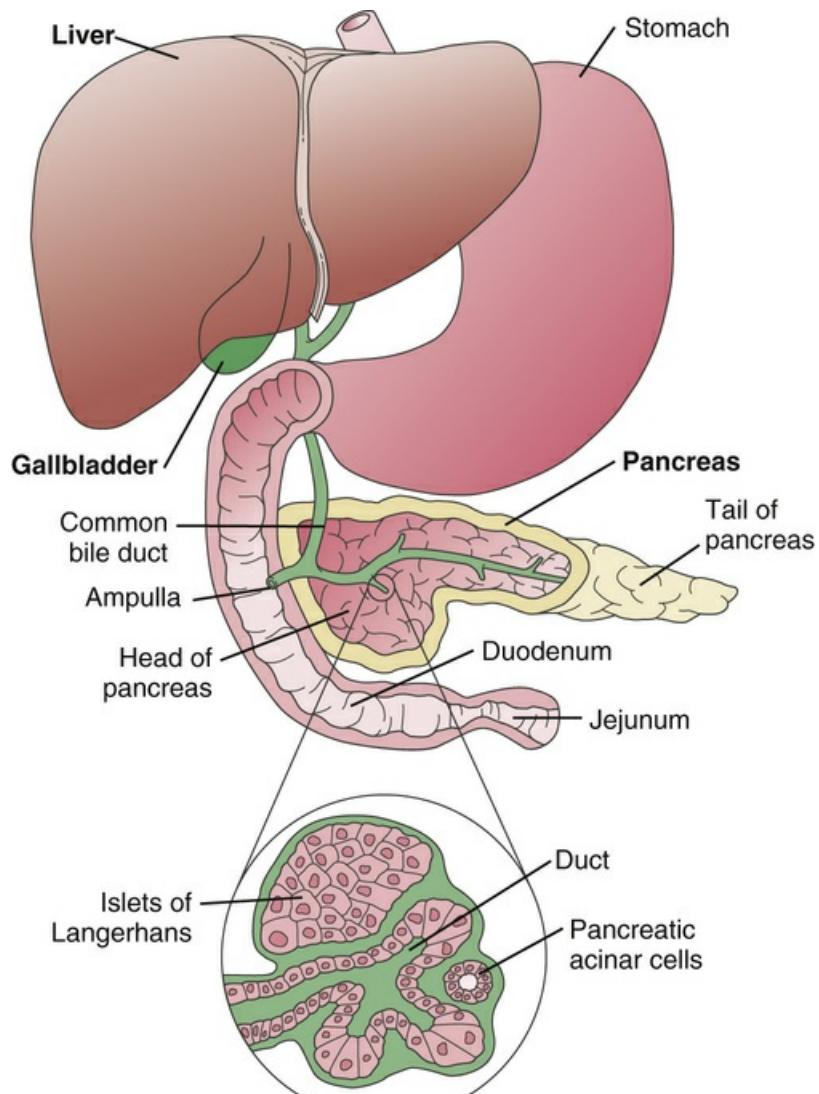


FIGURE 27-2 Accessory organs of the digestive system.

- The gastroesophageal sphincter (cardiac sphincter) controls the opening from the esophagus into the stomach; it prevents reflux from the stomach into the esophagus.
- The stomach lies in the upper left portion of the abdominal cavity (see [Figure 27-1](#)).
- The pyloric sphincter controls release of food substances into the small intestine ([Figure 27-3, B](#)).

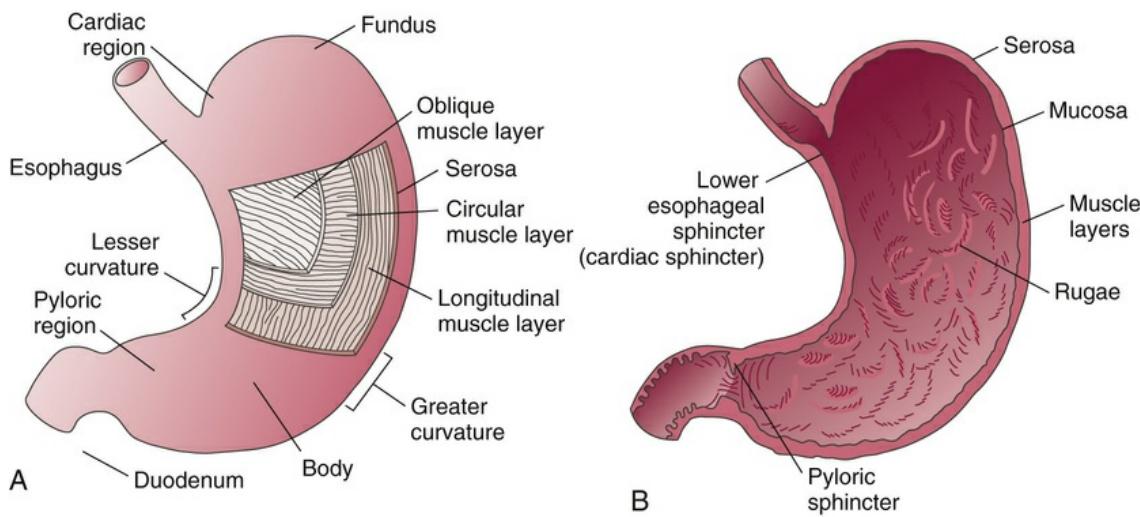


FIGURE 27-3 The stomach. **A**, External view. **B**, Internal view.

- The small intestine is divided into the duodenum, jejunum, and ileum and is about 6 m long.
- The ileocecal valve controls the progress of substances into the large intestine.
- The large intestine is divided into the cecum, colon, rectum, and anal canal; the colon is about 1.5 m long.
- The colon has four portions: the ascending, transverse, descending, and sigmoid colon.
- The appendix is attached to the cecum and has no known function in the digestive process.
- The walls of the digestive tract have four layers: mucosa, submucosa, muscular layer, and a serous layer called serosa.
- The peritoneum is a serous sac that lines the abdominal cavity and encloses the intestines, stomach, liver, and spleen and partially encloses the uterus and uterine tubes.

Functions of the Gastrointestinal System

- The teeth and tongue are instrumental in the chewing (**mastication**) process, and they help break down food into smaller pieces that can be acted on by various enzymes.
- Food moves from the mouth through the pharynx down the esophagus to the stomach, where mixing movements occur.
- Mucus, hydrochloric acid (HCl), intrinsic factor, pepsinogen, and gastrin are secreted into the stomach from cells within its walls and are mixed into the food to break down further the particles for absorption. This mixture of partially digested semi-liquid food is called **chyme**.
- The small intestine receives the chyme from the stomach, adds more digestive enzymes and fluids, receives bile and pancreatic enzymes from the common duct, and further digests the chyme into a more liquid state.
- Substances are moved along the intestinal tract by the peristaltic action of the intestinal smooth muscle.
- Digested food particles are absorbed into the bloodstream from the villi on the walls of the small intestine.
- The large intestine reabsorbs water and electrolytes, formulates some vitamin K, and eliminates waste products (Figure 27-4).

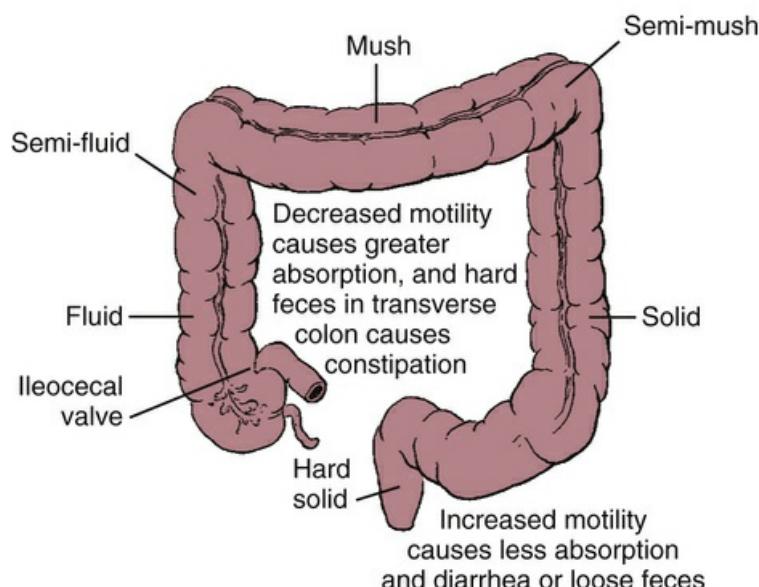


FIGURE 27-4 Absorptive and storage functions of the large intestine.

- The large intestine is populated with bacteria that aid in the breakdown of waste products.
- The rectum stores fecal material until it is eliminated through the anus.
- The internal anal sphincter at the top of the anal canal is under involuntary control; the external anal sphincter at the end of the anal canal is under voluntary control.
- The gastrocolic reflex initiates elimination; it is stimulated by the ingestion of food. By tightening the voluntary anal sphincter, the reflex emptying of the rectum can be stopped.

Effects of Aging on the Gastrointestinal System

- Dentures or partial plates and bridges are common in those older than 65 years. Ill-fitting dentures cause eating problems and can lead to nutritional deficits.
- With advanced age, muscles used for swallowing may become weaker and less coordinated, and food particles are retained in the cheek pouches or pharynx.
- The esophageal sphincter becomes less efficient at opening and closing, and risk for aspiration increases.
- Taste buds atrophy, causing inability to distinguish between flavors, particularly between salty and sweet.
- After age 70 years, the parietal cells in the stomach decrease their secretion of HCl; enzyme and intrinsic factor secretion also decrease. The lack of intrinsic factor may cause pernicious anemia.
- The mucosa of the small intestine becomes less absorptive, and the large intestine may develop diminished motility.

Structures and Locations of the Accessory Organs

- The **gallbladder** is a small sac attached to the lower portion of the liver.
- The **liver** is a large reddish brown organ located in the upper right quadrant of the abdominal cavity under the diaphragm; it is protected by the rib cage.
- The portal vein transports venous blood and nutrients absorbed from the small intestine to the liver.
- The **pancreas** is an elongated, flat organ that sits behind the stomach and consists of a "head" and a "tail" (see [Figure 27-2](#)).
- The gallbladder connects to the common bile duct that leads from the liver to the duodenum.
- The pancreatic duct extends the length of the pancreas and connects with the common bile duct, conducting its secretions into the duodenum.

Functions of the Gallbladder, Liver, and Pancreas

- The gallbladder stores bile produced in the liver and delivers it as needed to the small intestine; the gallbladder can store up to 50 mL of bile.
- The liver manufactures and secretes bile and bile salts necessary to digest fat.
- The liver synthesizes albumin, fibrinogen, globulins, and clotting factors.
- The liver is a storage area for glucose (in the form of glycogen); vitamins A, D, E, K, and B₁₂; and iron.
- The liver receives blood directly from the digestive tract via the hepatic portal vein. All nutrients and oral medications pass through the liver before being distributed to other parts of the body.
- The liver is responsible for how drugs are metabolized.
- The liver detoxifies and breaks down many compounds and drugs, preparing them for excretion; it alters ammonia, a byproduct of protein metabolism, so that it does not harm the body.
- The liver helps break down and excrete hormones, drugs, cholesterol, and hemoglobin from worn-out red blood cells.
- The liver plays a major role in glucose metabolism, removing excess glucose from the blood, converting it to glycogen, and then, as glucose is needed, converting glycogen back to glucose.
- The liver plays key roles in lipid metabolism, breaking down fatty acids and synthesizing cholesterol and phospholipids, and in converting excess carbohydrates and proteins into fats.
- The liver is instrumental in protein metabolism, converting certain amino acids into different ones as needed for protein synthesis.
- The liver is a large filter containing phagocytic Kupffer cells that remove bacteria, damaged red blood cells, and other toxic materials from the blood.
- The liver may store between 200 and 400 mL of blood.
- The liver synthesizes the prothrombin needed for normal blood clotting.
- The islets of Langerhans, which are regions of endocrine tissue in the pancreas, secrete the hormones insulin and glucagon into the blood; insulin is essential to the metabolism of carbohydrates.
- The pancreatic acinar cells secrete digestive enzymes into ducts that connect with the pancreatic duct.
- The major pancreatic enzymes are amylase, protease, trypsin, and lipase; these enzymes are essential to the digestion and absorption of nutrients from the small intestine.
- Secretion of pancreatic enzymes is controlled by secretin and cholecystokinin, two substances secreted by the intestinal mucosa.

Effects of Aging on the Accessory Organs of Digestion

- Gallstone incidence is higher in older adults, possibly because of an increase in biliary cholesterol related to diet and a tendency toward dehydration.
- Secretion of lipase from the pancreas decreases, altering fat digestion, and may contribute to a depressed nutritional state in older adults.

The Gastrointestinal System

The intestinal tract and accessory organs of digestion perform the intake, absorption, and assimilation of food to provide nourishment for the body. The transfer of nutrients from the intestine into the blood is referred to as **absorption**. Food substances are moved along the intestinal tract by **peristalsis** (wavelike motions of involuntary muscles within the walls of the organs).

Metabolism is the sum of many physical and chemical processes of the absorbed nutrients. Metabolic activities involve the synthesis of substances needed to build, maintain, and repair body tissues (**anabolism**). Metabolism is also responsible for the breakdown of larger molecules into smaller molecules so that energy is available (**catabolism**).

Gastrointestinal System Disorders

Causes

The GI tract is subject to infection, inflammation, physical and chemical trauma, and structural defects. An intestinal tract problem may be caused by blockage of movement of food through the intestine (intestinal obstruction). Postoperative **adhesions** sometimes cause intestinal obstruction. Adhesions are bands of scar tissue that bind two anatomic surfaces together that are normally separate. Tumor may also cause intestinal obstruction. Obstruction of the bile or pancreatic ducts can cause interference with the flow of digestive juices and of the enzymes needed for digestion. Continued irritation and inflammation of the GI mucosa can lead to intestinal bleeding and to increased peristalsis, causing inadequate absorption of nutrients.

Psychological and emotional stresses greatly influence appetite and motility of the stomach and intestines. The secretion of digestive juices in amounts sufficient for the breakdown of food is regulated in part by the emotions. The stress response may cause excessive GI secretions and decreased perfusion to the organs.

Think Critically

Why do you think providers frequently place hospitalized patients on GI prophylaxis medication?

Excessive stimulation of digestive acid and enzymes can cause a breakdown in the integrity of the mucous membrane lining the digestive tract. The damage to the mucous membrane can result in gastric or duodenal ulcers or chronic colitis.

Some disorders, such as Crohn disease and ulcerative colitis, are correlated with a genetic predisposition. Both disorders are more common among the Jewish population. Certain forms of colon cancer have been identified as having a genetic link, and there is a familial tendency for the occurrence of colon cancer. Esophageal and stomach cancer are linked to consumption of charred foods and those containing nitrates. Cigarette smoking is linked to stomach cancer.

Patient Teaching

Foods That May Contribute to Colon Cancer

The patient should be taught that the following foods may contribute to the development of colon cancer.

Nitrates and Nitrites

- Hot dogs
- Bologna and other luncheon meats
- Bacon
- Ham

- Smoked fish
- Some imported cheeses (check labels)

Nitrates and nitrites are used extensively as food preservatives. Check labels on “deli” products. Charred grilled foods and meat cooked at high temperatures also contain substances that are potentially cancer-causing.

Autoimmune diseases often affect the GI system, causing inflammation or fibrosis of organs. Treatments such as drug and radiation therapy may cause GI problems as a side effect. Some people who have undergone chemotherapy for cancer develop a mechanical form of sprue, a malabsorption problem that remains even after chemotherapy is complete. Lactose intolerance, which is common among older adults, may cause continuous diarrhea and malabsorption.

Think Critically

Can you identify any GI problems that seem to run in your family? What measures can family members take to prevent such problems?

Prevention of Gastrointestinal System Disorders

Eating a normal, well-balanced diet aids digestion. Maintaining good oral health is important to the health of the rest of the body. Consuming sufficient bulk in the diet helps maintain a healthy colon by enhancing passage of waste. A diet lacking in fiber is one factor in the development of diverticulosis, in which pockets form along the colon where waste material can lodge. Drinking at least eight glasses of fluid a day prevents constipation by helping to keep the stool moist.

Heeding the need to defecate promptly aids in keeping the gastrocolic reflex functioning well and prevents constipation and hemorrhoids. Straining at stool increases intra-abdominal pressure, which causes the hemorrhoidal vessels to engorge and contributes to hemorrhoid formation. Decreased mobility in older adults often leads to digestive problems; therefore ambulation is encouraged.

Health Promotion

Maintaining Abdominal Tone

Obtaining sufficient daily exercise maintains abdominal muscle tone and contributes to peristalsis and the ability to defecate normally. Defecating at more or less the same time each day aids the defecation process and helps promote continued ability to control defecation.

Maintaining body weight within normal limits helps prevent hiatal hernia and esophageal reflux. Developing healthy coping mechanisms and keeping stress within acceptable limits may prevent ulcers and chronic irritability of the bowel.

Mechanical and chemical irritants that produce inflammation often can be identified by elimination diets to determine the foods that cause GI upsets. Once the offending foods are identified, the patient can learn to avoid those foods while maintaining adequate nutrition.

Following general rules of good hygiene and sanitation can prevent many infectious GI events: wash the hands before cooking and eating and clean cooking and eating utensils properly. Food poisoning can be prevented by adequate refrigeration and by proper canning, freezing, and food-handling methods. Meats and foods containing mayonnaise or dairy products should be kept chilled. When not in the refrigerator, food should be kept covered.

Think Critically

How would you teach your family and friends about ways to decrease the risk of colon cancer? What would you recommend to your adult relatives regarding screening for colorectal cancer?

Causes of gallbladder disorders.

The formation of stones within the gallbladder can cause irritation and create areas susceptible to inflammation and infection. Stones can lodge in the common duct, causing obstruction to the flow of bile. Liquid weight loss diets or very rapid weight loss appears to be associated with developing gallstones. Women develop gallstones more frequently than men. The incidence increases with age, obesity, and having several children because pregnancy causes stasis of bile. People who have diabetes mellitus or Crohn disease are at higher risk for the disorder. Gallbladder disease tends to run in families, and it appears that there may be a genetic link.

Cultural Considerations

Genetic Gallstone Risk

Native Americans secrete high levels of cholesterol in their bile. Most Native American men have gallstones by age 60 years, and 70% of the women of the Pima Indians in Arizona have gallstones by age 30 years. Mexican Americans of both sexes and all ages also have high rates of gallstones ([National Digestive Diseases Information Clearinghouse, 2013](#)).

Prevention of gallbladder disorders.

Maintaining a normal body weight; eating a low-fat, low-cholesterol, high-fiber, and high-calcium diet; avoiding rapid weight loss diets; consuming alcohol moderately; and maintaining an active lifestyle all help prevent gallstones ([Watson, 2014](#)).  If gallstones are irritating the gallbladder, prompt surgery might help to prevent cancer.

Causes of liver disorders.

The liver filters out many toxic substances and is constantly exposed to any infectious organisms circulating in the bloodstream. The hepatitis virus in particular attacks the liver, causing inflammation and damage to the tissue. Hepatitis B and C are implicated in liver cancer ([Hepatitis B Foundation, 2014](#)). *Healthy People 2020* objectives include reducing the number of hepatitis infections and increasing awareness of having a hepatitis infection.

Many drugs and chemicals are toxic to the liver, and nurses should always be aware of the drugs their patients are taking that may cause liver damage. Alcohol and other toxic substances are major factors in  the development of cirrhosis of the liver ([Box 27-1](#)).

Box 27-1

Drugs and Substances Toxic or Harmful to the Liver

Toxic Drugs and Substances

- Acetaminophen (Tylenol)
- Carbon tetrachloride
- Ethyl alcohol
- Mushroom: *Amanita phalloides*
- Polychlorinated biphenyls (PCBs)
- Toluene
- Many pesticides

Many more drugs can cause liver problems. Consult the nursing implications for each drug administered. Consider the adequacy of the patient's liver function when administering medications because the liver detoxifies all medications.

Chemical Substances

- Acetaldehyde
- Aerosolized paint
- Cadmium
- Ethylene oxide
- Mercury
- Nitrosamines
- Paint thinner
- Many cleaning solvents

Liver trauma or laceration may cause massive internal hemorrhage. However, the liver is resilient and will regenerate if part of the liver remains functional and repair is performed quickly.

Parasites may cause cirrhosis, cysts, or abscesses. Most parasites that damage the liver enter the body when people wade or swim in contaminated water in tropical countries or eat contaminated food.

Cancer in the liver may be primary or may be secondary to metastasis from a site elsewhere in the body.

Prevention of liver disorders.

Obtaining immunization against hepatitis A and hepatitis B helps to prevent these viral diseases. A vaccine against hepatitis C is currently undergoing clinical trials (Vaccine News, 2015). Adults should be tested for the presence of hepatitis C. Using Standard Precautions (see [Appendix B](#)) when handling any body fluids, particularly blood, greatly reduces the risk of infection with hepatitis B and C, which may decrease the chance of developing liver cancer. Refraining from consuming excessive amounts of alcohol decreases the risk of developing cirrhosis of the liver. Avoiding exposure to known toxic or carcinogenic chemicals and drugs helps prevent liver damage and liver cancer.

Health Promotion

Preventing Contraction of Hepatitis

Practicing good hygiene and avoiding contact with substances that harbor the hepatitis virus, such as raw oysters and shellfish from contaminated waters, may prevent infection with hepatitis A. Avoiding unprotected sex with people who are drug users, or those known to be carriers of hepatitis B or C, helps prevent the contraction of both types of hepatitis.

Causes of pancreatic disorders.

Pancreatitis (inflammation of the pancreas) is associated with alcoholism, obstructive cholelithiasis, peptic ulcer, hyperlipidemia, and trauma. Pancreatic cancer incidence rises steadily with age. Although the cause of pancreatic cancer is not known, the incidence is higher in cigarette smokers. Obesity, chronic pancreatitis, and diabetes mellitus are also risk factors for this cancer. (See [Chapter 37](#) for information on diabetes mellitus.)

Prevention of pancreatic disorders.

Avoiding consumption of large quantities of alcohol may prevent pancreatitis. Removing a gallbladder that has gallstones can help prevent obstruction of the pancreatic duct with stones. Removal prevents backup of pancreatic enzymes that are believed to be a cause of pancreatitis. Compliance with therapy for a peptic ulcer helps prevent irritation of the pancreas and resultant

pancreatitis. Smoking cessation decreases the risk of pancreatic cancer.

Diagnostic Tests, Procedures, and Nursing Implications

Diagnostic tests for disorders of the intestinal tract and accessory organs consist of x-rays, computed tomography (CT) scans, nuclear medicine scans, magnetic resonance imaging, ultrasound studies, endoscopy, biopsy, laboratory tests, tests of gastric secretions, and stool and urine studies ([Table 27-1](#)).

Table 27-1
Diagnostic Tests for Gastrointestinal (GI) Disorders

TEST	PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
Radiologic Examinations			
Upper GI series (UGI)	Radiographic examination with fluoroscopy to locate obstruction, ulceration, or growths in the esophagus, stomach, and duodenum	Patient drinks a contrast medium and is placed in various positions on the x-ray table.	Keep patient NPO for 8-12 hr before the test. Explain what happens during test. After radiographs, increase fluids and give ordered laxatives to clear GI tract of contrast medium and prevent impaction. Stool may be white up to 3 days after test.
Barium enema (BE)	Radiographic examination of the colon using fluoroscopy to locate tumors, obstruction, and ulceration	A radiopaque substance is instilled into the colon by enema. After evacuation of this substance, air may be instilled for contrast studies.	Keep patient NPO for 8 hr before test. Give ordered laxatives and enemas. Bowel must be clear of stool. Explain what will happen during the test. Post-test care is same as for upper GI series.
Computed tomography (CT)	To visualize soft tissue and density changes when sonography is inconclusive To detect tumors, abscesses, trauma, cysts, inflammation, and bleeding	Radiography is combined with computer techniques to provide a series of sectional pictures of the gallbladder, intestines, and other abdominal structures.	Patient is kept NPO for 4 hr when oral contrast is to be used. Verify presence of signed informed consent form for this procedure. Assess for allergy to iodine or shellfish. Explain to patient that she will be positioned supine on a special, narrow table, and her body will be in the circular opening of the scanner. She will have a strap over her waist to secure her to the table. Clicking noises will be heard from the machine. The test takes about 30 min. An IV contrast agent that causes a transitory warm feeling may be given to enhance images. Patient will be asked to hold her breath at certain points in the test. The machine uses narrow x-ray beams.
Virtual colonoscopy	Noninvasive method of determining whether there are polyps or abnormalities in the colon Does not allow for biopsy of suspicious areas	Helical CT scan of the colon is performed. An oral contrast agent may be given 1 day before the scan.	Patient must lie still during the procedure. Remove all metal from the body surface. Usually takes about 30 min. Encourage large quantities of fluid after the procedure if barium contrast material was swallowed.
Magnetic resonance imaging (MRI) with or without contrast	To evaluate abnormalities in the liver or other abdominal structures.	Places the patient in a magnetic field. Uses radiofrequency signals to determine how hydrogen atoms behave in the magnetic field. Provides better contrast than CT between normal tissue and pathologic tissue. Administration of IV contrast may be used to provide better imaging.	Explain that there is no exposure to radiation. Antianxiety medication may be administered to those patients who are claustrophobic. There are no food or fluid restrictions before the test. The test takes 30-90 min. Remove all metal objects from the body, including dental bridges. Inform patient that she will be required to remain motionless during this study. A thumping sound will be heard during the test. There may be a tingling sensation in metal fillings.
Ultrasound Imaging			
Ultrasonography	To obtain images of soft tissue that indicate density changes To diagnose gallstones, tumor, cysts, abscess, etc.	Sonograms are produced with high-frequency sound waves that pass through the body. Echoes vary with tissue density.	Patient is kept NPO after midnight. Explain procedure: will be supine on table, lubricant will be applied to the skin surface, and a handheld metal probe is passed back and forth with light pressure. Test takes about 30 min. Patient needs to remain still.
Nuclear Imaging Scans (Scintigraphy)			
Hepatobiliary scintigraphy (hepatobiliary iminodiacetic acid [HIDA] scan)	To determine blood flow distribution in the liver, biliary tree, gallbladder, and proximal small bowel To confirm cirrhosis, neoplasm, and acute cholecystitis	^{99m} Tc is injected. Patient is positioned under imaging camera, and images are taken as radioactive material is distributed.	Only traces of radioactivity are administered, and there is little radioactivity danger. Patient will lie flat during scanning.
GI scintigraphy	To determine site of active GI bleeding	Radioactive tracer is administered IV and attaches to red blood cells. Images of the abdomen are obtained at intermittent intervals.	Same as for hepatobiliary scan.
Endoscopic Studies			
Esophagogastroduodenoscopy	To visualize the esophagus, stomach, and duodenum with a lighted tube (endoscope) to detect tumor, ulceration, site of bleeding or obstruction Separate study of esophagus, stomach, or stomach and duodenum may be done	Patient is given IV sedation for the test. A local spray or gargle may be used to anesthetize the throat. The patient lies on a table with head extended, and the endoscope is introduced through the mouth.	Keep patient NPO for 8 hr. Verify presence of signed informed consent form for procedure. Explain what she will experience during the test. Make sure an IV is in place. After procedure, keep patient NPO until gag reflex has returned. Take vital signs q15-30min as ordered. Watch for signs of perforation: rising temperature, pain, changes in vital signs.
Endoscopic retrograde cholangiopancreatography (ERCP)	Performed when common radiologic studies do not reveal the cause of the problem To identify obstruction and other pathologic conditions in the	An endoscope is passed through the mouth into the duodenum with the use of fluoroscopy. A cannula is positioned in the common bile duct, and a contrast medium is injected. Radiographs are then taken.	Verify presence of signed informed consent form for procedure. Patient is kept NPO after midnight. Explain the procedure to the patient (same as for esophagogastroduodenoscopy). Postprocedure care is same as for esophagogastroduodenoscopy.

	biliary and common ducts		
Flexible sigmoidoscopy	To examine the lining of the rectum and sigmoid colon to detect polyps, tumor, obstruction, or ulceration	The patient is placed in the knee-chest position, often on a special table. A sigmoidoscope is introduced through the anus. Biopsies can be taken from areas of suspect tissue; polyps can be removed. The patient will experience some cramping during the procedure.	Give bowel preparation medications the evening before or as prescribed. Give clear liquids for dinner the night before, then keep patient NPO until after examination. Explain what she will experience. Encourage use of deep breathing and relaxation techniques to decrease cramping. Observe for rectal bleeding after biopsy or polyp removal.
Colonoscopy	To directly view the lining of the colon with a flexible endoscope	Patient is moderately sedated for this procedure, which takes about 30 min to 1 hr. Polyps can be removed or biopsies taken.	Give clear liquid diet 1-3 days before test. Patient is kept NPO for 8 hr before test. Give bowel prep as ordered. Explain procedure and what she will experience. Verify presence of signed informed consent form for procedure. After procedure, observe for rectal bleeding and signs of perforation: abdominal distension, pain, elevated temperature.
Gastric analysis	To determine the rate of secretion of gastric juices and degree of acidity	A nasogastric tube is inserted, and the stomach contents are aspirated. A substance may be given to stimulate the flow of gastric secretions, and another sample is aspirated in 30 min. Increased secretion can indicate peptic ulcer or pancreatic tumor. A low degree of acidity may indicate gastric ulcer. An absence of acid can accompany cancer of the stomach or pernicious anemia.	Withhold drugs affecting gastric secretion for 24-48 hr before test. No smoking the morning of test (nicotine stimulates secretions). Keep patient NPO for 8 hr before test. Explain use of NG tube and procedure.
Liver biopsy	To remove a tissue sample for microscopic examination and diagnosis of various liver disorders	Under local or general anesthesia, a special biopsy needle is inserted through the abdominal wall into the desired area of the liver, and a tissue sample is aspirated.	Verify presence of signed informed consent form for procedure. Patient must be kept NPO 4-8 hr before procedure. Place patient in supine or left lateral position. Patient will need to hold very still if performed under local anesthesia. The needle is introduced during sustained exhalation. She will feel pain similar to a punch in the shoulder lasting only a minute or so. Procedure takes about 15 min. Take baseline vital signs. Assess for allergy to local anesthetic. Have patient empty her bladder before the procedure. Check coagulation studies for abnormalities. After biopsy, place a small dressing over puncture site; position patient on right side with support to provide pressure over biopsy site for 1-2 hr. Observe for bleeding. Monitor vital signs q15min for 1 hr; then q30min for 4 hr; then q4hr for 24 hr. Assess for tenderness at biopsy site. Observe for respiratory problems, such as dyspnea, cyanosis, or restlessness, which might indicate pneumothorax. Instruct patient to avoid coughing or straining that might increase intra-abdominal pressure. She should refrain from heavy lifting or strenuous activities for 1-2 wk.
Laboratory Tests			
Tubeless gastric analysis	To determine of presence or absence of hydrochloric acid in the stomach secretions	The patient is given special granules in 240 mL of water. Urine specimens are collected at specific intervals. If HCl is present in the stomach, the urine will be blue; if none is present, the urine will be normal color.	Explain test and procedure to patient.
Fecal analysis (stool examination): fecal occult blood test (FOBT) stool culture or fecal immunochemical test (FIT)	To analyze for presence of mucus, elevated fat content, blood (guaiac), bacteria, or parasites	Stool specimen is obtained in bedpan or container in commode. For fecal occult blood test, a small smear is made on special paper and tested with special solution for guaiac or with Hemoccult test. To culture stool a specimen is placed in container and sent to laboratory for testing. For FIT, swab is taken from middle of stool specimen and then placed in tube with special solution.	Explain test to patient. Provide means for collection of stool. Promptly retrieve stool, obtain sample for guaiac test, place specimen in laboratory container, and dispatch to laboratory immediately (bacteria will multiply if specimen is left at room temperature for extended period; parasites may disintegrate). Patient must have red meat-free diet for at least 3 days before a stool guaiac test can be considered accurate.
Serum bilirubin <i>Normal values:</i> Total: 0.3-1.9 mg/dL Direct: 0.0-0.3 mg/dL	To detect abnormal bilirubin metabolism Jaundice is present when bilirubin is >2.5 mg/dL	Collect venous blood. Protect sample from bright light.	Explain that a blood sample will be taken. Some laboratories require an 8-hr fast.
Alanine aminotransferase (ALT) <i>Normal value:</i> 1-45 International Units/L	An enzyme used to detect liver disease With viral hepatitis, ALT/AST ratio is >1.0 With other liver disease, ALT/AST ratio is <1.0	Collect venous blood. Injury of liver cells causes release of this enzyme.	Explain that a blood sample will be collected. No fasting is required.
Aspartate aminotransferase (AST) <i>Normal range:</i> 1-36 units/L	An enzyme found in heart, liver, and muscle tissue To detect acute hepatitis or biliary obstruction	Collect venous blood. Diseases affecting hepatocytes cause this enzyme to rise in the blood.	Explain that a blood sample will be drawn. Prevent hemolysis of sample. IM injection will affect level.
Alkaline phosphatase (ALP) <i>Normal range:</i> 35-150 units/L	Enzyme found in bone, liver, and placenta To detect liver tumor in conjunction with other clinical findings Rises when there is obstruction of biliary tree	Collect venous blood.	No fasting is required.
Ammonia <i>Normal range:</i> 10-80 mcg/dL	Is a product of protein metabolism To support diagnosis of severe liver disease with encephalopathy	Collect venous blood. May need to ice the specimen.	No fasting is required.
Gamma-glutamyl transpeptidase (GGT) <i>Normal range:</i> 510 g/dL	To detect liver cell dysfunction, biliary obstruction, cholangitis, or cholecystitis	Collect venous blood.	Explain that a blood sample will be taken. Drugs that affect this test are alcohol, phenytoin, phenobarbital, clofibrate, and oral contraceptives.
Protein <i>Normal range:</i> 6.0-8.0 g/dL	To detect altered protein metabolism Decreased in liver failure	Collect venous blood.	Explain that a blood sample will be drawn. No fasting is required.
Albumin <i>Normal range:</i> 3.5-5.5 g/dL	To detect altered protein metabolism	Collect venous blood.	No fasting is required.
Prothrombin time (PT) <i>Normal range:</i> 12.0-14.0 sec	Protein produced by the liver and used in blood clotting Depends on adequate intake and absorption of vitamin K Reduced in patients with liver disease, causing a prolonged clotting time	Collect venous blood.	No fasting is required. Apply pressure to venipuncture site. INR used to determine therapeutic level of anticoagulant medication.
Partial thromboplastin time	To detect deficiencies	Collect venous blood.	No fasting is required.

(PTT) Normal range: 60-70 sec	of stage II clotting mechanisms Prolonged in liver disease		Apply pressure to venipuncture site.
Activated PTT (APTT) Normal range: 20-35 sec	Activators have been added to PTT tests reagents: APTT decreased in liver failure	Collect venous blood.	If patient is receiving heparin injections, draw specimen 30-60 min before next dose.
<i>Helicobacter pylori</i> antibody test Normal: none present	To detect antibodies to <i>H. pylori</i> bacterium in the stomach <i>H. pylori</i> is a risk factor for gastric and duodenal ulcers, chronic gastritis, or ulcerative esophagitis	Collect a sample of venous blood according to the laboratory's instructions.	Explain to patient that a blood sample will be drawn. No fasting is required.

GI, Gastrointestinal; IM, intramuscular; INR, international normalized ratio; IV, intravenous; NG, nasogastric; NPO, nothing by mouth; ^{99m}Tc , technetium-99m.

The patient often is scheduled for a series of tests, some of which use a contrast medium. Check the patient's allergies to verify that a particular contrast medium or injectable marker is not contraindicated. For women of childbearing age, a pregnancy test might be ordered. It is important that GI tests be performed in the correct order, so that the contrast media do not interfere with other tests. For example, if a patient is scheduled for an upper GI series, a gallbladder sonogram, and a barium enema, she should have them done in this order: sonogram, barium enema, upper GI series.

A relatively new test, virtual colonoscopy, is available for colon cancer screening. The procedure combines images from a high-tech spiral CT scan to create a computer-generated three-dimensional picture of the colon. The procedure is less costly than standard colonoscopy and requires no sedation. However, if a polyp or suspicious area is seen, the patient must undergo a regular colonoscopy for tissue specimens to be obtained. For screening, a yearly fecal occult blood test, or fecal immunochemical test (FIT), is recommended. Stool DNA is a new primary screening test for colorectal cancer. Take-home fecal occult blood test smears should be performed in sets of three; positive results indicate the need for colonoscopy (American Cancer Society, 2014).

The patient needs specific instructions about preparing for a diagnostic test. Many of the studies require cleansing of the GI tract; inadequate bowel preparation may cause a delay or necessitate a repeat of the test. When laxatives are administered in liquid form, the patient can drink them more easily if they are chilled or poured over ice.

Older Adult Care Points

Older adults are especially at risk for problems of electrolyte imbalance, fluid overload, or dehydration when preparing for diagnostic tests that require a fasting state and/or bowel cleansing.

Assignment Considerations

Assisting with a Bowel Preparation

When a UAP is assigned to care for a patient who is undergoing a bowel preparation for a diagnostic test, ask the assistant to be prompt in answering a call bell for assistance to the bathroom. The need to defecate may be urgent. When a patient is consuming large quantities of fluid, such as with GoLYTELY, ask the UAP to promptly report any degree of confusion, shortness of breath, extra weakness, or muscle cramping. Remember that delegation is never a substitute for good nursing assessment.

Clinical Cues

If a patient has trouble with nausea, sucking on an ice cube first and then using a straw to drink the solution for colon preparation helps to decrease the taste sensation.

For many GI tests, the patient is kept on nothing-by-mouth (NPO) status the night before. In the hospital, mouth care should be offered in the morning, and the door of the room should be kept closed so that food odors do not enter and increase hunger. A food tray should be obtained immediately on return to the floor, as long as NPO status is no longer in effect. Provide juices and coffee or tea while waiting for the meal tray to be delivered. Frequent assessment for signs of

dehydration is necessary. Lack of oral intake can quickly dehydrate a patient who has already been ill with nausea, vomiting, or diarrhea.

❖Nursing Management

■ Assessment (Data Collection)

Assessment for problems of the digestive system and accessory organs begins during history taking. Ask questions regarding family history, diet, dietary intolerances, pain, bowel patterns, exposure to toxins or chemicals, and problems with blood clotting. Verify immunization status. Because of the many functions of the liver, assessment of a patient with liver disease must include all systems of the body.

▣ Focused Assessment

Data Collection for the Gastrointestinal System and Accessory Organs

When obtaining a GI history, ask the following questions:

- Have you gained or lost weight recently?
- Do you have any difficulty chewing or swallowing?
- When did you have your last dental examination?
- Do you ever experience indigestion? Do certain foods disagree with you? Do you have known food intolerances?
- Do you drink alcohol? About how often do you drink? How many drinks do you average?
- Has your appetite changed in any way?
- Have you been experiencing any abdominal pain or nausea and vomiting? Do you experience any regurgitation or reflux? Is pain related to your eating patterns?
- Can you describe your usual diet? How much of each item do you eat? (Ask about what is eaten at each meal typically, and then ask about between-meal snacks and drinks.)
- What drugs do you take on a regular basis? (Aspirin, nonsteroidal anti-inflammatory drugs [NSAIDs], and corticosteroids are particularly important.)
- Are you able to shop and prepare meals? Is there any problem with obtaining sufficient food (if patient is known to have economic constraints)?
- Do you have any cultural preferences for food?
- What is the typical frequency of your bowel movements? Have you noticed any changes in color, frequency, or form of stools?
- How do you handle stress? How do you relax?

Additional questions pertinent to the accessory organs:

- Does eating fatty or fried food give you pain or diarrhea?
- Does your blood take a long time to clot when you cut yourself?
- Have you had any rapid weight loss? Are you dieting?
- Have you been immobile for a long period of time?

- Have you been exposed to chemical toxins such as cleaning agents, pesticides, or industrial chemicals?
- Have you had hepatitis B and/or hepatitis A immunizations?
- Have you ever had a blood transfusion?
- Have you had any surgeries? If so, what were they and what year?
- Do you use recreational drugs?
- Do you have any tattoos or body piercings?
- Do you smoke? If so, how much do you smoke? How many years have you smoked?
- Have you experienced any abdominal trauma?
- Do you have a sexual partner? Are you monogamous? Has any sexual partner been a carrier of hepatitis B or hepatitis C?

Physical Assessment

Inspect the patient's teeth, gums, and oral mucosa for obvious problems. Examine the skin for color and lesions, and note any discolorations on the abdomen. Assess for the presence of edema and **ascites** (fluid in the abdominal cavity) by observing for marked abdominal distention and by taut, glistening skin. Check the contour of the abdomen, and note any outpouchings indicating a hernia.

Auscultate bowel sounds for each quadrant of the abdomen using the diaphragm of the stethoscope ([Figure 27-5](#)). **Perform auscultation before palpation or percussion, because palpation may cause peristaltic movement** that otherwise would not have occurred. Bowel sounds are caused by air and fluid moving through the intestinal tract and are heard as soft gurgles and clicks every 5 to 15 seconds. The normal frequency for these sounds is about 5 to 30 in 1 minute. Note both the character and frequency of sounds. Loud, frequent sounds occur when there is excessive motility in the bowel. Although routinely performed, there is controversy about the usefulness or accuracy of bowel sound auscultation ([Felder et al, 2014](#)).

Clinical Cues

For bowel sounds to be considered absent, it is necessary to verify that no sounds are heard after listening in each of the four quadrants for 5 minutes. Hypoactive bowel sounds can be noted in the medical record when no sounds are heard after listening in each of the four quadrants for 30 seconds. If hyperactive, high-pitched sounds are heard in one quadrant, and decreased sounds are heard in another quadrant, assess for nausea and vomiting, because the patient may have an intestinal obstruction.

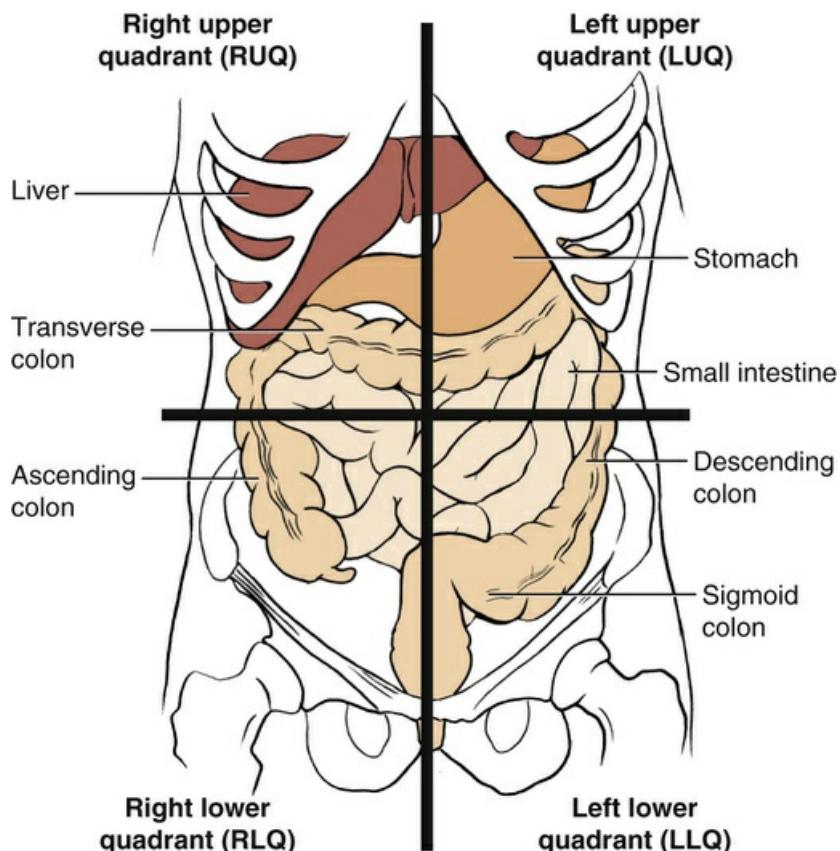


FIGURE 27-5 Auscultate bowel sounds in all four quadrants. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2013, Saunders.)

Lightly palpate over each quadrant of the abdomen to detect areas of tenderness and any masses that might be present. Watch the patient's face during palpation to detect signs of discomfort. If a pulsating abdominal mass is present, do not perform palpation; this pulsation could signal an abdominal aneurysm with a potential danger of sudden rupture.

Percussion is performed by placing the middle finger of one hand on the abdomen and striking the finger lightly below the knuckle and listening for the pitch of sound produced. A resonant sound is heard over areas filled with air, and a dull, thudding sound is heard over solid organs. **Percussion detects excessive air in the intestinal tract, which occurs with irritation and inflammation.**

Assess ascites by placing the patient supine and exposing the abdomen. With the patient's arms at the sides and knees flexed, observe for **bulging flanks**, indicating fluid accumulation. If ascites is present, measure abdominal girth. Place a tape measure around the fullest part of the abdomen, usually at the umbilicus. Place small ink marks at the sides of the tape on the axillary lines, so that future measurements may be taken at the same place for comparison. If ascites is continuous, the abdominal girth will increase with subsequent measurements. Percuss from the umbilicus to the flanks to detect shifting dullness caused by air rising and fluid shifting to the dependent areas.

Check the laboratory values and diagnostic test results (see Table 27-1). Evaluate the urine for presence of bilirubin, which makes the urine dark or tea-colored. Inspect stool for the presence of fat and urobilinogen. If undigested fat is present, the stool will float in the toilet bowl. If bile is not reaching the intestine, the stool appears clay-colored or whitish.

Focused Assessment

Physical Assessment of the Gastrointestinal System and Accessory Organs

- Inspect the mouth for condition of teeth, gums, and mucous membranes.
- Assess swallowing ability.

- Inspect the skin for color, areas of discoloration, and presence of surface vessels and easy bruising.
- Inspect the sclera and mucous membranes for signs of icterus.
- Inspect the contour of the abdomen.
- Auscultate for bowel sounds in all four quadrants.
- Lightly palpate each quadrant of the abdomen.
- Percuss each quadrant of the abdomen if there seems to be a problem with intestinal irritation or inflammation.
- If there is evidence of ascites, measure abdominal girth.
- Inspect stool, if available, for characteristics; test for occult blood if indicated.
- Inspect color of urine.
- Inspect anus for presence of external hemorrhoids.
- If vomiting has occurred, inspect vomitus for characteristics; test vomitus for blood if indicated.

Older Adult Care Points

Recording all the medications an older adult is taking, both prescription and over-the-counter, is very important when assessing the digestive system. Many drugs affect digestion, bowel motility, and appetite in these patients and can cause nausea, constipation, or diarrhea.

Nursing Diagnosis and Planning

Problem statements and examples of expected outcomes for problems of the GI tract are listed in **Table 27-2**. Specific NANDA-I nursing diagnoses are chosen from the NANDA-I list (see inside back cover). More time is typically needed to care for a patient who has diarrhea or is incontinent of feces. It is important to consider the time it takes for toileting and cleaning up after loose bowel movements. A bowel retraining program takes patience and time. These time-consuming tasks are also assignment considerations for UAPs. Patients may need to be treated using isolation precautions which will increase time for care.

Table 27-2
Common Problem Statements, Expected Outcomes, and Interventions for Patients With Gastrointestinal Disorders

PROBLEM STATEMENTS	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Fluid volume deficit due to nausea and vomiting or diarrhea	Vomiting will be controlled within 24 hr; diarrhea will be controlled within 24 hr. Fluid volume will be within normal limits within 48 hr as evidenced by adequate skin turgor and urine output >50 mL/hr.	Assess urine output for signs of fluid deficit. Provide mouth care after vomiting to decrease nausea. Medicate for nausea and vomiting as ordered. Provide quiet environment and rest. Medicate for diarrhea as ordered; keep patient clean and dry. Give only small sips of clear liquids by mouth until vomiting subsides. Continue clear-liquid diet until diarrhea is controlled.
Altered nutrition status due to anorexia, nausea, and vomiting	Patient will ingest at least 1200 calories per day after vomiting subsides.	Offer mouth care before meals. Provide six small meals a day plus small, high-calorie snacks between meals. Weigh every 3 days and record. Keep room odor free. Provide company and quiet atmosphere for mealtime.
Diarrhea due to intestinal infection or inflammation	Infection or inflammation episode will resolve within 72 hr. Diarrhea will be controlled to prevent fluid imbalance within 24 hr.	Medicate with antibiotics, anti-inflammatories, and antidiarrheals as ordered. Rest bowel with clear-liquid diet or bland diet as ordered. Protect anal mucosa with barrier ointment. Keep anal area clean and dry. Provide warm sitz bath to soothe anal tissues as needed. Medicate for discomfort from abdominal cramping as ordered. Provide restful environment.
Constipation due to side effects of medication, loss of ability to initiate defecation, or improper diet	Patient will have normal bowel movements regularly within 2 wk.	Increase fluid intake to 2500 mL/day unless contraindicated. Add fruit juices to diet. Increase fiber in diet; add slowly to prevent excessive gas formation. Increase exercise on a daily basis. Encourage patient to heed gastrocolic reflex and not delay defecation. Administer stool softener or bulk laxative as ordered. Monitor for fecal impaction.
Incontinence due to lack of rectal sphincter	Patient will use bowel training program.	Institute bowel training program.

control	Continence will be achieved within 1 mo.	Provide toileting opportunity after each meal. Provide privacy and comfort for attempts at defecation. Adjust diet to provide optimal fiber in diet. Keep patient clean, dry, and odor free.
Limited coping ability due to inability to handle excessive stress	Patient will identify desired ways of coping within 3 wk. Patient will learn new coping techniques within 2 mo.	Assist to identify present coping mechanisms. Assist to identify stressors. Instruct in ways to develop more effective coping mechanisms, such as relaxation techniques, alterations in perspective, exercise, or imagery. Refer for counseling as needed.

■ Implementation

Institute nursing interventions to control and eliminate pain; maintain fluid and electrolyte balance; promote adequate nutrition, rest, and healing; and prevent complications (see [Table 27-2](#)). All nurses must ask each patient each day about bowel movements to prevent constipation and possible impaction in hospitalized patients.

■ Evaluation

Analyze laboratory values to see whether problems are resolving with treatment. Ideally, the patient should demonstrate normalization of eating habits and bowel patterns; however, **continually evaluate whether the patient is experiencing adverse side effects of therapy or complications of the disease process**. For legal reasons and for continuity of care, your evaluation findings and your follow-up actions must always be documented.

Common Problems Related to the Gastrointestinal System

Anorexia

Anorexia is the absence of appetite. Physical causes for a diminished interest in eating include poorly fitting dentures, stomatitis, decaying teeth, halitosis, and a bad taste in the mouth. Pain or nausea or the presence of a mouth or GI infection or irritation decreases appetite. Diseases of the GI tract also can diminish appetite.

Appetite depends on complex mental processes having to do with memory and mental associations that can be pleasant or extremely unpleasant. Appetite is stimulated by the sight, smell, and thought of food. The physical and social environment in which a person is eating stimulates appetite. The enjoyment of eating can be inhibited by unattractive or unfamiliar food, by unpleasant surroundings, and by emotional states such as anxiety, anger, and fear. Mental depression also may cause anorexia.

Nursing management.

Loss of appetite is to be expected when a person becomes ill. However, persistent anorexia must be addressed to prevent the consequences of inadequate nutrition. Because of the complex nature of anorexia, it may be necessary for you to talk with the patient, family, and significant others and to consult the medical record to learn why appetite has diminished.

▣ Older Adult Care Points

Both taste and smell sensation diminish with age. Sometimes this is because of a zinc deficiency. Older adults may lose teeth because of gingival or dental disease, making eating more difficult. Dental plates may not fit correctly, making eating painful. Many older adults take a variety of medications for various conditions. The combination of these medications may greatly affect appetite and digestion. **Polypharmacy** (taking many medications) is often a cause of anorexia in older adults.

Nursing interventions include mouth care before each meal to eliminate or minimize oral causes of poor appetite. Laboratory results regarding albumin and electrolyte levels should be monitored. The percentage of each meal eaten should be noted and documented.

If psychosocial or cultural factors are involved, you might try offering preferred foods if possible and not detrimental to health. Meals that are planned to include a variety of colors, textures, and tastes are more appealing and enjoyable than those that are monotonous and bland.

▣ Assignment Considerations

Assisting with Meals

Instruct the UAP who is assisting with meals to encourage patients to eat slowly and enjoy the meal. If it is necessary to feed the patient, this should be done cheerfully and in a manner that encourages the social aspect of eating.

Older Adult Care Points

If weight loss and loss of appetite occur in an older adult without evidence of any specific cause, the possibility of depression should be investigated. A depressed older adult may give up hope and just stop eating much.

The nurse, a family member, or a friend can provide companionship while the patient eats. If there is a patient cafeteria or gathering place for patients to eat together, and the patient is able to go there for meals, this can sometimes alleviate or minimize anorexia.

Any time a patient has continual problems with eating, a dental care history and an oral cavity examination should be performed. Some people may be embarrassed by physical limitations that cause them to be awkward with eating, and so will eat very little in the company of others. Others who have difficulty swallowing and are afraid of choking are afraid to eat alone, but are embarrassed when eating with others. It is essential to explore each patient's causes of anorexia and feelings about eating.

Food from home often is a welcome addition to institutional meals. The person bringing it will need to be advised of any restrictions on the patient's dietary intake and the importance of adherence.

Assignment Considerations

Oral Rehydration for Older Adults

Institutionalized older adults are at high risk for dehydration. Instruct the UAP to directly offer small amounts of fluid, especially water, to patients throughout the day (unless contraindicated) and to assist by opening containers and positioning fluids within reach. A variety of fluids, such as juice, milk, or low-sodium liquids, should be available. Caffeine-containing beverages should be limited because of the diuretic effects (Mentes, 2012).

Nausea and Vomiting

Persistent nausea and vomiting interferes with eating and hinders nutrition. Nausea and vomiting may be related to illness, anesthesia, pain, effects of cancer treatment, or stress. Transient nausea is not treated, but when the disorder persists, medication with antiemetics, GI tube feedings, and administration of intravenous (IV) fluids are necessary.

Assignment Considerations

Smells Exacerbate Nausea

When caring for patients who are prone to nausea, all health care personnel should be instructed to avoid using self-care products with strong scents. Some very sensitive patients may be affected by the fragrance from common products such as laundry detergent, lotions, hair products, soaps, deodorant, or makeup.

Complementary and Alternative Therapies

Ginger for Nausea

Ginger has been used for centuries in Asia to combat nausea and vomiting, motion sickness, and

dyspepsia. It is available candied; in capsules, fluid extract, and tablets; and as a tincture or as fresh gingerroot that can be grated and used to make tea. Ginger may decrease the action of histamine (H_2)-receptor antagonists and proton pump inhibitors and may increase absorption of medications taken orally. Ginger may decrease the effect of antidiabetic medications. It should not be used during pregnancy or lactation.

Clinical Cues

A quick and temporary measure that relieves nausea is to have your patient sniff a fresh alcohol prep pad.

Accumulation of Flatus (Gas)

Surgical intervention, mechanical obstruction, and accidental injury to the intestinal tract can cause disturbances in the passage of gas and fecal material. Whenever ingested material cannot pass through the intestinal tract as it should, the material accumulates in the stomach and the intestines. Pressure and distention occur when peristalsis is decreased or the flow of chyme (semiliquid, partially digested stomach contents) is inhibited by an obstruction. **Flatus** (gas) is formed by the action of digestive juices and bacteria on the ingested material, resulting in bloating.

Nursing management.

Assisting the patient to ambulate has traditionally been the nursing intervention for sluggish peristalsis or bloating. This works for some patients, but others continue to have discomfort. If the provider will permit it, a slight Trendelenburg position can be useful in speeding the expulsion of gas. Placing the buttocks and legs higher than the trunk and head causes gas to rise toward the rectum, making it easier to expel flatus. For patients who do not have abdominal incisions, massaging the abdomen gently is helpful. Work up the right side, across, and down over the left colon to move gas toward the rectum. Use both hands, placing the left hand behind the right after moving the gas along the bowel before lifting the right hand. This helps prevent gas from moving backward. Advise the patient to avoid chilled or hot drinks, which may create more gas. Antiflatulent medications that contain simethicone, such as Phazyme, are helpful if the patient is not NPO.

Patient Teaching

Exercise to Reduce Gas and Bloating

Teach patients experiencing bloating and excessive gas the following exercise unless contraindicated:

- Lie on your back with your legs extended and a pillow under your knees.
- Slowly raise your right leg, bend the knee, and bring the leg down toward the abdomen.
- Hold this position for a count of 10, then slowly lower your leg back down to the bed.
- Take three slow deep breaths and repeat the exercise with the left leg.
- When you feel the need to expel gas, do so; do not hold back.
- Repeat the exercise three or four times with each leg. Perform the exercise several times a day with rest periods between the exercise periods.

Think Critically

Can you teach a patient three ways to prevent the occurrence of excessive gas postoperatively?

Constipation

When constipation occurs, the stool is hard, dry, and difficult to pass. There may be a bloated feeling, and defecation may be painful. Consistency of stool is greatly influenced by the type of food eaten and the quantity of liquid consumed. A diet low in fiber or inadequate fluid intake predispose to constipation. Physical inactivity, ignoring the gastrocolic reflex, stress, and some neurologic disorders affecting the nerves in the intestinal tract also may contribute to constipation. Opioid medications can also contribute to constipation by slowing peristalsis. Methylnaltrexone bromide (Relistor) was originally approved by the Food and Drug Administration for patients with advanced illness who are receiving opiates for palliative care. It has recently been approved for general use in all patients with opioid-induced constipation (Jeffery, 2014).

In addition to not passing stool regularly, signs and symptoms of constipation include hypoactive bowel sounds, abdominal distention, a firm abdomen, and abdominal discomfort or pain.

Older Adult Care Points

Constipation is a problem among many people older than 60 years. Decreased GI motility, lack of exercise, limited fluid intake, and constipating medications taken for various conditions all contribute. In much older adults, difficulty getting to the bathroom and suppression of the defecation urge may also contribute to the problem. Reliance on laxatives is common among older adults and is to be discouraged. Counsel individual patients about ways to increase dietary fiber and encourage fluid intake of at least 2500 mL/day, if not contraindicated by the presence of cardiac or renal disease.

Nursing management.

The first step is to identify the cause of constipation. Initial treatment may include a rectal suppository to induce evacuation or the administration of a laxative. A stool softener may be prescribed. Fiber and liquids are increased in the diet. If this does not resolve the problem, the patient is placed on one of the bulk-forming laxatives, to be used daily, such as Metamucil. If the colon has become impacted with stool, digital extraction may be needed. The patient may be medicated with a mild analgesic 30 to 60 minutes before impaction removal to decrease the discomfort of the procedure, and an oil retention enema may be given. Then apply a lubricant, such as K-Y jelly or the anesthetic lubricant lidocaine (Xylocaine) jelly, into the rectum and around the anus and, using a gloved finger, break up and remove the feces.

Counsel the patient to add lots of raw fruits and vegetables to the diet, to eat more whole-grain cereals and breads, add bran to the diet, and drink lots of fluids. Fruit juices are particularly helpful, because they contain fructose, which is a natural laxative. Help the patient to design an acceptable exercise program, such as walking, bicycling, running, swimming, or active sports participation. Advise her to heed the urge to defecate without delay.

Think Critically

Can you list six foods high in fiber that a patient might add to the diet to combat constipation?

Diarrhea

The frequent passage of liquid or semiliquid stool is called *diarrhea*. It occurs with a variety of illnesses, food poisoning, excessive stress, and inflammation of the bowel. Mild diarrhea is not treated. If diarrhea persists for more than 24 to 48 hours or the number of stools is so excessive that great quantities of fluid are lost, treatment should begin. Signs and symptoms include multiple liquid or semiliquid bowel movements, hyperactive bowel sounds, and abdominal cramping.

Antidiarrheal agents such as diphenoxylate hydrochloride (Lomotil), loperamide hydrochloride (Imodium), tincture of opium (paregoric), or a combination product, such as Kaopectate, are administered (see Table 29-1). If the diarrhea is severe, nothing is given by mouth until it subsides. If diarrhea is moderate, only clear liquids are permitted by mouth. Severe, long-term diarrhea may require the use of total parenteral nutrition. When diarrhea is caused by infection, stool cultures and antibiotics may be necessary. As the condition improves, the diet is advanced.

Complementary and Alternative Therapies

Probiotics for Infectious Diarrhea

When probiotics (“friendly” bacteria that are normally present in the intestinal tract) are used in conjunction with rehydration therapy, risk for diarrhea and duration of diarrhea are reduced ([WebMD, 2014](#)).

Nutrition Considerations

Foods That Thicken Stool

When a patient has severe diarrhea and is allowed to resume solids foods, slowly introduce foods that help to thicken the stool, including applesauce, bananas, rice, bread, beets, potatoes without skin, oatmeal, creamy peanut butter, pasta, tapioca, or yogurt.

Nursing management.

For patients with diarrhea, monitor intake and output and assess the amount of fluid lost in the stool, measuring it if needed. Administer ordered medications and replace lost fluids. Monitor the patient for electrolyte imbalances and watch for signs of dehydration, such as decreased skin turgor, thick oral secretions, and decreased urine output. Taking small amounts of an electrolyte replacement solution, or Gatorade, helps prevent imbalances. Avoiding coffee or tea helps, because caffeine is a gastric stimulant and increases peristalsis. Thorough hand hygiene is essential when caring for the patient, and Standard Precautions are followed (see [Appendix B](#)). When infection is the cause of the diarrhea, follow contact precautions to prevent spread of the infection. Antibiotics kill harmful bacteria but they also eliminate normal intestinal flora. Patients taking antibiotics can develop a bacterial infection with *Clostridium difficile* (*C. diff.*) that causes severe diarrhea. Isolation precautions for *C. diff.* are not the same as Contact Precautions (see [Chapter 6](#)).

Warm sitz baths may relieve soreness and discomfort in the tissues; help the patient cleanse the area and avoid excessive wiping. Keeping the patient clean and dry is a high priority. Odor in the room may be reduced with a deodorizing spray and by emptying and cleaning bedpans and commodes quickly.

Clinical Cues

Frequent, loose bowel movements cause rectal irritation. Instruct or assist the patient to apply a lubricant such as A&D ointment, Aquafor, Desitin ointment, or petroleum jelly to protect the skin and promote comfort.

Bowel Training

Severe illness, trauma, neurologic damage, or prolonged bed rest may bring about bowel incontinence. This is very embarrassing for alert patients. Make every effort to keep the patient clean and dry. Tracking the time of incontinent movements and offering toileting after each meal may help eliminate the problem. Should incontinence be persistent, the cause should be identified and then a bowel training program instituted. For bowel training, the patient should be in a private environment 20 to 40 minutes after a meal and assume a normal sitting position for defecation if possible, or a side-lying position if bedridden. The nurse or patient performs digital stimulation by gently inserting and rotating a gloved, well-lubricated finger into the rectal sphincter. This action should be done on a regular basis to mimic the patient's normal bowel pattern. A warm drink with lemon or prune juice may also help to stimulate the bowels. Consistency and patience are vital to the success of retraining the bowel. In accordance with National Patient Safety Goals, encourage safety and instruct the patient to call for help in getting to and from the toilet. Reassure the patient that calling for help ensures safety and provides an opportunity to observe the progress of the training program.

Get Ready for the NCLEX® Examination!

Key Points

- Peristalsis moves food through the GI tract.
- The process by which the nutrients are used in the body after digestion and absorption is called *metabolism*.
- **Anabolism** is the building of body tissues from the nutrients. **Catabolism** is the breakdown of larger molecules into smaller molecules so that energy is available.
- The gallbladder stores bile and can be removed without harm to the body.
- The pancreas provides enzymes for digestion and insulin, and daily replacement of these substances must occur if the pancreas is removed. The secretion of lipase from the pancreas decreases with age, altering fat digestion.
- Problems of the GI system include infection, inflammation, trauma, and structural defects. Continued irritation and inflammation of the GI mucosa can lead to intestinal bleeding and increased peristalsis with inadequate absorption of nutrients.
- Immunization for hepatitis A and B prevents liver disease. Hepatitis B and C are risk factors for liver cancer.
- Controlling alcohol consumption helps prevent cirrhosis of the liver and pancreatitis.
- If damage to the liver is halted before all tissue is affected, the liver can regenerate.
- Check urine color for darkness (color of tea), and check stool for whitish or clay color; these findings suggest that the bile ducts may be blocked.
- Taste and smell diminish with age, and the gradual loss of these senses may decrease appetite. Poor dentition may make eating difficult for the older adult.
- Medications can affect appetite and digestion.
- Ambulation and oral simethicone are helpful in reducing gas.
- Severe diarrhea can cause fluid and electrolyte imbalances and dehydration.
- Increasing fiber, fluids, and exercise helps prevent or relieve constipation.
- Bowel training is designed to mimic and restore the patient's normal bowel pattern.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- Cleveland Clinic: Gastrointestinal Disorders, http://my.clevelandclinic.org/disorders/gastrointestinal_tract_disorders/hic_gastrointestinal_disord
- Digestive Diseases Information Clearinghouse (NDDIC): Constipation, <http://digestive.niddk.nih.gov/ddiseases/pubs/constipation/index.aspx>
- Standard and Transmission-Based Precautions, www.cdc.gov/hicpac/2007IP/2007ip_part1.html#2

Review Questions for the NCLEX® Examination

1. A common cause of liver toxicity is:

1. daily hydrochlorothiazide administration for hypertension.
2. regular consumption of a high-fat diet throughout life.
3. long-term smoking of a pack of cigarettes per day.

4. taking extra-strength acetaminophen at doses of 4500 mg per day.

NCLEX Client Need: Physiological Integrity: Basic Pathophysiology

2. Measures used to teach patients to prevent gastrointestinal ulcers include:

1. limiting the amount of routine alcohol consumption
2. refraining from the use of aspirin for a headache
3. taking an H₂ inhibitor to decrease stomach acid daily
4. eating hot, spicy food at least once each day.

NCLEX Client Need: Health Promotion and Maintenance: Health Promotion/Disease Prevention

3. The nurse is planning care for several patients who had diagnostic testing. Which patient will require the most time for postprocedural care?

1. Patient who had an ultrasound
2. Patient who had hepatobiliary scintigraphy
3. Patient who had a liver biopsy
4. Patient who had a *Helicobacter pylori* antibody test

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

4. The nurse is preparing a patient for a liver biopsy. Which nursing interventions should be included? (Select all that apply.)

1. Attending to patient's fears and anxiety
2. Checking for a signed consent form for the procedure
3. Assessing for dehydration and electrolyte imbalance
4. Positioning on right side
5. Checking coagulation studies for bleeding problems
6. Noting any allergy to local anesthetics

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

5. A patient is consuming large quantities of laxative fluid as part of the bowel preparation for a diagnostic procedure. Which side effect is most likely to occur?

1. Constipation
2. Rashes
3. Dehydration
4. Chest pains

NCLEX Client Need: Physiological Integrity: Basic Pathophysiology

6. A decreased secretion of intrinsic factor is a physiologic change associated with the aging process; therefore the nurse suspecting decreased intrinsic factor should assess for which behavior?

1. A refusal to eat salty or sweet foods
2. A change in stools after eating fatty foods
3. Fatigue and activity intolerance
4. Difficulties with mastication

NCLEX Client Need: Physiological Integrity: Basic Pathophysiology

7. During assessment of the liver, the nurse assesses:

1. the right abdomen by palpation.
2. for areas of gas within the intestines.
3. history of episodes of vomiting.
4. for signs of gastrointestinal ulcer.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process (Nursing Process)

8. The nurse emphasizes the importance of eating natural sources of fiber to a patient who has frequent constipation. Which patient statement indicates effective health teaching?

1. "I will consider eating more white bread."
2. "I will drink fluids only while consuming meals."

3. "I will add more milk to my morning cereal."
4. "I will eat more fruits and vegetables."

NCLEX Client Need: Health Promotion and Maintenance: Health Promotion/Disease Prevention

9. A 30-year-old woman is admitted with complaints of severe nausea and vomiting over the past 2 days. On admission she is hypotensive and extremely weak. What is the priority problem?

1. Altered breathing pattern.
2. Altered activity tolerance.
3. Deficient fluid volume.
4. Altered cardiac output.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process (Nursing Process)

10. A nurse is discussing healthy lifestyle measures with a group of older adults during a senior seminar. What instruction(s) should the nurse include as accurate information? (*Select all that apply.*)

1. Consume sufficient fiber.
2. Eat a normal, well-balanced diet.
3. Exercise regularly.
4. Drink at least three glasses of fluids.
5. Take laxatives regularly.

NCLEX Client Need: Health Promotion and Maintenance: Health Promotion/Disease Prevention

11. An older adult woman of Puerto Rican descent is admitted for persistent anorexia and dehydration. There are no apparent underlying organic causes for loss of appetite. Which intervention(s) would be culturally appropriate? (*Select all that apply.*)

1. Determine food preferences.
2. Encourage family visits.
3. Provide small amounts of food and fluid frequently.
4. Consider parenteral nutrition.

5. Consult dietitian and speech therapy.

NCLEX Client Need: Psychosocial Integrity: Cultural Awareness

12. A patient who is dehydrated because of vomiting and diarrhea needs IV fluid therapy. The provider orders 1000 mL normal saline to infuse over 6 hours. The drip factor is 10 gtt/mL. Calculate the rate to infuse per gravity at _____ drops per minute.

NCLEX Client Need: Physiological Integrity: Pharmacological Therapies

Critical Thinking Questions

Scenario A

Mr. Achaba, 68 years old, was admitted with jaundice, abdominal distention, abdominal pain, and malaise. He is to undergo an ERCP. He is apprehensive and frightened about what may be wrong with him.

1. What is involved in an ERCP procedure?
2. Explain pretest care to help alleviate Mr. Achaba's apprehensions.
3. What is included in the post-test care?
4. What could be possible causes of his jaundice?

Scenario B

Ms. Hopgood is a resident in your extended care facility. She has been losing weight, has no appetite, and is becoming more withdrawn. Her daughter has a new job and is not able to visit as many times a week as she had been.

1. What assessments would you think appropriate for Ms. Hopgood at this time?
2. What nursing interventions could you institute that might improve her nutritional status?
3. What could you do to help her loneliness now that her daughter cannot visit as often?

Scenario C

You are making home visits to an older adult to check his blood pressure. During the visit he tells you that he is having trouble with constipation.

1. What questions should you ask to further assess the problem?
2. Why is constipation a common problem for people older than 60 years?
3. Would you recommend the use of an over-the-counter laxative? Why or why not?
4. What dietary and lifestyle recommendations would you make?

CHAPTER 28

Care of Patients With Disorders of the Upper Gastrointestinal System

Objectives

Theory

1. Discuss eating disorders and their management, including bariatric surgery.
2. Compare the signs and symptoms of oral, esophageal, and stomach cancer.
3. Illustrate the cause of gastroesophageal reflux disease (GERD).
4. Explain the etiology and prognosis for Barrett esophagus.
5. Describe the pathophysiology, means of medical diagnosis, and treatment for gastritis.
6. Compare and contrast the treatment and nursing care of a patient with GERD and a patient with a peptic ulcer.
7. Contrast the difference between the care of a patient with a nasogastric tube for decompression and the care of a patient with a feeding tube.
8. Determine reasons why total parenteral nutrition might be prescribed for a patient and describe necessary precautions to take during administration.

Clinical Practice

9. Implement a teaching plan for a patient who has GERD.
10. Provide appropriate care for a patient with dysphagia.
11. Plan postoperative care for a patient having gastric surgery.
12. Demonstrate proper care of a patient with a Salem sump tube for gastric decompression.
13. Manage a tube feeding for a patient receiving formula via a feeding pump.
14. Write a nursing care plan for a patient with an upper gastrointestinal disorder.

KEY TERMS

- achlorhydria** (ă-chlör-HĪ-drē-ă, p. 661)
anastomosis (ă-năs-tō-MŌ-sĭs, p. 657)
bariatric (BĀ-rē-ÄT-rik, p. 645)
dumping syndrome (DŪM-pĭng SĬN-drōm p. 646)
dyspepsia (dīs-PĒP-sē-ă, p. 650)
dysphagia (dīs-FĀ-jē-ă, p. 647)
Helicobacter pylori (hĕl-ĕ-cō-BĀC-tĕr pī-LŌ-rē, p. 654)

hematemesis (hē-mă-TĚM-ě-sīs, p. 655)

melena (mĕ-LĒ-nă, p. 661)

roux-en-Y (roo-ěn-WĪ, p. 646)

stomatitis (stō-mă-TĬ-tīs, p. 647)

vagotomy (vă-GŎT-ō-mē, p. 657)

Eating Disorders

Anorexia Nervosa

Anorexia nervosa is classified as a psychological disorder (see [Chapter 45](#)), but it has serious nutritional consequences. In many contemporary cultures, the emphasis on a slim body has influenced young women's body image. A patient with anorexia nervosa refuses to eat adequate quantities of food and is in danger of literally starving to death. Although it is a psychiatric disorder, the patient may be admitted to the medical floor for treatment of malnutrition by enteral or parenteral therapy. Diagnosis requires extensive interviewing and treatment—including behavior modification and nutrition support—which may take months to years.

Bulimia Nervosa

Bulimia nervosa is another psychological disorder covered in [Chapter 45](#). A person who has bulimia nervosa consumes large quantities of food and then induces vomiting to get rid of it so that weight is not gained. Laxatives may be taken to purge the system after an eating binge. Some patients with anorexia nervosa also have bulimia nervosa. Some individuals practice bulimia occasionally, without harm. When it is practiced frequently, it can lead to severe fluid and electrolyte imbalances, starvation, dental problems, and death. Treatment of bulimia includes psychotherapy, antidepressant medication, and behavior modification.

Obesity

Obesity is a worldwide problem and is particularly prevalent in industrialized nations. More than one third of adults in the United States are obese, and more than one third are overweight ([Centers for Disease Control, 2014](#)). Obesity is a known risk factor for cardiovascular disease and associated death. Type 2 diabetes and certain cancers are also linked to obesity. Children are showing a continued trend for increasing obesity. There is an ongoing search to determine a possible genetic predisposition to this disorder. Prevention of obesity and encouraging healthy and nutrition-dense foods are goals of *Healthy People 2020*.

Etiology and Pathophysiology

Several factors must interact for obesity to occur: a diet of foods high in calories and fat, lack of exercise, and overconsumption of food. There may be a genetic predisposition as well. Some medications increase appetite. Known contributors to obesity include readily available high-calorie prepackaged foods, the prevalence of high fructose corn syrup in foods, consumption of sodas, and high-fat fast food and “supersized” portions available in restaurants.

For some people overeating is a reaction to stress; for others overeating is a substitute for absent pleasures. Some obese people seem to metabolize nutrients differently from others. The way a person develops fat cells and deposits fat is another factor in obesity. Family lifestyle is most likely a factor because obesity seems to occur among family members.

Signs and Symptoms

A person is considered obese if he weighs more than 20% above the ideal weight for his height, age, and body type. Approximately 3 million Americans are **morbidly obese**, meaning being 100% above their ideal body weight, or having a body mass index greater than 40.

Obese patients should be counseled to lose weight to help prevent the many diseases in which obesity is a contributing factor. Complications of obesity include:

- Diabetes mellitus
- Hypertension
- Hyperlipidemia
- Coronary artery disease
- Obstructive sleep apnea
- Cholelithiasis

- Cancer
- Arthritis with back and/or knee problems
- Increased susceptibility to infectious disease and decreased wound healing.

Think Critically

You have a friend who is overweight, and she asks your opinion about the effectiveness and safety of over-the-counter “diet” pills. How would you respond?

Diagnosis

To determine whether a patient is obese, the following measurements are used:

- Height and weight chart: if more than 20% above ideal body weight for age and body build, the patient is considered obese.
- Measure the waist and then the hip circumference. Calculate the waist-to-hip ratio (waist measurement divided by the hip measurement). If the ratio is more than 1.0 in men or 0.8 in women, it indicates that the person is overweight. This is a more accurate indicator for obesity in the older adult.
- A body mass index (BMI) of more than 30 indicates obesity .

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

Thyroid function should be determined to ascertain that hypothyroidism is not a cause of the weight gain.

Treatment

Dietary control and exercise are the main treatments for obesity. A general health assessment should be conducted before a patient is placed on a weight reduction diet. A provider will usually prescribe a lower-calorie diet and exercise. The patient is taught ways to change thinking about food and weight. Those with a BMI greater than 40 may have surgery to achieve weight reduction if they meet established criteria. Participation in a support group and behavior modification with some sort of reward for weight loss are part of the total treatment plan. Teaching stress reduction and alternate ways of coping are essential to success. Medications that suppress appetite or block fat absorption may be used on a short-term basis. Orlistat (Xenical, Alli) inhibits lipase, causing fats to remain partially undigested and unabsorbed. Gastrointestinal (GI) side effects of orlistat include diarrhea (sometimes uncontrolled), abdominal cramping, and nausea. Lorcaserin (Belviq) can cause a 5% weight loss within 1 year for those for whom it works. It has a potential serious side effect of serotonin syndrome if taken along with selective serotonin reuptake inhibitor (SSRI) antidepressants or monoamine oxidase inhibitor (MAOI) medications. Phentermine-topiramate (Qsymia) was approved in 2012 for obesity. It has been found to be safe for 2 years of usage. A 12-week trial is used to determine whether it will work for the patient. These drugs are not to be used during pregnancy. Some of the newer medications being marketed are a combination of older Food and Drug Administration (FDA) approved medications paired with newer drugs.

Older Adult Care Points

Older adults may become obese because of decreased mobility from arthritis or other joint disorders. Cooking and eating are less appealing if the person is living alone, and snacking on junk food may replace meals. Metabolic rate slows with age, and a decreased calorie intake is needed to maintain a normal weight.

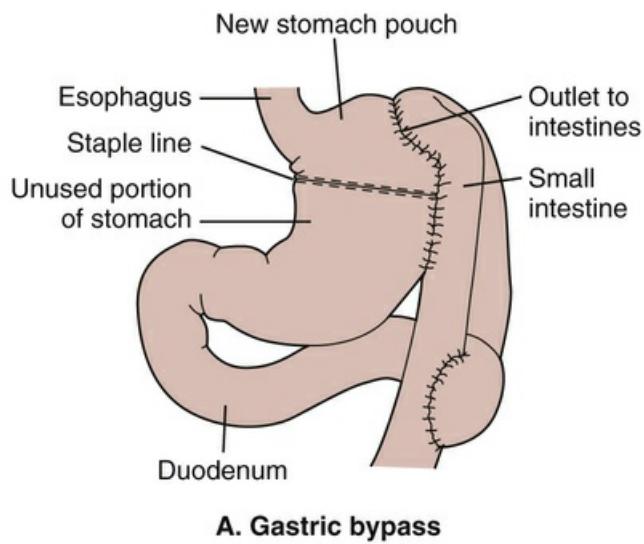
Bariatric surgery.

Bariatric surgery reduces gastric capacity. The patient undergoes extensive counseling and assessment. The patient must agree to modify his lifestyle and follow the stringent regimen

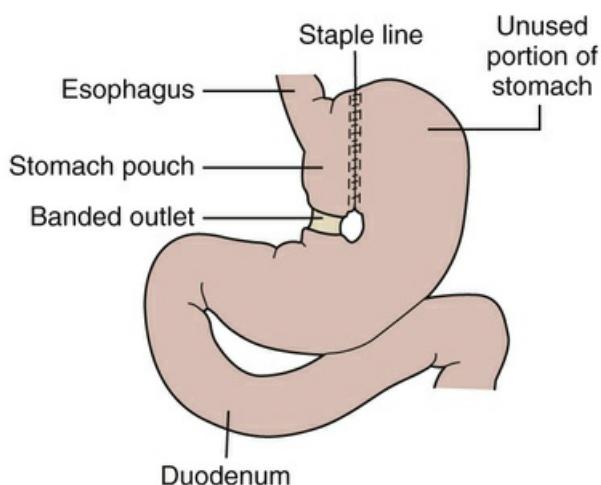
required to lose weight and keep weight off. Three common types of bariatric surgery are gastric restrictive, malabsorptive, and gastric restrictive combined with malabsorptive surgery.

Restrictive procedures.

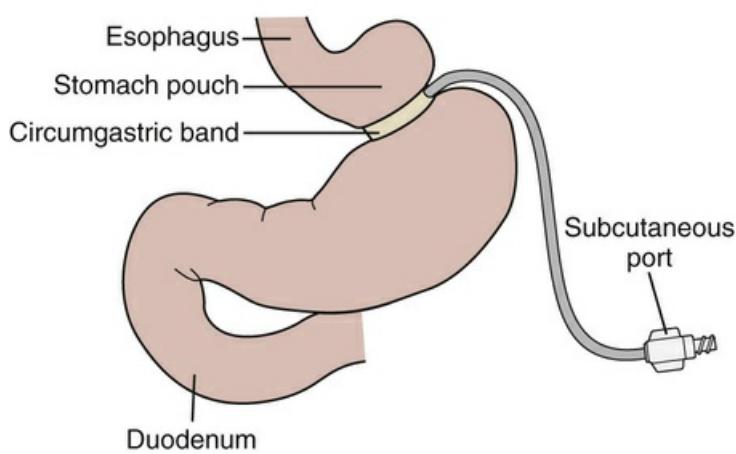
Adjustable gastric banding is a laparoscopic procedure performed by placing an inflatable band around the fundus of the stomach. The band is inflated and deflated via a subcutaneous port to change the size of the stomach as the patient loses weight. For **vertical banded gastroplasty**, the surgeon creates a small stomach pouch by placing a vertical line of staples. A band is placed to provide an outlet to the small intestine ([Figure 28-1](#)).



A. Gastric bypass



B. Vertical banded gastroplasty



C. Circumgastric banding

FIGURE 28-1 Bariatric surgical procedures. **A**, Gastric bypass. **B**, Vertical banded gastroplasty. **C**, Circumgastric banding.

Malabsorptive and combination procedures.

The total gastric bypass procedure causes severe nutritional deficiencies and is no longer recommended. The **roux-en-Y** gastric bypass (RYGB) limits the stomach size, and the duodenum

and part of the jejunum are bypassed. This limits the absorption of calories.

Biliopancreatic diversion with a duodenal switch creates a more tubular gastric “sleeve” with connection to a small part of the duodenum. Long-term problems can result from the decrease in the amount of food, vitamins, and minerals that can be absorbed. **Vertical sleeve** gastrectomy removes at least half of the stomach, restricting ghrelin, the hormone that prompts appetite. This reduces hunger more than other restrictive surgeries.

Complications.

With the RYGB procedure, there is danger of leakage of stomach contents into the abdomen in the early postoperative period. Later, gastric stretching may cause the staple line to break and a leak to occur. Signs and symptoms are abdominal pain, nausea and vomiting, tachycardia, fever, and hypotension. An upper gastrointestinal (UGI) series or computed tomography scan can diagnose the problem. The band in the vertical banding procedure may erode into the stomach over time and cause leakage. RYGB patients are also at risk for **dumping syndrome**, which results in nausea, weakness, sweating, and diarrhea that occurs after meals. Other complications of major surgery may occur in the respiratory and cardiovascular systems (see [Chapter 5](#) for complications of surgery). Patients who are obese have a greater risk of pulmonary dysfunction, thrombus formation, and death. Approximately one third of patients who undergo bariatric surgery develop gallstones because of the rapid weight loss.

All bariatric surgery patients are at risk of nutritional deficiencies. Those who have RYGB procedure are most likely to develop deficiencies of iron, vitamin B₁₂, calcium, and folate. Supplements must be taken for life. Support by a dietitian is very important both preoperatively and postoperatively.

7 Think Critically

What effect might a RYGB have on an individual's nutritional status? Why? What might be the physical long-term consequences?

❖Nursing Management of Obesity

■ Assessment (Data Collection)

Data collection includes establishing whether there is a family history of obesity, determining contributing factors, and obtaining an accurate record of eating patterns for a 7-day period. Physical assessment includes measuring weight and height, calculating BMI, and taking a skin fold thickness measurement. A general health assessment is performed.

■ Nursing Diagnosis and Planning

Examples of problem statements relevant to the care of obese patients include:

- Altered body image due to excess weight
- Altered nutritional status due to high-fat diet and excessive weight gain
- Decreased self-esteem due to excess weight

Specific NANDA-I diagnoses may be chosen from the NANDA-I list (see inside back cover).

Goals should be long term, and expected outcomes might include:

- Patient will make positive statements about decreasing body size.
- Patient will consume less fatty food and more fruits and vegetables.
- Patient will verbalize feelings of self-worth.

■ Implementation

The diet and exercise plan should be designed according to the patient's lifestyle and preferences.

Encourage the patient to keep an eating and exercise diary. Weekly meetings for counseling and evaluation are important to provide guidance. Offer support by being available to talk about the positive aspects and frustrations of staying on the diet. Discourage fad diets and emphasize the importance of a well-balanced, nutritious, low-calorie diet. Commercial programs are available to assist patients with weight reduction. Weight Watchers and TOPS (Take Off Pounds Sensibly) are two commercial programs that have shown good long-term results with maintenance of normal weight.

Preoperative and postoperative care for a patient having bariatric surgery depends on the type of surgical procedure performed, but general principles are similar to other types of abdominal or abdominal laparoscopic surgery. Because of the weight and size of the client, lifting apparatus and an extra-wide bed and chair must be available. Hospitalization may be for 1 to 5 days depending on the procedure and the patient. If a nasogastric (NG) tube is in place, do not reposition it because you might disrupt the suture line. Feedings are designed in consultation with a dietitian; you would anticipate feeding progression in the early postoperative period, then onto multiple small meals, a balanced meal plan, and possibly parenteral nutrition (PN) in high-risk patients ([Mechanick et al, 2013](#)). For example, feedings begin with 1 ounce of clear liquid at a time, advancing to pureed foods, thinned soups, and milk. Doses of multivitamins and other supplements are administered as needed per individual. The diet is increased in 1-ounce increments taken over 5 minutes until the patient's appetite is satisfied. The diet is maintained for 6 weeks and then progressed to regular foods. Nausea, vomiting, and discomfort may occur, especially if too many liquids are ingested. After hospitalization, the support of a registered dietitian is recommended and increases the amount of weight loss for most patients. Sugar in any form is to be avoided, as well as concentrated sweets such as fruit juice; juice (if approved by provider) should be diluted. In addition to the calories, concentrated sugar can cause dumping syndrome. For the first 2 months, calorie intake is between 300 and 600 calories a day; thereafter no more than 1000 calories a day should be consumed. The patient remains under medical supervision to monitor for vitamin deficiency or malnutrition and for the need for further micronutrient supplementation.

Evaluation

The patient's diet and exercise diary should be evaluated each week if possible. Weight is tracked on a graph to show progress in weight loss. If the outcomes are not being met, the plan's interventions must be reconsidered. Bariatric surgery patients do best with group support.

Upper Gastrointestinal Disorders

Stomatitis

Stomatitis is a generalized inflammation of the mucous membranes of the mouth. Causes include trauma from ill-fitting dentures or malocclusions of the teeth, poor oral hygiene, and nutritional deficiencies. Excessive smoking, excessive drinking of alcohol, pathogenic microorganisms, radiation therapy, and drugs (especially anticonvulsants and those used in chemotherapy for malignancies) are other contributors to the problem.

Common symptoms of stomatitis include pain and swelling of the oral mucosa, increased salivation or excessive dryness, severe halitosis, and sometimes fever. Small crater-like aphthous ulcers may appear in the mouth, commonly called *canker sores*.

Treatment of stomatitis is chiefly symptomatic, unless a specific infectious causative agent is identified. Nursing measures to control the symptoms of stomatitis—including special mouth care, artificial saliva, and diet—are discussed in [Chapter 8](#).

■ Complementary and Alternative Therapies

Lysine for Canker Sores

Canker sores from food sensitivities or stomach upset often can be healed more quickly by taking the dietary supplement lysine three or four times a day. This often helps reduce the length of time of a “fever blister” on the lips as well.

Dysphagia

Dysphagia means difficulty in swallowing. It is the most common symptom of disorders of the esophagus and varies from a mild sensation that something is sticking in the throat to a complete inability to swallow solids or liquids. Tumors, esophageal diverticula, inflammation, or motility disorders from a neurologic disorder may cause swallowing problems. If the patient is experiencing choking or difficulty with swallowing, he is kept on nothing-by-mouth (NPO) status and swallowing ability is evaluated at the bedside by a speech therapist. If additional information is needed a modified barium swallow test may be ordered to determine the specific cause. Videofluoroscopy is used during the test to visualize the swallowing process.

Treatment and Nursing Management

Have the patient take some “practice swallows” before beginning a meal or giving oral medications for the first time. Watch to see that the larynx rises with each swallow. Observe the kinds of food the patient can tolerate and the conditions under which difficulties are experienced. Knowing the consistency and temperature of the foods most easily ingested by the patient is helpful. Some patients may choke on liquids, but will tolerate soft and semisolid foods. Others may have the feeling that high-fiber foods are not moving past a certain point in the esophagus. Measures that may be helpful in relieving dysphagia include instructing the patient to chew food more thoroughly or to eat semisoft or pureed foods. Drinking liquids throughout the meal may help; however, **liquids will cause many patients to choke. If thin liquids are a problem, adding thickener to liquids makes them easier to swallow.** Sitting upright with the head forward and the neck flexed with the chin slightly tucked aids in swallowing. Head position may be altered, depending on the particular type of problem present. A speech pathologist should be consulted to design the most effective therapy for the patient.

■ Older Adult Care Points

Older patients who have experienced a stroke may have impaired swallowing ability. Swallowing pills is often difficult for this age group. Instruct older adults to take a drink of water, swallow, place the pill on the back of the tongue, take another drink of water, tuck the chin down slightly, and swallow, then drink at least 6 to 8 ounces of water.

The patient may be a candidate for neuromuscular electrical stimulation (NMES). One type of NMES device stimulates muscle at rest, to compensate for muscle wasting. Another NMES device is used for patients who have swallowing issues related to neurologic disorders such as stroke. Some helpful strategies to improve swallowing include licking lollipops to strengthen tongue movements, practicing vowel sounds to stimulate movement, and sucking or blowing through a straw to strengthen the soft palate. Meals should be served in a relaxing atmosphere with pleasant surroundings and relief from emotional stress.

Problem statements for patient with swallowing problems are:

- Altered swallowing ability
- Altered nutrition: less than body requirements
- Potential for aspiration

Both acute and chronic dysphagia are likely to produce nutritional deficiencies and electrolyte imbalances. If the dysphagia is such that the patient cannot swallow sufficient amounts of food for adequate nutrition, tube feeding may be indicated. This sometimes is necessary when the dysphagia is the result of cerebral damage, as in cerebrovascular accident.

Clinical Cues

When your patient has a swallowing problem, the oral suction equipment should always be readily available. Aspiration of food or mucus can occur quickly. The patient or family should be taught how to quickly use the oral suction apparatus (Yankauer). Aspiration can cause pneumonia; the patient's respiratory status should be monitored after a choking episode.

If the patient cannot swallow anything because of a neurologic condition (see [Chapters 21](#) and [23](#)), or if the esophagus is obstructed and cannot be corrected surgically, the patient must have a gastrostomy. An opening in the wall of the stomach is created, and a permanent feeding tube is sutured in place. Nursing interventions for feeding tubes are discussed later in this chapter.

Cancer of the Oral Cavity

Etiology, Pathophysiology, and Signs and Symptoms

Approximately 37,000 people will develop oral cancer in the United States annually ([American Cancer Society, 2014b](#)). Although the specific cause is unknown, oral or throat cancer is curable if discovered early. Cell mutation occurs until an area of cells becomes neoplastic. A genetic factor is most likely present. Oral and pharyngeal cancer risks are cigarette smoking, use of smokeless tobacco, pipe smoking, and heavy alcohol use. The effect of using electronic cigarettes is not yet known. Infection with the human papillomavirus is another risk factor. Leukoplakia, a precancerous lesion, may occur on the tongue or mucosa. Dental examinations should include inspection for this lesion. Sores or discolorations on the lips or in the mouth that do not heal within 2 weeks should be checked by a health care provider.

Diagnosis and Treatment

Diagnosis is made by physical examination and biopsy. Oral cancer treatment varies depending on the structures involved. Radiation, chemotherapy, and surgery are treatment options.

Mandibulectomy (removal of the mandible), **hemiglossectomy** (removal of half of the tongue), or **glossectomy** (removal of the tongue) with resection of other parts of the mouth may be necessary. If the cancer has spread to the cervical lymph nodes, radical or modified neck dissection is performed. This surgery involves wide excision of the primary tumor with removal of the regional lymph nodes, the deep cervical lymph nodes, and lymph channels. A tracheostomy accompanies these procedures to protect the airway (see [Chapter 13](#)). A drain is placed to prevent fluid accumulation. Tube feedings are used as long as swallowing is difficult.

Targeted modulated radiation and chemotherapy may be indicated depending on the degree of involvement of the lymph nodes and whether or not margins of the surgical specimen are clear of cancer cells. Chemotherapeutic agents used may include 5-fluorouracil, methotrexate, cisplatin, carboplatin, paclitaxel, docetaxel, cetuximab, and bleomycin singularly or in combination.

Nursing Management

Postoperative care includes close monitoring of respiratory status, airway, and oxygenation. Cold packs and elevation of the head prevent excessive swelling in the neck that might compress the airway, circulation, and nerves. Aseptic wound care and tracheostomy care are provided.

Nutritional support is an ongoing concern and is very important in the healing process. Many of these patients are malnourished before surgery. See [Chapter 8](#) for the specific care of a patient undergoing radiation and/or chemotherapy.

Think Critically

You are caring for a young woman who was recently informed that she would need surgery and radiation treatment for oral cancer. What are the implications for her sense of body image and psychological well-being?

Cancer of the Esophagus

Etiology and Pathophysiology

Cigarette smoking is a major cause of esophageal cancer in the United States. When combined with heavy alcohol consumption, the risk for esophageal cancer greatly increases. Both substances are irritants to the mucosa of the esophagus. About 18,170 new cases were diagnosed in 2013 ([American Cancer Society, 2014a](#)). The cancer is usually well advanced when discovered. The tumor is either adenocarcinoma or squamous cell cancer.

Gastroesophageal reflux disease (GERD) is a cause of Barrett esophagus, which is a precancerous condition. The cellular changes caused by irritation of the stomach fluids may eventually become malignant. About 0.5% of patients with Barrett esophagus develop esophageal cancer per year. Care is focused on measures encouraging the prevention of GERD and on regular checkups. Periodic endoscopy and biopsy are performed for those who show dysplasia in the esophagus.

Signs, Symptoms, and Diagnosis

Signs and symptoms of esophageal cancer may include progressive dysphagia, hoarseness, regurgitation of foods, foul breath, and persistent cough. At first the dysphagia only occurs with solids such as meat, but then it happens with soft foods and eventually even with liquids. Pain occurs late in the disease and is substernal, epigastric, or in the back and occurs with swallowing. Weight loss is typical. Barium swallow with fluoroscopy may show a narrowed esophagus. Definitive diagnosis is by esophagogastroduodenoscopy (EGD) and biopsy.

Think Critically

A 76-year-old Chinese man complains of progressive difficulty swallowing and fullness of the throat. When interacting with this patient, what would be the most effective approach?

Think Critically

A patient who smokes is awaiting surgery for esophageal cancer and desires to smoke. How would you approach the situation?

Treatment

Options for treatment are endoscopic ablative therapy such as photodynamic therapy, radiotherapy ablation, or endoscopic mucosal resection. An esophagectomy, or removal of sections of the esophagus with reconstruction with part of the stomach, is only occasionally performed because of multiple potential complications. Radiofrequency ablation uses bursts of radiofrequency energy to burn away abnormal cells. Photodynamic therapy uses a medication that causes damaged cells to be sensitive to light; a laser is used to destroy the damaged cells while preserving normal tissue. Endoscopic mucosal resection is a procedure in which a saline solution is injected under the lining of abnormal tissue, which makes it easier to suction away ([National Digestive Diseases Information Clearing House, 2013](#)). For patients who have advanced-stage cancer, palliative care may include a combination of external beam radiation, chemotherapy, esophageal dilation, electrocoagulation,

photodynamic therapy, and the insertion of expanding metal stents to relieve severe dysphagia (American Cancer Society, 2014c).

Nursing Management

Postoperative care is the same as for any patient having gastroendoscopic, thoracic, or abdominal surgery depending on the surgical procedure. Maintaining a patent airway is the top priority.

Nursing interventions focus on promoting adequate respiration, providing a way to adequately communicate, ensuring adequate nutritional intake to promote wound healing, and attention to pain and discomfort. Nutrition is initially supplied by parenteral fluids. Oral intake begins with small amounts of water every hour while the patient is awake with gradual progression to small, frequent, bland meals. The patient should be upright when eating to prevent regurgitation. After esophageal resection, pain, increased temperature, and dyspnea may indicate leakage of the feeding into the mediastinum. Intolerance of food is evidenced by vomiting and abdominal distention. The patient may need a feeding tube for several weeks or a gastrostomy tube to sustain nutrition.

Hiatal Hernia (Diaphragmatic Hernia)

Etiology and Pathophysiology

Loss of muscle strength and tone, factors that cause increased intra-abdominal pressure (such as obesity or multiple pregnancies), and congenital defects contribute to the formation of a hiatal hernia. Hiatal hernia is the result of a defect in the wall of the diaphragm where the esophagus passes through; this creates protrusion of part of the stomach or the lower part of the esophagus up into the thoracic cavity. The herniated portion often slides back beneath the diaphragm. Women are more frequently affected with hiatal hernia than are men.

Signs and Symptoms

Often there are no signs and symptoms of hiatal hernia unless there is reflux of stomach acid. Signs of reflux include indigestion, belching, and substernal or epigastric pain or feelings of pressure after eating caused by the reflux of gastric fluid into the esophagus. Regurgitation of a hot, sour liquid coming into the throat or mouth may occur. Nighttime coughing may awaken the patient. The symptoms are more severe when the patient lies down.

Diagnosis and Treatment

Hiatal hernia is diagnosed by a UGI series. Treatment includes weight reduction; avoidance of tight-fitting clothes around the abdomen; administration of antacids, histamine (H_2)-receptor antagonists, or proton pump inhibitors; and elevating the head of the bed 6 to 8 inches. The patient is instructed not to eat within 3 hours of going to bed. Intake of alcohol, chocolate, caffeine, and fatty food is limited, and smoking should be avoided. Ingestion of fats relaxes the sphincter, allowing reflux. Occasionally a patient with reflux esophagitis, which is caused by the hernia, may bleed extensively. If bleeding or discomfort cannot be controlled, surgical correction of the hernia is required.

Nursing Management

Patients with hiatal hernia are taught ways to prevent pain and reflux. If weight is above normal, encourage weight reduction. Remind the patient to stay upright for 2 hours after eating and not to eat 3 hours before bedtime. Lifting or moving heavy items is to be avoided. If the head of the bed cannot be raised, a wedge pillow should be used to elevate the upper body; this position helps prevent reflux and assists gravity in maintaining the stomach in the abdominal cavity. Prescribed H_2 -receptor antagonists or proton pump inhibitors should be taken at bedtime to prevent reflux and damage from acid entering the esophagus. The patient should avoid foods that cause bloating, which increases abdominal pressure. Increased abdominal pressure may push the stomach upward through the diaphragmatic defect.

Gastroesophageal Reflux Disease

Etiology and Pathophysiology

GERD is a syndrome, not a disease. Ninety percent of patients with GERD have a hiatal hernia. GERD occurs equally in men and women. It is caused by transient relaxation of the lower esophageal sphincter and may accompany a hiatal hernia. The relaxation allows fluids or food to reflux into the esophagus from the stomach. Delayed stomach emptying is another factor. Certain foods and medications contribute to this mechanical problem. Being overweight is common among patients with GERD. GERD may contribute to bronchoconstriction and asthma symptoms because of irritation of the upper airway by gastric secretions. About 75% of patients with asthma have GERD ([Kerr, 2012](#)).

Signs and Symptoms

Heartburn ([dyspepsia](#)) and reflux are the most common symptoms of GERD. Other symptoms may include chest pain, coughing, dysphagia, belching, flatulence, and bloating after eating. Symptoms are aggravated by lying down.

Diagnosis

GERD is diagnosed by EGD and sometimes barium esophagram. Occasionally, other tests such as an esophageal manometry, ambulatory 24-hour pH monitoring, or radionuclide measurement of gastric emptying are performed. Esophageal manometry measures pressures in the esophagus; pressures will be increased during episodes of reflux. For 24-hour pH monitoring, a tiny tube with a transducer is introduced into the esophagus to take measurements of the esophageal pH.

Treatment and Nursing Management

Diet therapy, lifestyle changes (particularly weight loss for those who are overweight), drug therapy, and education are the mainstays of GERD treatment. Drug therapy may include antacids, H₂-receptor antagonists, proton pump inhibitors, and prokinetic drugs ([Table 28-1](#)). Check for interactions with other drugs the patient is taking. Verify that the patient can afford the drugs prescribed because some are very expensive.

Clinical Cues

Patients prescribed long-term use of proton pump inhibitors are at risk for nutrient malabsorption, particularly of magnesium, calcium, and B₁₂. There is also risk of bacterial overgrowth because of the decreased stomach acid secretion. There have been links to pneumonia and possibly to more cases of *Clostridium difficile* in patients who are receiving these drugs. More clinical research is under way. Unless there is a good indication of need, these drugs should not be taken for more than 6 weeks ([Johnson and Oldfield, 2013](#)).

Patient Teaching

Measures to Decrease the Symptoms of Gastroesophageal Reflux Disease

Dietary Alterations

- Avoid high-fat oils and spicy foods.
- Eat four to six small meals a day.
- Eat slowly and chew food thoroughly, and avoid using a straw for liquids to decrease belching and reflux.
- Avoid carbonated beverages because they increase bloating.
- Eliminate or limit alcohol, tomato-based products, caffeine, citrus juice, raw onions, chocolate, coffee, peppermint, and spearmint from the diet. These foods either relax the esophageal sphincter or increase acid production.

Lifestyle Alterations

- Wait 2 to 3 hours after eating before lying down.
- Do not wear clothes that constrict around the middle of the body.
- If overweight, lose the extra pounds; a 10% weight loss can decrease symptoms considerably.
- Sleep with the head of the bed elevated 6 to 8 inches with blocks or a foam bolster pillow.
- Take medications as directed in relationship to meals and bedtime.
- Stop smoking because it may stimulate gastric acid secretion.
- Participate in regular stress-reducing activities such as exercise, meditation, deep breathing, and laughter.

Safety Alert

Proton Pump Inhibitors and Cardiac Problems

The Food and Drug Administration (FDA) has issued a warning that long-term use of the proton pump inhibitors esomeprazole (Nexium) or omeprazole (Prilosec) may increase the risk of heart problems, particularly in those with pre-existing cardiovascular disease. Patients taking these drugs should consult their health care provider.

 **Table 28-1**
Drugs Commonly Used to Treat Upper Gastrointestinal Disorders

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Antacids			
There are four antacid families consisting of compounds of aluminum, magnesium, calcium, and sodium. Gelusil, Maalox, Mylanta-II, Riopan, Di-Gel, Amphojel, Basalgel, Gaviscon	Neutralize stomach acid	Aluminum hydroxide compounds promote constipation, whereas magnesium hydroxide compounds promote diarrhea. Sodium compounds may adversely affect hypertension and heart failure. All antacids may adversely affect the dissolution and absorption of other drugs. One hour should be allowed between antacid administration and administration of another drug. Magnesium compounds are used cautiously in patients with renal insufficiency.	Antacids for treatment of peptic ulcer should be taken seven times a day: 1 hr and 3 hr after meals and at bedtime. Separate from other drug administration by 2 hr. Shake liquid preparations well before pouring from container. Chew antacid tablets thoroughly, and follow with a glass of water or milk. Report problems of constipation or diarrhea to the provider. Take even after pain has disappeared; consult provider.
Histamine (H₂)-Receptor Antagonist			
Cimetidine (Tagamet) Famotidine (Pepcid) Nizatidine (Axid) Ranitidine (Zantac)	Suppress acid secretion by blocking H ₂ receptors on parietal cells	Cimetidine may interact with many other drugs; check drug interactions for other drugs patient is receiving. Cimetidine may cause confusion and other CNS effects. Separate administration of these drugs and antacids by 1 hr. Monitor for decreased abdominal pain and ulcer symptoms.	These drugs should be taken with meals and at bedtime. Once-a-day dose should be taken at bedtime. Advise patient to avoid cigarettes, aspirin, and other NSAIDs. Advise to avoid alcohol or only consume it in moderation and only in conjunction with food. Advise to use stress-reduction techniques.
Proton Pump Inhibitors			
Omeprazole (Prilosec) Omeprazole and sodium bicarbonate (Zegerid) Lansoprazole (Prevacid) Dexlansoprazole (Kapidex)	Suppress secretion of gastric acid	May cause headache, nausea, vomiting, or diarrhea. Use is preferably limited to 4-8 wk.	Follow regimen of diet and stress reduction for ulcer healing.
Rabeprazole (AcipHex)	Same as above	Do not crush delayed-release tablets.	This is a slow-release preparation that acts throughout the day. Teach patient to wear sunscreen; drug may cause sun sensitivity.
Pantoprazole (Protonix)	Same as above	Do not crush tablets.	A slow-release preparation.
Esomeprazole (Nexium)	Same as above	Do not administer with digoxin, rabeprazole, or iron salts.	May affect absorption of digoxin, rabeprazole, and iron salts.
Misoprostol (Cytotec)	Prevents gastric ulcers caused by long-term therapy with NSAIDs	May cause diarrhea or abdominal pain. Not safe during pregnancy.	Is a synthetic prostaglandin. Report abdominal pain, diarrhea, or GI bleeding.
Miscellaneous			
Sucralfate (Carafate)	Provides protective coating barrier over ulcer crater	Monitor for constipation.	Take only as directed. Wait 30 min before taking any other drug.
Antimicrobials			
Clarithromycin (Biaxin)	Suppresses protein synthesis in bacteria Used to kill <i>Helicobacter pylori</i>	Assess for drug allergy. Report hematuria or oliguria. Administer every 12 hr to maintain serum levels. Do not crush tablets. Monitor for diarrhea, abdominal pain, or signs of jaundice.	May cause diarrhea, anorexia, or nausea. Must be taken at regular intervals to be effective. Take the entire prescription. Taking acidophilus between doses may alleviate diarrhea. Increase fluid intake if diarrhea occurs.
Amoxicillin (Amoxil)	Causes cell wall of bacteria to swell and burst, preventing replication	Assess for drug sensitivity. Assess for side effects. Monitor renal function. Monitor for blood in stool and abdominal pain.	Take on an empty stomach with a full glass of water. Take at regular intervals around the clock to sustain blood levels. Take entire prescription.
Tetracycline	Bacteriostatic Inhibits protein synthesis in microorganism	Assess for drug sensitivity. Monitor CBC, liver, and kidney functions. Increases effect of warfarin and digoxin. Decreases effect of penicillin and oral contraceptives.	Do not take with dairy products or antacids; separate by 2 hr. Avoid sun exposure. Supplies may be limited.
Metronidazole (Flagyl)	Kills amoebas and <i>Trichomonas</i> ; degrades DNA in organism	Do not give during second and third trimesters of pregnancy. Increases action of anticoagulants.	Do not drink alcohol during or for 48 hr after therapy has ended. May cause severe vomiting.

		Decreases action of phenobarbital and phenytoin. May cause toxicity if administered with cimetidine or lithium. Patient should have vision examination before and after therapy. Monitor for neurotoxicity. Discontinue if fever, chills, rash, or itching occur.	and prostration. Urine may turn dark brown. Notify provider of numbness or tingling. Dizziness may occur; avoid hazardous activities. May cause dry mouth; chew sugarless gum or sip water frequently.
Antispasmodics			
Dicyclomine hydrochloride (Bentyl, Antispas) Propantheline bromide (Pro-Banthine), hyoscyamine (Levsin)	Block acetylcholine, thereby decreasing smooth-muscle spasm and GI motility and inhibiting gastric acid secretion	These drugs interact with many other drugs; check each drug patient is taking for interactions. Most of these drugs are contraindicated in glaucoma, prostatic hypertrophy, myasthenia gravis, and other conditions; consult information on each drug individually. May predispose to drug-induced heat stroke. Monitor vital signs and urine output carefully.	Take 30-60 min before meal. Patient can suck on hard candy to relieve mouth dryness unless contraindicated. Drink 2500-3000 mL of fluid to prevent constipation. Avoid driving and hazardous activities if drug causes dizziness, sleepiness, or blurred vision. Report rash or skin eruption to provider.
Metoclopramide (Reglan)	Hastens gastric emptying and relaxes pyloric and duodenal segments of GI tract	Assess for neurologic or psychotropic side effects such as restlessness, anxiety, ataxia, or hallucinations. Not for long-term use.	Take before meals.

CBC, Complete blood count; CNS, central nervous system; GI, gastrointestinal; NSAIDs, nonsteroidal anti-inflammatory drugs.

If these therapies do not control the problem, endoscopic noninvasive therapies often are effective. Laparoscopic surgical fundoplication—in which the fundus of the stomach is wrapped around the esophagus to create a new valve junction (Figure 28-2)—may be effective. It is not recommended for morbidly obese patients because it tends not to relieve symptoms in this group. This is the same procedure used to correct a hiatal hernia.

Think Critically

Many patients with GERD and hiatal hernia do not really modify their diet and lifestyle over the long term; instead they rely on medications, which can be expensive, to decrease their symptoms. What measures could you use to show patients that lifestyle changes may control symptoms without medication?

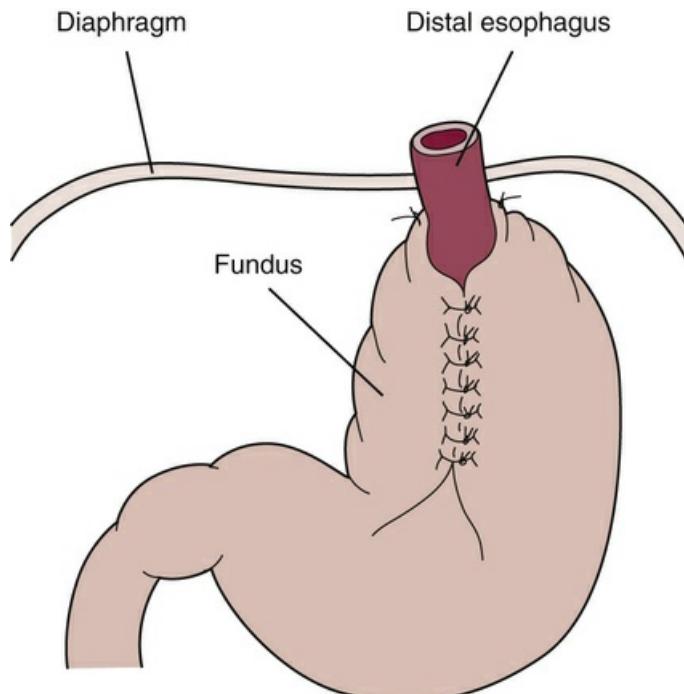


FIGURE 28-2 Nissen fundoplication surgery for hiatal hernia or to treat gastroesophageal reflux disease.

Complications

Irritation results when stomach contents containing hydrochloric acid, pepsin, and other enzymes are refluxed into the esophagus. Constant irritation may cause cellular changes, such as the precancerous lesions in Barrett esophagus. Reflux is also a risk factor for aspiration of stomach contents and pneumonitis. Acid reflux into the mouth, over time, may cause dental caries.

Gastroenteritis

Gastroenteritis is inflammation of the stomach and small intestine. It is caused by intake of food or water contaminated with a virus, a pathogenic bacteria, or parasites. The Norwalk virus (Norovirus) is a common cause, as are *Giardia*, *Shigella*, and *Clostridium difficile*. Signs and symptoms of gastroenteritis include vomiting, diarrhea, abdominal cramping, and distention. Fever, elevated white blood cell count, and blood or mucus in the stool may occur. In healthy adults the disorder is self-limiting and does not require hospitalization. Young children, older adults, and chronically ill patients may need intravenous (IV) therapy to take in enough fluid to compensate for the fluid lost from vomiting and diarrhea.

A patient with gastroenteritis should be kept NPO until vomiting has stopped. When tolerated, fluids containing glucose and electrolytes should be started (e.g., Pedialyte, Gatorade). If diarrhea continues beyond 3 or 4 days, stool studies for the causative organism should be performed. Therapy to eradicate the causative agent can then be started. Rest is important during the course of the vomiting and diarrhea. After 24 to 48 hours, medication may be prescribed for the vomiting, abdominal cramping, and diarrhea.

Nutrition Considerations

Dietary Guidelines for a Patient With Vomiting

- Liquid diet for 12 to 24 hours. Frequent, small amounts of clear liquids are best.
- Avoid milk, ice cream, pudding, cheese, yogurt, citrus juice, and cream soups.
- Foods allowed on the liquid diet are electrolyte solutions, carbonated beverages, bouillon, unflavored gelatin, apple juice, peach or pear juice, plain hard candy, sugar, honey, sugar substitutes, and frozen Popsicles.

When nausea and vomiting stop:

- Add some of the following foods for the next 12 to 24 hours: soda crackers, toast and jelly without butter, tea, rice, pretzels, bananas, applesauce, cooked cream of wheat or cream of rice, and fruit or vegetable juice (BRATT diet: banana, rice, applesauce, tea, and toast).
- If this diet is tolerated without further symptoms, add the following foods for the next 12 to 24 hours: potatoes (not fried), soups, soft eggs, custards, puddings, white turkey meat or white chicken meat, and cottage cheese.
- If no further symptoms occur, resume a regular diet but avoid highly seasoned foods, greasy or fried foods, heavy fatty foods, excessively hot or cold foods, raw vegetables, coffee, colas, and milk products for 1 week after symptoms have stopped.

Gastritis

Etiology

The main cause of chronic gastritis is *Helicobacter pylori* bacteria, but other bacteria, viruses, or parasites can also be a cause. Contributors to acute gastritis are drinking excessive amounts of alcohol; infection from eating contaminated food; cocaine use; and ingestion of medications. Corticosteroids are very harsh on the stomach, as well as nonsteroidal anti-inflammatory drugs (NSAIDs) such as aspirin and ibuprofen.

Pathophysiology

Gastritis is not a disease; it is an acute or chronic inflammation of the mucous membrane lining the stomach. **Atrophic** gastritis involves all layers of the stomach. It is seen in association with gastric ulcer and malignancies of the stomach. Gastritis associated with uremia is common in patients with kidney failure. The excessive urea that builds up from the kidney failure causes gastric irritation. Untreated chronic gastritis may progress to ulcer formation and upper GI hemorrhage.

Signs, Symptoms, and Diagnosis

The main symptoms are anorexia, nausea, vomiting, pain and tenderness in the stomach region, hiccoughs, and sometimes diarrhea. A patient with chronic gastritis may have no symptoms, but may suddenly experience massive hemorrhage from the stomach. Diagnosis is by history, physical examination, and endoscopic examination.

Treatment and Nursing Management

Acute gastritis usually is of very short duration. Treatment consists of withholding all foods by mouth and administering drugs that slow down the peristaltic action of the GI tract. If severe dehydration or nausea and vomiting occur, IV fluids may be given. Patients with gastritis must be watched closely for signs of fluid and electrolyte imbalance. Treatment for chronic gastritis consists of antispasmodics to decrease the pain of stomach spasms, antacids, an H₂-receptor antagonist such as ranitidine to decrease acid secretions and change pH, or a proton pump inhibitor to decrease the secretion of hydrochloric acid. All NSAIDs and substances known to cause gastritis are discontinued. When *H. pylori* is present, treatment is proton pump inhibitors, amoxicillin, and clarithromycin for 7 to 14 days, with metronidazole substituted for amoxicillin if the patient is allergic to penicillin.

Older Adult Care Points

If an older adult experiences vomiting and is unable to retain fluids for 12 hours, IV fluids may need to be infused to prevent severe dehydration.

Chronic gastritis is not as easily treated as acute gastritis. Diet therapy is of primary importance; patients frequently admit to indiscretion in dietary and drinking habits and find it difficult to change. Patients with chronic gastritis should not eat any spicy or acidic foods. Tact and patience may convince the patient to follow the prescribed diet.

Peptic Ulcer

Etiology

About 4.5 million people in the United States have experienced a peptic ulcer. *H. pylori* infection is the major cause. Smoking and the continued use of NSAIDs are other causes. *H. pylori* is rich in an enzyme that may cause corrosion of the coating of the upper GI mucosa, making it more susceptible to damage from gastric acid and pepsinogen. Duodenal ulcers and some prepyloric ulcers are associated with an increased amount or hyperacidity of the gastric juices, and 70% are associated with *H. pylori*. Gastric ulcers, by contrast, are characterized by normal or abnormally low levels of hydrochloric acid, but 90% have been associated with *H. pylori*. Colonization of the stomach with *H. pylori* is an important cause of gastric cancer and of gastric mucosa-associated lymphoid tissue (MALT) lymphoma ([National Cancer Institute, 2013](#)).

Older Adult Care Points

By age 60 years, approximately 65% of the population in the United States is infected with the *H. pylori* bacterium. However, most people never have symptoms of gastritis, and few develop ulcers.

There is a weak genetic link for peptic ulcer that is not fully understood. Neither hot, spicy foods nor caffeine has been proven to be a risk factor for ulcers, but these substances make symptoms worse in many people. Gastric ulcers do occur in those who are poorly nourished because of poverty or because of poor eating habits. Despite the stereotype of the hard-driving executive suffering from an ulcer and ingesting antacid tablets, there is a greater incidence of ulcers in lower-income workers.

Stress does have a bearing on the progression of peptic ulcer. Tension, anxiety, and prolonged stress alter gastric function. Prolonged physiologic stress produces what is known as a *physiologic stress ulcer*, which is believed to be the result of unrelieved stimulation of the vagus nerves and decreased perfusion to the stomach. A stress ulcer is pathologically and clinically different from a

chronic peptic ulcer. It is more acute and more likely to produce hemorrhage. Perforation occurs occasionally, and pain is rare. Stress ulcers are a hazard for patients who are severely ill and in intensive care units for prolonged periods. Patients with multiple trauma, burns, or multisystem disorders are subject to physiologic stress ulcers. Such patients often receive medication to prevent ulcer formation.

Drug-induced ulcers are most commonly caused by aspirin, NSAIDs, biphosphonates, alcohol, and glucocorticoids (Mayo Clinic Staff, 2013).

Pathophysiology

Normally, the upper GI mucosa can resist corrosion; all areas exposed to hydrochloric acid and pepsin in gastric juices have an ample supply of mucous glands that secrete a protective alkaline mucus. Ulcers develop when the mucosa cannot protect itself from corrosive substances, such as gastric acid, pepsinogen, alcohol, bile salts, and irritating food substances. A **peptic ulcer** is an ulceration with loss of tissue of the upper GI tract. The term includes both duodenal and gastric ulcers (Figure 28-3). The most common site for development of a peptic ulcer is in the first few centimeters of the duodenum, just beyond the pyloric muscle.

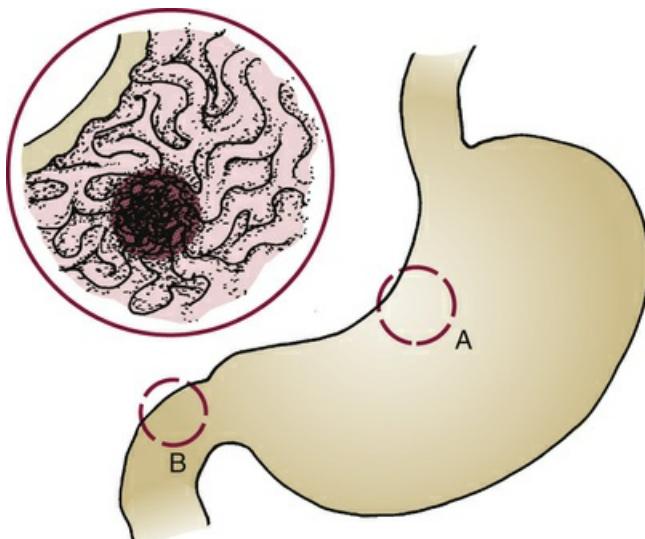


FIGURE 28-3 Peptic ulcers. A, Gastric. B, Duodenal.

Signs and Symptoms

Symptoms of uncomplicated ulcer include epigastric pain that might be described as burning, gnawing, cramping, or aching that usually comes in waves and lasts several minutes. The daily pattern of pain is associated with the secretion of gastric juices in relation to the presence of food, which can act as a buffer. **For example, with a gastric ulcer the pain is diminished in the morning when secretion is low and after meals when food is in the stomach, and pain is most severe before meals and at bedtime.** Discomfort often appears for several days or weeks and then subsides, only to reappear weeks or months later. Other subjective symptoms include nausea, loss of appetite, anemia, and weight loss. Spontaneous vomiting is more common with duodenal ulcers than with gastric ulcers.

Older Adult Care Points

Older adults may not display the typical ulcer symptoms. Pain is less typical and may be poorly localized, or it may be described as lower chest discomfort or left-sided pain. Anorexia, weight loss, general weakness, anemia, nausea, and painless vomiting may occur; peptic ulcer is difficult to diagnose in this population.

Gastrointestinal bleeding.

Signs of acute GI bleeding include complaints of weakness and feeling faint, nausea and vomiting, restlessness, thirst, and mental confusion. **Hematemesis** (the vomiting of bright red blood) indicates an active bleed; blood that has been sitting with gastric juices looks like coffee grounds. Diarrhea, decreased blood pressure, rapid pulse, and other signs of hypovolemic shock may occur. Blood in the GI tract acts as a cathartic and causes diarrhea. If bleeding from the upper GI system is profuse, maroon or bright red blood may appear in stool because of the rapid transit of the blood through the intestinal tract. Black stools almost always indicate the presence of digested blood, which means that the source of bleeding is in the upper GI tract.

Clinical Cues

Remember that iron salts can cause the stool to be black and that the ingestion of beets can cause the stool to be bright red.

Estimates of blood loss from the GI tract are based in part on blood pressure readings and pulse rates. Blood pressure and pulse rate should be monitored every 15 to 30 minutes when there is evidence of extensive GI hemorrhage.

Clinical Cues

Changes in the vital signs that signal hypovolemic shock do not appear until after the patient has lost 20% or more of the blood volume.

Hemoglobin and hematocrit levels are useful in determining the status of patients with GI bleeding. These levels can be normal or even slightly elevated at the beginning of a bleeding episode. It takes 4 to 6 hours for the body to shift fluids from other compartments to the intravascular compartment. The shift of fluid changes the ratio of formed elements to fluids in the blood. The white cell count may be elevated in massive GI bleeding, probably because of the body's response to injury or hypovolemia. An elevated level of blood urea nitrogen (BUN) can indicate digestion of large amounts of blood.

Diagnosis

Peptic ulcer is diagnosed by endoscopy, which can locate the site of ulceration and bleeding. It also allows for differentiation between benign and malignant ulcerations and between the esophageal ulcer and a *diverticulum* (pouching of the intestinal wall). UGI series may be done if endoscopy is not available.

Testing for the presence of *H. pylori* is essential. The urea breath test measures the gas released in the breath after ingestion of a radio-labeled urea isotope; when *H. pylori* is present, the test result is positive. Serum tests for *H. pylori* detect antibodies, indicating active or recent infection. A fecal antigen test for *H. pylori* is another option.

Think Critically

How do the symptoms of a gastric ulcer differ from those of a hiatal hernia?

When a patient is experiencing extensive GI bleeding, the patient's condition is stabilized and diagnostic procedures are performed to locate the source of bleeding. These procedures include endoscopic examination of the esophagus, stomach, and small intestine.

Treatment

Peptic ulcer is initially treated with medication. Surgical treatment is used when conservative treatment is not effective. Medications to relieve pain from local irritation of the intestinal mucosa include antacids and proton pump inhibitors, which decrease gastric secretions (see [Table 28-1](#)).

An NG tube may be used for normal saline lavage. Studies have shown no benefit from lavage and no difference in patient outcomes ([Saltzman, 2015](#)). NG tubes can help evacuate the stomach

contents to decrease vomiting.

Clinical Cues

The practice of inserting an NG tube in a patient with frank gastric bleeding may become obsolete because these patients undergo endoscopy quickly to determine the site of the bleeding and its treatment (Rockey, 2014).

Endoscopy is routinely performed to identify the source of bleeding and, if indicated, to treat it. A tissue biopsy may be done. Proton pump inhibitors are given IV or orally to decrease or stop acid secretion (see Table 28-1). These treatments are effective to stop the bleeding 80% of the time; the other 20% will require surgery.

If there is major blood loss, transfusions of packed cells, platelets, or fresh frozen plasma may be necessary. Normal saline, Plasmanate (plasma protein fraction), or Ringer solution may be administered until blood is available. Maintenance of fluid balance is extremely important. Intake and output must be measured and recorded accurately. Oxygen therapy is started to maximize tissue oxygenation.

Sucralfate (Carafate) tablets may be used for short-term (up to 8 weeks) treatment of a duodenal ulcer. Sucralfate has negligible acid-neutralizing capacity because the action of this drug is local. Its benefits probably derive from its adherence to the ulcer site, providing protection from further damage by gastric juices. Misoprostol (Cytotec) is used to replace gastric prostaglandins depleted by NSAID therapy and helps to prevent ulcer formation caused by NSAIDs. Sedatives are sometimes prescribed for a patient with a peptic ulcer to help reduce anxiety and relieve tension.

Safety Alert

Proton Pump Inhibitor Drug Interactions

Because proton pump inhibitors slow the liver's ability to metabolize and clear some drugs from the bloodstream, they should be used with caution in patients taking diazepam (Valium), phenytoin (Dilantin), and warfarin (Coumadin). Patients taking a proton pump inhibitor along with any of these three drugs should be watched closely for signs of toxicity.

Complications

The three major complications of peptic ulcer are hemorrhage, perforation, and obstruction. Hemorrhage occurs when the ulcer erodes vessels, causing bleeding into the stomach. Signs of hemorrhage include the vomiting of blood. If the hemorrhage is unchecked, hypovolemic shock may occur.

Perforation is erosion of the ulcer through all walls of the stomach or intestine. A spilling of the contents of the GI tract into the peritoneal cavity ensues; it constitutes a surgical emergency because of the danger of hemorrhage and peritonitis. **Perforation is characterized by a sudden and severe pain in the upper abdomen that persists and increases in intensity and sometimes is referred to the shoulders.** The abdomen is rigid and boardlike and extremely tender. In a short time the patient shows signs of shock.

Obstruction occurs as a result of scarring and loss of musculature at the pylorus, narrowing the stomach outlet, and is manifested chiefly by persistent vomiting.

Surgical Treatment

Surgical treatment becomes necessary when a chronic ulcer fails to respond to medical or endoscopic treatment; when complications such as perforation, obstruction, or hemorrhage occur; or when malignancy is present.

In **pyloroplasty with truncal or proximal gastric vagotomy**, the pylorus, which has been narrowed by scarring, is widened. The branches of the vagus (tenth cranial) nerve that stimulate acid secretion in the stomach are selectively severed (**vagotomy**) so that the stomach does not receive impulses from the brain and therefore does not secrete hydrochloric acid. A vagotomy is often done at the same time that a gastric resection is performed.

Subtotal gastrectomy (gastric resection) consists of removing a part of the stomach and then joining the remaining portion to the small intestine by anastomosis. **Anastomosis** is the joining of two hollow organs by suturing the open ends together so that they become one continuous tube. An **antrectomy**, in which the gastrin-producing portion of the stomach (the antrum) is removed, may be done in conjunction with a truncal vagotomy. When the fundus of the stomach is anastomosed to the duodenum, the procedure is known as a *Billroth I*. In the *Billroth II* procedure, the duodenum is closed, and the fundus of the stomach is anastomosed to the jejunum. **Total gastrectomy** is the surgical removal of all of the stomach. The esophagus is anastomosed to the small intestine ([Figure 28-4](#)).

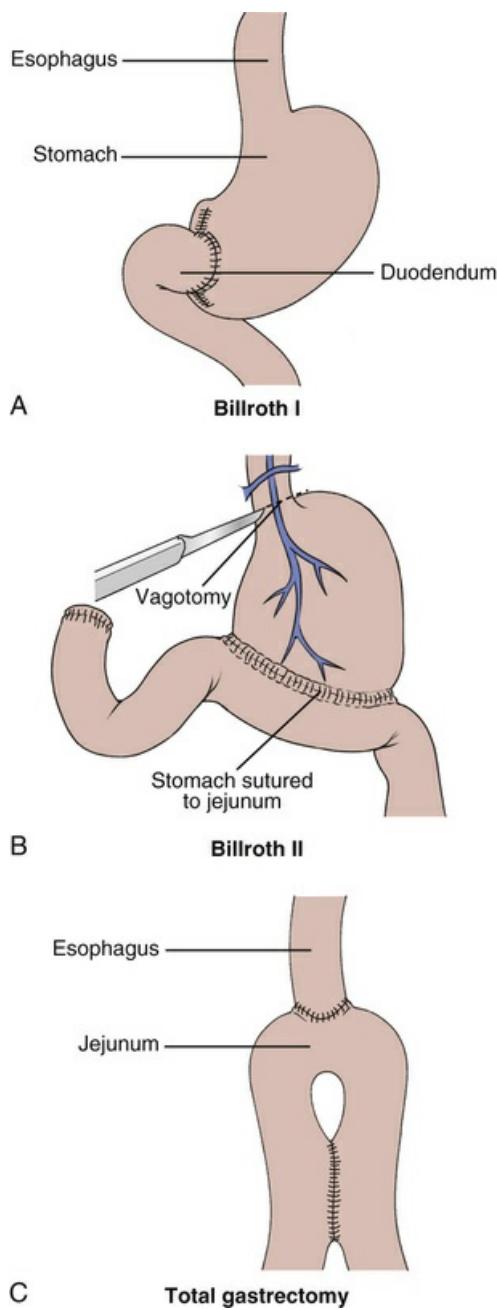


FIGURE 28-4 Stomach surgical procedures. **A**, Billroth I. **B**, Billroth II. **C**, Total gastrectomy.

Nursing care of patients undergoing gastric surgery.

Preoperative care.

Patients having gastric surgery are restricted to a liquid diet during the day before surgery. On the day of surgery, the patient is kept NPO. An NG tube is inserted once the patient is in the operating room, and all stomach contents are suctioned out before surgery.

The patient undergoes the routine preparations necessary for all major abdominal surgery, including bowel preparation with oral laxatives and antibiotics so that the colon is emptied of fecal material and bacteria. If the patient has had a barium enema, look for and report stools that contain whitish material. The whitish material is barium, and it will become hardened if left in the colon, thus presenting the possibility of fecal impaction later on.

Postoperative care.

Care of patients who have had gastric surgery is routine, with some exceptions. After surgery in which part of the stomach has been removed, care must be taken in handling the NG tube to prevent injury to the sutures and to prevent introduction of infectious agents. The surgeon will write specific orders about irrigating fluids and movement of the gastric tube.

After the tube is removed, the patient is given small amounts of liquid to determine tolerance. These liquids are gradually increased. The patient's ability to take them without nausea, vomiting, or abdominal distress is assessed. If the liquids are well tolerated, the patient progresses to small, frequent feedings. Within 6 months, most patients are able to take three regular meals a day. The remaining portion of the stomach stretches to accommodate more and more food. Patients who have had a **total** gastrectomy have restricted diets. They are usually restricted to small, frequent feedings of easily digested semisolids for the rest of their lives. Before discharge, the hospital dietitian usually is called to help the patient and his family learn about the special diet needed after undergoing gastric surgery. Medications may not be as effective due to altered absorption. The provider should be consulted for all medications.

Dumping syndrome.

Some patients who have had a gastrectomy experience a complication known as *dumping syndrome*. The patient has nausea, weakness, abdominal pain, and diarrhea and may feel faint and perspire profusely or experience palpitations after eating. These sensations are caused by the rapid passage of large amounts of food and liquid into the jejunum. This occurs because part or all of the stomach and duodenum has been surgically removed. The progress of the ingested foods and fluids is not slowed by passing through the upper portion of the GI tract. The patient with dumping syndrome should be taught to avoid eating large meals and to minimize fluids during the meal. Fluids may be taken in small amounts later, between meals. Refined sugar can cause or aggravate the condition, and the patient should try to avoid sugary foods or snacks. It also may be helpful for the patient to lie down flat for 30 minutes after a meal.

❖ Nursing Management

■ Assessment (Data Collection)

Begin by asking the patient to describe the chief complaint (patient's perception of the main problem).

☒ Focused Assessment

Data Collection for Peptic Ulcer

Assess the following areas:

History

- Pain: where located, characteristics, what affects pain, what relieves it, when pain began
- Nausea or vomiting; presence of bright red or "coffee-ground" emesis
- Dark "tarry" stool or maroon-colored stool
- Anorexia, weight loss

Physical Assessment

- Vital signs and changes from baseline
- Presence of restlessness, confusion, or thirst
- Skin tone
- Appearance and amount of emesis
- Stool color, characteristics, frequency
- Abdominal tenderness, rigidity, guarding, bloating
- Bowel sounds

Laboratory Data

- Complete blood count (CBC)
- BUN
- *H. pylori* testing

Nursing Diagnosis and Planning

Common problem statements/nursing diagnoses, expected outcomes, and interventions for patients with a peptic ulcer are presented in **Nursing Care Plan 28-1**. Before a peptic ulcer can be successfully controlled, the patient must understand how and why the ulcer developed in the first place. Once the predisposing factors are understood, it is easier to avoid them. Unless the patient can cooperate fully, there is a strong possibility that ulcers will develop again despite medical or even surgical treatment. ☺

Think Critically

How can you increase compliance with the medication schedule prescribed for ulcers?

Nursing Care Plan 28-1

Care of a Patient With a Bleeding Peptic Ulcer

Scenario

Mr. Jackson is a 52-year-old long-distance truck driver admitted to the hospital with a diagnosis of bleeding peptic ulcer. He has had recurrent bouts of epigastric pain that is more pronounced before meals and at bedtime. Mr. Jackson states that he eats "whenever I can grab a bite." He eats mostly fried and spicy foods and he smokes two packs of cigarettes a day. He went to the provider because of fatigue and discomfort that seemed to be getting progressively worse despite antacid use. He also admits to having some vomiting episodes with blood in the secretions. Mr. Jackson is the sole support of his wife and four children and is very concerned about the expense of hospitalization and the time away from work. He is scheduled for an endoscopic examination of the esophagus, stomach, and duodenum.

Problem Statement/Nursing Diagnosis

Pain/Pain due to irritation and possible ulceration of gastric mucosa.

Supporting Assessment Data

Subjective: Recurrent bouts of epigastric pain more pronounced before meals.

Objective: Epigastric tenderness increases with gentle palpation.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize relief of pain.	Assess location and severity of pain every shift.	Provides data regarding condition and need for medication.	Pain is epigastric at 3/10 on pain scale; now occurring between meals.
Patient will verbalize ways to prevent gastric pain.	Administer ordered antacids, antispasmodics, and H ₂ inhibitors.	Medications neutralize stomach acid or decrease acid production.	Taking medications as ordered. Verbalizes rationale for medication.
	Give caffeine-free diet.	Caffeine causes more stomach acid production.	No caffeine drinks; bland diet. Verbalizes understanding of effect of caffeine on stomach pain.
	Encourage him to quit smoking.	Smoking constricts blood vessels, decreasing perfusion to stomach. Decreased perfusion makes the stomach more susceptible to inflammation.	Patient said he would think about quitting smoking. Provided community resource information for stopping smoking. Still smoking. Continue plan.
	Give frequent feedings to neutralize gastric acid.	Keeping food in the stomach helps neutralize acid.	Eating a snack every 2 hr between meals. Verbalizes understanding of how frequent meals or snacks can help control pain.

Problem Statement/Nursing Diagnosis

Anxiety/Anxiety due to expenses, time off work, and worry about what is wrong with him.

Supporting Assessment Data

Subjective: "I'm the only one working"; expresses worry over hospital expenses; worried about blood in vomitus.

Objective: Self-treated with antacids and continued to work until symptoms progressed.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize reduction in anxiety before discharge.	Encourage verbalization of concerns and fears.	Verbalizing fears may decrease their intensity.	Verbalizing specific concerns about finances and expresses fear that blood is a sign of serious illness.
Patient will devise plan to cover hospital expenses to decrease anxiety.	Advocate for financial consultation regarding hospital expenses.	A plan for meeting financial obligation will somewhat decrease anxiety.	Appointment with social worker to discuss financial situation.
Patient will verbalize understanding of diagnosis and treatment of his condition.	Explain all diagnostic procedures and medications.	Decreases the fear of the unknown and reduces anxiety.	Brochure given about endoscopic procedures and test for <i>Helicobacter pylori</i> ; reviewed purpose of each medication.
	Assess usual coping techniques and teach new ways to cope as necessary.	Establishes usual coping methods and provides data for other coping methods to be taught.	Uses smoking and television as relaxation.
	Reinforce wife's assurances that they can manage expenses at home.	Reinforcement of information helps patient remember.	Wife says he tends to be a "worry wart"; reinforced information about her ability to cope with expenses.
	Encourage relaxation techniques.	Relaxation techniques help decrease anxious feelings.	Taught relaxation exercise and encouraged to practice it. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for altered tissue perfusion/Potential for decreased tissue perfusion due to increased bleeding (gastrointestinal) from irritation of gastric mucosa.

Supporting Assessment Data

Subjective: States has experienced blood-streaked vomitus; history suggestive of peptic ulcer; increasing fatigue.

Objective: Blood-tinged vomitus and blood in stool (positive guaiac test); pale conjunctiva; below-normal Hgb and Hct.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have no signs of intestinal blood loss by discharge.	Monitor CBC count for evidence of continued bleeding.	CBC count may indicate whether bleeding is occurring.	Hgb 11.9 g/dL and Hct 32.
Hemoglobin and hematocrit will be within normal levels within 30 days.	Assess vomitus for blood.	Blood in vomitus indicates bleeding is still occurring.	No vomitus this shift.
	Check stool for occult blood as ordered.	Blood in stool indicates GI bleeding.	Stool positive for occult blood x2.
	Monitor vital signs and assess for continued or rapid blood loss as ordered.	Active bleeding will be reflected by vital signs.	Pulse 92 and BP 138/86.
	Teach about foods high in iron (i.e., meat and green leafy vegetables) to correct anemia.	Eating foods high in iron helps correct anemia.	Agrees to try and eat more spinach, chard, and lean beef.
	Administer iron supplements as ordered.	Iron supplementation helps correct anemia.	Iron supplement not ordered yet. Continue plan.

Postprocedure

Mr. Jackson's provider found a duodenal ulcer on endoscopic examination. He has prescribed sucralfate (Carafate), 1 g orally four times per day before meals and bed; ranitidine (Zantac), 300 mg at bedtime; and Mylanta II, 30 mL 30 min after meals, in hopes of healing the ulcer and preventing surgery.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/Deficient knowledge due to factors that contribute to peptic ulcer and information about medications.

Supporting Assessment Data

Subjective: States was unaware that cigarette smoking contributed to ulcers; has never heard of the medications prescribed for him, except for the antacid.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize factors that contribute to ulcer formation.	Instruct in contributing factors of ulcer formation (i.e., explain how the eating behavior of "grab a bite" and eating spicy or fried foods are contributing to ulcer formation).	Understanding how behavior affects health may help the patient to make better choices.	Acknowledged that smoking, his diet, and lifestyle contribute to his ulcer. States that he will quit eating foods that cause pain (i.e., spicy foods).
Patient will attempt to quit smoking within 2 wk.	Assist him to learn new ways to cope with stress.	Practicing relaxation and deep breathing helps decrease stress.	Taught deep-breathing exercise. Will begin exercise program for stress reduction.
	Discuss smoking cessation strategies (i.e., set a stop date, enlist help of family, use of a prescribed nicotine patch, substituting an activity such as chewing gum).	Nicotine is very addictive and having a formalized plan increases success.	Expresses interest in talking to doctor about getting a prescription for the nicotine patch. Has cut smoking down to <u>½</u> pack per day, states he will try to quit.
	Discuss ways to manage proper eating when on the road (e.g., packing healthy snacks or choosing baked foods, not fried).	Knowing good food choices for his situation can help him eat properly when on the road.	Discussed food places that have appropriate choices. Wife agrees to pack fruits and whole grain crackers.
Patient will verbalize reason for each medication, dosage schedule, and side effects.	Teach action, dosage, and side effects of sucralfate (Carafate), ranitidine (Zantac), and Mylanta II. Obtain feedback for material taught.	Understanding how to take medications and what to expect, or report, helps with compliance and prevents toxic reactions.	Went over each medication and gave list with dosages. Discussed possible side effects and what to report to the provider.

Critical Thinking Questions

- How would you interact with this patient to try to help him quit smoking?
- What does he need to know about taking an antacid if he is taking other medications?
- Considering he is a truck driver and on the road a lot, what can you do to help him change his diet?

BP, Blood pressure; *CBC*, complete blood count; *GI*, gastrointestinal; *Hct*, hematocrit; *Hgb*, hemoglobin.

■ Implementation

Measure blood pressure and pulse rate regularly. Observe skin color, observe for diaphoresis or thirst, and look for other signs of continued blood loss such as restlessness. Watch for impending hypovolemic shock. Measure intake and output and note the character of vomitus, aspirated gastric fluid, and stools. Measure and record the patient's daily weight. **Melena** stools (black, tarry stools with digested blood) cause an unpleasant odor, and the room must be kept as free of odor as possible.

Diet counseling is a top priority once the patient is stable. Currently, most authorities believe that it is best to restrict only those foods that the patient identifies with the onset of symptoms. It is generally agreed that the kind of food is less important than when the food is eaten; therefore the patient is instructed to eat at frequent and regular intervals throughout the day, rather than in two or three large meals. Meals should not be skipped. Alcohol and caffeine should be excluded.

■ Evaluation

You can point out signs of improvement that will help to relieve the patient's anxiety. For example, if an NG tube is being used to lavage and decompress the stomach, there will be a decreased showing of hematemesis as the bleeding resolves. After the bleeding has apparently stopped and the patient's vital signs have stabilized, there must be continuous monitoring for signs of persistent or renewed bleeding.

Gastric Cancer

The [American Cancer Society \(2015\)](#) estimates that 24,590 cases of stomach cancer will be diagnosed in 2015 and 10,720 people will die of stomach cancer in the United States. Stomach cancer is usually discovered very late because patients often lack symptoms. The 5-year survival rate is 71% if the disease is caught fairly early, and only 4% in those with advanced disease. Metastasis to surrounding organs is common in late disease.

Etiology

The cause of gastric cancer is unknown, but pernicious anemia and **achlorhydria** (absence of hydrochloric acid) are often present. It is believed that a diet high in smoked, highly salted, or spiced foods may be a contributor. Food preservatives such as nitrates or nitrites increase the risk. The presence of *H. pylori*—particularly if present from an early age—is a definite factor. Genetic influence plays a role; the risk is increased in family members and in those with blood type A.

Pathophysiology

Gastric cancer grows primarily from the mucous glands. Most tumors arise in the antrum or pyloric area. The lesion begins as an ulcerative crater with an irregular border and a raised margin. The tumor eventually spreads through the layers of the stomach and spreads to the lymph nodes, the liver, and the ovaries in women.

Nutrition Considerations

Prevention of Gastric Cancer

Refraining from eating a diet high in smoked and salted foods or pickled vegetables helps prevent gastric cancer. Eating a diet high in fruits and vegetables, particularly those high in beta-carotene and vitamin C, decreases stomach cancer risk. People who eat a lot of red meat each week have double the risk of gastric cancer. Foods such as bacon and many “lunch meats” are high in nitrates, which are carcinogenic. When eating those foods, drinking orange juice reduces the absorption of nitrates. The ascorbic acid in the orange juice counteracts the nitrite concentration.

Cultural Considerations

Stomach Cancer Incidence

Stomach cancer is almost double in incidence in African American individuals as in non-Hispanic whites. Native Americans and Hispanic Americans are also at an increased risk for stomach cancer. *Helicobacter pylori* is more common in Hispanic and African American individuals. Research with minority populations is under way to determine how *H. pylori* is transmitted in these populations in an effort to decrease stomach cancer incidence.

Signs and Symptoms

Gastric cancer is usually asymptomatic until the disease is far advanced. Signs and symptoms may include indigestion, loss of appetite, nausea and vomiting, and weight loss but may be limited to just intermittent abdominal distress. Belching and the use of antacids may relieve the distress. The patient may become pale and weak and complain of fatigue, weakness, dizziness, and sometimes shortness of breath. Anemia is the underlying cause of those symptoms. There is often blood in the stool.

Diagnosis

Diagnosis is by upper GI series and endoscopic examination of the stomach with biopsy. Anemia, verified with a complete blood count, is usually present. Tumor markers such as carcinoembryonic antigen and carbohydrate antigen (CA) 19-9 are useful in determining the degree of invasion of the tumor and liver metastasis.

Treatment and Nursing Management

Surgical intervention may relieve symptoms such as obstruction or may debulk the tumor. The same surgical procedures are used as for peptic ulcer; lymph node dissection may be performed. There is only a 40% 5-year cure rate with surgery for gastric cancer. In Japan, laparoscopic surgery for the removal of small tumors is being studied. Adjuvant therapy of radiation and/or chemotherapy may be employed. Radiation has proved to be of value only for palliation. 5-Fluorouracil (5-FU) and cisplatin or 5-FU with epirubicin and cisplatin or other similar

combinations of chemotherapy are used. Cancer therapy and nursing care are discussed in [Chapter 8](#). Nursing care after surgery is the same as for patients after surgery for a peptic ulcer but with excision of involved lymph nodes.

Common Therapies for Disorders of the Gastrointestinal System

Gastrointestinal Decompression

Abdominal distention with increased pressure within the abdominal cavity is very uncomfortable. Excess fluids and gases also interfere with ventilation of the lungs and normal function of other nearby organs.

An NG tube to remove fluids and gas from the stomach may be inserted. Gastrointestinal tubes vary in length, design, and purpose. The Levin tube and gastric sump tube are shorter because they are intended to reach only as far as the stomach. The Miller-Abbott, Cantor, and Harris tubes are longer tubes that are directed past the stomach and into the small intestine. Intestinal tubes are described in [Chapter 29](#).

Clinical Cues

NG tube is a generic term that you may see in providers' orders or in the nurses' or providers' notes, or you may hear that term in report; however, the purpose of the therapy for the NG tube dictates the type of NG tube. Make sure that you clarify the purpose of the therapy and the type of tube before starting the care of the patient.

Nursing Management

Observe the patient for continuing signs of abdominal distention during gastric decompression, which would indicate that excess fluids and gases are not being removed as intended. **Nausea, vomiting, complaints of feeling full or bloated, increasing shortness of breath, and increase in the girth of the abdomen are signs that the stomach and intestines are not being decompressed adequately.**

Applying too much suction can pull the gastric mucosa into the drainage openings, or "eyes," of the tube, causing damage to the mucosa and traumatic ulceration.

Assignment Considerations

Caring for a Patient With a Salem Sump Tube

When assigning assisted ambulation of a patient with a Salem sump tube, remind the CNA or UAP to keep the tube above the level of the stomach to prevent leaking of stomach contents from the pigtail. The main tube should be plugged for ambulation. The assistant can be instructed to reattach the tubing to the wall suction after ambulation is completed, but the nurse is ultimately responsible to follow up and verify that the tube and suction are functioning correctly.

Using a gastric sump tube (Salem, ventral) that has an air vent can help prevent damage to the mucosa. Sump tubes are usually attached to continuous "low" suction; Levin tubes function best with intermittent suction. **Unless ordered otherwise, use the low setting for suction.** The connecting tubing leading to the suction machine works best if it is kept above the height of entry into the drainage container.

Clinical Cues

If there is leakage from the pigtail, it can be cleared by instilling a few milliliters of air; nothing but air should be instilled through it.

Irrigation of the tube with normal saline is usually ordered to keep the tube patent. The amount instilled should be added to the patient's intake count, and the amount of drainage is recorded as output for each shift. If the patient has had surgery on the intestinal tract, the irrigation procedure should be done with aseptic technique rather than clean technique.

The characteristics of the drainage are charted each shift. If coffee-ground-like material is noticed in the tube, the drainage should be tested for presence of blood by using a Hemastix strip dipped into the secretions. If blood unexpectedly appears in the drainage, the provider should be notified. Fluid and electrolyte imbalance problems that can be caused by continuous suction and irrigation are discussed in Chapter 3.

An NG tube is uncomfortable for the patient. The nares must be checked for signs of pressure, and the tube may need to be repositioned in the nares to relieve the problem. Common complaints are sore throat, dry mouth, earache (from congestion of the eustachian tube), and dry lips and nasal mucosa. Frequent mouth care and application of a lubricant to the lips and nares will help. A room humidifier can also be helpful, but this requires a provider's order. The provider may allow the patient to have limited amounts of ice chips, hard candy, or chewing gum to decrease the problem of dry mouth.

After the tube is removed, the patient is monitored for nausea, vomiting, and abdominal distention. Sometimes it is necessary to insert the tube again.

Enteral Nutrition

If a patient has long-term difficulty taking in food orally, as when in a coma, enteral feeding is indicated. Current practice calls for a nasoduodenal tube, which is a small-diameter polyurethane tube that may be weighted at the tip (Figure 28-5). The tube delivers special-formula liquid feedings into the duodenum.

Clinical Cues

When you are working with a nasoduodenal tube, always use a large syringe (10 mL or larger) to flush and to give medications because smaller syringes create too much pressure and may cause the tube to rupture.

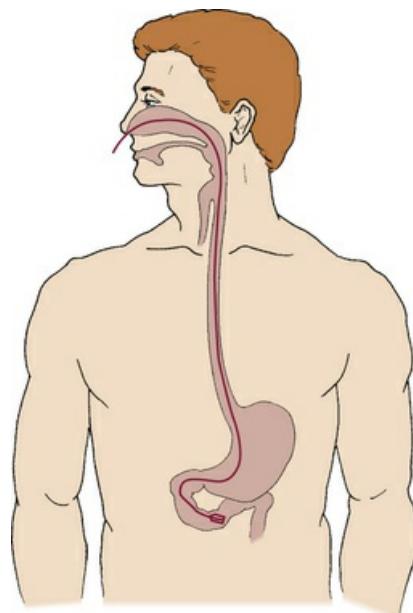


FIGURE 28-5 Small-bore feeding tube placement.

These tubes are inserted by the provider or a registered nurse, and placement in the duodenum is confirmed by x-ray film before feedings are started. Thereafter, the mark at the nares is checked to see that the tube has not slipped out of place before a feeding is begun. The feedings can be given at specified times throughout the day or on a continuous basis. If continuous tube feedings are ordered, they are administered with a feeding pump.

Patients who require long-term nutritional support for problems such as inability to swallow may undergo percutaneous endoscopic gastrostomy (PEG). A feeding gastrostomy tube is placed

endoscopically through the abdominal wall (Figure 28-6). The patient then receives enteral feedings via the gastrostomy tube. The tube is marked with indelible ink at the point of exit so that correct placement can be checked daily. The area is observed for signs of infection and cleansed daily with soap and water until healing is complete. A 4 × 4 gauze dressing is used over the outside bumper while the area is healing. Box 28-1 presents nursing interventions for patients receiving tube feedings. **Adding a feeding when there is too much residual from the last feeding may cause regurgitation and aspiration.**

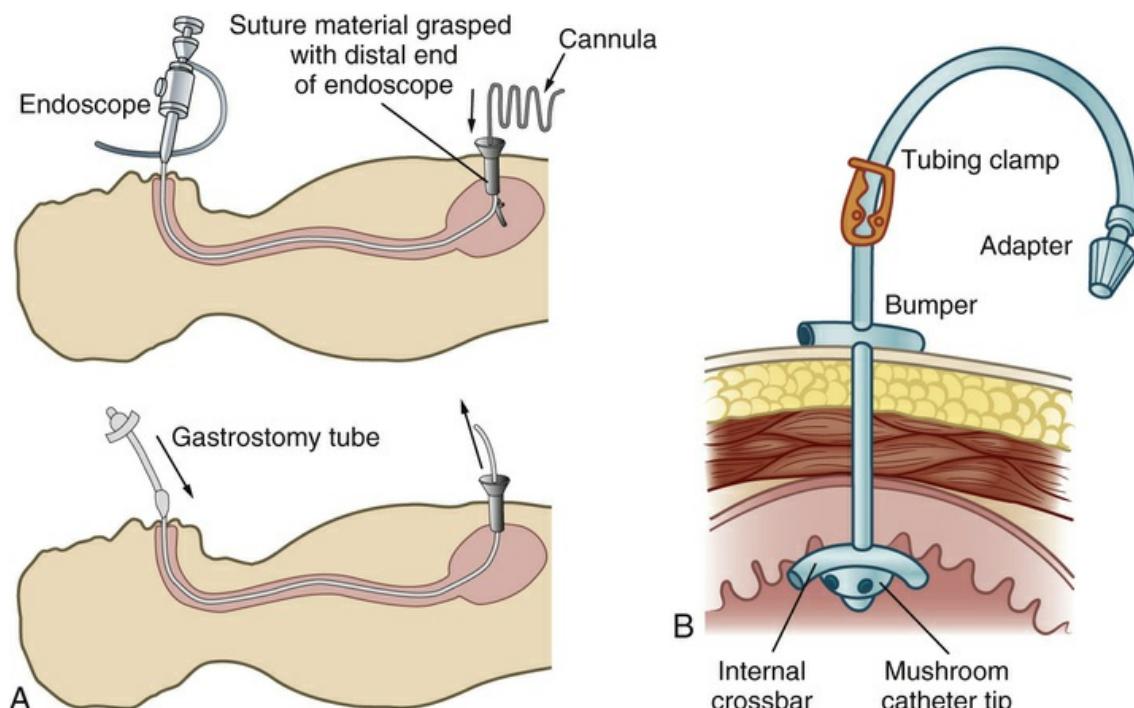


FIGURE 28-6 Percutaneous endoscopic gastrostomy. **A**, Gastrostomy tube placement via percutaneous endoscopy. The gastrostomy tube is inserted through the esophagus into the stomach and pulled through a stab wound made in the abdominal wall. **B**, A retention disk on the inside of the stomach and a bumper disk on the outside secure the tube. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2015, Mosby. Redrawn from Mahan LK, Arlin M: *Krause's food, nutrition, and diet therapy*, ed 8, Philadelphia, 1992, Saunders.)

Box 28-1

Nursing Interventions for Patients Receiving Enteral (Tube) Feedings

- Be certain tube placement has been checked by x-ray and is correct.
- Check and record the residual volume every 4 hours or as ordered.
- Verify tube placement by checking the mark at the nares every 4 hours.
- Verify the order of the drip rate for the feeding.
- Assess the feeding pump to verify it is set up correctly and that the drip setting is accurate. Be certain the formula being instilled is what was ordered.
- Change the feeding bag and tubing every 24 hours. Change the irrigation set every 24 hours also.
- When continuous feeding is ordered, add only 4 hours of formula to the bag at a time to prevent

bacterial growth; a closed system may be used for 24 hours.

- Do not use food dye in the formula because it can cause complications.
- Keep the head of the bed elevated at least 30 degrees during the feeding and for 1 hour after an intermittent or bolus feeding. For continuous feeding, keep the patient in a semi-Fowler position.
- Monitor laboratory values: blood urea nitrogen, electrolytes, hematocrit, albumin, and glucose.
- Monitor for diarrhea or excessive gas.
- Monitor and record intake and output.
- Monitor and record the patient's weight at least weekly.
- Flush the tube with 30 to 60 mL of sterile water every 4 hours during continuous feeding, and before and after each intermittent feeding.
- Flush with 30 mL of sterile water before and after each individual medication; do not mix medications together or with the feeding formula. Use liquid medications whenever possible.
- If tube becomes clogged, flush with 30 mL of sterile water in a 50-mL piston syringe; use gentle pressure.
- Provide mouth care every 4 hours.
- Clean the nares and around the tube in the naris each shift or twice a day. Inspect the naris for pressure areas.
- Change the tape or tube securing device if it becomes loose or soiled.

For Gastrostomy Tube

- Assess the insertion site for signs of infection or excoriation.
- Rotate the tube 360 degrees every day and check for $\frac{1}{4}$ -inch play in and out. If tube cannot be moved, report this to the provider because the retention disk may have become embedded in the tissue.
- Change the dressing at least once a day, applying a dry sterile dressing.

For Jejunostomy Tube

- Be certain that the suture holding the tube is intact and that the mark on the tube is at the skin surface before starting or adding to a feeding. If it is not, stop the feeding and notify the provider.
- Do not attempt to aspirate a jejunostomy tube; it will collapse because of its small interior diameter.
- Inspect the insertion site and change the dressing once a day.

Sometimes the feeding tube is placed in the jejunum via a jejunostomy. If this is the case, the tube is sutured in place, and the spot where the tube enters the abdominal skin is marked. The mark and suture are checked before beginning a feeding to make certain that the tube has not been dislodged. It is difficult to aspirate anything from a jejunostomy.

Safety Alert

Jejunostomy Tube Displacement

If a jejunostomy tube has moved or the suture is broken, no feeding should be given. Peritonitis may occur if feeding formula spills into the peritoneal cavity. The tube must be replaced by the provider. Always document that placement was checked and whether the suture is intact and the mark is at the skin. If displacement has occurred, document what action was taken.

Total Parenteral Nutrition

Total parenteral nutrition (TPN) is indicated when the patient cannot ingest or digest foods normally or has a problem with malabsorption. If a patient has continued weight loss and a negative nitrogen balance, TPN is indicated. Conditions that could warrant TPN include severe trauma to the intestinal tract, as with a gunshot wound, and chronic inflammatory conditions. Regional ileitis that prevents absorption of nutrients is an example of an inflammatory condition. Other conditions not related to the intestinal tract but nevertheless capable of seriously interfering with normal nutrition over time include prolonged sepsis, fever, extensive burns, and cancer.

TPN is essentially a form of IV feeding. The amounts and kinds of nutrients needed for long-term nutrition cannot be administered using peripheral veins, so the nutrient mix is given using a larger central vein such as the superior vena cava. The provider may choose to use a direct central line into the vena cava or jugular vein, or a peripherally inserted central catheter (PICC) line may be inserted and threaded into the vena cava instead. Lipids may be given via a peripheral vein. Further information about TPN and the principles for administration are found in [Chapter 3](#).

Safety Alert

Do NOT confuse enteral feedings and TPN feedings. The solutions and routes are not interchangeable. **Infusing an enteral feeding into an IV site can result in death.** First, verify the solution and route. Trace the tube down to the patient's body to ensure that you are using the correct tube.

Care of the patient must be a team effort on the part of providers, pharmacists, dietitians, and nurses. Nursing care includes assisting with the insertion of the IV central line, changing the tubing with each new bag or bottle, changing the dressing, observing the insertion site, and removing the tubing when TPN therapy is discontinued. Day-to-day care includes monitoring vital signs, glucose levels, and fluid and electrolyte balance. The patient is weighed daily and provided frequent mouth care. The rate of TPN is slowly decreased to gradually lower the dextrose load before TPN is discontinued.

Get Ready for the NCLEX® Examination!

Key Points

- A calorie reduction diet combined with exercise and behavior modification are the initial treatments for obesity. Bariatric surgery may be considered for obese patients with a BMI over 40.
- Dysphagia may cause respiratory problems from aspiration.
- Oral cancer and esophageal cancer are associated with alcohol and tobacco use.
- Common symptoms of GERD include dyspepsia and reflux. Diet therapy, lifestyle changes, drug therapy, weight reduction, and education are the mainstays of treatment.
- A peptic ulcer (gastric or duodenal) is ulceration of the upper GI tract. Symptoms include epigastric pain before meals and during the night. Complications include hemorrhage, perforation, and obstruction.
- Monitor vital signs every 15 to 30 minutes when there is evidence of extensive GI hemorrhage. Replacement of blood and fluids may be required.
- Surgical procedures for peptic ulcer include pyloroplasty with vagotomy, subtotal gastrectomy, antrectomy, or total gastrectomy (see [Figure 28-4](#)).
- *Helicobacter pylori*, pernicious anemia, and achlorhydria are all implicated in the development of gastric cancer.
- Symptoms of dumping syndrome are nausea, weakness, abdominal pain, diarrhea, faintness, palpitations, and diaphoresis.
- An NG tube is used for gastric decompression; a nasoduodenal tube is used for enteral feeding. After NG tube removal, the patient is monitored for abdominal distention, nausea, and vomiting.
- When a patient cannot digest foods and liquids normally, total parenteral nutrition (TPN) may be required. The TPN solution must be sterile and administered at the ordered rate into a blood vessel with high-volume blood flow.

Additional Learning Resources

-  Go to your Study Guide for additional learning activities to help you master this chapter content.
- Online Resources
 - Gastric bypass surgery, <http://www.webmd.com/diet/weight-loss-surgery/what-is-gastric-bypass-surgery>
 - Verification of feeding tube placement,
<http://www.aacn.org/wd/practice/docs/practicealerts/verification-feeding-tube-placement.pdf?menu=aboutus>

Review Questions for the NCLEX® Examination

1. When working with an obese patient who wants to lose weight, which statement would indicate that the teaching has been understood?
 1. “Starting to exercise 2 hours a day is a good beginning for me.”
 2. “Eating everything I want except for anything sweet will help me lose weight.”
 3. “A program such as Weight Watchers will help me cut calories and keep on track.”

4. "Over-the-counter diet pills are a good way to jump start my weight loss."

NCLEX Client Need: Health Promotion and Maintenance: Health Promotion/Disease Prevention

2. When screening for the presence of risk factors for oral and pharyngeal cancers, which questions would the nurse ask? (*Select all that apply.*)

1. How much alcohol do you consume?
2. Have you had any oral lesions?
3. Do you have family members who have cancer?
4. Do you smoke?
5. Have you been exposed to hepatitis virus?

NCLEX Client Need: Physiological Adaptation: Alterations in Body Systems

3. The nurse reinforces diet recommendations to a patient with GERD. Which patient statement indicates a need for further teaching?

1. "I should avoid spicy Italian sauces."
2. "Clothes should be loose around the waist and abdomen."
3. "I need to wait 30 minutes after eating before lying down."
4. "I need to consider removing caffeine from my diet."

NCLEX Client Need: Health Promotion/Disease Prevention

4. A patient who has GERD for many years is diagnosed with Barrett esophagus. Etiologic factors for Barrett esophagus include:

1. eating spicy foods and hot peppers on a regular basis.
2. long-term gastroesophageal reflux causing mucosal irritation.
3. previous history of oral cancer.
4. moderate alcohol consumption during adult years.

NCLEX Client Need: Physiological Adaptation: Basic Pathophysiology and Alterations in Body

Systems

5. A nurse is taking care of a patient who had a modified radical neck dissection surgery. The patient's spouse asks, "Why do you have to apply cold packs and elevate my husband's head?" Which response is the most appropriate?

1. "These interventions decrease the need for opiates."
2. "These interventions reduce neck swelling."
3. "These interventions promote faster healing."
4. "These interventions reduce the incidence of postoperative fever."

NCLEX Client Need: Reduction of Risk Potential: Potential for Complications from Surgical Procedures and Health Alterations

6. A nurse is reviewing signs and symptoms of esophageal cancer with people who are at risk. Which statement indicates that the participants have understood the information?

1. "A feeling of fullness in the throat is an early sign."
2. "Belching and indigestion are caused by cancerous lesions."
3. "Common symptoms are halitosis and dryness of the mouth."
4. "Choking or coughing while swallowing liquids is an early sign."

NCLEX Client Need: Health Promotion/Disease Prevention

7. A patient reports a history of gastric ulcer. Which sign or symptom indicates the need for a priority action of physician notification?

1. Epigastric pain that is described as a burning sensation.
2. Pain is most severe at bedtime.
3. Reports vomit that "looks like coffee grounds."
4. Discomfort comes for several days and then subsides.

NCLEX Client Need: Physiological Integrity: Alterations in Body Systems

8. While a nurse is obtaining a clinical history, a patient with a known history of peptic ulcers suddenly complains of a severe upper abdominal pain of increasing intensity that spread to the shoulders. The abdomen has boardlike rigidity. Which sign(s) and/or symptom(s) signal worsening related to the peptic ulcer? (*Select all that apply.*)

1. Slow, deep respirations
2. Decreased oxygen saturation
3. Increased pulse
4. Hot, dry skin
5. Belching and flatulence
6. Confusion and restlessness

NCLEX Client Need: Physiological Integrity: Alterations in Body Systems/Medical Emergencies

9. A patient is receiving continuous enteral feedings. Which intervention will address the most common problem associated with the feeding therapy?

1. Assist the patient to ambulate several times a day.
2. Assess the skin in the rectal area and apply a barrier cream.
3. Place an emesis basin and tissues within close proximity.
4. Frequently offer water, other fluids, or ice chips.

NCLEX Client Need: Physiologic Integrity: Reduction of Risk Potential: Potential Complications of Treatments

10. A nurse is supervising a nursing student during the care of a patient with a gastrostomy tube. The nurse should intervene if the student:

1. aspirates for residual contents before feeding.
2. flushes the tube after each feeding.
3. changes the tubing and bag every 4 hours.
4. cleans and dries the skin around the tube.

NCLEX Client Need: Physiologic Integrity: Reduction of Risk Potential

11. A family member tells a nurse, "Dad seems to be having some trouble swallowing lately." What is the nurse's priority action?

1. Notify the provider.

2. Consult the speech therapist for advice.
3. Initiate aspiration precautions.
4. Observe during “practice swallows.”

NCLEX Client Need: Physiologic Integrity: Reduction of Risk Potential

12. A nurse is caring for a patient who is vomiting blood. The provider orders a normal saline IV fluid bolus of 500 mL to infuse over 30 minutes. The correct pump setting in mL/hour is _____.
(Fill in the blank.)

NCLEX Client Need: Physiological Integrity: Physiological Adaptation/Fluid and Electrolyte Imbalances

Critical Thinking Questions

Scenario A

Ms. Olivera, age 56 years, is experiencing a lot of abdominal discomfort and reflux. She visits her provider, who believes she has GERD. She is 5 feet, $3\frac{1}{2}$ inches tall and weighs 158 lb.

1. What measures would be recommended to decrease the symptoms of GERD?
2. What specific instruction would you give Ms. Olivera regarding her diet?
3. Why would losing some weight help her problem?

Scenario B

Mr. Eoyang, age 47 years, is admitted to the hospital because he has epigastric pain, is vomiting blood, and has a suspected gastric ulcer.

1. What tests might be done to establish a diagnosis for Mr. Eoyang?
2. What kind of information will help Mr. Eoyang prevent difficulty with his diet after he is discharged?
3. What would Mr. Eoyang need to know to keep his ulcer under control and eventually cure it?

Scenario C

The nursing assistant tells you that Mr. Yamamoto had an episode of coughing while he was eating breakfast. You check on the patient and he is not having any respiratory distress, but you notice that there are some food stains on his shirt. He says, “Sometimes water makes me cough.” You decide to feed the patient his lunch so that you can observe him eating and inform the provider about your observations.

1. What position will you place him in before feeding?
2. Explain how to observe for problems with swallowing.
3. What dietary modifications can be made for patients who have difficulties with swallowing?

CHAPTER 29

Care of Patients With Disorders of the Lower Gastrointestinal System

Objectives

Theory

1. Discuss the characteristics of irritable bowel syndrome.
2. Explain how diverticulitis occurs.
3. Identify the causes and signs and symptoms of a strangulated (incarcerated) hernia.
4. Illustrate how the two types of intestinal obstruction occur and their symptoms.
5. Describe the pathophysiology, methods of diagnosis, and treatment for ulcerative colitis and Crohn disease.
6. Differentiate the signs and symptoms of appendicitis from peritonitis.
7. Plan nursing interventions for a patient having surgery of the lower intestine and rectum.
8. Discuss ways to help a patient psychologically adjust to having an ostomy.
9. Compare the characteristics of hemorrhoids, pilonidal sinus (cyst), and anorectal fistula.

Clinical Practice

10. Choose nursing interventions for a patient with inflammatory bowel disease.
11. Assess for the signs and symptoms of appendicitis.
12. Identify types of patients who are at risk for peritonitis.
13. Create a teaching plan for the prevention of colorectal cancer.
14. Write a nursing care plan for a patient with cancer of the colon and intestinal obstruction.
15. Evaluate a nursing care plan for a patient undergoing colostomy, considering the type of stoma and the effluent it produces.
16. Observe the equipment and procedure for changing an ostomy appliance.

KEY TERMS

- anastomosis** (ă-năs-tō-MŌ-sĭs, p. 683)
colectomy (kō-LĒK-tō-mē, p. 683)
colostomy (kō-LŌS-tō-mē, p. 683)
cryotherapy (krī-ō-THĒR-ă-pē, p. 690)
diverticulitis (dī-vĕr-tīk-ū-LĪ-tīs, p. 671)

diverticulosis (dī-věr-tǐk-ū-LŌ-sīs, p. 671)
diverticulum (dī-věr-TÍK-ū-lūm, p. 671)
hemicolecotomy (hě-mě-kō-LĚK-tō-mě, p. 683)
hemorrhoidectomy (HĚM-röyd-ĚK-tō-mě, p. 690)
hemorrhoids (HĚM-róydz, p. 690)
hernia (HĚR-ně-ă, p. 676)
hernoplasty (hěr-ně-ō-PLĀS-tē, p. 676)
herniorrhaphy (hěr-ně-ÖR-ě-fē, p. 676)
ileostomy (īl-ē-ÖS-tō-mě, p. 685)
intussusception (īn-tūs-sūs-SĚP-shūn, p. 672)
lysed (līzd, p. 673)
mucorrhea (mū-kō-RĒ-ă, p. 668)
paralytic ileus (pär-ă-LÍT-ik īL-ē-ūs, p. 672)
peritonitis (pěr-ě-tō-Nī-tīs, p. 680)
photocoagulation (fō-tō-kō-ăg-ū-LĀ-shūn, p. 690)
pilonidal (pī-lō-Nī-dāl, p. 691)
scleropathy (sklěr-ō-pă-thē, p. 690)
steatorrhea (stě-ă-tō-RĒ-ă, p. 681)
volvulus (VŌL-vū-lūs, p. 672)

Disorders of the Abdomen and Bowel

Irritable Bowel Syndrome

Irritable bowel syndrome (IBS) is a functional disorder of gastrointestinal (GI) motility. In the United States more people have IBS than diabetes or asthma, and IBS is a major reason for missing workdays. In North America, IBS is far more common in women than in men.

Etiology

The cause of IBS is unknown, but is currently being researched. At this time it is thought to result from a hypersensitivity of the bowel wall that leads to disruption of the normal function of the intestinal muscles. There is a familial predisposition. Stress, caffeine, and sensitivity to certain foods such as dairy and wheat products seem to trigger IBS in some people.

Pathophysiology

An altered bowel pattern and abdominal pain with bloating are caused by altered motility of the small and large intestines. IBS can occur after a bowel infection, possibly related to changes in intestinal cells and normal GI flora. There is evidence that with IBS there is an abnormality of nerve function in the intestine. The chemical mediator 5-hydroxytryptamine (5-HT), or serotonin, plays a role in bowel motility and visceral sensitivity, and medications altering 5-HT₃ and 5-HT₄ activity have been used in treatment. Research is focusing on the neurohormonal control of the gut for answers to the pathophysiology and treatment of IBS ([Camilleri, 2014](#)).

Signs and Symptoms

IBS is a group of symptoms that together represent the most common disorder in patients who consult gastroenterologists. The three characteristics typical of this disorder are (1) alteration in bowel elimination (either constipation or diarrhea or both); (2) abdominal pain and bloating; and (3) the absence of detectable organic disease. The bloating and abdominal pain usually have a sudden onset with production of flatus. The pattern of bowel dysfunction varies from case to case, and each patient seems to have a unique pattern.

Diagnosis

Diagnosis of IBS is based on clinical manifestations and ruling out the presence of organic bowel disease. Diagnostic criteria include:

- Abdominal pain or discomfort that is:
 - Relieved by defecation
 - Associated with a change in stool frequency and/or consistency
 - Other symptoms that support the diagnosis:
 - **Mucorrhea** (mucus in the stool)
 - Abdominal bloating

No diagnostic testing is recommended unless certain additional “alarm features” are present: weight loss, iron deficiency anemia, or family history of organic GI illness ([Lehrer, 2015](#)).

Diarrhea or Constipation

Treatment and Nursing Management

A thorough general health assessment is conducted along with a focused assessment. Medications for symptom control are prescribed according to the patient's individual symptoms. Drugs that have been used include bulk-forming agents, antidiarrheals, antispasmodics, antidepressants, anticholinergics/sedatives, and mild analgesics to relieve discomfort (Table 29-1). A diet high in fiber also may be prescribed. Bulk forming agents such as Metamucil or stool softeners may be recommended.

Table 29-1
Drugs Commonly Used to Treat Gastrointestinal Disorders

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Antidiarrheals			
Diphenoxylate hydrochloride (Lomotil) Loperamide (Imodium) Opium tincture (Paregoric) Kaolin-pectin combinations (Kaopectate) Bismuth subsalicylate (Pepto-Bismol)	Decrease motility, propulsion, and secretions. Decrease fluid in stool. Bind water; coat mucosa, absorb toxins.	Observe for effectiveness; should be effective within 48 hr. Observe for signs of constipation. Use cautiously in patients with prostatic enlargement; may cause urinary retention. Warn that Pepto-Bismol will make stool black.	Warn that medication will cause dry mouth. Instruct not to take more than recommended dosage; toxicity can occur. With Lomotil, warn not to operate machinery until effect on central nervous system is known. Advise to contact provider if acute diarrhea does not abate within 2 days.
Antiflatulents			
Simethicone (Phazyme, Mylicon, Di-Gel)	Defoaming action disperses gas.	Warn that the drug does not prevent gas formation, but will decrease bloating and discomfort. Gas is expelled via belching or flatus.	Instruct to chew tablets before swallowing.
Laxatives			
Bulk-Forming			
Methylcellulose (Citrucel) Psyllium (Metamucil, Konsyl)	Act like fiber, absorbing water in the bowel and hastening transit time through the bowel.	None specific; monitor effectiveness.	Instruct to take with an 8-oz glass of water to prevent esophageal or bowel obstruction.
Surfactants			
Docusate sodium (Surfak, Colace) Docusate potassium (Dialose)	Facilitate absorption of water by stool by decreasing the surface tension. Enhance secretion of fluid and electrolytes in the bowel.	Contraindicated for patients with signs of intestinal obstruction. Act in 24–48 hr. Used to prevent constipation rather than treat it.	Instruct to take with a full glass of water. Not to be used for more than 1 wk without provider's knowledge.
Contact Laxatives			
Bisacodyl (Dulcolax) Phenolphthalein (Feen-a-Mint, Ex-Lax, Modane) <i>Cascara sagrada</i> and senna (Senokot, Fletcher's Castoria) Castor oil	Act on intestinal wall to increase secretion of fluid and electrolytes into the intestine.	Most act within 6–12 hr to produce a semifluid stool. Bisacodyl is available as a rectal suppository as well as an oral tablet. Phenolphthalein may turn the urine pink. <i>Cascara sagrada</i> and senna may cause a brownish yellow or pink tinge to the urine. Castor oil acts within 2–6 hr. Castor oil should not be used routinely to treat constipation. The unpleasant taste of castor oil can be decreased by chilling or pouring over ice or mixing in chilled fruit juice.	Contact laxatives should be used only for occasional treatment of constipation. They are habit forming, decreasing the natural mechanisms for evacuation. Tablets should not be chewed. Take tablets with a full glass of water. Do not exceed recommended dosage. Take bisacodyl 1 hr after taking antacids or milk. Suppository form may cause burning sensation in the rectum.
Drugs for Inflammatory Bowel Disease (IBD)			
Sulfasalazine (Azulfidine) Mesalamine (5-ASA) Olsalazine (Dipentum) Balsalazide disodium (Colazal)	Sulfasalazine is a sulfonamide antibiotic. Mesalamine is the active agent in sulfasalazine. Olsalazine contains two molecules of 5-ASA. These drugs reduce inflammation in the bowel by suppressing prostaglandin synthesis and the migration of inflammatory cells into the affected area.	May cause muscle aches, nausea, fever, or rash. Complete blood counts needed periodically; can cause agranulocytosis and anemia. Determine whether allergy to sulfonamides exists before administration.	Caution patient to avoid direct sunlight and ultraviolet light to prevent photosensitivity reaction. Advise to use form of contraception other than oral contraceptives; these drugs interfere with their effectiveness. Warn that when used with oral hypoglycemics, an increased hypoglycemic effect may occur. Advise that urine may be tinted orange. GI upset may be minimized by taking drug after meals. Instruct to report rash or sensitivity reaction to provider promptly.
Linaclootide (Linzess)	Guanylate cyclase-C agonist causing increased fluid in the intestine and reduces nerve pain sensitivity	For treating chronic constipation and IBS in patients older than 17 years.	Should be taken in the morning on an empty stomach 30 min before the first meal of the day.
Lubiprostone (Amitiza)	Increases the volume of intestinal fluid, which makes stool easier to pass.	For treating constipation in women older than 18 years. Can cause nausea, diarrhea, and abdominal pain. In rare cases can cause dyspnea.	Teach to take with food and water to decrease side effects. Advise to seek attention immediately if dyspnea occurs.
Infliximab (Remicade)	Monoclonal antibody that neutralizes the activity of tumor necrosis factor-alpha found in Crohn disease; decreases infiltration of inflammatory cells.	Given IV over at least 2 hr. Dose repeated at 2 wk and then q6wk from first dose. Observe for anaphylactic reaction.	May initially cause increased diarrhea. Advise to report nausea, vomiting, abdominal pain, itching, or rash to provider. Need periodic blood counts. Patient should not breast-feed while taking this drug.
Antispasmodics			
Dicyclomine hydrochloride (Bentyl, Antispas) Propantheline bromide (Pro-Banthine) Oxyphenylamine hydrochloride (Daricon)	Block acetylcholine, thereby decreasing smooth-muscle spasm and GI motility and inhibiting gastric acid secretion.	These drugs interact with many other drugs; check each drug patient is taking for interactions. Most of these drugs are contraindicated in glaucoma, prostatic hypertrophy, myasthenia gravis, and other conditions; consult information on each drug individually. May predispose to drug-induced heat stroke. Monitor vital signs and urine output carefully.	Advise to take 30–60 min before meal. Patient can suck on hard candy to relieve mouth dryness unless contraindicated. Have patient drink 2500–3000 mL of fluid to prevent constipation. Warn to avoid driving or hazardous activities if drug causes dizziness, sleepiness, or blurred vision. Teach to report rash or skin eruption to provider.
Hyoscyamine (Levsin)	Inhibits action of acetylcholine at postganglionic receptor sites, decreasing spasm and abdominal pain.	May decrease absorption of antacids and antidiarrheals. May increase effects of anticholinergics. May cause urinary retention. Assess for dehydration; encourage adequate fluid intake.	May cause dry mouth. Instruct to inform provider of rash, eye pain, difficulty in urinating, or constipation. Advise to avoid hot baths and saunas. May initially cause dizziness or faintness; warn to not operate machinery until response is known.

5-ASA, 5-Aminosalicylic acid; GI, gastrointestinal; IV, intravenously.

Gas-forming foods such as legumes and those in the cabbage family should be avoided. Avoiding onions, potatoes, cucumbers, coffee, tea, carbonated beverages, and alcohol can be helpful. Milk is restricted if the patient has shown evidence of intolerance to it. Lactase tablets may be used for lactase deficiency but are not indicated if an allergic sensitivity is present. Gluten intolerance has been identified as a possible trigger for IBS symptoms. Wearing loose clothing is more comfortable if bloating or increased abdominal pressure occurs. Give instruction about medications and diet therapy.

Ineffective coping patterns in response to stress may be present in these patients. Randomized, controlled trials have shown cognitive therapy, psychotherapy, and hypnotherapy help to improve overall symptoms ([Lehrer, 2015](#)). Consultation with a psychiatric nursing specialist can help the staff nurse develop more realistic goals and effective nursing interventions to improve the patient's coping skills.

Focused Assessment

Data Collection for a Patient With Suspected Irritable Bowel Syndrome

For a patient with symptoms suggesting IBS, gather the following data:

History

- When symptoms first began
- Stool pattern: frequency, character of stool
- Presence of bloating and flatus
- Incidence of pain or cramping; location, duration, character
- Pain that awakens the patient at night
- Precipitating factors for cramping or diarrhea
- Known food intolerances
- Methods of self-treatment
- Known stressors
- Methods of coping with stress

Physical Examination

- Presence and character of bowel sounds
- Degree of firmness and tenderness of abdomen
- Location of tenderness
- Appearance of stool

Complementary and Alternative Therapies

Peppermint Oil for the Relief of Abdominal Discomfort

Peppermint oil may provide some temporary relief of abdominal pain for patients with IBS; however, those with gastroesophageal reflux disease (GERD) should avoid this alternative therapy because it can worsen heartburn ([Alam et al., 2013](#)).

Clinical Cues

Having the patient keep a food diary can be very helpful in identifying foods that cause a reaction with bloating and inflammation. If the diary is kept over a period of weeks, a pattern may be established. Food intolerance symptoms may not be evident for up to 4 days after the food is eaten. Sometimes if one food is linked to the symptoms, that food can be simply left out of the diet.

Diverticula

The term **diverticulum** refers to a small, blind pouch resulting from a protrusion of the mucous membranes of a hollow organ through weakened areas of the organ's muscular wall. Diverticula are most prevalent in older individuals and occur anywhere in the intestinal tract, but are found primarily in the colon. When diverticula are present, the patient is said to have **diverticulosis**. The exact incidence of diverticulosis is not known because most diverticula are asymptomatic. It is uncommon in people younger than 50 years and almost universal in those older than 90 years. Increases in intra-abdominal pressure from constipation and straining to defecate, obesity and a low fiber diet appear to be factors in the development of colon diverticula.

Etiology and Pathophysiology

Diverticulitis occurs when the diverticula become inflamed or infected and occurs in about 20% of those affected by diverticulosis. Food particles accumulate in the diverticula, mix with the intestinal bacteria, and can irritate the mucosal wall. The intestinal wall may become infected, and if it is not treated, perforation and peritonitis may occur.

Esophageal diverticula occur when there is herniation of esophageal mucosa and submucosa into surrounding tissue. The disorder is more common in older patients.

Signs, Symptoms, and Diagnosis

A person with diverticulosis may initially be asymptomatic; however, symptoms will develop when inflammation or infection occurs because material has lodged in diverticula. For bowel diverticula, there is usually a history of constipation. There may be rectal bleeding. **Diverticulitis of the intestine produces symptoms of diarrhea or constipation, acute left lower abdominal pain, bloating, nausea, and vomiting. The condition may be complicated by intestinal obstruction or by peritonitis if the intestinal wall ruptures.** If bleeding is massive, there will be hypotension and eventual shock. Computed tomography of the abdomen with colonic contrast is the preferred diagnostic test. Barium enema and colonoscopy should be avoided in acute cases because of the risk of bowel perforation (Shahedi, 2014).

Esophageal diverticula produce symptoms of dysphagia, regurgitation, nocturnal cough, and **halitosis** (bad breath). There is a risk of esophageal perforation.

Think Critically

What is the difference between the signs and symptoms of diverticulitis and those of irritable bowel syndrome?

Treatment and Nursing Management

Diverticulosis often can be managed conservatively. A high-fiber diet, increased fluids and bulk laxatives, or stool softeners to control constipation may be all that are needed.

For diverticulitis, antidiarrheal medication may be prescribed. The role of the LPN/LVN is to reinforce education about the diet, fluid intake, and exercise. Mild pain medication may be used for abdominal discomfort in ambulatory patients. Outpatient treatment may include clear liquids for 2 to 3 days with oral antibiotics. Diet can be advanced as tolerated. In acute cases of diverticulitis or failed outpatient treatment, parenteral antibiotics with intravenous (IV) hydration and bowel rest by placing the patient on nothing-by-mouth (NPO) status for 2 to 3 days may be necessary.

Morphine is acceptable for pain management and has fewer side effects than meperidine (Demerol). In earlier recommendations meperidine was the drug of choice based on a theoretical risk not shown in studies. (Shahedi, 2015)  Recurrent episodes of diverticulitis, or perforation and peritonitis, require surgical removal of the affected part of the colon.

Safety Alert

Meperidine Toxicity

A metabolite of meperidine is toxic, and older adults have difficulty metabolizing and eliminating it. The buildup of the toxin in the blood can cause seizures and other mental status changes such as acute confusion. Ask for an alternate analgesic for these patients.

Nutrition Considerations

Diet for Diverticular Disease

A high-fiber diet is encouraged for patients with diverticular disease. Eating whole-grain cereals and breads and fruits such as apples, seedless berries, peaches, and pears adds fiber. High-fiber vegetables—squash, broccoli, cabbage, and spinach—and legumes, including dried beans, peas, and lentils, provide bulk that decreases constipation and speeds intestinal transit time. Drinking plenty of fluids helps regularity. This diet, combined with exercise to prevent constipation, can usually control diverticular disease. Patients who have recurrent diverticulitis may be instructed to avoid foods with husks, such as peanuts, sunflower seeds, berries with seeds, tomatoes, and popcorn, as a precaution; the husks may get into the diverticulum and irritate it, causing inflammation and eventual diverticulitis. This has not been identified as a risk for diverticulitis and these foods may not need to be restricted.

Intestinal Obstruction

Intestinal obstruction is a sudden or gradual blockage of the intestinal tract that prevents the normal passage of GI contents through the intestines.

Etiology and Pathophysiology

Mechanical obstruction results in blockage of the lumen of the bowel. Examples include tumors, adhesions, strangulated hernia, twisting of the bowel (**volvulus**), telescoping of one part of the bowel into itself (**intussusception**), barium impaction, intestinal parasites, and gallstones. ([Figure 29-1](#)). Abdominal adhesions are a common cause of intestinal obstruction. Adhesions form when inflammation from abdominal trauma or surgery has occurred, and fibrous bands of scar tissue hold together two segments of bowel that are normally separated.

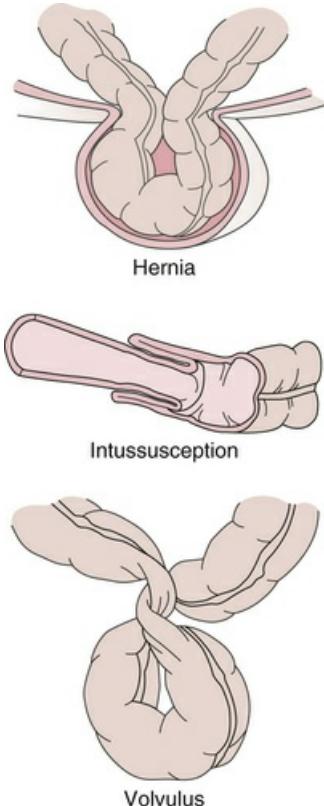


FIGURE 29-1 Mechanical causes of intestinal obstruction.

Nonmechanical obstruction results from the absence of peristalsis. Nonmechanical obstructions may occur as a result of **paralytic ileus** (failure of forward movement of bowel contents) after abdominal surgery, from infection, or as a consequence of hypokalemia. Nonmechanical obstructions may be secondary to intestinal thrombus. Infections can occur in some pelvic inflammatory diseases or peritonitis, in uremia, and in heavy-metal poisoning. All of these conditions can interfere with normal peristaltic action and produce a nonmechanical obstruction.

Older Adult Care Points

Older adults are more prone to the occurrence of volvulus and consequent intestinal obstruction, partially because of decreased muscle tone. Suspect this disorder when an older adult complains of sudden abdominal pain with vomiting, has abdominal distention with a palpable mass, has increased bowel sounds on auscultation, and shows signs of dehydration.

When obstruction occurs, fluid and gas accumulate in the intestine, increasing intraluminal pressure. Peristaltic waves above the obstruction may occur as the intestine attempts to move material down the tract. These waves may cause severe pain.

Signs and Symptoms

The symptoms of intestinal obstruction vary according to the location of the obstruction. Obstructions occurring high in the intestinal tract are characterized by sharp, brief pains in the upper abdomen. Frequent, high-pitched bowel sounds are heard above the point of obstruction, and bowel sounds are absent below the obstruction. Other symptoms include vomiting, with rapid dehydration and only slight abdominal distention. An acute intestinal obstruction in the upper abdomen can cause respiratory difficulty because of the pressure of the distended abdomen against the diaphragm.

Obstructions of the colon are characterized by a more gradual onset, with marked abdominal distention as the bowel fills, vomiting may occur (which occurs late in the process if at all), and **pains that last several minutes or longer and correspond to peristaltic waves**. Fecal odor or material in the emesis suggests a complete intestinal obstruction.

Diagnosis and Treatment

Abdominal radiographs are ordered to locate the obstruction. Insertion of a nasogastric (NG) tube relieves symptoms by decompressing or removing gas, intestinal contents and mucous. The long tube or Miller-Abbott tube has a balloon that is inflated after passage into the pylorus (Figure 29-2). Peristalsis, which is preserved above the blockage, moves the tube to the point of blockage. Use of the long tube has not been shown to be more clinically effective than a standard-length NG tube (Noble, 2014). Surgery is indicated for obstruction caused by adhesions, volvulus, hernia, or tumor. Adhesions are **lysed** (broken apart), a volvulus is untwisted, or a colectomy may be necessary if tumor is involved.

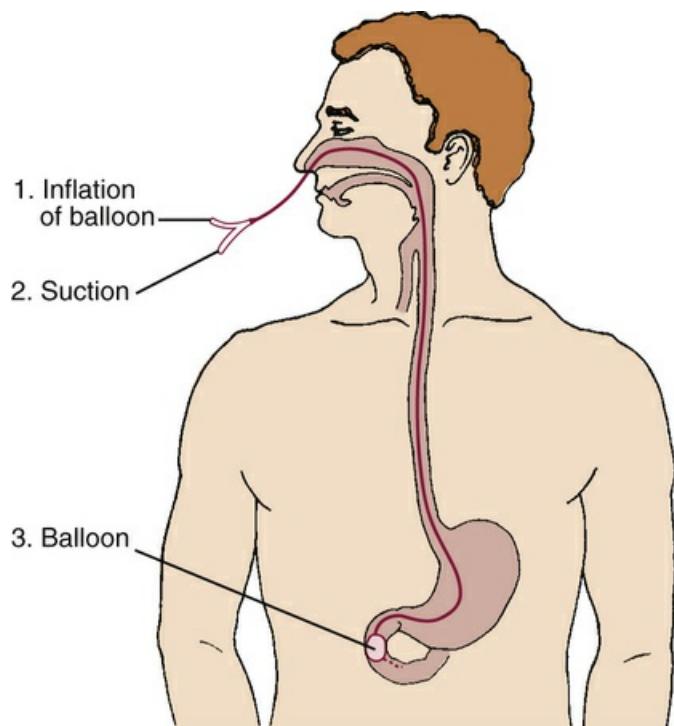


FIGURE 29-2 Miller-Abbott intestinal tube used for decompression. It is advanced through the intestines to the prescribed point. The Miller-Abbott tube has a double lumen and is weighted with tungsten. 1, Portion of the metal tip leading to the balloon. 2, Portion of the metal tip leading to the lumen that can be suctioned. 3, Balloon inflated with air.

Nursing Management

Placing the patient in a Fowler position helps relieve pressure and aids in removing gas and intestinal contents through the intestinal tube. Fluid and electrolyte status must be monitored closely. Measure abdominal girth every 2 to 4 hours by placing the tape at the same location on the abdomen each time. Pain control is essential, but worsening pain may signal an unresolved, intestinal obstruction that can lead to rupture of the intestine, peritonitis, shock, and death. If the obstruction cannot be resolved, surgical correction must be done. Postoperative care is the same as for other abdominal surgery patients (see Chapter 5, Nursing Care Plan 29-1, and Nursing Care Plan 29-2 on Evolve).

Nursing Care Plan 29-1

Care of a Patient Undergoing Colectomy for Probable Colon Cancer

Scenario

Mrs. Simpson, age 58 years, just returned from surgery and has a dressing over a colectomy site.

She has a family history of polyposis of the colon. She had the colectomy because of a malignant lesion in the upper portion of the sigmoid colon. She was NPO before surgery for a variety of tests. She has an IV running at 125 mL/hr and is on a clear liquid diet. She is experiencing pain and receiving morphine by PCA pump. She is very frightened because her father died of colon cancer. She dreads chemotherapy. Mrs. Simpson is a loan officer with a national bank, is very busy, and had put off having a physical examination and sigmoidoscopy until this month, when she noticed some blood in a loose stool. She had experienced some bouts of loose stools but thought these were a result of the stress she was experiencing on her job.

Problem Statement/Nursing Diagnosis

Pain/Pain due to abdominal surgery.

Supporting Assessment Data

Subjective: "I'm still really hurting."

Objective: Colectomy, abdominal incision with wound drain; pain at 7/10.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Pain will be controlled to a level of 3/10 with analgesia during hospitalization.	Initially assess for pain q1-2h or prn using pain scale and document location and characteristics. Monitor use of PCA pump.	Pain scale use provides more objective measure of pain. Frequency of assessment may be changed to q3-4h as condition improves. PCA allows patient better control over pain.	Pain at 2-3 with use of PCA. Using PCA appropriately.
Patient will use relaxation techniques to decrease pain before discharge.	Teach relaxation techniques to decrease anxiety. Provide comfort measures, such as a tidy odor-free room and quiet environment.	Relaxation helps decrease pain. Comfort measures help to decrease the subjective experience of pain.	Taught deep-breathing relaxation exercise. Lights dimmed and linens changed. Patient expresses appreciation. Continue plan.

Problem Statement/Nursing Diagnosis

Potential fluid volume deficit/Risk for deficient fluid volume/nutritional intake due to prior NPO status and colon surgery.

Supporting Assessment Data

Objective: NPO for several days; on clear liquids; IV infusing.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not develop fluid or electrolyte imbalance as evidenced by good skin turgor, moist mucous membranes, and electrolyte studies within normal range.	Assess skin turgor and mucous membranes each shift. Monitor for adequate urine output. Assess for signs of dehydration (i.e., poor skin turgor, decreased amounts of and concentrated urine). Maintain IV fluid flow as ordered. Evaluate tolerance of oral fluids, so diet can be advanced to promote nutritional intake. Monitor electrolyte laboratory values.	Skin and mucous membrane assessment gives indication of fluid status. Adequate urine output indicates adequate intake. If dehydration persists or worsens, the doctor must be notified so that therapy can be adjusted. Provides fluid until the patient has adequate oral intake. GI delivery of nutrition is the most effective and efficient. Laboratory values indicate electrolyte imbalances if they occur.	Mucous membranes moist, good skin turgor. Urine output 600 mL this shift. Voiding pale yellow urine; skin dry, but no tenting. IV flowing at 125 mL/hr. Able to tolerate fluids without nausea or abdominal distention. Laboratory specimens to be obtained in A.M. No signs of electrolyte imbalance. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for infection/Risk for infection due to colectomy and abdominal incision.

Supporting Assessment Data

Objective: Colectomy and abdominal incision with drain.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience wound infection as evidenced by temperature and WBC count within normal range at discharge and wound clean and dry without redness, pain, or purulent drainage.	Assess surgical wounds and adjacent tissues for redness, swelling, warmth, pain, and presence of odors or drainage. Track temperature and WBC count.	Close observation is necessary to identify the beginning of infection in the early phase. Changes may indicate beginning infection.	No redness noted in surrounding tissue. Denies pain or tenderness. Temp 98.8° F (37.1° C); WBC count 9400/mm ³ .
	Reinforce dressings PRN; change every 24h or PRN when ordered. Use strict aseptic technique for dressing changes. Clean skin around incision with ordered solution.	Maintaining sterile intact dressing decreases chance of infection.	Incision clean and dry without redness. Sterile dressing changed using sterile technique.
	Maintain patency of drain.	Draining excess fluids from wound site facilitates healing.	Drain in place; small amount of serous fluid noted.

Problem Statement/Nursing Diagnosis

Potential for bleeding from surgical site/*Risk of bleeding from surgical site.*

Supporting Assessment Data

Objective: Fresh colectomy incision.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not have excessive blood loss as evidenced by stable vital signs and adequate urine output	Assess vital signs per postoperative routine: q30min for 2 hr; q1h for 2 hr; q2h for 4 hr; then q4h until stable.	Vital signs can indicate hemorrhage.	P 86, R 18, BP 136/84.
	Notify provider for change of mental status, tachycardia with increased respirations, or blood pressure 15-20 points below preoperative baseline level; unremitting pain.	Change of mental status is usually the first sign of decreased cerebral perfusion. Tachycardia with increased respirations and falling blood pressure indicates hemorrhage.	Alert and oriented to person, place, and time. Skin is warm, pink, and dry. Vital signs stable.
	Monitor hourly urine output; report if <30 mL for 2 consecutive hours.	Decreasing urine output indicates decreased renal perfusion which can lead to renal failure if prolonged and severe.	Urine output 125 mL over 2 hr.
	Assess dressings for bleeding; check underneath patient.	Postsurgical patients have risk for hemorrhage, and blood can pool underneath the patient.	Dressings dry; no drainage under patient.
	Assess abdomen for increasing girth or rigidity.	Increasing abdominal girth or rigidity could signal internal bleeding.	Abdomen not rigid; girth not increasing. Continue plan.

Problem Statement/Nursing Diagnosis

Anxiety/*Anxiety due to fear of cancer, treatment, and possible death.*

Supporting Assessment Data

Subjective: Father died of colon cancer; expresses fear of cancer and death; dreads chemotherapy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will openly discuss fears and concerns with nurse, family, or provider.	Establish trusting relationship with patient by active listening and attentive caring.	A trusting relationship helps patient express feelings.	Not wanting to talk yet; spent quiet time with patient.
	Assess mood, verbal, and nonverbal behaviors that suggest readiness to talk.	Expressions of anxiety and fear will manifest differently for each patient; therefore therapeutic responses are based on assessment of the behavior (i.e., crying, yelling, demanding, rejecting, withdrawn, flat affect, sad expression).	Is withdrawn and quiet; does not wish to discuss situation until pathology report is back. Sat quietly with patient for 15 min.
	Reassure patient that you are available for future discussions.	Patient needs to know that you are willing to return and support her, regardless of how she initially responds to you.	Continue plan.
	Offer to contact a cancer organization that provides visits from survivors of similar cancers.	Talking with someone that has experienced the same situation allows the patient to be with someone who understands.	Name and telephone number of volunteer given to patient for contact when the patient is ready.
	Offer to contact hospital Chaplin services or individuals of the patient's choice for spiritual support	Many people look to faith based support during times of crisis and find comfort and direction for decision making.	Patient requested her rabbi to be asked to visit her.

Problem Statement/Nursing Diagnosis

Potential altered breathing pattern/*Risk for altered breathing pattern due to anesthesia, analgesia, and postoperative pain.*

Supporting Assessment Data

Subjective: "I don't want to cough."

Objective: Underwent general anesthesia; receiving morphine via PCA; shallow breaths.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not develop atelectasis or pneumonia as evidenced by normal breath sounds in all lobes of lungs.	Assist patient to turn, cough effectively, and deep breathe at least q2h.	Coughing and turning assists with lung expansion.	Coughing and turning q2h. Decreased breath sounds in bases of lungs.
	Monitor for proper use of incentive spirometer.	Incentive spirometer helps prevent atelectasis.	Using incentive spirometer correctly q2h.
	Auscultate lungs every shift. Monitor pulse oximetry.	Auscultation tells whether all areas of the lungs are aerating.	Decreased breath sounds in bases bilaterally; no adventitious sounds. SpO ₂ 98%.
	Assist to get out of bed to sit in chair or ambulate as ordered.	Early mobility improves lung function and decreases complications such as pneumonia.	Able to move, stand, pivot, and sit in chair with one-person assist. Continue plan.

Critical Thinking Questions

1. Why is it significant that Mrs. Simpson has familial polyposis?
2. What should other family members be told? What is the nurse's role in disclosing information?

3. Why is a patient such as Mrs. Simpson likely to have IV therapy ordered?

BP, Blood pressure; CBC, complete blood count; GI, gastrointestinal; I&O, intake and output; IV, intravenous; NG, nasogastric; NPO, nothing by mouth; P, pulse; PCA, patient-controlled analgesia; PRN, as needed; R, respirations; WBC, white blood cell.

Abdominal and Inguinal Hernia

Etiology and Pathophysiology

If there is a defect in the muscular wall of the abdomen, the intestine may break through the defect. This protrusion is called a **hernia** or a *rupture*.

The most common locations for a hernia are in areas where the abdominal wall is normally weaker and more likely to allow a segment of intestine to protrude (Figure 29-3). These include the center of the abdomen at the site of the umbilicus and the lower abdomen at the points where the inguinal ring and the femoral canal begin. A hernia may form at an old abdominal surgical incision. The most common contributing factors in the development of a hernia are straining to lift heavy objects, chronic cough, straining to void or pass stool, and ascites. Inguinal hernias are more common in men. Hernias are classified as **reducible**, in which the protruding organ can be returned to its proper place by pressing on the organ, and **irreducible** or **incarcerated**, in which the protruding part of the organ is tightly wedged outside the cavity and cannot be pushed back through the opening. If the protruding part of the organ is not replaced and its blood supply is cut off, the hernia is **strangulated** or **incarcerated**.

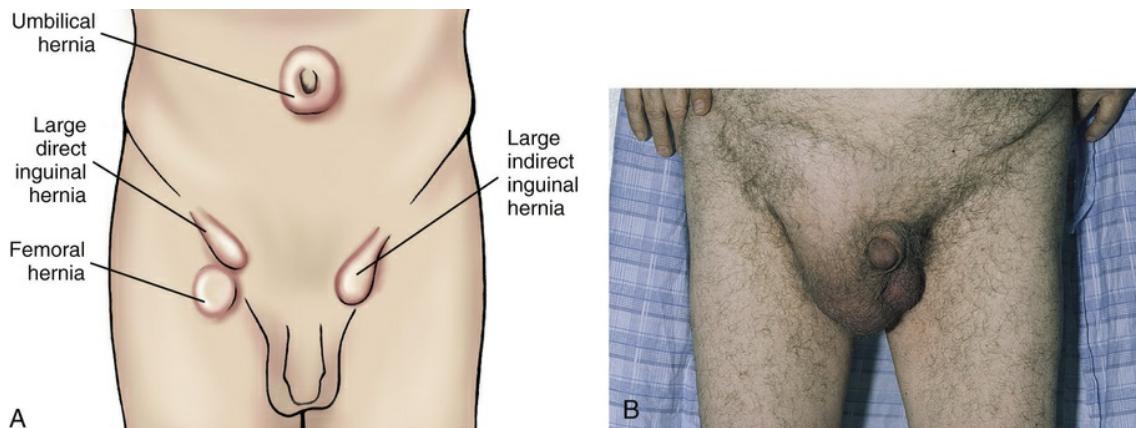


FIGURE 29-3 **A**, Umbilical hernia. **B**, Indirect inguinal hernia. (**A**, From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed 9, St. Louis, 2015, Mosby. **B**, From Swartz MH: *Textbook of physical diagnosis: History and examination*, ed 6, Philadelphia, 2010, Saunders.)

Signs and Symptoms

If the hernia is not incarcerated, there will just be an abnormal pouching, a “lump” or local swelling out from the abdominal wall or in the groin area (inguinal or femoral hernia). When pressure on the abdominal wall is removed by lying down, the swelling disappears. Lifting of heavy objects, coughing, or any activity that puts a strain on the abdominal muscles may force the organ back through the opening, and the swelling reappears.

Some discomfort may accompany the hernia. Pain occurs when the peritoneum becomes irritated or when the hernia is incarcerated or strangulated. The flow of intestinal contents can be blocked by an incarcerated hernia, causing symptoms of intestinal obstruction. **This is an emergency because when the blood supply is restricted, part of the intestine may die.**

Treatment

The surgical procedure used in the treatment of a hernia is called a **herniorrhaphy**. The defect in the muscle is closed with sutures. If the area of weakness is very large, a **hernioplasty** is done. In this procedure, some type of strong synthetic material is sewn over the defect to reinforce the area. The

material used is a mesh product; it has potential for complications because a foreign object is being implanted. Studies show the recurrence of a hernia is significantly decreased with the mesh implant. The procedure can be done on an outpatient basis as an open or laparoscopic procedure. Local or regional anesthesia is used instead of general anesthesia for uncomplicated and minimally invasive cases.

If surgery is not possible because of age or high surgical risk, the patient may be fitted with an appliance called a *truss*, which simply reinforces the weakened cavity wall and prevents protrusion of the intestines. The truss is put on in the morning before the patient gets out of bed because the hernia is more likely to be reduced at that time. It is only a symptomatic measure and does not cure the hernia.

Nursing Management

Care after hernia repair is directed at pain control and preventing recurrence of the hernia. The patient is cautioned not to do heavy lifting, pulling, or pushing that increases intra-abdominal pressure. Postoperative care is similar to other surgical patients (see [Chapter 5](#)).

Careful discharge instructions are given to the patient to prevent problems at the surgical site. Guidelines on signs and symptoms of complications are sent home with the patient, along with a written list of activities to avoid until healing is complete. Lifting restrictions are usually implemented for 1 to 2 weeks, and the patient is instructed to support the site with the hand if coughing or sneezing.

Think Critically

What would you say to a family member who mentions to you that he has a swelling in the groin area and thinks he may have a hernia?

Bowel Ischemia

Bowel ischemia occurs when the blood supply to the bowel is insufficient to support metabolic needs. It can be an acute process with a sudden onset of symptoms or a chronic condition.

Etiology and Pathophysiology

The problem may involve the arterial or the venous blood supply in the form of emboli, thrombosis, or the gradual narrowing and occlusion of vessels. Ischemia can occur as the result of a bowel obstruction or as the result of hypovolemic shock. In 95% of chronic conditions, diffuse atherosclerotic disease of the mesenteric vessels is the source of decreased blood flow. Chronic mesenteric ischemia (CMI) is a rare diagnosis. Most episodes of bowel ischemia result from an acute event.

Acute mesenteric ischemia can result from arterial emboli or thrombosis. Emboli can originate in the heart chambers or plaque inflammation in major vessels, leading to clot formation. Acute events not involving obstruction of blood flow include those that decrease blood flow, such as hypotension, sepsis, or severe liver or renal disease. When blood flow is limited, the gut is bypassed in favor of the brain, heart, lungs, and kidneys so hypotension has more of an effect on the blood flow to the intestines than to other organs.

Signs, Symptoms, and Diagnosis

A careful history is necessary because the symptoms are similar to many other abdominal disorders. The sudden onset of severe abdominal pain signals an acute condition. Nausea, vomiting, diarrhea, and abdominal cramps may also be present. The abdomen is tender to palpation, and the patient will exhibit guarding. Bowel sounds will be minimal or absent. The white blood cell count is likely to be elevated. Computed tomography angiography or magnetic resonance angiography is used to confirm the medical diagnosis.

Treatment and Nursing Management

The patient will be NPO and an NG tube will be inserted to relieve distention. Intravenous hydration is usually ordered, and a Foley catheter may be used to monitor output in the acute phase. Ischemia from an obstructive cause, either thrombus or embolus, may be treated with intra-

arterial infusions of a vascular smooth muscle relaxant at the site of the blockage, or thrombolytic therapy may be used. The standard treatment is IV heparin. If bowel tissue has become necrotic, surgery is indicated.

Inflammatory Bowel Disease

Ulcerative Colitis and Crohn Disease

Inflammatory bowel disease (IBD) includes both ulcerative colitis (UC) and Crohn disease (regional ileitis). UC is an inflammation with formation of ulcers of the mucosa of the colon. It frequently is a chronic disease, and the patient is usually asymptomatic between acute flare-ups. People with UC have a 40% higher incidence of some types of arthritis. Crohn disease is a chronic inflammatory disease that can involve any part of the GI tract but most commonly affects the distal ileum and proximal colon. Both diseases are idiopathic, meaning the cause is not known. There are theories and research being conducted but no proof of a cause.

Etiology

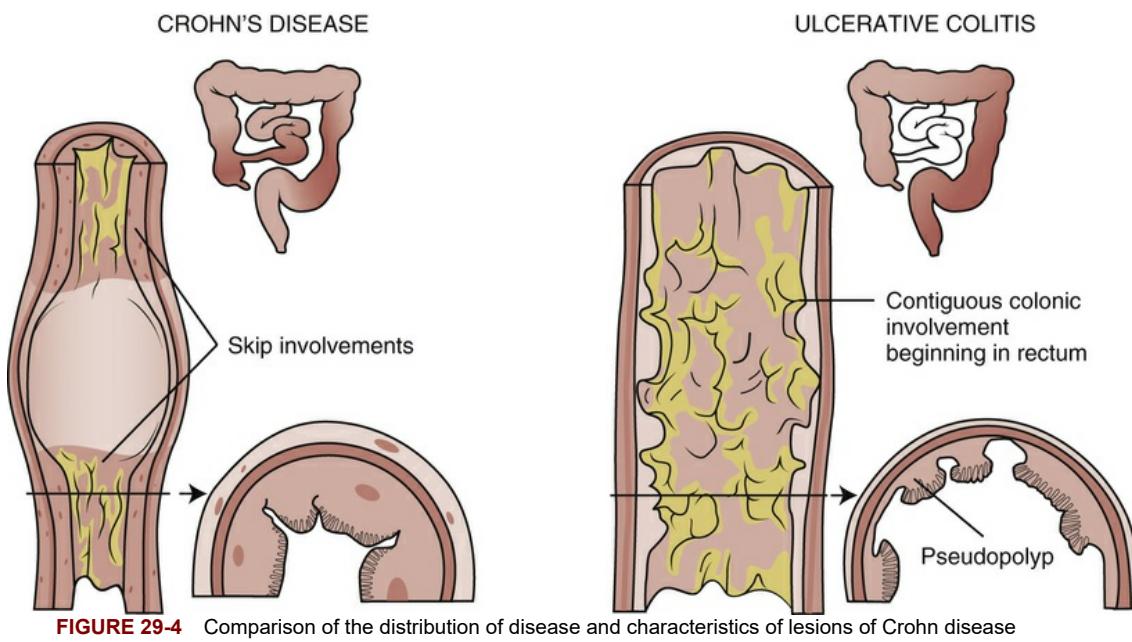
Crohn disease and UC have a genetic predisposition; UC is three times more common than Crohn disease. Both disorders also have an ethnic correlation: they are more common among the Jewish population. Immunologic activity is thought to be involved as well because anticolon antibodies are often present in the blood. With UC, infections and emotional tension often bring about acute attacks.

Pathophysiology

The pathophysiology of IBD is being investigated. It is suspected that UC and Crohn disease are immunologic responses to the same (as-yet-unknown) etiologic agent. The end result is inflammation of the mucosal lining of the intestinal tract, causing ulceration, edema, bleeding, and fluid and electrolyte loss. UC and Crohn disease share many of the same characteristics ([Table 29-2](#)). One difference is that the inflammatory changes in UC are nonspecific, whereas those in Crohn disease are granulomatous (a mass of inflamed tissue characterized by the presence of small granules). Patients with long-standing chronic UC are at 10 to 20 times greater risk for developing cancer of the colon than patients with Crohn disease. The constant inflammation disrupts normal cell function, and cellular mutations may occur. Crohn disease can affect any area of the intestine, although it more often affects the ascending colon and can affect the small intestine ([Figure 29-4](#)). UC typically affects the rectosigmoid and left colon. Changes caused by UC tend to be continuous along the affected portion of the bowel, whereas changes caused by Crohn disease are segmental, leaving healthy sections of bowel in between diseased portions ("skip lesions"). With Crohn disease, radiography reveals a cobblestone appearance to the mucosa.

Table 29-2
Comparison of Ulcerative Colitis and Crohn Disease

	ULCERATIVE COLITIS	CROHN DISEASE
Area affected	Mucosa only; usually involves rectum and proceeds up the colon.	Full thickness of the intestine; most common in small intestine.
Characteristics	Mucosa is red; intestinal wall is edematous and friable, bleeding easily; pseudopolyps are present.	Edematous bowel wall, inflammatory cells, mucosal ulcerations, granulomas, and "skip" lesions (normal areas).
Signs and symptoms	Diarrhea, frequently bloody; abdominal cramping relieved by defecation; rectal bleeding.	Fever, malaise, fatigue, weight loss, intermittent diarrhea, cramping or steady right lower quadrant or periumbilical pain, postprandial bloating.
Complications	Massive hemorrhage; hypovolemia; toxic megacolon (rapid dilation of the intestines); cancer of the colon.	Fistulas, anal fissures, perianal disease, bowel obstruction or perforation.



Signs and Symptoms

Patients with IBD have attacks of diarrhea that may be **bloody and contain mucus; abdominal pain with cramping; malaise; fever; and weight loss**. The color of blood in the stool depends on the degree and rapidity of the bleed. Slow bleeding and oozing will show a black, tarry stool. If diarrhea is frequent, the blood may be more reddish. The stool color is also dependent on where in the intestine the bleeding is occurring. Blood tends to be redder when the bleeding location is lower in the intestine. The bouts of IBD symptoms often are precipitated by events that cause physical or emotional stress. An acute attack can last for days, weeks, or even months, followed by periods of remission extending from a few weeks to several decades. A few patients experience only one attack, and then remain free of symptoms for the rest of their lives. Others have serious intestinal hemorrhage with fluid and electrolyte imbalances.

Safety Alert

Opioids and Anticholinergic Medications

If your patient has ulcerative colitis, opioid medications or anticholinergic medications should be avoided if there is fever, leukocytosis, or worsening symptoms because these medications will further reduce the tone of the colon ([Peppercorn and Farrell, 2013](#)).

Diagnosis

Medical diagnosis of IBD usually is based on the patient's medical history and symptoms. Colonoscopy, flexible sigmoidoscopy, mucosal biopsy, barium enema, and stool analysis may be performed to confirm the diagnosis.

Treatment

Treatment for UC and Crohn disease varies according to severity and frequency of symptoms. Conservative approaches to medical treatment include administration of antidiarrheal drugs, long-term sulfasalazine therapy, and medications to relieve abdominal cramps. The recommended diet consists of low-fat, low-fiber foods that are high in protein and calories. Small frequent feedings are best. Lactose avoidance helps some patients. Corticosteroids are used for moderate to severe cases to decrease the inflammation. During acute attacks, fluid replacement may be necessary. Blood transfusions are given when anemia is present. Oral 5-aminosalicylic acid (5-ASA) derivatives, such

as olsalazine sodium (Dipentum), are useful for those patients who cannot tolerate sulfasalazine (see [Table 29-1](#)). Budesonide (Entocort) is used to help control disease in the ileum. Patients with advanced disease who are not surgical candidates may be given azathioprine, 6-mercaptopurine, methotrexate, levamisole, or cyclosporine to help control the disease ([Rowe, 2015](#)).

Infliximab (Remicade), a monoclonal antibody against tumor necrosis factor, has greater than 80% response rate for Crohn disease, but only about a 50% success rate with UC. The drug is extremely expensive and is given IV by a set protocol. Certolizumab pegol (Cimzia) is a drug for patients with moderate to severe Crohn disease who have not responded to conventional treatments.

Surgical intervention is an alternative treatment for some patients. The surgical procedure usually involves removing the affected portion of the bowel, often by proctocolectomy, and creating an ileostomy. A patient with UC may be a candidate for an ileal reservoir (Kock pouch) or an ileoanal anastomosis rather than a standard ileostomy. Both of these procedures allow the patient control over the discharge of wastes from the reservoir, and consequently a collection pouch is not necessary. The patient uses a catheter to empty the reservoir after the Kock procedure. With an ileoanal anastomosis, the patient retains control over the anal sphincter with voluntary defecation. These procedures are not usually performed for Crohn disease because as the disease progresses, the area of the reservoir becomes involved.

❖Nursing Management

■ Assessment (Data Collection)

A complete health assessment is performed with particular attention to nutritional, fluid, and electrolyte status. A thorough abdominal assessment is performed, identifying pain location.

■ Nursing Diagnosis and Planning

Problem statements/nursing diagnoses might include:

- Acute or chronic pain due to intestinal inflammation.
- Fluid volume deficit due to diarrhea fluid loss.
- Diarrhea.

Other problem statements are listed in [Table 27-2](#). Specific NANDA-I nursing diagnoses are chosen from the NANDA-I list (see inside back cover).

Expected outcomes might include:

- Patient's pain will be controlled with analgesia within 8 hours.
- Patient will regain fluid balance within 24 hours.
- Patient will experience decreased number of diarrhea bowel movements within 24 hours.

Long-term goals are to help the patient adhere to the prescribed regimen, develop effective coping mechanisms, and participate in prescribed psychotherapy.

■ Implementation and Evaluation

For an acute attack of IBD, care includes monitoring the number and character of stools, periodic auscultation of bowel sounds, measurement of intake and output, and daily weight measurement. Check for signs of internal bleeding and monitor laboratory data for evidence of electrolyte imbalances and anemia. Indicators of successful therapy include a decrease in abdominal cramping and discomfort and return of typical bowel pattern.

❑ Think Critically

Can you describe three key differences between Crohn disease and UC?

Appendicitis

Etiology and Pathophysiology

Appendicitis is an inflammation of the appendix, which is a blind pouch and is therefore easily infected by bacteria passing through the intestinal tract.

Signs, Symptoms, and Diagnosis

Pain in the lower right side, halfway between the umbilicus and the crest of the ileum at McBurney point, is the best-known symptom of appendicitis. It is usually accompanied by muscle guarding. However, the location of the pain may—and often does—vary among individuals. The patient may rest with the right thigh drawn up. Extending the leg causes pain. **A slight temperature elevation (1° F), nausea and vomiting, and an increase in the white cell count also are characteristic of appendicitis.** Oral contrast-enhanced computed tomography (CT) scan or ultrasound are used for diagnosis. Concerns about radiation exposure have made ultrasound the preferred imaging technique. CT is used if the ultrasound is negative or inconclusive. Ultrasound should be used to make the diagnosis if the patient is pregnant ([Craig, 2014](#)). Laboratory testing may be performed to rule out other causes of the presenting symptoms.

Treatment

Appendicitis is treated by surgically removing the appendix (**appendectomy**). This procedure may be performed laparoscopically or require an open laparotomy. Patients may be observed for 6 to 10 hours if there is no immediate need for surgery. Before surgery, the patient is NPO. If an abscess is present, IV antibiotics may be given for several days or weeks before appendectomy is performed. If the infection is widespread immediate surgical intervention is indicated. **Under no circumstances should laxatives be given when appendicitis is suspected because of the increased risk for rupture.**

Safety Alert

Cold, Not Heat, for Appendicitis

Never use heat to relieve abdominal pain if appendicitis is suspected. Heat might bring enough blood and fluid to the appendix to cause it to rupture and cause peritonitis. An ice bag may be placed on the abdomen to slow down the inflammation and thus prevent rupture of the swollen and inflamed appendix.

The patient is usually encouraged to be out of bed within several hours of surgery, if there are no complications. The patient undergoing an uncomplicated laparoscopic appendectomy may be discharged the same day after an adequate anesthesia recovery period. The convalescent period is usually uneventful, and the patient may return to her former activities within 1 to 2 weeks. Recovery from an open laparotomy takes 2 to 4 weeks.

Nursing Management

Assess for nausea, determine pain level, take vital signs, and check the abdomen for rigidity that might indicate a ruptured appendix. A diet history for the previous 24 to 48 hours is obtained to help determine whether food poisoning is a cause of the symptoms. Date and character of the last bowel movement and usual bowel pattern are obtained. Common problem statements are listed in **Table 27-2**. Preoperatively, *Pain* is the primary problem. Postoperatively, pain control and prevention of infection at the surgical site are nursing priorities.

Older Adult Care Points

Peritoneal inflammation does not necessarily cause abdominal rigidity in older adults. These patients often have only diffuse abdominal pain, malaise, and weakness. Confusion may be present, and older adults have an increased risk for falls.

Peritonitis

Etiology

Peritonitis is an inflammation of the peritoneum. It usually occurs when one of the organs it encloses ruptures or is perforated so that the organ's contents (including bacteria) are spilled into the abdominal cavity. Examples of common causes of peritonitis are ruptured appendix; perforated

duodenal or gastric ulcer; ruptured ectopic (tubal) pregnancy; diverticulitis with perforation; and traumatic rupture of the colon, spleen, or liver. Patients receiving peritoneal dialysis have a constant risk of developing peritonitis from pathogens entering the abdominal cavity via their dialysis catheter.

Pathophysiology

As the peritoneum becomes inflamed, there is local redness and swelling of the membrane and production of serous fluid that becomes increasingly purulent as the bacteria multiply. Normal peristaltic action of the intestines slows or ceases, and symptoms of paralytic ileus occur.

Signs and Symptoms

The patient experiences nausea, vomiting, and severe abdominal pain and distention. Fever, chills, tachycardia, and pallor occur, and other symptoms of shock may emerge. Unless the condition is treated promptly and successfully, peritonitis can be fatal.

Diagnosis and Treatment

Diagnosis of peritonitis is by history, physical examination, and results of a complete blood count (CBC). A CT scan of the abdomen may be performed to rule out structural problems or tumor. Broad-spectrum antibiotics are given IV, IV fluids and electrolytes are administered to restore a normal balance, and gastric or intestinal decompression is initiated to relieve distention. Surgical procedures needed to repair a ruptured organ are performed as soon as the patient's condition will permit. Complex situations may require multiple surgical interventions. The abdominal incision may be closed temporarily to protect from contamination. In some cases the wound may be left open with packing and dressings as the only covering.

Nursing Management

Frequent assessment and prompt and accurate reporting of unexpected changes in condition are required. The patient is usually placed in the semi-Fowler position to facilitate breathing, prevent respiratory complications, and aid in localizing the purulent material in the lower abdomen or pelvis. Vital signs are taken and recorded as frequently as every 15 minutes during the critical stage. If vomiting occurs, the characteristics and amount of vomitus are noted. Pain management is also important because this is one of the primary presenting symptoms.

A common complication of peritonitis is paralytic ileus. Auscultate at least once a shift for the return of bowel sounds. If the patient passes flatus or feces rectally, this should be recorded on the chart because it indicates return of peristalsis.

Because of the high fever and toxicity that accompany peritonitis, the patient may be delirious or disoriented and must be protected from self-injury. This includes putting side rails up, activating the bed alarm, or having someone at the bedside at all times. The patient should be turned **very gently** and moved in the bed with care because of extreme tenderness in the abdominal region. A high fever and the presence of a gastric tube demand frequent mouth care to protect the lips, prevent halitosis, and cleanse the mouth.

Malabsorption

Etiology and Pathophysiology

Many disorders interfere with the normal absorption of nutrients, water, and vitamins from the intestine. Adult celiac disease (**sprue**), in which the patient cannot properly metabolize gluten (a protein found in all wheat products, barley, and rye), is one cause. Lactose intolerance is another cause because it results in diarrhea. Pancreatic disease with interference in secretion of pancreatic digestive enzymes also causes malabsorption. Some patients who have undergone chemotherapy for treatment of cancer experience alteration of the intestinal mucosa that causes malabsorption. **Whatever the cause, malabsorption creates a nutritional deficiency.** Pathophysiologically, there is irritation of the intestinal mucosa and consequent diarrhea. Both problems limit the ability of the intestine to absorb nutrients.

Cultural Considerations

Lactose Intolerance

Lactose intolerance is most common in Native Americans, African American, Hispanic, and Asian populations, but it can affect people at any age and any ethnicity. It is caused by lack of the enzyme lactase, which is needed to digest lactose. Assess for bloating, flatulence, cramps, and loose stools or diarrhea after consuming milk or milk products.

Signs, Symptoms, and Diagnosis

A key sign of fat malabsorption is **steatorrhea**, or passage of stool that is bulky, frothy, and foul smelling and usually floats in the toilet. Other signs and symptoms include weight loss, weakness, and various signs of vitamin deficiency, depending on the type of malabsorption the patient is experiencing. Diagnosis is by history, upper and lower GI series, and endoscopy with biopsy. Gluten intolerance is diagnosed by blood tests for gluten antibodies and small bowel biopsy.

Clinical Cues

If your patient is to undergo testing for gluten intolerance, she must eat wheat and gluten products for a minimum of 2 weeks before testing. The gluten load should be the equivalent of 2 slices of bread per day; otherwise, the tests will not be accurate.

Treatment and Nursing Management

Treatment is directed at the underlying cause. Pancreatic insufficiency can be treated by administering pancreatic enzymes with meals. Celiac disease is treated by completely omitting gluten from the diet. Lactose intolerance is treated primarily by diet adjustment, limiting intake of lactose. Lactase enzyme preparations are available over the counter and relieve symptoms in some patients. Nursing management consists of supporting the patient through the diagnostic process and reinforcing teaching about diet and medications. The patient is often required to take supplements of vitamins and minerals as a lifetime therapy.

Cancer of the Colon

Cancer of the large intestine, also called colorectal cancer, is the third most common malignancy in both men and women in the United States. Certain forms of colon cancer have been identified as having a genetic link and definitely show a familial tendency for occurrence. Approximately 93,090 colorectal cancer cases were expected to occur in 2015 ([American Cancer Society, 2015](#)). Colorectal cancer is one of the most preventable and curable of all cancers if it is found in the early stages, and mortality rates have fallen over the last 30 years as detection has become easier. *Healthy People 2020* objectives include the reduction of deaths by colorectal cancer and a decrease in the incidence of invasive^E colorectal cancer.

Cultural Considerations

Colorectal Cancer Incidence

Colorectal cancer incidence is highest in African American men and women. Mortality rates in African Americans also are higher than in the white population. It is not certain whether this is because of limited access to health care or other reasons. Always assess an African American older than 40 years for risk factors and signs and symptoms of colorectal cancer. Encourage annual screening after age 50 years. High-risk patients need individualized counseling for screening and follow-up ([American Cancer Society, 2015a](#)).

Etiology

The cause of colorectal cancer has not been established but is generally believed to be a mutation of

a naturally occurring process of colon tissue repair and replacement. The disease mainly occurs in people older than 50 years, although there is a type that occurs in young people. People most at risk include those with disorders of the intestinal tract, especially UC and familial polyposis. Other risk factors are smoking, alcohol consumption, physical inactivity, obesity, and a diet high in saturated fat and/or red meat, as well as inadequate intake of fruits and vegetables (American Cancer Society, 2015a).

Nutrition Considerations

The Colon and Conjugated Linoleic Acid

In research studies with animals, conjugated linoleic acid (CLA) was found to have a protective effect against inflammation-induced colon cancer. Human studies have found that the action of CLA in modifying the immune response decreased symptoms in patients with IBD. CLA is found in high-fat nonpasteurized dairy foods, grass-fed beef, and lamb with a diet supplemented by safflower oil (Bassaganya-Riera et al., 2012).

Health Promotion

Colon Cancer Preventive Measures

Preventive measures include a diet that is high in fiber and low in red meat and animal fat. Nutrients that offer protection against colon cancer are fiber, calcium carbonate, selenium, and vitamin C.

Pathophysiology

The cancerous tumor tissue may be polypoid, protruding into the bowel lumen, or it may be annular and extend around the bowel, causing stricture. Most large bowel tumors are adenocarcinomas and are believed to arise from adenomatous polyps that visibly protrude from the mucosal surface of the bowel. The tumor may spread into adjacent structures or via the lymphatics or the bloodstream.

Complementary and Alternative Therapies

Aspirin, Folic Acid, and Calcium

Some studies suggest that polyp formation can be reduced by taking a baby aspirin each day and diet supplementation with folic acid and calcium. A diet high in fruits, vegetables, and whole grains and adequate exercise are still the recommendations for maintaining colon health (American Cancer Society, 2015a).

Signs and Symptoms

In the early stages, symptoms are typically mild and vague and depend on the location of the tumor and the function of the affected area. Weight loss may be the first sign. Later signs of colorectal cancer are the result of obstruction of the bowel and extension of the growth to adjacent structures.

Any change in bowel habits, either diarrhea or constipation, could be a sign of colon cancer (American Cancer Society, 2015a).

Other symptoms include red blood in the stool, black tarry stools, change in stool shape (ribbonlike stool), abdominal distention without weight gain, sensation of incomplete evacuation after a bowel movement, and anemia resulting from intestinal bleeding. Abdominal pain and a sensation of pressure in the lower abdomen or rectum usually are present. Digital examination may reveal a mass in the anus.

Diagnosis

Screening tests include an annual stool guaiac test or fecal immunochemical test or stool DNA test

(the ideal frequency for the DNA test is undetermined). Beginning at age 50 years, flexible sigmoidoscopy is recommended every 5 years, colonoscopy every 10 years, double contrast barium x-ray every 5 years, or CT colonography (virtual colonoscopy) every 5 years. Colonoscopy is recommended if any of the screening tests are positive ([American Cancer Society, 2015a](#)). If adenomatous polyps are discovered early and removed, colon cancer could be prevented. Tumors of the rectum or lower sigmoid colon are seen by proctosigmoidoscopy. Transrectal ultrasound may be used to determine the extent of a small rectal lesion. Carcinoembryonic antigen (CEA) is elevated in 70% of patients with colorectal cancer, but because it is nonspecific to this type of cancer, it is mainly used to monitor the effectiveness of treatment.

Treatment

Treatment of colorectal cancer usually involves surgical removal of the affected portion of the intestine. Reconnection of the remaining intestine portions (**anastomosis**) is done if the lesion is small and localized (**hemicolectomy**). Alvimopan (Entereg), may be used short term to speed the healing process of the bowel in cases when there is resection and anastomosis. Larger tumors are treated by excising the affected portion of the colon. Occasionally, a surgically created opening on the abdomen (**colostomy**) is needed to provide for elimination of fecal matter. A permanent colostomy is rarely needed for cancer of the colon. After healing takes place, the colon is reconnected.

Most tumors are resected with an open approach, but laparoscopic surgery is an option for a small, localized tumor. Further treatment depends on the stage of the cancer—whether the tumor is through the bowel mucosa, through the bowel wall, or affecting lymph nodes or has metastasized to other organs.

Coleectomy or hemicolectomy.

Coleectomy is the removal of the diseased portion of the colon. The remaining ends of the colon are reattached (anastomosed). **Hemicolectomy** is removal of one half of the colon.

Abdominoperineal resection.

Abdominal resection is performed for cancer in the rectum or low sigmoid colon. It is a very extensive surgical procedure in which part of the colon and the entire rectum, anus, and regional lymph nodes are removed. Both an abdominal and a perineal incision are necessary for this procedure. Because of the nature of the surgery, a permanent colostomy is necessary.

Adjunctive treatment.

Preoperative, intraoperative, or postoperative radiation and chemotherapy may be given for cancer of the rectum. Use of radiation or chemotherapy for colon cancer depends on the stage of the tumor and the presence of metastasis. These therapies may be used preoperatively to shrink a mass so it is more easily addressed surgically. When metastasis is present, the patient is usually treated with 5-fluorouracil (5-FU) with or without leucovorin (folic acid). Oxaliplatin (Eloxatin) is used with 5-FU and leucovorin for treatment-resistant tumors. Intra-arterial chemotherapy may be directed into the liver if metastasis has occurred. Two other drugs may be used as well. Bevacizumab (Avastin) is an antiangiogenesis medication that reduces blood flow to the growing tumor cells, depriving them of nutrients needed for replication. Cetuximab (Erbitux) and panitumumab (Vectibix) are monoclonal antibodies that bind to protein to slow cell growth. Both are used with other chemotherapy drugs. Irinotecan (Camptosar) is available to treat recurrent colon cancer. Capecitabine (Xeloda) is given orally when the tumor has not penetrated the colon wall.

Nursing Management

An abdominal assessment is performed. Questions are asked regarding bowel pattern and changes, diet pattern, and amounts of red meat and charred or grilled food usually eaten. Determine the amount of alcohol consumption and the degree of cigarette smoking. Assess for a family history of colon cancer. Check diagnostic test results such as the CBC for anemia, liver enzymes, and amylase for signs of possible metastatic involvement of the liver or pancreas.

The patient is likely to be very anxious once a diagnosis of colon cancer has been made. Before surgery, focus on the preoperative care and what the patient needs to be taught. Cover what to

expect and provide information about postoperative care. [Nursing Care Plan 29-1](#) describes postoperative care of a patient who has had abdominal surgery with a colectomy.

Health Promotion

Quadrivalent human papilloma virus (HPV) vaccine is FDA approved for use in prevention of anal cancer. HPV is associated with about 90% of anal cancer in homosexual males ([Cagir, 2014](#)).

Common problem statements are located in [Table 27-2](#), but diagnoses specific to cancer (see [Chapter 8](#)) are also relevant. The patient will experience multiple physical and psychological challenges through the diagnosis and treatment process; if interventions are not working, the plan should be changed.

Ostomy Surgery and Care

In an ostomy procedure, an abdominal incision is made, and either the colon (**colostomy**) or the ileum (**ileostomy**) is brought to the outside to drain fecal material.

Colostomy

A colostomy may be required after a colectomy. The colostomy may be permanent or temporary. For a temporary colostomy, the patient will have surgery later for anastomosis of the open ends.

Types of Colostomies

Colostomies are identified by their location and whether one or two lumens are visible. Transverse colostomies may be a **loop colostomy** or **double-barreled colostomy**. Usually these techniques are used when there are plans for reversing the colostomy. Colostomies are also located on the ascending and descending colon and can be double lumen or single lumen. Single opening colostomies are called **single-barreled** or **end colostomy**. **Sigmoid colostomies are the most common location.**

Think Critically

What do you think might be psychological concerns for a person who is to have a colostomy?

Loop colostomy.

During surgery, a loop of the colon is brought through an abdominal incision and onto the surface of the body. An open or laparoscopic approach is used. The colon is transected and the edges sutured to the abdominal skin (Figure 29-5).

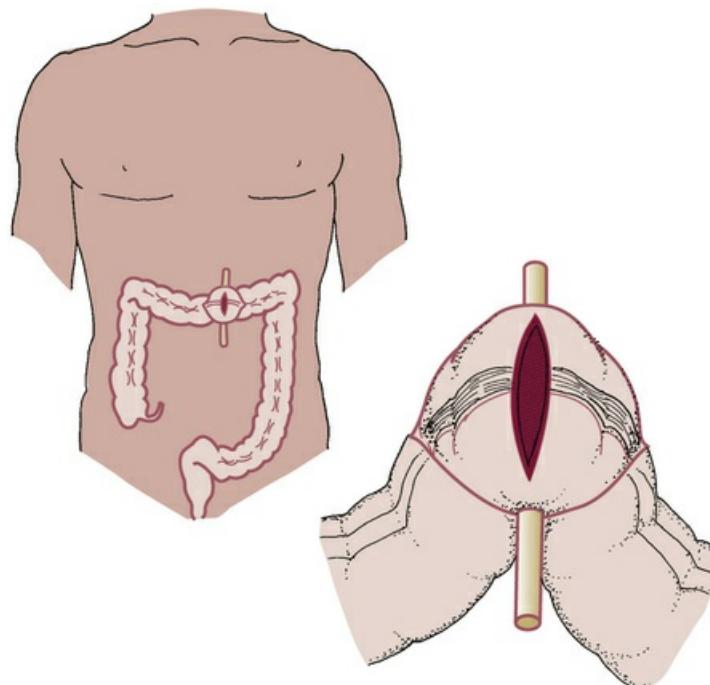


FIGURE 29-5 First stage of loop transverse colostomy. A segment of transverse colon is brought out through the abdominal wall and supported by a bridge. A slit in the bowel allows feces to drain from the proximal colon. The support is removed 5 to 7 days after surgery or when the bowel adheres to the abdominal wall.

An appliance for collection of fecal material is attached over the entire exposed colon.

Double-barreled colostomy.

In a double-barreled colostomy, there are two separate stomas (Figure 29-6). The loop of intestine is completely severed, creating a **proximal stoma** and a **distal stoma**. The proximal stoma is the one closer to the small intestine, so fecal material passes through it to the outside. The distal stoma leads to the rectum and should discharge only small amounts of mucus. The distance between the stomas varies; if they are too close together, it is difficult to get a good seal for the collection device around each one. Eventually the colon ends will be reattached.

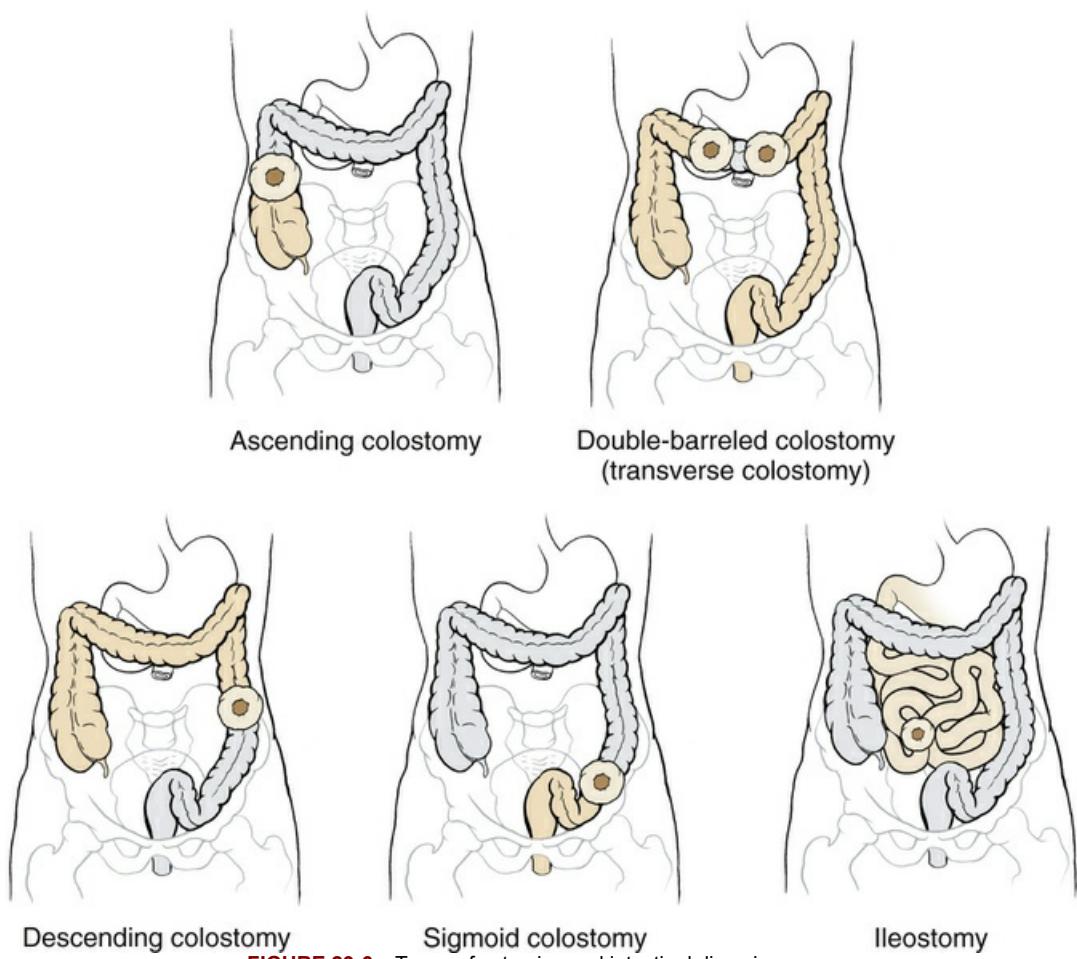


FIGURE 29-6 Types of ostomies and intestinal diversions.

Single-barreled or end colostomy.

There is only one stoma in a single-barreled colostomy. The end is brought to the abdominal surface, **effaced** (cuffed over itself), and sutured to the skin, making what is called a *surgically matured stoma*. If the colostomy is temporary, the remaining portion of bowel and rectum are left intact. If the colostomy is permanent, an abdominal perineal resection may be performed to remove the freed bowel, anus, and rectum, or the end of the bowel is closed and returned to the abdomen. It will continue to produce mucous and expel it from the anus.

Colostomy Locations

An ascending colostomy is one in which either one end or a loop of a portion of the ascending colon is brought to the surface of the abdomen to form a stoma. The stool from an ascending colostomy is thus watery and unformed.

An ascending colostomy usually is temporary and is performed to allow the bowel distal to the ostomy to rest and heal. This is sometimes necessary for patients with IBD, to reconstruct an

intestinal birth defect, or for patients who have experienced an intestinal tear from trauma. After the rest and healing period, the surgeon will replace and reattach the intestine ends, and fecal material can be defecated normally.

A transverse colostomy is situated toward the middle of the abdomen (location of transverse colon). This kind of colostomy usually is temporary. The stool from a transverse colostomy is soft and is discharged unpredictably.

A sigmoid (descending) colostomy is located on the surface of the lower quadrant of the abdomen (see [Figure 29-6](#)). It is the most common type of permanent colostomy and usually is done to treat cancer of the rectum. The stool from a sigmoid colostomy is more solid and well formed and may be discharged no more often than once a day or every 2 days. It is therefore much easier to establish a pattern of evacuation to control the flow of fecal material through a sigmoid colostomy.

Ileostomy

An [ileostomy](#) is performed to drain fecal material from the ileum. It is indicated when disease, congenital defects, or trauma require bypassing the entire colon. The most common indications for ileostomy are chronic IBD, such as UC and Crohn disease; malignancy; and the presence of many polyps in the colon (multiple polyposes). The latter disease is hereditary, and the polyps have a high potential for malignancy.

The site for the stoma of an ileostomy must be carefully selected so that it is not near any bony prominences, folds of skin, or scars and is in a place where the patient can see it and care for it (see [Figure 29-6](#)). The stool from an ileostomy is liquid, and although digestion is completed by the time the fecal material reaches the stoma, it still contains digestive enzymes that are highly irritating to the skin. Skin protection is very important for long-term management.

Surgeons may choose from several techniques to create an ileostomy. The pouch ileostomy or continent ileostomy frees the ileostomy patient from the need to wear a collection device. A small segment of the ileum is looped back on itself to form a pouch (Kock pouch), and a nipple effect is created ([Figure 29-7, A](#)). Pressure from the accumulating feces closes the nipple valve, preventing constant drainage through the stoma. The patient empties the pouch every 3 to 4 hours during the day by inserting a catheter into the stoma.

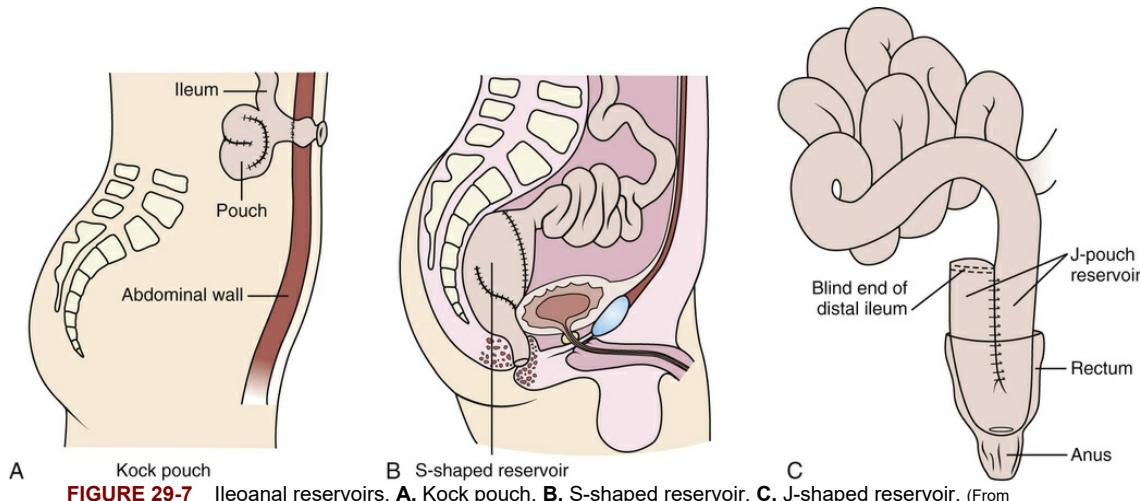


FIGURE 29-7 Ileoanal reservoirs. **A**, Kock pouch. **B**, S-shaped reservoir. **C**, J-shaped reservoir. (From deWit SC: *Fundamental concepts and skills for nursing*, ed. 2, Philadelphia, 2005, Saunders.)

Not every patient can be treated by this surgical technique. It has some disadvantages and must be performed by a surgeon skilled in the procedure. Among those who are not good candidates for a continent ileostomy are patients with chronic inflammatory disease, because the disease tends to recur. Another consideration is the patient's potential for self-care; a catheter must be inserted for periodic drainage of the Kock pouch, and the patient must be able to understand instructions and perform self-care. A third contraindication is related to previous surgery. Patients who have had a conventional ileostomy cannot have a continent ileostomy done if they have less than 29 mm of terminal ileum remaining. This much is needed to construct the nipple valve.

The preferred procedure for UC is the creation of a pouch from the terminal ileum; the pouch is sutured directly to the anus (**ileoanal pouch**). The anal sphincter is left intact and functional. It is a two-stage surgical procedure in which a loop ileostomy is performed and then is closed 3 or 4 months later, when healing is complete. The reservoir may be S-shaped or J-shaped (see [Figure 29-7, B and C](#)). Most patients then have three to eight bowel movements a day. Slight fecal incontinence may be a problem, particularly at night. This procedure is performed only on those patients younger than 55 years who do not have any anal sphincter deterioration. The mucosa is stripped from the small segment of the rectum that is retained to prevent recurrent UC. "Pouchitis" occurs in about 29% of patients and tends to be recurrent. A course of metronidazole (Flagyl) may adequately treat pouchitis. Otherwise, alternate antibiotics and/or steroids are used.

Although not every patient needing an ileostomy can have a continent ileostomy, it is a safe and effective procedure for many. It eliminates the need for an external appliance, is a more natural way to handle waste, greatly reduces fear of embarrassment from leakage of gas and feces, and minimizes peristomal skin problems.

Preoperative Nursing Care

Before surgery of the large intestine, fecal material is removed from the colon. To accomplish this, the patient usually takes oral laxatives the night before surgery and ingests only clear liquids. An enema may also be indicated. In certain cases oral antibiotics may be started.

The contents of the stomach are removed by inserting an NG tube and connecting the tube to a suction apparatus in the operating room. The tube may be left in place after surgery to remove accumulations of mucus and gas that may cause distention and strain on the sutures, but is usually removed in the operating room or recovery room. Postoperative ileus occurs in approximately 5% of patients, in which case the tube is replaced.

❖Nursing Management

■ Assessment (Data Collection)

The immediate postoperative care for a patient who has had intestinal surgery is the same as for other patients having major abdominal surgery. Frequent assessment of vital signs, surgical site, bowel sounds, and IV site is conducted. The patient is assessed for nausea and treated in the early postoperative period because vomiting places a strain on suture lines. Intake and output are tracked, and fluid balance is assessed.

Psychosocial assessment postoperatively focuses on the patient's perception of her altered body image; the meaning of the altered body part; her usual and current coping skills, emotional state, support systems, and presurgery lifestyle; and her perception of physical prognosis and its effect on her life.

■ Nursing Diagnosis and Planning

Problem statements/nursing diagnoses concerning the surgical procedure are similar to abdominal surgery (see [Nursing Care Plan 29-1](#); see also [Table 27-2](#)).[©] Nursing Care Plan 29-2 (on Evolve) presents problem statements/nursing diagnoses and expected outcomes for a patient with an ostomy.

■ Implementation

The patient is started on liquids when tolerated, and the diet is slowly advanced. Early feeding encourages peristalsis in the gut, decreasing ileus.

▣ Complementary and Alternative Therapies

Chewing Gum Postoperatively

"Current best evidence suggests that chewing gum should be offered to selected patients with the intent of decreasing^Q postoperative ileus" ([Keenan, 2014](#)).

The passing of gas, liquids, or solids through the rectum (or stoma) is an indication of active peristalsis. Observe patients carefully for evidence of the return of peristalsis, and chart it in the medical record. The IV site, fluids, and electrolyte levels are monitored very carefully because the patient is especially prone to fluid and electrolyte imbalances. Pain assessment is ongoing, and the effectiveness of analgesia should be assessed after administering pain medication.

Think Critically

How does the effluent from a transverse colostomy, from a sigmoid colostomy, and from an ileostomy differ?

Care of the stoma.

The stoma is inspected for a normal pink or deep red color, which indicates adequate blood supply. It should look like healthy mucous membrane such as that inside the mouth. Later, the stoma will shrink in size and may be less highly colored. There may be slight bleeding around the stoma and its stem, but any more than slight bleeding should be reported. Most collection devices are transparent, so checking for color and bleeding does not require removal of the appliance. Dark purple or black stoma color should be reported immediately. The skin around the stoma is assessed for irritation or signs of breakdown.

Observe the stoma for signs of edema. In the early postoperative period, the stoma will be slightly edematous and larger than it will be after complete healing has taken place. Stoma edema can be caused by a collection device whose opening is too narrow to accommodate the stoma. The opening of the collection device should be at least $\frac{1}{8}$ -inch larger than the circumference of the stoma. There are a variety of appliances available, one- and two-piece devices. The two-piece systems allow for changing the collection bag without removing the appliance from the skin. This allows for direct visualization of the stoma.

Fecal output from the colostomy stoma does not occur for 2 to 4 days, because of the preoperative bowel evacuation and clear liquid diet postoperatively. If there is a perineal wound, the appearance, amount, and character of drainage are assessed and charted. Carefully inspect for signs of infection. Such a wound may be left open to heal by secondary intention, in which case it may be 3 months before it is completely healed. Initially there will be a drain in the wound. Antibiotic therapy is usually given for 24 hours postoperatively for antimicrobial prophylaxis or longer if there is a known infection.

A surgical dressing is never placed over an ileal stoma. If there is a significant decrease in ileal output accompanied by stomach cramping, the ileum may be obstructed. Such symptoms should be reported to the surgeon immediately. If the condition is not relieved, perforation or rupture of the intestine eventually may occur.

Older Adult Care Points

Older adults may require assistance with ostomy care because of poor vision or severe arthritis in the hands. In this case a family member must be taught the techniques of care. Older adults should be given easy-to-follow, large-print instructions for care.

Measurement of intake and output.

Accurate recording of intake and output is especially important in the care of an ostomy patient. Total output of fecal material is calculated every 8 hours. If the stool is liquid, the accuracy of measurement is very important. When the patient's condition is stable, ostomy output is regular, and the patient's nutrition and hydration status are normal, intake and output recording is discontinued.

A patient who has had an ileostomy must always be watched for signs of dehydration and fluid imbalance. This is especially important during the immediate postoperative period, but remains a concern as long as the patient has the ileostomy. To prevent dehydration, fluid intake should be sufficient to compensate for the loss of fluid through the feces.

Evacuation and irrigation.

Once the patient is eating again, ileostomy drainage is usually emptied every 2 or 3 hours. The pouch should be emptied when it is half full. The patient sits on the toilet, unclamps the drainage device, and allows the effluent to drain into the bowl. The clamp is then closed, and the outside of the bag is cleansed of any debris. Ileostomies are not usually irrigated unless there is blockage by large particles of undigested food; then irrigation is done by a provider or enterostomal therapist.

A continent ileostomy with a Kock pouch has a drainage tube inserted with gravity drainage maintained in the immediate postoperative period to prevent distention and allow the pouch to heal. In about 2 weeks, the patient is taught to insert a catheter into the pouch to drain the contents. As the pouch matures and its capacity increases, the time between drainings will lengthen. The pouch may be irrigated occasionally to remove fecal residue.

A sigmoid colostomy will usually expel formed stool on a relatively regular schedule. Irrigation of the colostomy gives the patient some control over when elimination takes place. The procedure is done daily or every other day at about the same time and takes close to an hour. A catheter with a cone tip is attached to a bag, which is filled with 500 to 1000 mL of warm (not hot) tap water. The bag is positioned 18 to 20 inches above the height of the stoma. The colostomy appliance is removed, and an irrigating sleeve is attached to direct the drainage into the toilet. The cone tip is lubricated and inserted gently into the ostomy stoma, and the water is infused slowly to prevent cramping and distention. The cone tip is removed, and the drainage flows through the sleeve into the toilet. When drainage is complete, the sleeve is removed, skin care is performed, and a clean appliance is secured in place. If the patient has a regular evacuation pattern, irrigation is not necessary. If the patient has a regular evacuation schedule whether irrigated or natural, they may be able to use a stoma cap and not need an appliance.

The major reason for irrigating a colostomy is to establish a pattern of predictable bowel movements at the patient's convenience. If the patient prefers not to irrigate, suppositories can be used to stimulate evacuation. Patients who do not irrigate must wear a drainable pouch, because evacuation can be unpredictable.

Cultural Considerations

Cultural Issues for Ostomy Patients

Be aware that cultural and religious considerations for hygiene and fasting may be important for your ostomy patient. For example, on the Jewish Shabbat, strictly observant practice may prohibit the use of running water or electricity; therefore hygiene must be accomplished before the start of Shabbat. A Muslim patient may observe a strict fasting practice for Ramadan that lasts 28 days, when no food or fluid is consumed between sunrise and sunset. An ileostomy patient could be at risk for dehydration, or change of eating patterns could lead to diarrhea or constipation (Black, 2009).

Assignment Considerations

Ostomy Care

The care of a new postoperative ostomy should not be assigned to UAP, because assessments of the stoma, incision, and skin are essential. When ostomy care for a mature ostomy is assigned to a CNA or UAP, remind the person to note the color of the stoma and to immediately report if the stoma appearance is not rosy pink or if there is excoriation of the skin. Documenting the appearance of the stoma, the condition of the skin, and the type and amount of effluent is your responsibility regardless of whether the patient or assistive personnel does the actual cleaning and appliance change.

Peristomal skin care.

Drainage from an ileostomy contains enzymes and bile salts that are highly damaging to the skin. The area of skin around the stoma must be kept clean and protected; fecal material should not be allowed to seep around the opening of the collection device and pool on the skin. In the immediate postoperative period, the pouch should not be changed any more than is necessary to prevent

trauma to the skin.

Clinical Cues

Gently placing a cotton tamponade into the stoma opening after removing the appliance will prevent ileostomy contents from getting on the skin and causing irritation.

The two major principles to follow to protect the skin are cleanliness and the provision of a protective barrier to prevent contact between the skin and the discharge from the stoma. If there is a proper seal to prevent seepage of feces around the stoma, irritation and breakdown of the skin occur much less frequently.

Appliances are generally changed twice a week to maintain an effective seal. When the appliance is changed, it should be removed carefully and the skin washed gently with soap and water so that skin is not damaged by vigorous rubbing and scrubbing. The area should be rinsed thoroughly and dried by patting, not rubbing, the skin. In humid weather, a hair dryer on the low setting may be used to dry the skin. Possible causes of skin problems are allergic reactions, yeast infections, or irritation from changing the faceplate too frequently. After cleansing, a protective skin barrier paste, wipe, or spray—which serves to prevent contact between the skin and the waste being discharged through the stoma—is applied. This may or may not be used for a sigmoid colostomy stoma.

Protective barriers are available in a number of forms and types. The enterostomal therapist or surgeon will indicate which type of barrier is most effective for the individual patient. Should the skin become highly irritated despite efforts to protect it, the provider will prescribe topical medications. Fungal infection of the skin sometimes occurs.

Older Adult Care Points

The changes related to aging reduce reaction time and manual dexterity, decrease visual and hearing acuity, and cause memory loss and fatigue. In addition, changes in body contour such as loss of supporting subcutaneous tissues, wrinkling, and fragility of skin may result in improper fit of appliances. An older adult may have been “educated” about self-care when the ostomy was first established; however, she may have had no follow-up because of transportation issues or because she “didn’t want to bother anybody.” Nurses should advocate for regular follow-up appointments.

Changing the collection device.

There are two kinds of pouches or appliances: the drainable or closed-ended. Each is attached to a faceplate that is secured to the skin around the stoma with a special adhesive. Drainable pouches are used when the flow of waste cannot be regulated and the contents must be emptied frequently (Figure 29-8). Closed-end pouches are used only for security once bowel movements have been regulated. Either new appliance is trimmed to size using a template drawn from the dimensions of the stoma plus $\frac{1}{8}$ inch. The appliance should not be constricting to the stoma but must be tight enough so that skin is not exposed to effluent.



FIGURE 29-8 Ostomy collection appliance in place and sealed around the stoma. (From deWit SC, O'Neill P: *Fundamental concepts and skills for nursing*, ed. 4, St. Louis, 2013, Saunders.)

Psychosocial concerns.

Patients with an ostomy usually go through the stages of grief and loss (see [Chapter 8](#)). Your attitude toward the patient, the stoma, and care has a major effect on the attitude the patient develops about body image changes and self-care. Disposing of body waste is not a pleasant nursing task, but a matter-of-fact, efficient approach is best when caring for the stoma, the effluent, and the drainage device.

Encourage social interaction, and contact available support groups. **As soon as postoperative pain is well controlled, it is best if the patient can talk with another person who has fully adjusted to her ostomy and is living a full and active life.** A series of such visits allows time to formulate and address questions. Such visits do require an order by the provider.

The patient should be guided to express her concerns about the physical and social problems she might encounter as a result of her ostomy. Most patients have concerns about odor, leakage, and noise from the passing of flatus. The nurse and patient should jointly explore changes in lifestyle and realistic alternatives. For example, a patient with a colostomy might be interested in trying a stoma cap, which is a small flat absorbent device that is placed directly over the stoma. The cap will absorb mucus but has no capacity to collect stool or fluids; thus irrigation must be done immediately before application. This option might be used for sexual relations or sports ([Burch, 2009](#)).

The nurse should indicate that concerns about sexual function are expected. Concerns should be addressed matter-of-factly, and the patient's sexual partner should be included in discussions. The enterostomal therapist is a good resource for specific information and suggestions in this area.

When the patient has prolonged dysfunctional grieving, becomes clinically depressed, or cannot accept her altered body image, referral for professional counseling is appropriate.

Patient Education

After teaching the patient about the physiology of her ostomy and the steps involved in taking care of the stoma and skin, teach the patient how to control odor. There will be odor when the drainage pouch is changed or emptied, just as there is with normal bowel movements.

Good basic hygiene is essential. Another measure to control odor is to eliminate from the diet foods known to cause odor or gas. Such foods include eggs, fish, garlic, raw onions, cucumbers, radishes, sauerkraut, corn, broccoli, cabbage, cauliflower, asparagus, dairy products, beans and other legumes, soy, some spices, and chewing gum. Eating too quickly and not chewing food well can cause gas. Carbonated and alcoholic beverages also contribute to the problem.

Gas entering the pouch from the stoma will accumulate there until the pouch is opened and the gas is released (called "burping" the bag). To release gas, open the lower end of the pouch and gently press against its sides. If not released, the gas may cause enough pressure to make the device separate from the stoma. Newer pouches have a charcoal-filtered valve that allows gas to escape.

There are deodorizing sprays and tablets that can be put in the bag that can reduce odor.

Patients with a colostomy slowly resume a regular diet. All ostomy patients are taught to prevent problems with diarrhea, constipation, and blockage. Dietary guidelines are more important for the ileostomy patient.

Patient Teaching

Measures to Prevent Intestinal Blockage for Ileostomy Patients

Teach the patient the following:

- Eat six small meals a day.
- Eat a soft diet during the healing period.
- Chew food very thoroughly.
- Add other foods to your diet gradually.
- Drink more than 8 cups of fluid per day.
- Avoid the following foods:
 - Dried fruits
 - Corn, including popcorn
 - Nuts
 - Sunflower and other seeds
 - Sausages and foods with casings
 - Apple peel
 - Oranges
 - Pineapple
 - Raw cabbage
 - Celery
 - Chinese vegetables
 - Coconut
 - Mushrooms
- If you experience a blockage in the intestine or of the ostomy:

- Begin a liquid diet.
- Cut the opening in your faceplate a little larger than normal, because the stoma may swell.
- Take a warm bath to relax the abdominal muscles.
- Massage the abdomen and area around the stoma; this might increase the pressure behind the blockage and help it to “pop out.” Most food blockages occur just below the stoma.
- Try different body positions, such as a knee-chest position, to move the blockage forward.
- Take oral enzymes to encourage digestion.
- If you still have a blockage or have no stomal output for several hours:
- Call your provider or enterostomal nurse and report the problems.
- If you cannot reach your provider or the enterostomal nurse, go to the emergency department. Take all of your pouch changing supplies with you.
- **Do not try to lavage the ileostomy.**
- **Do not take a laxative.**
- Other pointers:
 - **Ileostomy patients should not take time-release capsules and enteric-coated tablets, because there is not enough time for adequate absorption before the medication is expelled through the stoma.**
 - **Adequate intake of fluids is important for all ostomy patients, to prevent dehydration and electrolyte imbalance.**

Many sources of information are available for ostomy patients (see [Online Resources](#)). These include the local branches of the American Cancer Society, ostomate clubs, enterostomal therapists, and other members of the health care team who have expertise in managing a stoma. Enterostomal therapists are wound care specialists (often with a master's degree, but with certification in wound and ostomy care).

Evaluation

The patient should demonstrate an ability to perform ostomy care and an understanding of how to

manage diet and to prevent potential complications such as fluid and electrolyte imbalance, skin breakdown, and blockage of the ostomy. In addition, the patient should demonstrate psychological adjustment to changes in body image. The plan is adjusted if goals are not being met.

Anorectal Disorders

Hemorrhoids

Hemorrhoids are varicosities of the veins of the rectum. They may be **internal** (inside the sphincter muscles of the anus) or **external** (outside the sphincter muscles) (Figure 29-9).

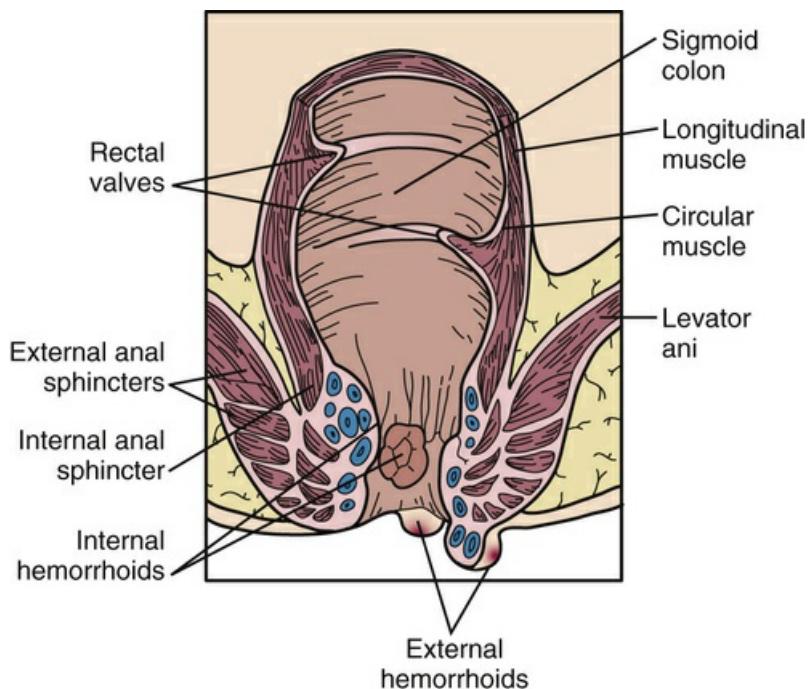


FIGURE 29-9 Hemorrhoids. (From deWit SC, and O'Neill, P.: *Fundamental concepts and skills for nursing*, ed. 4, Philadelphia, 2014, Saunders.)

Etiology and Pathophysiology

Venous congestion from interference with venous return from the hemorrhoidal vessels leads to the development of hemorrhoids. Constipation, obesity, prolonged standing or sitting, and pregnancy are predisposing causes of hemorrhoids. The habit of sitting on the toilet and straining at the stool for long periods is one of the primary factors responsible for many cases of hemorrhoids. Enlargement of the prostate, uterine fibroids, and rectal tumors are other contributing factors. Chronic liver disease with portal hypertension is another cause.

Signs, Symptoms, and Diagnosis

Local pain and itching are the most common symptoms of hemorrhoids. Bleeding from the rectum at the time of defecation may also occur. Hemorrhoidal blood is usually bright to dark red and is located on the outside of the stool. External hemorrhoids are less likely to bleed, but they are more evident, because they appear as tumorlike projections around the rectum. Diagnosis is by physical examination.

Treatment

The symptoms of hemorrhoids may be relieved by correcting constipation, local applications of heat or cold, and sitz baths. The use of ointments that contain a local anesthetic helps relieve the itching and pain. Hydrocortisone ointment and suppositories help decrease the swelling. The patient also should be instructed to wash the anal region with warm water after each bowel movement to prevent infection at the breaks in the mucosa. Wipes not containing alcohol may be used for cleaning without the mucosal drying that soap causes.

Hemorrhoids can be treated by **sclerotherapy** (injection of a solution that causes the vessel to dry up and disintegrate), **cryotherapy** (freezing), **photocoagulation** (burning), or infrared coagulation (IRC). **Hemorrhoidectomy** using a laser or standard surgical procedure may be performed. Another treatment method is rubber band ligation, in which a rubber band is slipped around the hemorrhoidal vessel, cutting off the blood supply. This causes the hemorrhoid to shrivel and disintegrate. All of these methods are usually done as outpatient treatments. Hemorrhoidectomy may occasionally be done as an inpatient procedure.

Nursing Management

Preoperatively, instruct the patient on rectal hygiene and the use of hydrocortisone suppositories or cream and sitz baths to decrease swelling. Teach the patient ways to prevent constipation and to promote regular bowel evacuation.

After surgery, the patient receives a prescription for analgesics. A air-filled or foam pillow may be used while the patient is sitting down to decrease pain and pressure on the rectal area. The patient should not use a ring-shaped device, because it increases stress to the surgical site. Sitz baths are usually ordered three times a day and cold or warm compresses are a comfort measure. Mild, wet nonalcohol dressings also may be used on the surgical site. These dressings have a glycerin base and contain a mild astringent that reduces swelling and relieves pain.

Bowel movements after a hemorrhoidectomy will cause some pain, and the standard procedure is to administer a stool softener to make defecation less traumatic. The patient and family should be warned that the patient may become faint, and someone should stay close by.

A high-fiber diet is started right away, because it is best if formed stool is passed regularly. A sitz bath after each bowel movement will offer relief and also cleanses the affected area, keeping it free from irritation. The patient should continue warm water cleansing after bowel movements until healing is complete.

Pilonidal Sinus (Pilonidal Cyst)

Etiology and Pathophysiology

The word **pilonidal** means "having a nest of hair." A pilonidal sinus is a lesion located in the cleft of the buttocks at the sacrococcygeal region. It is sometimes called a *pilonidal cyst*, but it is believed to be a subcutaneous canal (sinus) with one or more openings into the skin (rather than a true cyst or fluid-filled sac). The condition occurs when the stiff hairs in the sacrococcygeal region irritate and eventually penetrate the soft skin in the cleft of the buttocks. Factors that can lead to development of such a sinus include local injury, improper cleaning of the area, and obesity. People who have more than the average amount of body hair are particularly susceptible.

Signs, Symptoms, and Diagnosis

A pilonidal sinus may cause no trouble until it becomes infected, and then the patient experiences pain in the area, with swelling and a purulent drainage. Diagnosis is by history and examination.

Treatment and Nursing Management

When symptoms are severe or persistent, with abscess formation, the area must be incised surgically and the connecting canals opened and drained. Hairs and necrotic tissue must be removed so the area can heal. This is usually performed as an outpatient surgical procedure. Packing is left in the cavity so drainage can continue.

Postoperative care includes removal of wound packing, cleansing with warm water 2 to 3 times a day, and redressing the wound. Site care continues until the wound has closed. Good hygiene and shaving the site every few weeks may prevent future infections. Antibiotics do not heal a pilonidal cyst.

Anorectal Abscess and Fistula

Etiology and Pathophysiology

An abscess may form where there has been irritation with breaks in the skin or mucosa. Localized infection with a collection of pus forms an anorectal abscess. Tears in the mucosa of the rectum from

hard, constipated stools may predispose to abscess and fistula formation. A fistula is a chronic granulomatous tract that travels in a line from the anal canal to the skin outside the anus, or from an anorectal abscess to the anal canal or the area around the anus.

Signs, Symptoms, and Diagnosis

A discharge of pus from the fistula opening may be the first sign of an abscess or fistula. Both abscess and fistula are painful, and sitting or coughing aggravates the pain. If a fistula is accompanied by diarrhea, Crohn disease is suspected; 50% of patients with Crohn disease develop a rectal fistula. Diagnosis is by history and physical examination.

Treatment and Nursing Management

Antibiotics are usually not administered unless other conditions are present. Medication for pain is prescribed. Incision and drainage of an abscess may be necessary. A fistula usually requires surgical excision and repair. Nursing management involves teaching measures to prevent further incidence of constipation and infection and rectal hygiene measures. Sitz baths are used to decrease inflammation. Education about pain medication and possible complications is provided.

Community Care

Nurses in the community should teach self-care and habits that promote healthy function of the GI system. A healthy diet with appropriate quantities of fiber and fluid, counseling regarding exercise programs, and teaching about the warning signs of colon cancer are all appropriate nursing interventions, to be used whenever possible. Nurses should be a role model for a healthy diet and exercise program to maintain weight within normal limits.

Nurses who work in long-term care facilities and in home settings must be vigilant to spot problems of the GI system. Monitoring nutritional and bowel status is standard practice for every patient. On a continuing basis it is important to assess bowel changes that might indicate colon cancer. Remember that patients who are under care for other disorders still need to have regular cancer screenings.

Get Ready for the NCLEX® Examination!

Key Points

- IBD includes UC and Crohn disease. An altered bowel pattern, abdominal pain with bloating, and diarrhea or constipation are typical. Problems include ulceration, edema, bleeding, and fluid and electrolyte loss. Drug therapy includes antidiarrheals, sulfasalazine, drugs to relieve abdominal cramping, and corticosteroids.
- Surgery for ulcerative colitis usually involves a proctocolectomy with ileostomy, a Kock pouch creation, or an ileoanal reservoir.
- A hernia can become incarcerated, trapping intestine and cutting off its blood supply and causing intestinal obstruction.
- Diverticulitis produces diarrhea or constipation, left lower abdominal pain, fever, and rectal bleeding. Treatment of diverticulitis includes antibiotics, NPO or a liquid diet, IV hydration, and surgical hemicolectomy.
- A high-fiber diet and lots of fluid are prescribed for patients with diverticular disease.
- Mechanical bowel obstruction is mainly caused by adhesions, volvulus, intussusception, and strangulated hernia. Nonmechanical bowel obstruction may be a result of paralytic ileus after surgery, hypokalemia, infection, uremia, or heavy-metal poisoning.
- Appendicitis (inflammation of the appendix) classically causes right lower quadrant pain accompanied by muscle guarding. Nausea and vomiting, a slight temperature elevation, and an increase in the white blood cell count may also occur.
- Peritonitis is an inflammation of the peritoneum. Serous fluid is purulent, and normal peristaltic action slows or ceases.
- Malabsorption in adults is usually from sprue or lactose intolerance, radiation therapy, or chemotherapy. Malabsorption can also occur with IBD or diarrhea when transit through the intestines is too rapid.
- Ulcerative colitis, familial polyposis, smoking, alcohol consumption, obesity, physical inactivity, and a diet high in saturated fat or red meat are risk factors for colon cancer.
- Cancer treatment depends on tumor stage and may include surgery, chemotherapy, and radiation. Abdominoperineal resection is performed for rectal cancer and may include a colostomy.
- An ileostomy drains fecal material from the ileum and is usually performed for IBD problems. Fluid and electrolyte monitoring is crucial when there is an ileostomy.
- The stoma should be a normal pink or red color. Protective powders, sprays, and skin paste and a proper fit of the appliance will help to protect the skin. The opening should be cut $\frac{1}{8}$ -inch larger than the stoma.
- Hemorrhoids are caused by straining at stool for long periods while sitting on the toilet, prolonged standing, prolonged sitting, or pregnancy.
- Anorectal abscess or fistula may be treated with incision and drainage or surgery. Nursing measures include teaching to prevent further constipation and infection.

Additional Learning Resources

- SG** Go to your Study Guide for additional learning activities to help you master this chapter content.
- Online Resources
 - United Ostomy Associations of America, <http://www.ostomy.org/Home.html#>
 - Wound Ostomy and Continence Nurses Society, www.wocn.org

Review Questions for the NCLEX® Examination

1. A nurse encourages a patient with IBS to keep a food diary. What is the best nursing response to

the patient regarding the importance of keeping the diary?

1. "The diary will monitor caloric intake."
2. "The diary will help identify foods that cause bloating."
3. "The diary will determine food preferences."
4. "The diary will reinforce the need for better food choices."

NCLEX Client Need: Health Promotion and Maintenance

2. A 68-year-old patient complains of mild left lower abdominal pain that is accompanied by frequent diarrhea, slight fever, and rectal bleeding. Which treatment measure should the nurse anticipate?

1. Administration of a bulk-forming stool softener
2. Increasing fluid intake
3. Encouraging solid foods
4. Increasing physical activity

NCLEX Client Need: Basic Care and Comfort

3. A patient admitted with a bowel obstruction is complaining of severe pain, his abdominal girth has increased 4 inches in the past hour, and his blood pressure is now 80/50. List in priority order the actions of the nurse.

1. Assess breathing.
2. Notify the provider.
3. Position to support blood pressure.
4. Ensure IV patency.

NCLEX Client Need: Physiological Adaptation

4. During a home visit, a nurse provides verbal instructions to a patient with a possible blockage of an ostomy. What would be an appropriate instruction for the nurse to give?

1. Massage the stoma.
2. Try different body positions.

3. Take a cold bath.
4. Begin a high-fiber diet.

NCLEX Client Need: Physiological Adaptation

5. A nurse is caring for a patient who is postoperative after an ileostomy. Which order should the nurse question?

1. Strict intake and output recording for 8 hours
2. Clear liquid diet
3. IV fluids 125 mL/hr
4. Occlusive dressing over stoma

NCLEX Client Need: Physiological Adaptation

6. In caring for a patient with an ostomy, which statement is true regarding medication administration?

1. Time-release capsules can be given to patients with an ileostomy.
2. Enteric-coated tablets are adequately absorbed by patients with ileostomy.
3. Glycerin suppositories are readily evacuated in the distal colostomy stoma.
4. An antiemetic suppository can be effectively absorbed when inserted in the distal colostomy stoma.

NCLEX Client Need: Pharmacological Therapies

7. A patient has a new colostomy. Which behavior is an early sign of acceptance in the change of body image?

1. The patient allows the nurse to empty the colostomy bag.
2. The patient refuses to look at the ostomy site.
3. The patient holds and examines a new appliance bag.
4. The patient continues to ask for bedpan to have a bowel

movement.

NCLEX Client Need: Psychosocial Integrity

8. A patient develops a paralytic ileus as a complication of peritonitis. Which patient comment suggests a return of peristalsis?

1. "I feel thirsty; may I have some water?"
2. "I would like to try and walk to the toilet."
3. "When will I be allowed to have solid food?"
4. "I am sorry to pass gas while you are here."

NCLEX Client Need: Reduction of Risk Potential

9. What would be included in the recommended diet for patients with IBD? (*Select all that apply.*)

1. Low fat
2. High fiber
3. High protein
4. Low calorie
5. Lactose avoidance

NCLEX Client Need: Reduction of Risk Potential

10. A nurse admits a 23-year-old patient with possible appendicitis. The nurse anticipates which sign(s) and/or symptom(s)? (*Select all that apply.*)

1. Increased red cell count
2. Abdominal tenderness
3. Anorexia and vomiting
4. Mild fever
5. Dark black stools

NCLEX Client Need: Physiological Adaptation

Critical Thinking Questions

Scenario A

Mrs. Blein, age 29 years, has had frequent bouts of diarrhea associated with physical and emotional stress since her early teens. She is admitted to the hospital with a diagnosis of UC. Her admitting physician, a gastroenterologist, feels certain that she will benefit from an ileostomy, because previous efforts on the part of several other providers have brought no lasting relief from Mrs. Blein's symptoms. She is admitted to the hospital to rehydrate and improve her nutritional status for surgery. Mrs. Blein is 40 pounds underweight and is suffering from severe diarrhea and fluid deficit.

1. What questions would be relevant when taking Mrs. Blein's nursing history?
2. What should be included on Mrs. Blein's nursing care plan regarding observations, measurements, and nursing interventions?
3. Discuss some benefits of an ileostomy over the alternative of continued bouts of severe diarrhea.

Scenario B

Mr. Huang, age 52 years, was found to have occult blood in his stool when he underwent a physical examination for a new insurance policy. Fiberoptic flexible sigmoidoscopy revealed a small lesion in the sigmoid colon; the biopsy result was positive for malignancy. He is scheduled for a hemicolectomy.

1. What are the probable postoperative problem statements/nursing diagnoses that should be on Mr. Huang's care plan?
2. What are the psychosocial concerns that need to be addressed for this patient? What would be appropriate nursing interventions?
3. What further treatment will be necessary for Mr. Huang?

Scenario C

Mr. Frick has a history of diverticulitis. He reports that he has intermittent diarrhea and left lower abdominal discomfort. He is admitted to the hospital for symptoms of nausea, vomiting, and severe abdominal pain and distention. Mr. Frick is diagnosed with peritonitis.

1. What signs or symptoms should you observe for that may signal worsening of his condition?
2. What medical orders do you anticipate from the provider to treat Mr. Frick's peritonitis?
3. Discuss general nursing interventions that would be appropriate for Mr. Frick.

CHAPTER 30

Care of Patients With Disorders of the Gallbladder, Liver, and Pancreas

Objectives

Theory

1. Explain the plan of care for a patient with cholelithiasis.
2. Describe treatment for a patient with cholecystitis.
3. Compare the ways in which the various types of hepatitis can be transmitted.
4. Identify signs and symptoms of the various types of hepatitis.
5. Devise appropriate nursing interventions for a patient with cirrhosis and ascites.
6. Summarize potential causes of liver failure.
7. Differentiate the signs and symptoms of acute and chronic liver failure.
8. Discuss the criteria used for selection of liver transplantation recipients.
9. Devise a nursing care plan for a patient with cancer of the liver.
10. Prepare a plan for adequate pain control for a patient with pancreatitis.
11. Compare the treatment options for cancer of the pancreas.

Clinical Practice

12. Perform preoperative teaching for a patient who is to undergo laparoscopic cholecystectomy.
13. Evaluate a nursing care plan, including psychosocial concerns, for a patient who has hepatitis with jaundice.
14. Implement a discharge teaching plan for a patient who has been in the hospital with a flare-up of chronic pancreatitis.

KEY TERMS

- ascites** (ă-SĬ-tēz, p. 705)
asterixis (ăs-tĕr-ĬK-sĭs, p. 711)
biliary colic (BĬL-ĕ-är-ĕ kō-LĬC, p. 695)
caput medusa (KĂP-ĕt mĕ-DŪ-să, p. 705)
cholecystectomy (kō-lĕ-sĭs-TĚK-tō-mē, p. 696)
cholecystitis (kō-lĕ-sĭs-Tī-tĭs, p. 695)
choledocholithiasis (kō-lĕd-ō-kō-lĭ-THĪ-ă-sĭs, p. 694)
cholelithiasis (kō-lĕ-lĭ-THĪ-ă-sĭs, p. 694)

cirrhosis (sīr-RŌ-sīs, p. 705)
encephalopathy (ěn-sěf-ă-LŌP-ă-thē, p. 702)
esophageal varices (ě-sōf-ă-JĒ-ăl VĀR-ĭ-sēz, p. 710)
fetor hepaticus (FĒ-tōr hě-PĀ-tī-kūs, p. 711)
hematemesis (hē-mā-TĒM-ě-sīs, p. 710)
hepatitis (hě-pă-TĪ-tīs, p. 698)
icterus (ĬK-těr-ūs, p. 705)
jaundice (JĂWN-dīs, p. 695)
palmar erythema (PĀLHM-ěr ěr-ĕ-THĒ-mă, p. 705)
paracentesis (pär-ă-sěn-TĒ-sīs, p. 706)
prodromal stage (prō-DRŌ-mäl STĀJ, p. 703)
pruritus (prū-RĪ-tūs, p. 705)
pseudocyst (sū-dō-sīst, p. 712)
spider angiomas (SPĪ-děr än-jē-Ō-măz, p. 705)
varices (VĀR-ĭ-sēz, p. 706)

Disorders of the Gallbladder

Cholelithiasis and Cholecystitis

Etiology

Cholelithiasis is the presence of gallstones within the gallbladder or in the biliary tract. The stones may vary in size, from very small “gravel” to stones as large as golf balls. Tiny stones pass into the bile ducts, where they become lodged and obstruct bile flow (Figure 30-1). When stones lodge in the common bile duct, the patient has **choledocholithiasis**. Cholelithiasis is more likely to occur in people with a sedentary lifestyle, a familial tendency, diabetes mellitus, and obesity. Cholesterol-lowering drugs increase the amount of cholesterol secreted in bile. This cholesterol secretion can increase the risk of gallstones.

Cultural Considerations

Ethnic Predisposition to Gallstones

Native Americans are genetically more prone to develop gallbladder stones than any other group. Hispanic Americans have the next highest propensity to develop gallstones. Teaching dietary changes to decrease the amount of cholesterol and total fat in the diet may be an effective means of decreasing the incidence of gallstones in these populations (National Digestive Diseases Information Clearinghouse, 2013).

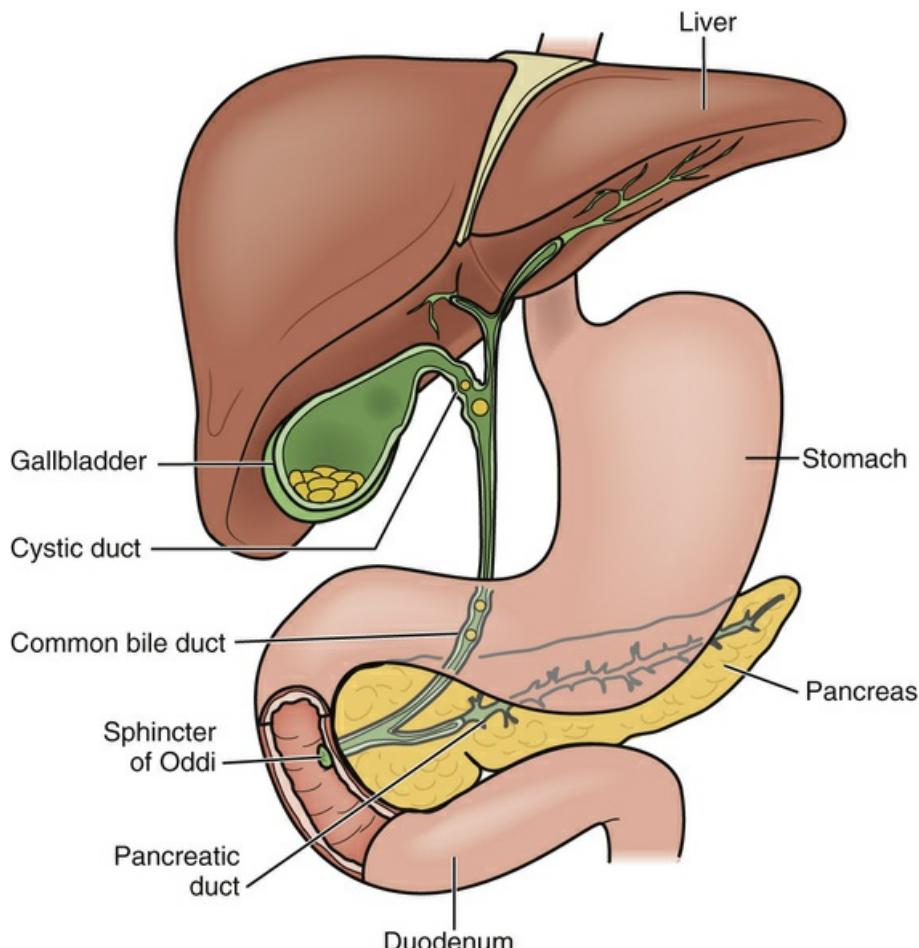


FIGURE 30-1 Gallstones within the gallbladder with obstruction of the common bile and cystic ducts.

Hemolytic disease, extensive resection of the bowel to treat Crohn disease, bariatric surgery, rapid weight loss, multiple pregnancies, and use of oral contraceptives or hormone replacement therapy also increase the risk for gallstones.

Cholecystitis is an inflammation of the gallbladder and is associated with gallstones in 90% to 95% of occurrences. Other causes include obstructive tumors of the biliary tract and severely stressful situations such as cardiac surgery, severe burns, or multiple trauma.

Pathophysiology

Cholelithiasis (gallstones) develops when the balance between cholesterol, bile salts, and calcium in the bile is altered to the point that these substances precipitate. When cholesterol precipitates, the nucleus of a stone can be formed. The stone grows as layers of cholesterol, calcium, or pigment accumulate over the nucleus. Immobility, pregnancy, and obstructive lesions decrease bile flow. Stasis of bile leads to changes in chemical composition and stone formation. The formation of stones within the gallbladder can cause irritation and areas of inflammation in the gallbladder wall (cholecystitis). Infection can occur from organisms such as *Escherichia coli*. The organisms enter the gallbladder through the sphincter of Oddi from adjacent structures.

Signs and Symptoms

Symptoms depend on the degree of obstruction to bile flow and extent of inflammation of the gallbladder. The absence of bile in the intestine results in clay-colored stools that float as a result of undigested fat content. If a duct is obstructed by a stone, obstruction of bile flow by stones in the cystic or common bile duct causes strong muscle contractions that attempt to move the stones along; severe pain may be triggered by a fatty meal. Nausea and vomiting, fever, and leukocytosis occur with cholecystitis. Pain may be referred to the right clavicle, scapula, or shoulder. As bile backs up into the liver and blood, **jaundice** (yellow tint to skin and sclera) occurs. If obstruction is unrelieved, inflammation occurs and can progress to liver damage.

The symptom most often present in an acute flare-up of chronic cholecystitis is unbearable upper right quadrant pain (**biliary colic**). The pain sometimes is referred to the back at the level of the shoulder blades. Attacks can occur as frequently as daily or may only appear once every year or so. Vomiting may accompany acute flare-ups, along with chills and fever. If the inflammation is not corrected or if there is an infection, the gallbladder can become filled with pus and rupture. Rupture spills gallbladder contents into the abdominal cavity and causes peritonitis.

Chronic cholecystitis causes milder symptoms between acute attacks. Symptoms are indigestion after eating fatty foods, flatulence, nausea after eating, and some discomfort in the right upper quadrant. **Table 30-1** compares signs and symptoms of gallbladder disorders.

Think Critically

What questions would you ask when assessing a patient who might have cholecystitis?

Older Adult Care Points

Cholelithiasis should be considered in any older adult with abdominal pain when another cause cannot be found. Symptoms may be atypical, and the presenting symptom of cholecystitis in this age group may be low-grade fever rather than pain.

Table 30-1
Comparison of Gallbladder Disorders

SIGN/SYMPOTM	CHOLELITHIASIS	ACUTE CHOLECYSTITIS	CHRONIC CHOLECYSTITIS
Pain/biliary colic	Sudden onset, acute	Waves of pain lasting 2-6 hr	Intermittent during the year; pain commonly referred to back at shoulder blade
Nausea, vomiting	Often present	Frequent	During acute attack
Indigestion and flatulence	—	—	Common complaint
Low-grade fever	Present	Present, often with chills	Present
Jaundice	If duct is obstructed	May be present	May be present during attack

Diagnosis

Gallstones usually can be diagnosed with ultrasonography or computed tomography (CT) of the

gallbladder and biliary tract. Cholescintigraphy (hepatobiliary iminodiacetic acid [HIDA] scan) diagnoses abnormal contraction of the gallbladder or obstruction. Liver function tests are helpful to diagnose gallbladder and biliary tract disease. Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) will be slightly elevated. If there is common duct obstruction, gamma-glutamyl transpeptidase (GGT) is elevated. In biliary obstruction, both direct bilirubin and alkaline phosphatase levels are elevated.

The diagnosis of cholecystitis is aided by indicators of infection, such as elevated white blood cell count and sedimentation rate.

Treatment

Initially, a low-fat diet, loss of excessive body weight, and restriction of alcohol intake are recommended, and meals are spaced so that no large amounts of food are put into the intestinal tract at any one time. This prevents overstimulation of gallbladder activity. Treatment varies depending on whether or not the patient has symptoms. Medical treatment includes giving oral medications that dissolve the gallstones. If the patient does not respond to this therapy or if bile obstruction occurs, correction of the obstructed biliary tract is indicated. Endoscopic retrograde cholangiopancreatography (ERCP) may be performed to remove stones obstructing the common duct. The procedure combines endoscopy with fluoroscopy to visualize and treat obstructions. Gallbladder removal is indicated for patients with ongoing symptoms or complications. The procedure may be done laparoscopically or as an open abdominal surgery. Antibiotics are usually only given if peritonitis is present or as surgical prophylaxis.

The surgical procedure of choice is **cholecystectomy** (gallbladder removal). Laparoscopic cholecystectomy is the most common surgical procedure used. One to four small incisions are made in the abdomen; abdominal muscles have less trauma from smaller incisions, and the patient experiences less pain and a quicker recovery than with an “open” cholecystectomy. A laparoscope with an attached camera and a dissecting laser are used along with grasping forceps. Carbon dioxide (CO₂) is instilled into the abdominal cavity to aid visualization. The gallbladder is removed through the incision at the umbilicus. The patient will have dressings over the incisions on the abdomen. In the United States 90% of cholecystectomies are performed laparoscopically. Recovery time is shorter for the laparoscopic procedure compared with open procedures.

Monitor the patient closely for internal bleeding and watch for signs of increasing abdominal rigidity and pain and for changes in vital signs. Sometimes the retained CO₂ used during a laparoscopic procedure causes “free air” pain. Early and frequent ambulation helps the CO₂ gas dissipate. The patient is usually discharged after recovering from the anesthesia. Depending on his age and condition, a longer stay may be indicated, and he must have careful discharge teaching about signs of complications.

Patient Teaching

Postoperative Laparoscopic Cholecystectomy

Teach the patient to:

- Remove the bandages from the puncture site(s) the day after surgery and shower, leaving the Steri-Strips intact. They will fall off in 7 to 10 days.
- Report the following signs and symptoms if they occur:
- Redness, swelling, bleeding, or bad smelling drainage from wound site
- No bowel movement or gas for 3 days or watery diarrhea for more than 3 days

- Bile-colored drainage or pus from any surgical site
- Severe abdominal pain that is not relieved by medication or is getting worse
- Nausea, vomiting, chills, or fever greater than 101 °F
- Light-colored stool, dark urine, or yellow tint to the eyes or skin, which may indicate obstruction to the flow of bile
- Resume normal activities gradually.
- Expect that return to work is probable 1 week after surgery.
- Stick to a low-fat diet for several weeks, slowly introducing fattier foods to determine whether they cause unpleasant symptoms.

With an open abdominal cholecystectomy, a 2- to 4-day stay in the hospital is typical, and there is about a 6-week recovery period. Residual stones can lodge in the common duct after cholecystectomy. ERCP is usually used to remove residual stones.

Oral dissolution therapy is available and works best on small cholesterol stones. Ursodiol (Actigall) and chenodiol (Chenix) are prescribed for 6 months to 2 years to dissolve stones. This therapy may be tried in a patient who is a poor surgical risk. Although the medication may dissolve the stones, there is a high incidence of reoccurrence. Lithotripsy, or “shock wave” therapy, is rarely used for gallstones. The procedure involves using sound waves directed through the body to break up the stones. The treatment of choice is gallbladder removal.

Nursing Management

Preoperative care.

Preoperatively, the patient will be kept on nothing-by-mouth (NPO) status. An analgesic may be ordered to decrease pain, and antiemetics are given for nausea. If nausea cannot be controlled with medication, a nasogastric tube may be placed to reduce vomiting.

Clinical Cues

In the recent past, morphine was not used because it was thought to cause spasm of the sphincter of Oddi; however, this is not supported by research ([Bloom, 2014](#)).

Intravenous (IV) fluids are begun to prevent dehydration. Coagulation times are monitored if jaundice is present, and vitamin K, if needed based on international normalized ratio (INR), is administered before surgery to improve clotting ability of the blood. The patient scheduled for gallstone surgery has needs similar to those of any patient having abdominal surgery. Teaching is adapted for the standard procedure or the laparoscopic procedure (see [Chapters 4 and 5](#)).

Postoperative care.

The patient is placed in the semi-Fowler position after he recovers from anesthesia. This position is more comfortable and decreases strain on the sutures. The patient will also be able to take deep breaths and cough more easily in this position.

A patient who has had open gallbladder surgery may have tubes or drains if continuing drainage is expected. In many cases, the surgery was performed to relieve an obstruction to the flow of bile through the bile ducts or to drain purulent material to the outside. The drainage is absorbed by the dressings over the surgical wound. Dressings must be changed often and should be checked frequently for signs of fresh bleeding. Tubes may also exit the surgical wound and drain into a bag,

which needs to be emptied routinely. The drain is left in as long as necessary and is then removed by the surgeon.

When an obstruction of the common bile duct has occurred because of stones or tumors, the surgeon may insert a small T-shaped tube (T-tube) directly into the common bile duct during an open cholecystectomy (Figure 30-2). This tube must be kept patent at all times and is connected to a bedside drainage bag. The length of time the T-tube is left in place varies according to the condition of the patient. Only a small amount of bile will be going to the duodenum. No tension should be put on tubes or drains that have been inserted in the surgical wound. **Dressings must be changed carefully because T-tubes are sutured in place, and if they are accidentally pulled out, the patient must be returned to the operating room and the incision reopened to replace the tube.**

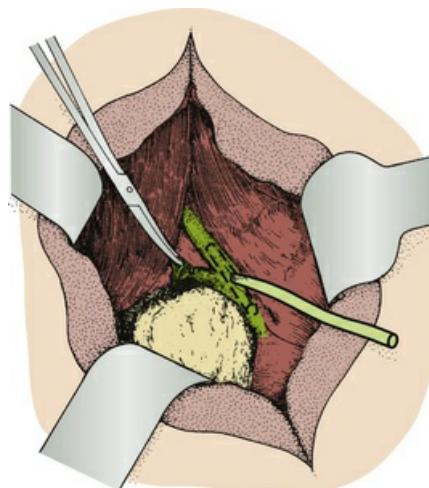


FIGURE 30-2 T-tube inserted into the common bile duct and sutured in place.

The patient should be prepared to expect a greenish yellow discharge (bile) on the dressings. The drainage bag is emptied when the dressing is changed. Patients may go home with the T-tube in place.

Patient Teaching

Caring for a T-Tube

Teach the patient to:

- Wear loose-fitting, older clothes.
- Coil the drainage tubing and secure it to the abdomen with tape.
- Take showers rather than baths.
- Avoid heavy lifting and strenuous activity.
- Carefully change the dressing every day, cleansing the skin around the tube.
- Inspect for signs of infection: redness, swelling, warmth, pain, or pus.
- Take his temperature every day and report to surgeon if it is greater than 100° F (37° C).
- Empty the drainage bag at the same time each day.
- Note the amount, color, and odor of the drainage.
- Report any change in drainage, abdominal pain, nausea, or vomiting to the surgeon.

- Return to the surgeon for the follow-up appointment.

Carefully observe the color of the patient's stools because a return of a normal brown-colored stool is an indication that bile is flowing and entering the small intestine. If the bile duct is obstructed, there will be signs of jaundice and stool will be light in color.

Patients who have had an open cholecystectomy may be reluctant to deep-breathe and cough because of pain in the operative area. Encourage these exercises with the use of an incentive spirometer, and auscultate lung sounds every shift to discover any signs of extra secretions or atelectasis. A patient-controlled analgesia (PCA) pump will help the patient to cooperate with turning, coughing, and ambulating and thus prevent complications.

No specific diet is recommended for patients after gallbladder surgery, although it is wise to avoid excessive amounts of fatty foods.

Think Critically

Can you outline the points to be covered for teaching a patient who is about to undergo a cholecystectomy?

Complications

Constant irritation of the gallbladder from inflammation and infection produce purulent material, and a fistula may form. Necrosis, gangrene, and rupture of the gallbladder causing peritonitis may occur. Choledocholithiasis may cause inflammation of the common duct and obstruct the pancreatic duct. This can lead to pancreatitis.

Disorders of the Liver

The liver becomes inflamed when injured by trauma, toxins, or tumor invasion. Disruption of the normal functions of the liver occurs depending on how much of the liver tissue is affected. Chronic inflammation causes fibrosis of the liver cells and abnormal function.

Hepatitis

Etiology and Pathophysiology

There are five types of viral **hepatitis** (Table 30-2) that cause physical problems. Researchers believed they had discovered a new virus, hepatitis F, but the finding was not confirmed; when a valid discovery was made, hepatitis G emerged. Since its discovery, additional structural information has become known, and the virus has been labeled GBV-C. Liver cells are damaged either by direct action of the virus on hepatocytes or by cell-mediated immune responses to the virus. Hepatitis viruses cause extensive inflammation of the liver tissue. Liver cell damage results in necrosis of hepatic cells. The Kupffer cells proliferate and enlarge. Bile flow may be interrupted because of the inflammation. With severe inflammation, fibrous scar tissue may form in the liver. Scar tissue often obstructs normal blood flow, causing further damage from ischemia.

Table 30-2
Comparison of Hepatitis-Causing Viruses

HEPATITIS A VIRUS (HAV)	HEPATITIS B VIRUS (HBV)	HEPATITIS C VIRUS (HCV)	HEPATITIS D VIRUS (HDV)	HEPATITIS E VIRUS (HEV)
Transmission Mode				
Fecal-to-oral route; poor sanitation and contaminated water and shellfish; often from infected food	Sexual contact; blood and body fluid contact; perinatal from mother to infant	Contact with blood and body fluids; sexual contact with carrier; contact with contaminated surgical, tattooing, and piercing equipment	Blood and body fluid contact; accompanies hepatitis B; close personal contact	Fecal-to-oral route; contaminated water or food
Incubation Period				
15-60 days (average 30 days)	6 wk-6 mo (average 12-14 wk)	6-7 wk	Same as hepatitis B, which precedes it; chronic carriers of hepatitis B are at risk throughout their carrier state	14-60 days (average 40 days)
Infective Period				
Most infectious 2 wk before onset of symptoms; not likely to be infectious after first week following onset of jaundice	Begins before symptoms appear and persists for 4-6 mo after acute illness; persists for lifetime of chronic carriers	Begins 1-2 wk before symptoms appear; continues throughout life for chronic carriers	Blood potentially infectious in active hepatitis B infection; may still be present in blood of chronic hepatitis B carriers even though undetectable	Shedding of virus starts during the incubation period and into the early acute phase of the disease
Signs and Symptoms				
Acute onset Prodromal phase: Malaise, fever, loss of appetite, nausea, fatigue, joint aching, skin rash, and upper abdominal discomfort May develop jaundice; malaise and fatigue	Slow onset May be asymptomatic	Slow onset May be asymptomatic until liver damage has occurred	Slow onset May be asymptomatic	Abdominal pain, anorexia, dark urine, fever, hepatomegaly, jaundice, malaise, nausea and vomiting

Liver cells do have the capacity to regenerate and resume their normal appearance. The cells can function as long as there are no complications or added stressors.

Hepatitis A and hepatitis E viruses are transmitted primarily by the oral-fecal route. They are responsible for the epidemic forms of viral hepatitis. Hepatitis A virus can be transmitted by food handlers to customers or by mollusk shellfish from contaminated waters. Hepatitis E virus infection is primarily seen in less developed countries. It is transmitted through fecal contamination of water.

Hepatitis B, C, and D viruses may cause chronic inflammation and necrosis of liver tissue. A carrier state of hepatitis B, C, or D may occur, and asymptomatic individuals can transmit infection to others. **Hepatitis B and C viruses are transmitted by parenteral routes and sexually; they are present in the semen, vaginal secretions, and saliva of carriers. Sexual partners of patients who are carriers of hepatitis B or C virus are at high risk for contracting the virus.** Hepatitis D virus coexists with hepatitis B or C virus and is transmitted in the same ways.

Intravenous drug use is currently the primary cause of hepatitis C infection; therefore users are a target group for screening and counseling. The virus can also be transmitted by straws used to snort cocaine. Accurate numbers are hard to obtain because many infected individuals are asymptomatic and have not been tested. Since 1992 all blood products have been tested for blood-borne pathogens. Patients who received blood transfusions and clotting factors before that time may have been exposed and may be carriers. Hepatitis B and C viruses can be transmitted from mother to infant. **Hepatitis B and C are the most serious forms of hepatitis, often progressing to chronic hepatitis, cirrhosis, liver cancer, and death.**

Cultural Considerations

Hepatitis B Virus Among Asian Americans

Hepatitis B virus infection is 5 to 12 times more common among Asian Americans than the general U.S. population. It is the leading cause of liver disease and cancer among Asians ([Maxwell et al, 2014](#)). Because of the high number of people who are unaware of their infection, the virus is passed from mother to child and within families.

Older Adult Care Points

Older adults who had several major surgeries and blood transfusions before 1992 are at higher risk for hepatitis B and C. These patients may be carriers of these viruses.

Signs and Symptoms

The clinical signs and symptoms of hepatitis A tend to have an acute onset, whereas in hepatitis B, C, and D the onset is slower and more insidious. There are four phases of hepatitis A. In the first, the **viral replication** phase, individuals will have positive blood tests but display no symptoms. The second is the **prodromal** phase, in which symptoms such as nausea and fatigue and those that would likely be diagnosed as influenza begin (see [Table 30-2](#)).

The third, or **icteric**, phase is characterized by jaundice and lasts 2 to 4 weeks. Urine becomes dark and stools may become light if bile flow is obstructed. Pruritus may occur from the bile pigment deposited in the skin. The liver becomes tender and enlarged.

The fourth phase, the **convalescent** phase, begins when jaundice is disappearing. Convalescence may take 2 to 4 months. Major complaints are malaise and fatigue. Liver enlargement may continue, but if the spleen was enlarged, it returns to normal in this phase.

With chronic hepatitis B and C, patients are likely to be asymptomatic or have symptoms of chronic liver disease. Patients with acute hepatitis B or C could also be asymptomatic. Symptoms include fatigue, nausea, vomiting, poor appetite, right upper quadrant pain, dark urine, and light-colored stools.

Hepatitis D sometimes causes massive destruction of liver cells, liver failure, and death. Hepatitis B and D become chronic in 2% to 10% of infected patients. The patient is then a constant carrier of the virus. There are no currently known signs and symptoms of GBV-C, but many patients also have hepatitis B and/or C virus at the same time. GBV-C is diagnosed by laboratory tests.

Clinical Cues

We often assume that liver disorders are associated with jaundice; however, be aware that viral hepatitis without jaundice (anicteric hepatitis) is two to three times more common than viral hepatitis with jaundice.

Diagnosis

Hepatitis is diagnosed by history, physical examination, and laboratory testing. Serologic assays or enzyme immunoassays (EIAs) detect specific antibodies to the various types of hepatitis. Molecular assays can detect viral nucleic acid. These assays do not measure the severity of disease or indicate prognosis. The genotype assay can be used to predict the response to and duration of therapy. Chronic hepatitis is determined by liver biopsy. Elevations in liver function tests (LFTs) are expected findings ([Table 30-3](#)). Abnormalities in the white blood cell count, platelets, alkaline phosphatase, albumin, and prothrombin time (PT)/international normalized ratio (INR) may also occur depending on the severity of the disease.

Table 30-3
Laboratory Test Findings in Acute Viral Hepatitis

TEST	ABNORMAL FINDINGS
Aspartate aminotransferase (AST)	Elevated in prodromal phase up to 20 times normal; decreases as jaundice subsides
Alanine aminotransferase (ALT)	Elevated in prodromal phase; ALT/AST ratio greater than 1; decreases as jaundice subsides
Gamma-glutamyl transpeptidase (GGT)	Elevated

Bilirubin	Elevated unconjugated (direct) bilirubin
Alkaline phosphatase	Some elevation
Serum albumin	Normal or decreased
Serum bilirubin (total)	Elevated to about 8–15 mg/dL (137–257 μmol/L)
Prothrombin time/international normalized ratio (INR)	Prolonged

Treatment

Hepatitis A is treated by rest and avoidance of any substances, including alcohol, that can cause liver damage. These measures help the liver to regenerate. A well-balanced diet helps liver cells to heal. Four to six small meals a day are tolerated more readily than three larger ones. Sucking on hard candy is recommended and adds to caloric intake. Nausea may be treated with ondansetron (Zofran) or over-the-counter medications. Phenothiazines are not used because of their hepatotoxic effects. Vaccines are available for those at risk for exposure. People who have been exposed to the patient should be notified so they can receive prophylaxis.

For hepatitis B, drug therapy is used to decrease the viral load, thereby decreasing the disease progression ([Table 30-4](#)). Pegylated interferon alpha 2a (Pegasys), entecavir (Baraclude), and tenofovir disoproxil fumarate (Viread) are all available for use in treatment of hepatitis B. Antiviral medications have been used successfully in treatment of acute hepatitis C. Combinations of medications have proved the most effective. Nonpharmaceutical treatment is supportive to enhance the patient's natural defenses and promote healing of the liver. Hydration, sufficient rest, and adequate nutrition are the goals. Medication for nausea may be prescribed to encourage adequate nutrition.

 **Table 30-4**

Drugs Commonly Used to Treat Liver Disorders

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Diuretic			
Potassium-Sparing Diuretics			
Spirostanolactone (Aldactone)	Blocks action of aldosterone in the distal nephron, preventing sodium uptake in exchange for potassium secretion.	It is not necessary to supplement potassium for patients taking this type of diuretic alone.	Avoid foods high in potassium content: bananas, oranges, salt substitutes, dried apricots, and dates.
Amiloride (Midamor)	Potassium is “spared” (not secreted), and sodium is excreted.	Monitor potassium levels.	Alcohol consumption can worsen side effects of the medication.
Eplerenone (Inspra)	Blocks aldosterone.	If administered with ACEIs or ARBs, may increase risk of hyperkalemia.	Can take with or without food. May cause dizziness.
Triamterene (Dyrenium)	Inhibits the reabsorption of sodium in the distal tubule of the kidney.	Sensitive to light. Monitor potassium levels.	Take after a meal with a full glass of water.
Loop Diuretics			
Furosemide (Lasix)	Blocks reabsorption of sodium and chloride in the loop of Henle, promoting water secretion. Promotes powerful diuresis.	Give early in the morning. Monitor potassium levels and supplement potassium as needed. Monitor for hypokalemia, I&O. Weigh patient daily. Assess for hearing loss. Monitor for postural hypotension.	Warn that the drug will cause the need to empty the bladder frequently. Caution regarding dizziness when changing positions.
Bumetanide (Bumex)	Prevents the reabsorption of sodium in the ascending loop of Henle	Monitor potassium. Can produce ototoxicity. Can react with NSAIDs, gentamycin, and digitalis	Do not use if allergic to sulfa medications.
Ethacrynic acid (Edecrin)	Prevents the reabsorption of sodium.	Weigh patient throughout treatment to assess volume loss. Monitor potassium.	Avoid taking within 4 hours of bedtime to avoid getting up to the bathroom during the night.
Torsemide (Demadex)	Increases urinary excretion of sodium, chloride, and water.	Onset of action is within 1 hr and action lasts 6 to 8 hours. Use cautiously in patients with a sulfa allergy.	Report to provider if using aminoglycosides, NSAIDs, or digoxin. Drug interactions may occur.
Laxative: Ammonia Detoxificant			
Lactulose (Cephulac)	Prevents absorption of ammonia in the colon; increases water in the stool.	Assess stool amount and color. Monitor serum ammonia level, electrolytes, and I&O. Assess perineal skin frequently for excoriation from diarrhea.	Advise that this drug is intended to cause bowel evacuation and diarrhea is likely.
Antibiotic			
Neomycin (Mycifradin)	Decreases protein synthesis in bacterial cells, causing bacterial death.	Monitor renal function and hearing.	Explain the purpose of this drug.
Rifaximin (Xifaxan)	Decreases bowel flora. This prevents the breakdown of protein in the GI tract and helps prevent formation of ammonia.	May cause flatulence or headache. Observe for dehydration.	Taken twice per day with food.
Vasoconstrictor			
Vasopressin (Pitressin)	Causes vasoconstriction; stops bleeding of esophageal varices.	Monitor BP and I&O—may cause water retention.	Explain the purpose of the drug.
Vitamins			
Thiamine (vitamin B ₁)	Corrects vitamin B ₁ deficiency that occurs from excessive alcohol use.	Assess thiamine levels.	Explain purpose of the drug.
Vitamin K (AquaMEPHYTON)	Needed for hepatic formation of coagulation factors II, VII, IX, and X.	Monitor prothrombin time and INR.	Explain injection may cause discomfort.
Antiretrovirals			
Lamivudine (Epivir)	Inhibits replication of HBV.	Monitor blood count, viral load, liver functions, amylase, lipase, and triglycerides. Watch for signs of lactic acidosis.	GI complaints and insomnia resolve after 3–4 wk. Drug is not a cure, but will help control symptoms. Notify provider of swollen lymph nodes, fever, malaise, and sore throat. May still pass virus on to others; maintain precautions.
Ribavirin (Rebetol)	Inhibits viral protein synthesis.	Ribavirin is used together with interferon alpha-2a to treat chronic HCV.	Drug may cause fainting or dizziness.
Adefovir dipivoxil (Hepsera)	Prevents DNA replication.	Monitor respiratory status; assess for skin rash.	Report any difficulty breathing or itching, swelling, or redness of the eyes.
Entecavir (Baraclude)	Prevents viral replication.	Monitor renal function.	May cause weakness.
Telbivudine (Tyzeka)	Prevents viral replication.	Monitor renal function and electrolytes.	May cause lactic acidosis and myopathy.

Tenofovir disoproxil fumarate (Viread)	Prevents viral replication.	Monitor renal function and electrolytes.	May cause lactic acidosis and severe hepatomegaly.
Immunomodulator			
Peginterferon alpha-2a (PEG-Intron, Pegasys)	Inhibits viral replication and increases phagocytic action of macrophages, augmenting specific cytotoxicity of lymphocytes.	Perform baseline assessments. Monitor for signs of depression; offer emotional support. Monitor for abdominal pain and bloody diarrhea. Monitor viral load.	Maintain hydration and avoid alcohol. May experience flulike symptoms.
Antimetabolite/Neoplastic Metabolite			
5-Fluorouracil (5-FU) and floxuridine (FUDR)	Antimetabolite that acts during cellular metabolism to prevent cellular division.	Perform baseline assessments with attention to temperature. Monitor blood count.	Avoid crowds and prevent exposure to infection. Promptly report fever, diarrhea, vomiting, bleeding, bruising, or redness and burning of the palms of hands or soles of feet.

BP, Blood pressure; *GI*, gastrointestinal; *HBV*, hepatitis B virus; *HCV*, hepatitis C virus; *I&O*, intake and output; *INR*, international normalized ratio; *NSAID*, nonsteroidal anti-inflammatory drug.

Vaccines are available to provide active immunity against hepatitis A and B. The vaccine for hepatitis A is administered in two doses, 6 months apart. The vaccine for hepatitis B produces immunity in about 95% of vaccinated individuals and is administered in three or four doses for probable lifetime immunity ([Buggs, 2012](#)).

Passive immunity to type A hepatitis can be conferred by the administration of immune globulin (IG). IG is also recommended for those who have been exposed to someone infected with hepatitis B virus who was not immunized against this virus. There is no protective vaccine for hepatitis C virus.

Health Promotion

Healthy People 2020 Goal for Hepatitis B

Hepatitis is an occupational hazard for all people who have direct contact with patients or surgical and diagnostic equipment. Standard Precautions must be observed at all times. All health care personnel should be immunized with the hepatitis B vaccine. These practices will help meet the [Healthy People 2020](#) goal of reducing hepatitis B and the National Patient Safety Goal to reduce the risk of health care-associated infections.

❖Nursing Management

■ Assessment (Data Collection)

Data collection for a patient with hepatitis should include a nursing history of any previous contacts and whether the contacts have been notified and immunized. By law, viral hepatitis must be reported to the state department of public health. **Because the liver detoxifies many chemicals and metabolizes certain drugs, a complete list of recently taken or current medications is essential. It may be necessary to discontinue some drugs that are particularly toxic to the liver** (see [Box 27-1](#)).

Assess for problems related to silent gastrointestinal (GI) bleeding, respiratory distress, and neurologic dysfunction. Mental confusion and coma associated with hepatic encephalopathy occurs from circulating toxins that result from liver failure. **Encephalopathy** is malfunction or disease of the brain.

Focused Assessment

Data Collection for a Patient With a Liver Disorder

Health History

- Have you ever had a parasitic infection?
- Do you have a history of cancer?
- How much alcohol do you drink?
- Do you have a history of hepatitis?
- Have you been exposed to hepatitis?

- What drugs do you take?
- Have you been exposed to pesticides or industrial chemicals? Which ones?
- Has your appetite decreased? Have you had nausea or vomiting?
- Are you more fatigued than usual?
- Have you noticed any fever?
- Have you noticed dark-colored urine?
- Have you had any light or clay-colored stools?
- Have you had excessive gas?
- Have you been bruising easily?
- Has your skin been itchy or made you feel uncomfortable?
- Has your abdomen increased in girth lately?
- Do you have abdominal pain? Where? Can you describe it?
- Have you gained weight recently?
- Do you take dietary supplements?

Physical Assessment

- Inspect the skin for signs of jaundice, scratch marks, and general condition.
- Inspect the sclera and mucous membranes of the mouth for signs of jaundice.
- Gently palpate the abdomen for masses and for liver enlargement.
- Auscultate bowel sounds.
- Measure abdominal girth for a baseline.
- Inspect extremities for signs of edema.
- Check liver function test values and urinalysis for bilirubin presence.

Nursing Diagnosis and Planning

Problem statements specific to hepatitis infection might include:

- Altered nutrition due to anorexia, nausea, and vomiting
- Fatigue due to disease process and malaise
- Pain due to inflamed liver and pruritus
- Insufficient knowledge due to disease process and self-care needed
- Inadequate diversional activity
- Altered body image due to yellow discoloration of skin

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected outcomes might be:

- Patient will maintain body weight within normal limits during

illness.

- Patient will verbalize lessened fatigue after rest periods each day.
- Patient will verbalize a decrease in pain after pain medication and comfort measures.
- Patient will verbalize knowledge of disease process and self-care within 2 days.
- Patient will engage in appropriate diversional activities during convalescence.
- Patient will list personal strengths that compensate for altered appearance.

Older Adult Care Points

Older adults are at higher risk for drug-induced hepatitis if they have chronic conditions that require the administration of various drugs that can cause liver damage over a long period of time. With liver inflammation, the liver will not function well, and drug dosages will need to be lowered; otherwise drug toxicity may occur.

Implementation and Evaluation

Nursing interventions include reviewing trends of serum liver enzyme levels and serum bilirubin values. Preventing the spread of infection is a major concern when caring for patients with viral hepatitis. The patient and family will need to be instructed regarding special precautions to prevent the spread of the infection, such as proper handling of body secretions, proper hand hygiene, and limiting contact with others.

Sedatives must be given with caution because a diseased liver cannot detoxify them very well. Alcohol is particularly damaging to the liver and should be avoided for 4 months after recovery from hepatitis.

The convalescence of patients with hepatitis is slow and long. A nutritious diet with supplements is prescribed. A variety of diversional activities that are not physically taxing should be planned, such as a new hobby or learning a new skill, computer games, puzzle books, and movies. Nursing interventions for selected problem statements relevant to patients with hepatitis are found in [Table 30-5](#) and [Table 27-2](#).

Complementary and Alternative Therapies

Promoting Good Liver Function

Several supplements are known to be beneficial to promoting good liver function. *N*-acetylcysteine (NAC), glutathione (GSH), choline, methionine, milk thistle, carnitine, and antioxidants are helpful. NAC promotes detoxification pathways; choline helps prevent deposition of fat in the liver. Carnitine allows fats to be used as energy and alleviates deposition of fat in the liver and elsewhere in the body. The provider should always be consulted before the patient takes supplements.

Table 30-5

Common Problem Statements, Expected Outcomes, and Nursing Interventions for Patients

With Hepatitis

PROBLEM STATEMENT	EXPECTED OUTCOMES	NURSING INTERVENTIONS
Fluid volume deficit due to nausea and vomiting	Patient will cease vomiting within 24 hr. Patient will establish fluid balance within 48 hr as evidenced by moist mucous membranes, good skin turgor, and stable blood pressure.	Administer antiemetics as ordered. Monitor IV infusion site and fluid rate. Encourage clear oral fluids if ordered and tolerated. Monitor electrolyte levels for imbalances. Monitor I&O. Provide mouth care q2h while awake.
Altered nutrition due to nausea, vomiting, and improper diet	Patient will ingest a 1200-calorie diet per day within 7 days after subsidence of acute vomiting. Patient will maintain present weight.	Keep door of room closed to keep odors out. Offer mouth care before meal time. Provide six small meals a day plus small, high-calorie snacks between meals. Weigh daily and record. Keep hard candy at bedside for snacking.
Altered comfort due to jaundice and bile pigments in skin causing itching	Patient will verbalize that itching is decreased.	Assist to bathe with tepid water three times a day. Apply lotion q2h. Provide diversional activities. Teach relaxation techniques.
Insufficient knowledge due to ways in which HBV is transmitted, effects of hepatitis on the body, self-care measures, and measures to prevent transmission to others	Patient will verbalize ways HBV is transmitted, effects on body, self-care measures, and measures to prevent transmission to others before discharge.	Teach ways in which HBV is transmitted: parenteral routes, sexual contact, contact with blood and body fluids. Give explanation in understandable terms of what HBV does to the body. Reinforce teaching regarding self-care measures: hygiene, diet, rest, follow-up. Teach importance of not sharing personal articles (especially razor, toothbrush, etc.) with others. Instruct to inform health care workers of the presence of the virus until tests for it are negative. Inform that sexual partner(s) will need injection of special immune globulin for protection and then immunization.
Disturbed body image due to yellow skin color from jaundice	Patient will demonstrate acceptance of present body image by allowing visitors within 3 days.	Assure that jaundice is not permanent. Allow to ventilate feelings about the illness and present appearance. Encourage verbalization of positive aspects about self. Increase fluid intake to help flush bilirubin from blood during recovery.
Fatigue due to vague flulike symptoms	Patient will verbalize less fatigue before discharge.	Assess current level of energy. Assist with ADLs as needed. Suggest that visitors come when energy level is higher. Cluster care and allow for periods of rest. Help identify activities that require more energy and help patient prioritize accordingly.

ADLs, Activities of daily living; HBV, hepatitis B virus; I&O, intake and output; IV, intravenous.

Prevention

Transmission precautions.

Both feces and blood of patients with hepatitis A contain virus during the **prodromal stage** (infected but asymptomatic) and early symptomatic stage. Consistent use of Standard Precautions will provide protection for health care personnel; the patient and family must use precautions at home.

Hepatitis B and D viruses are rarely transmitted by the fecal-oral route, but it is strongly recommended to be very careful when disposing of a patient's stool. Standard Precautions guidelines must be carefully followed for handling, sterilizing, and disposing of equipment contaminated with blood. Hepatitis viruses are transmitted by sexual contact, so the patient must be educated.

Home Care Considerations

Preventing the Spread of Hepatitis Virus

Hepatitis A

- Notify close contacts so they can obtain immune globulin protection and hepatitis A vaccine.
- Practice extremely good hygiene, washing with warm water and soap (liquid soap is best).
- Wash hands after using the toilet and before eating and after changing diapers.
- Avoid preparing food during the infectious period.
- Use separate bath and hand towels from other members of the family.

- Avoid sharing toothbrushes.
- Use gloves to disinfect the bathroom fixtures with a 10 : 1 bleach solution.
- Refrain from sexual contact until the provider states that the infectious period is over.

Hepatitis B or C

- Avoid sexual contact until there is no chance of transmission of the virus.
- Advise close contacts to obtain hepatitis B vaccine as indicated.
- Avoid sharing razors or toothbrushes because of the chance of blood transmission.

Safety Alert

Hepatitis C

Hepatitis C virus is transmitted by blood and saliva. Standard Precautions and careful handling of all body fluids are recommended. The first line of defense is scrupulous hand hygiene. Wear gloves when handling plasma-containing body fluids and use extreme caution when handling used needles, syringes, and IV tubing. Needle sticks; open wounds; and the mucous membranes of the eyes, nose, and mouth can serve as portals of entry. Dentists, providers, nurses, and other health care workers must be informed of a patient's carrier status.

When a patient with viral hepatitis has been admitted to the hospital, the infection control professional must be notified. It is important to familiarize yourself with the hospital's policies and procedures so that protection for others and follow-up for the infected patient is not overlooked. Infection with hepatitis A in a person who handles food on the job must be reported promptly. The Centers for Disease Control and Prevention (CDC) has published guidelines for the care of patients hospitalized with hepatitis. These same guidelines can be modified for home care to prevent the spread of the infection.

Complications

A small percentage of patients with hepatitis can develop massive necrosis of liver cells that results in acute liver failure. *Acute liver failure* is the preferred term according to the American Association for the Study of Liver Diseases. *Fulminant hepatitis* or *necrosis* and *fulminant hepatic failure* are older terms. The only hope for recovery is a liver transplant; without transplant, death occurs in about 75% of these cases. Symptoms of liver diseases include mental confusion, disorientation, and drowsiness, which indicate hepatic encephalopathy. **Ascites** (abnormal accumulation of serous fluid within the peritoneal cavity) and edema accompany liver failure.

Safety Alert

Subsequent to a CDC warning in 2013, a body building and weight loss supplement marketed as OxyElite Pro was recalled and removed from the market. It was linked to acute liver failure ([FDA, 2013](#)).

Cirrhosis

Etiology

There are approximately 31,000 deaths attributed to chronic liver disease and cirrhosis in the United States annually ([Taylor, 2014](#)). Excessive alcohol ingestion is the leading cause of cirrhosis in the United States, and hepatitis B or C is the second most common cause ([Sood, 2013](#)). **Postnecrotic cirrhosis** is caused by viral hepatitis, toxic substances, parasites, or infection. There are three other types of cirrhosis. **Laënnec cirrhosis**, or **portal cirrhosis**, results from alcoholism. The first change caused by excessive alcohol ingestion is the deposition of fat in the liver cells. This is reversible if

alcohol consumption is halted; otherwise, widespread scar formation occurs. **Biliary cirrhosis** is from chronic biliary obstruction and infection. **Cardiac cirrhosis** results from long-standing, severe right-sided heart failure in patients with cor pulmonale.

Cultural Considerations

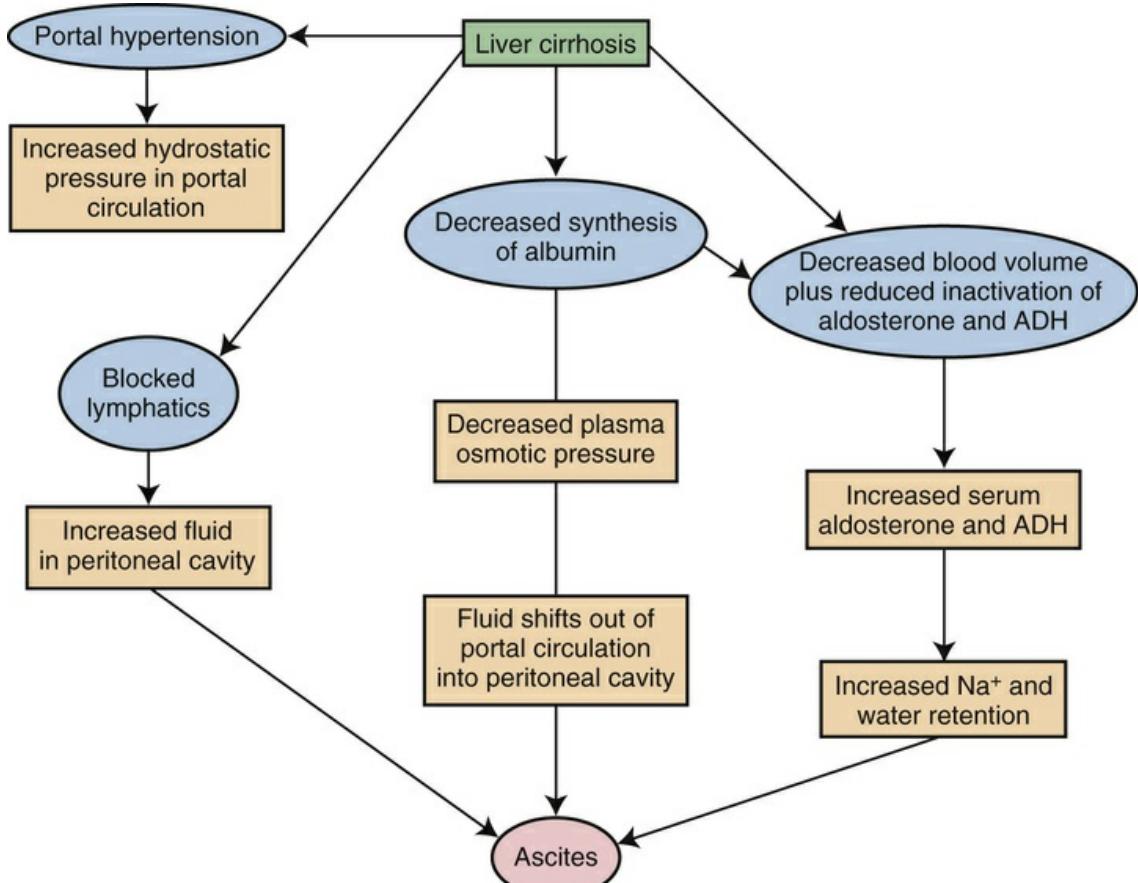
Liver-Related Deaths

Death related to liver disease is not among the top 10 causes of death for the general population; however for the American Indian and Alaska Native population, chronic liver disease and cirrhosis rank fifth as a cause of death, and for the Hispanic population liver disease is the sixth leading cause of death ([Kochanek et al, 2014](#)).

Pathophysiology

Cirrhosis is a progressive, chronic disease of the liver. Normal hepatic structures are destroyed and replaced with necrotic tissue. Fibrous bands of connective tissue develop in the organ, which eventually constrict and partition the liver tissue into irregular nodules. If this process is halted before too much liver tissue is damaged, the liver tissue will regenerate. Late cirrhosis is considered irreversible.

When liver cells begin to degenerate, the blood vessels within the liver also fail to function. This causes an obstruction to the flow of blood through the portal circulatory system, causing portal systemic hypertension. There is altered vessel permeability and fluid leakage into the abdomen, resulting in ascites. As pressure increases in the hepatic veins, there is a shift of protein-rich plasma filtrate into the lymphatic ducts. If the pressure is high enough in the ducts, the excess fluid will ooze from the surface of the liver into the peritoneal cavity. The fluid has a high colloidal pressure because of its high protein content and is not readily reabsorbed. Fluid accumulates in the cavity, causing increased abdominal girth and weight gain. Secondarily, the damaged liver's inability to synthesize albumin and the osmotic pressure within the blood vessels falls, allowing fluid to be pulled out into the tissues. The third mechanism contributing to ascites and edema is excess circulating aldosterone, which is not properly metabolized by the damaged liver. The excess aldosterone causes sodium and water retention ([Concept Map 30-1](#)).



CONCEPT MAP 30-1 Relationship of systemic portal hypertension and ascites in liver cirrhosis. *ADH*, Antidiuretic hormone.

Signs and Symptoms

Cirrhosis usually progresses without symptoms until severe liver damage is present. Subjective symptoms of liver cirrhosis include fatigue, weakness, headache, anorexia, indigestion, abdominal pain, nausea, and vomiting. Fluid retention in the right hemithorax or ascites can limit expansion of the chest and cause dyspnea. Objective symptoms of liver cirrhosis include excessive gas, skin rashes, and fever. Leg and foot edema and **palmar erythema** (redness of the palms that blanches with pressure) occur. Sometimes bluish varicose veins, called **caput medusa**, radiating from the umbilicus (indicating portal hypertension) are seen. Bleeding and bruising because of deficiencies in vitamin K, thrombin, or prothrombin interfere with clot formation. The liver often is enlarged and “knobby” and is palpable below the level of the right rib cage. Abdominal distention is present. The spleen also enlarges. Skin lesions, jaundice, **pruritus** (severe itching of the skin), bleeding disorders, endocrine disorders, and peripheral neuropathy occur in late disease. **Spider angiomas** (abnormal collection of blood vessels under the skin) may appear on the face, neck, upper trunk, and arms.

Urine may become dark and foamy, and stools turn clay colored, which indicates that bile is not reaching the intestine. Jaundice occurs either because the liver cannot metabolize bilirubin or because bile flow is obstructed. Excessively high levels of bile pigment (**bilirubin**) are present in the blood. The pigment is deposited in the skin, mucous membranes, and body fluids, causing a change in color ranging from pale yellow to golden orange. The first signs of jaundice are usually seen in the sclera of the eye (**icterus**), which takes on a yellow tint. Jaundice is not always a sign of liver damage. In **hemolytic jaundice**, there may be an increased level of bilirubin as a result of excessive destruction of red blood cells, with resultant release of the pigment into the bloodstream. Figure 30-3 shows the signs and symptoms of cirrhosis. **Elevations in liver enzymes usually do not occur until 65% of liver function is gone.** The patient is likely to delay seeking medical attention until symptoms are pronounced.

Think Critically

Can you list the ways in which you would collect data when checking a patient for signs of jaundice?

Clinical Cues

In people with dark skin, jaundice is best detected by checking the buccal mucosa, hard palate, palms, soles of the feet, sclera, and conjunctiva.

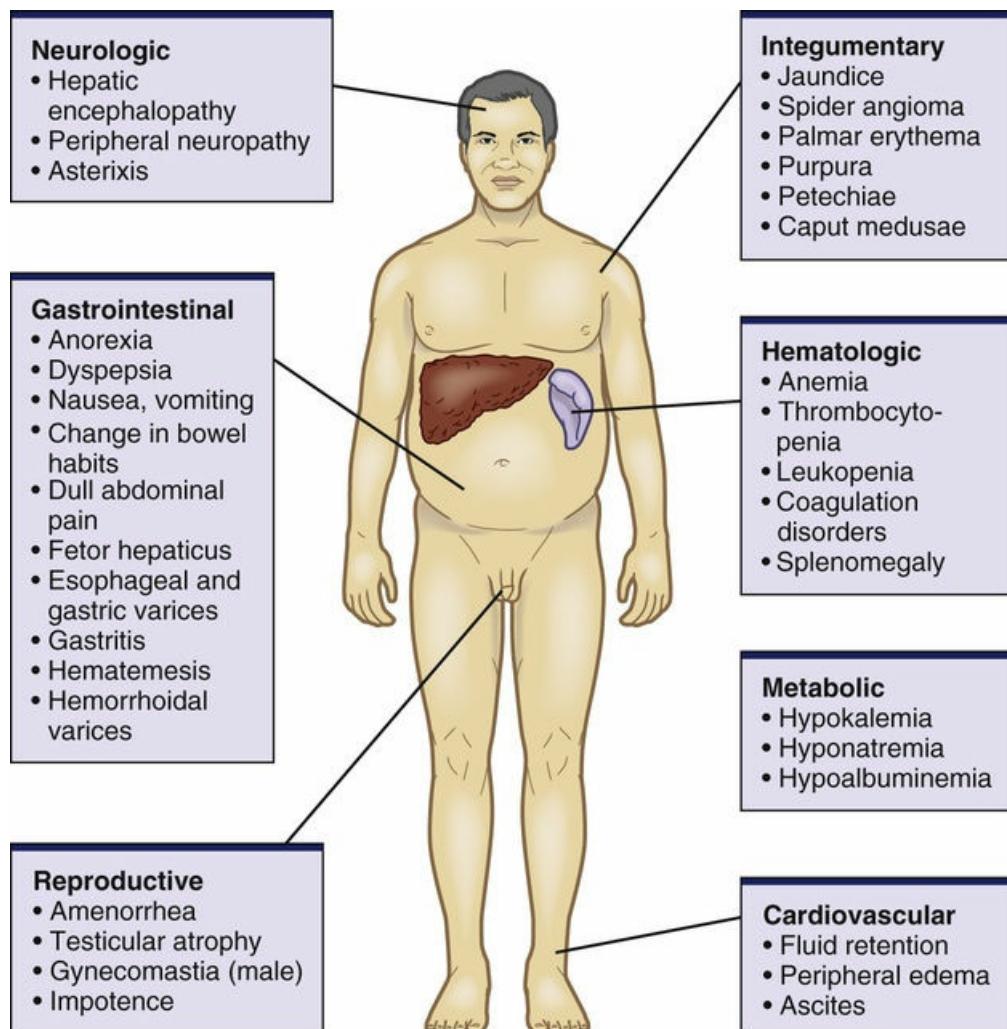


FIGURE 30-3 Signs and symptoms of cirrhosis. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Diagnosis

A definitive diagnosis of cirrhosis of the liver is made by liver biopsy. Laboratory testing may show a low albumin level and elevated PT/INR, as well as elevated AST, ALT, ammonia level, and lactate dehydrogenase (LDH) values. CT and liver ultrasound can help determine the size of the liver and presence of any masses and outline the hepatic blood flow and any vascular obstruction. Magnetic resonance cholangiopancreatography—similar to ERCP but without the use of an invasive procedure—may be performed.

Treatment

Treatment is aimed at stopping the liver damage, restoring the liver's functions, and managing the

symptoms. **Medical treatment of ascites includes restriction of fluid and sodium intake and administration of diuretics.** Abdominal **paracentesis** (removal of ascites fluid) can be performed to remove accumulated fluid; however, this is a temporary measure that poses problems of rapid fluid shift, loss of protein, and the potential for introducing infectious organisms into the peritoneum. A transjugular intrahepatic portosystemic shunt (TIPS) may be used to decrease pressure between portal and hepatic veins in the liver and decompress **varices** (abnormally dilated veins). A catheter is inserted into the venous system and threaded to the hepatic vein and then directed to the portal vein. Stents are placed through the liver that extend into both veins, bypassing some of the portal circulation, thereby decreasing pressure. TIPS is performed to decrease risk of bleeding from esophageal varices and reduce accumulation of ascites.

Safety Alert

Liver Inflammation

Patients with liver inflammation or cirrhosis should avoid taking large doses of vitamins and minerals. Vitamin A, iron, and copper can worsen the liver damage.

Traditionally, limitation of dietary protein intake was prescribed; however, this approach is being challenged, and the current recommendation is to manage encephalopathy with medications rather than to restrict protein. Vegetable proteins are preferred because they do not contribute to encephalopathy ([Caruana and Shah, 2011](#)).

Thiamine, zinc, and multiple vitamins are given to counteract vitamin deficiency. Lactulose, an exchange resin, is given orally or by a feeding tube to induce diarrhea and prevent diffusion of ammonia out of the intestinal tract. Ammonia has been believed to be the origin of hepatic encephalopathy; however, many patients with cirrhosis have elevated ammonia levels without symptoms, and patients with significant alteration in level of consciousness have normal ammonia levels. Studies continue ([Wolf, 2013](#)). Kidney failure sometimes accompanies liver failure (hepatorenal syndrome).

Cholesterol-binding medications such as cholestyramine (Questran), colestipol (Colestid), and colesevelam (Welchol) may be given to relieve pruritus from bile pigment deposits in the skin.

Research continues on use of cell-based and non-cell-based liver dialysis therapies to “bridge” patients who are waiting for a liver transplant or to support function while acute failure is resolving. Devices trialed so far have failed to show survival benefit with the therapy. Many patients with acute liver failure have potential for liver regeneration if function can be supported during the healing process ([Maiwall et al, 2014](#)).

Nursing Management

Assessment (Data Collection)

A thorough assessment to identify specific patient care problems related to abnormal liver function is performed (see [Focused Assessment](#)). Assess for safety issues related to change in mental status. The patient may have signs of bleeding. Pay extra attention to ammonia levels, albumin, AST, ALT, and PT/INR results. Increase in ascites is determined by measuring and recording abdominal girth each day. Daily weight checks should also be initiated if fluid retention is observed. If alcoholism is an issue, be vigilant for signs of withdrawal, which may occur 6 to 12 hours after the last drink and can continue for 3 to 5 days (see [Chapter 46](#) for additional information). Be sure to get an order to implement the alcohol withdrawal protocol if indicated.

Nursing Diagnosis, Planning, Implementation, and Evaluation

The intake of alcohol and administration of drugs toxic to the liver must be completely restricted. Sedatives and opiates are either avoided or given with great caution. Rest may be prescribed to aid healing. The degree of rest and activity is dictated by the stage of illness. Nutritional deficiencies are treated with supplements and diet. The patient is at great risk for infection and should be protected from exposure to infectious agents; antibiotics should be given quickly when infection occurs.

Nursing diagnoses, expected outcomes, and interventions for patients with cirrhosis are listed in [Nursing Care Plan 30-1](#) (see also [Table 30-5](#)). Stabilization of fluid balance, normalization of vital

signs, and progress toward baseline mental status and increasing ability to perform activities of daily living (ADLs) independently are indicators that the expected outcomes are being met; if not, new interventions are chosen for the plan.

Think Critically

Can you identify signs and symptoms that you might find when assessing a patient with advanced cirrhosis of the liver?

Nursing Care Plan 30-1

Care of a Patient With Cirrhosis of the Liver

Scenario

A 62-year-old man with a 25-year history of alcoholism is admitted with hepatic encephalopathy caused by progressive alcoholic cirrhosis. His complaints include thirst, extreme fatigue, a swollen abdomen, edema of the feet and ankles, jaundice, itching, shortness of breath, nausea and indigestion, drowsiness, and confusion. Esophageal varices are present. All his liver function test results and his ammonia level show elevation, and his PT and INR are prolonged. His hematocrit, hemoglobin, and serum albumin levels are low.

Problem Statement/Nursing Diagnosis

Actual (or potential for) altered breathing pattern/*Altered gas exchange due to fluid accumulation in the chest (hydrothorax) or abdomen (ascites).*

Supporting Assessment Data

Subjective: "I feel like I can't get my breath."

Objective: Shallow rapid breathing, RR 28-32/min; pauses to catch breath after slight exertion of moving in bed. Pulse oximetry 88% on room air.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will maintain adequate oxygenation as evidenced by respiratory rate of 12-24/min and oxygen saturation of greater than 92%.	Assess rate, rhythm, and quality of respirations and pulse oximeter readings at baseline and after interventions. Place in semi-Fowler position and observe for relief. Auscultate lung fields at the beginning of the shift and as required (PRN) for worsening breath sounds.	Changes in respiratory pattern or pulse oximeter suggest worsening, stabilization, or improvement. Raising head of bed (HOB) usually alleviates dyspnea, but ascites or hydrothorax may restrict chest expansion. Compare findings to your initial assessment to discover changes.	Breathing is shallow and rapid if lying in supine position. If assisted to a sitting position, experiences temporary subjective relief. Pulse oximeter 93% when coached to inhale deeply. Relief obtained with HOB at 30 degrees. Diminished in the bases bilaterally, with fine crackles.
	Administer oxygen as ordered.	Oxygen is generally ordered if saturation falls below 92% (provider may set the parameter higher).	Currently, pulse oximeter shows 93% when awake; however, level drops to 90% when asleep.
	Encourage use of incentive spirometer and teach deep breathing and coughing.	Chest expansion may be limited; therefore patient must be encouraged to make an extra effort to prevent pneumonia and atelectasis.	Willing to try spirometer, but needs continuous reminding. Family members able to help by encouraging him.

Problem Statement/Nursing Diagnosis

Potential for bleeding due to esophageal varices and decreased clotting factors/*Risk for bleeding related to esophageal varices and decreased clotting factors.*

Supporting Assessment Data

Subjective: "Thirsty."

Objective: Elevated liver function test results; cirrhosis, spider angiomas, jaundice, ascites, and prolonged PT/INR.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience life-threatening hemorrhage while hospitalized. Any bleeding will be promptly recognized and reported.	Monitor stool and emesis for blood and other bleeding signs. Feed only soft foods. Give vitamin K as ordered. Monitor vital signs q2-4h as ordered.	Alerts to bleeding. Prevents mechanical irritation of esophagus. Vitamin K is needed for synthesis of clotting factors. Vital sign changes, restlessness, and confusion may indicate bleeding.	No signs of bleeding. Eating soft foods; favors puddings and cooked cereals. Vitamin K administered. BP 120/80, pulse 87/min, RR 24/min; is anxious.

	Observe for increasing restlessness and confusion.	Indicators of hypoxia secondary to bleeding.	Alert and oriented to person and place.
	Monitor PT and INR.	Prolonged clotting times contributes to rapid blood loss.	Laboratory test results pending. Continue plan.

Problem Statement/Nursing Diagnosis

Acute confusion/*Acute confusion due to increased ammonia level caused by liver failure.*

Supporting Assessment Data

Subjective: Confused as to month.

Objective: Elevated serum ammonia and drowsiness.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Serum ammonia levels will not increase further during hospitalization.	Administer oral antibiotics as ordered.	Antibiotics kill intestinal bacteria that help digest protein and produce ammonia.	Administered medication.
Serum ammonia levels will return to normal within 2 mo.	Administer lactulose as ordered.	Lactulose decreases absorption of ammonia.	Lactulose administered; diarrhea occurring. A&D ointment applied to anal area after bowel movements.
	Monitor serum ammonia levels.	Assists in determining likelihood of coma.	Laboratory work to be drawn in A.M. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury due to confusion, drowsiness, and weakness.*

Supporting Assessment Data

Subjective: "This room looks strange. I can't find the toilet."

Objective: Elevated serum ammonia and slight confusion.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience injury while hospitalized.	Monitor mental status every 2h.	Determines worsening of disorientation.	Oriented to person and place, can recall month with repeated coaching.
	Place call bell within reach and bed at lowest level. Activate bed alarm.	Prevents injury from accidental fall from bed.	Bed down, call bell within reach, alarm activated.
	Offer frequent assistance with toileting and other needs (i.e., hygiene, fluids).	Decreases incidents of wandering or falls if trying to meet own needs.	Offered toileting and mouth care q2-3h. No injury sustained. Continue plan.

Problem Statement/Nursing Diagnosis

Inability to perform self-care due to fatigue, drowsiness and ascites/*Deficient self-care due to fatigue, drowsiness, and ascites.*

Supporting Assessment Data

Subjective: "I'm so sleepy and weak."

Objective: Cannot perform ADLs; very drowsy, ascites present.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will be able to assist with ADLs within 2 wk.	Have patient brush own teeth and wash face. Add in other self-care activities as energy level increases. Allow rest periods between activities.	Gradual increase in activity level allows for patient to participate and build strength.	Patient able to brush teeth, wash face, and wash perineal area.
Patient will be able to perform ADLs independently within 1 mo.	Offer mouth care q2h.	Mouth care improves appetite. Improved nutrition increases energy level.	Mouth care given q2h.
	Assist with meal trays, gradually decreasing assist.	May lack fine motor coordination to open packages.	Set up meal tray. Patient able to unwrap eating utensils and take lids off of liquids.
	Assist with toileting. Gradually decrease assist.	Prevents falls and aids with elimination.	Assisted with toileting. Needed to be steaded upon standing, able to ambulate without assist. Continue plan.

Problem Statement/Nursing Diagnosis

Fluid retention/*Excess fluid volume excess due to ascites and peripheral edema from portal hypertension.*

Supporting Assessment Data

Objective: Ascites, edema of feet and ankles, 6-lb weight gain in 2 days.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have no further increase in ascites this week.	Measure abdominal girth every shift.	Determines whether ascites is increasing or decreasing.	Abdominal girth down inch.
Patient will return to normal fluid balance within 2 wk.	Administer diuretics as ordered and monitor I&O.	Diuretics remove excess fluid from the body. I&O tracks fluid removal.	Diuretic administered. Intake 400 mL; output 670 mL.
	Weigh daily and record.	Daily weight indicates whether diuretic therapy is effective.	Weight down 1.5 lb.
	Turn at least q1-2h. Provide good skin care.	Turning and skin care prevent pressure sores.	Turned q2h; skin care provided; no reddened or excoriated areas over pressure points. Continue plan.

Critical Thinking Questions

1. Can you describe the correct way to measure abdominal girth?
2. Why is good skin care even more important when a patient has edema and ascites?
3. How high would a PT or INR level have to climb before you would report it to the provider immediately?
4. Why would it be important to monitor this patient for symptoms of alcohol withdrawal?

ADLs, Activities of daily living; *BP*, blood pressure; *I&O*, intake and output; *INR*, international normalized ratio; *PT*, prothrombin time; *RR*, respiration rate.

Complications

Esophageal varices.

Bleeding from **esophageal varices** (dilated, distorted, engorged veins) is a major complication of cirrhosis. They are the result of portal congestion and hypertension. In advanced cirrhosis, blood that normally flows from the intestines to the portal vein and on through the liver is shunted to other veins, including the veins of the upper stomach and lower esophagus. The added load of blood causes congestion of these veins. When the vein walls rupture, massive bleeding occurs. Another factor in hemorrhage is that the liver is no longer able to make vitamin K, which is an essential component of clotting factors. Varices may rupture and produce **hematemesis** (vomiting of bright red blood) from increased blood pressure, coughing, vomiting, or mechanical irritation from poorly chewed food. More than 20% of patients with cirrhosis who have bleeding esophageal varices die within 6 weeks of the first bleed ([Carale, 2014](#)).

Treatment options are administration of parenteral vasopressors such as vasopressin (Pitressin) to lower portal pressure, injection sclerotherapy, or ligation of the bleeding vessels ([Figure 30-4](#)). Surgical intervention is only used when endoscopic treatment or medications have failed to control the bleeding. Vasoconstrictors such as somatostatin (Zecnil) and octreotide (Sandostatin) are used to reduce portal blood flow. A beta blocker may be given to lower blood pressure. The patient is given vitamin K to help rectify clotting factor deficiencies. The treatment of hemorrhage of the upper GI tract is discussed in [Chapter 28](#).

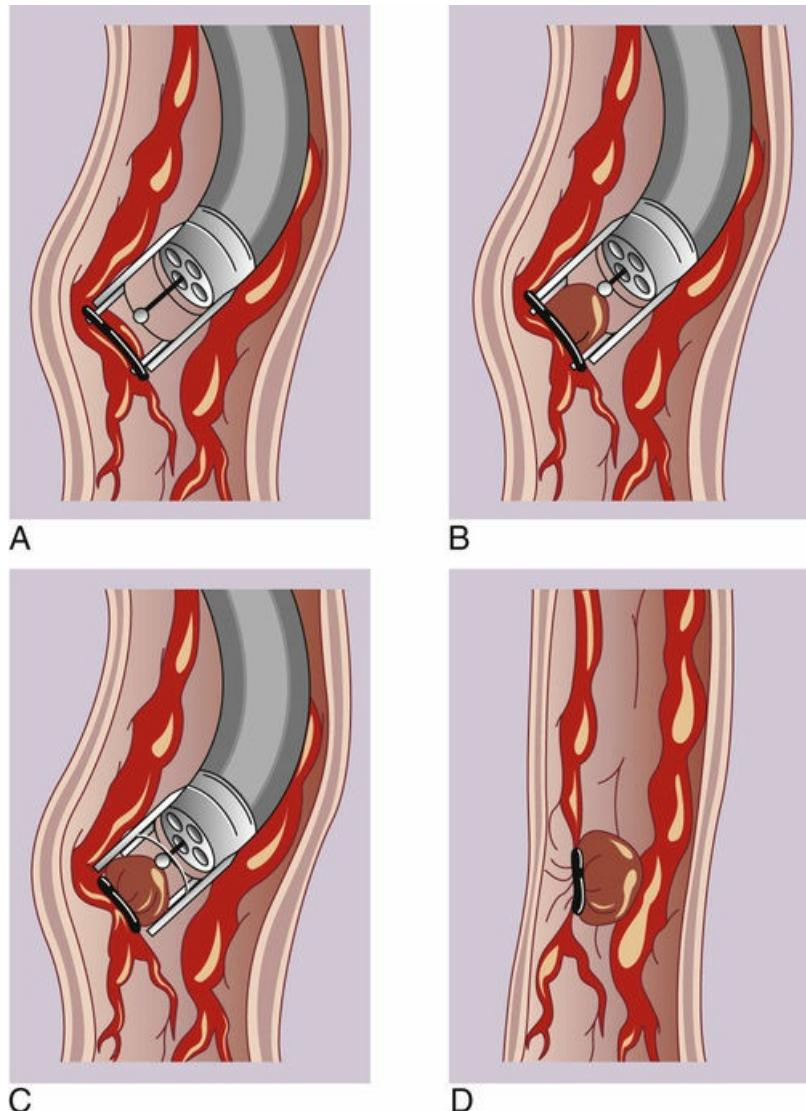


FIGURE 30-4 Treatment for esophageal varices. **A**, Endoscope positioned over varix. **B**, Suction is applied to draw varix toward the endoscope. **C**, Ligation band is deployed around varix. **D**, Band in place.

Encephalopathy.

Portal systemic encephalopathy or hepatic encephalopathy is another dangerous complication of cirrhosis. Encephalopathy in this instance is directly related to liver failure and is believed to be caused by the buildup of ammonia and gamma-aminobutyric acid. Symptoms such as delirium, convulsions, **asterixis** (flapping tremors), and coma occur. Asterixis is identified by having the patient hold out the arms and hands and observing for rapid flexing and extension movements of the hands. There may be rhythmic movements of the legs with dorsiflexion of the foot and rhythmic movements in the face with strong eyelid closure. **Fetor hepaticus** (breath with a sweet, fecal odor) occurs as liver failure progresses.

Liver Transplantation

Liver transplantation is considered for patients with progressive and advanced liver disease that does not respond to treatment. It is most commonly done for nonalcoholic cirrhosis, chronic active hepatitis, sclerosing cholangitis, metabolic disorders, and biliary atresia in children. Some recovered alcoholics with cirrhosis are candidates. Between 70% and 80% of liver transplant recipients survive at least 3 years with good quality of life. Survival rates are 67% at 10 years after transplant (UNOS, 2012). Organ transplantation, tissue matching, and measures to prevent organ rejection are discussed in Chapter 11. If the patient has encephalopathy preoperatively, an intracranial pressure

monitor is placed to assess intracranial pressure (ICP). Every attempt is made to keep ICP within normal limits because increased ICP levels are correlated with decreased survival rates after transplantation.

Nursing Management

After surgery a T-tube and Jackson-Pratt drains will usually be in place. The patient must take cyclosporine for life to prevent rejection of the new liver. Other immunosuppressants such as azathioprine (Imuran), corticosteroids, tacrolimus (Prograf), monoclonal antibody OKT3, and interleukin-2 receptor antagonists such as basiliximab (Simulect) and daclizumab (Zenapax) may also be added. Strict infection control and prevention is necessary, and the patient is monitored closely for signs of hemorrhage or hypovolemia. Measures are instituted to prevent pneumonia, atelectasis, and pleural effusions. Liver function, serum potassium, serum glucose, and coagulation factors are monitored closely. Right quadrant or flank pain, increasing jaundice, fever, and changes in stool and urine color may indicate organ rejection. Close medical supervision is necessary after discharge.

Cancer of the Liver

Etiology

Primary cancer of the liver is rare in the United States but is a common malignancy in Africa and Asia, where it is caused by a parasite called the *liver fluke*. Liver cancer may be triggered by aflatoxin, a mold that grows on spoiled peanuts, corn, and grains. Metastatic liver cancer is much more prevalent than primary liver cancer, but the end result is the same. Cirrhosis and hepatitis B or C increase the risk. Because of an increase in hepatitis C, there has been an increase in hepatocellular carcinoma. Three times as many men as women develop liver cancer.

Pathophysiology

There are two types of primary liver cancer: (1) hepatoma, which arises from the hepatocytes, and (2) cholangiocarcinoma, or bile duct cancer. Benign tumors also occur in the liver. Hepatoma usually develops in people who have cirrhosis. A rare disorder called *hemochromatosis*, which causes deposits of iron in the body, predisposes to the development of hepatoma. The cause of cholangiocarcinoma is unknown, but it occurs more often in people with inflammation of the bowel, such as ulcerative colitis.

Pathophysiologically, there is irritation and inflammation with disruption of the structure of normal liver cells. The cancer spreads throughout the organ and invades the portal vein and lymphatics. It may metastasize to the lungs, brain, kidneys, and spleen.

Signs, Symptoms, and Diagnosis

Symptoms may include right upper quadrant pain, fatigue, anorexia, weight loss, weakness, or fever plus signs of poor liver function. Pain may radiate to the back. Because symptoms often are vague, diagnosis of liver cancer occurs late, and death may occur within 6 to 18 months.

Diagnostic tests are used to determine the presence of tumor and the stage of the cancer and to find areas of metastasis. Fine-needle biopsy or brush biopsy during ERCP gives a definitive diagnosis for bile duct cancer.

Treatment and Nursing Management

If no distant spread is found and there is no lymph node involvement, surgical resection may be attempted. If the tumor is primary and has not metastasized, liver transplantation is an option. Treatment is combined radiation and chemotherapy that is infused intravenously or directly into the hepatic circulation. Commonly used agents are 5-fluorouracil (5-FU), floxuridine (FUDR), doxorubicin, and methotrexate. In chemoembolization, an interventional radiologist cannulates the main artery feeding the tumor and injects chemotherapy agents. The treatment may induce toxic hepatitis, which subsides after the end of therapy. A newer drug, sorafenib (Nexavar), has improved the survival of patients with advanced cancer. Other drugs that inhibit tumor growth by interfering with the blood supply that feeds the tumor are being tested in combination with sorafenib and include bevacizumab (Avastin), erlotinib (Tarceva), and sunitinib (Sutent) ([Axelrod](#),

2012).

Tumor ablation is used for tumors less than 5 cm in diameter. Ethanol or acetic acid is injected through the skin into the tumor. The liquid destroys the cancer cells. The procedure is carried out in the radiology department with the use of ultrasound.

Laser or radiofrequency ablation that uses heat to destroy cancer cells is performed with a local anesthetic. This procedure is used for cholangiocarcinoma. Cryotherapy may be used during surgery; a probe deposits liquid nitrogen to the tumor site. Cancer cells are destroyed by freezing.

Nursing care includes assessing for signs and symptoms of liver failure and blockage in the common bile duct. Additional care is directed at the associated problems, such as ascites and encephalopathy. Surgical care is provided as for other abdominal surgery patients (see [Chapter 5](#)). Care of patients undergoing chemotherapy and radiation for cancer is discussed in [Chapter 8](#).

Disorders of the Pancreas

Acute Pancreatitis

Pancreatitis is an inflammation of the pancreas. It may be acute or chronic. Pancreatitis frequently accompanies obstruction of the pancreatic duct from gallstones or from the backflow of bile into the pancreatic duct.

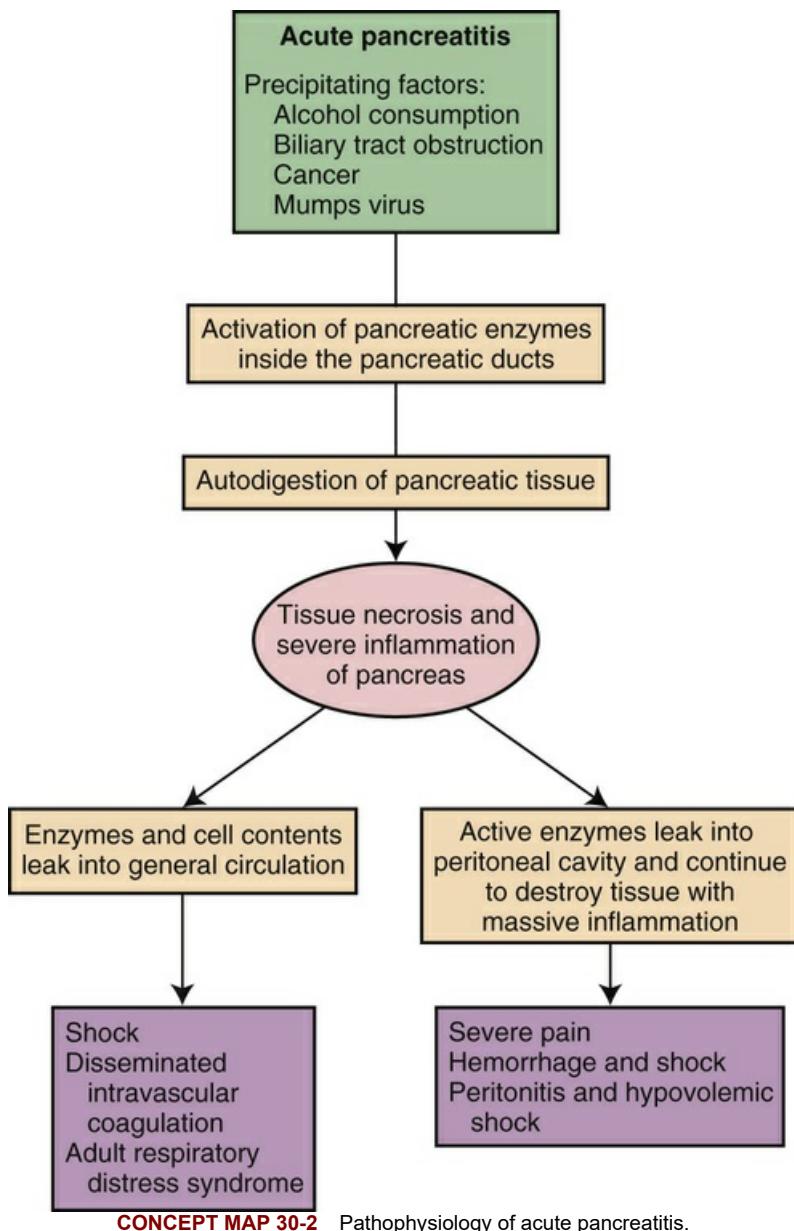
Etiology

Many cases of pancreatitis are related to alcoholism, although it can be caused by biliary disease. Viral infections, trauma, ERCP, penetrating ulcers, drug toxicities, metabolic disorders, scorpion stings, and a variety of other factors can cause pancreatitis. Men tend to develop pancreatitis related to alcohol. In women, it is more commonly associated with gallstones.

Pathophysiology

In some types of pancreatitis, the severe inflammation and damage are caused by escape of pancreatic digestive enzymes. The enzymes act directly on the tissue, causing hemorrhage, autodigestion, and necrosis. It is unclear how the autodigestion is activated. Reflux of bile and duodenal contents into the pancreatic duct is a possible mechanism. A gallstone stuck in the ampulla of Vater can cause edema of the sphincter of Oddi, which might permit reflux of duodenal contents. Alcohol can cause spasm of the sphincter of Oddi, blocking secretion through the pancreatic ducts. This may lead to activation of the pancreatic enzymes within the pancreas.

Pancreatic abscess or pseudocysts may develop. An abscess may form from the purulent liquefaction of the necrotic pancreatic tissue. A **pseudocyst** is a saclike structure that forms on or around the pancreas. It may contain several liters of enzymatic pancreatic exudates. If a pseudocyst ruptures, it may cause hemorrhage. Shock may occur, as may other life-threatening complications ([Concept Map 30-2](#)).



Signs and Symptoms

Pancreatitis causes abdominal pain that is usually acute, but this can vary among individuals. The pain is steady and is localized to the epigastrium or left upper quadrant. As it progresses, it spreads and radiates to the back and flank. Sitting and leaning forward may ease the pain. The severity of the pain may slowly decrease after 24 hours. **Eating makes the pain worse.** Nausea, vomiting, sweating, jaundice, and weakness often accompany pain.

Clinical Cues

A patient with acute pancreatitis may curl up in a tight fetal position (knee-chest) because this opens up the retroperitoneal space and decreases pain. Assuming a supine position for a procedure or assessment is likely to increase the pain; therefore acknowledge the patient's discomfort and help him to resume the position of greatest comfort when the procedure is over.

Examination of the abdomen will reveal tenderness and guarding. If peritonitis is present, there will be distention and rigidity. Bowel sounds may be reduced or absent. A pseudocyst can be palpated as an epigastric mass in about 50% of cases. If retroperitoneal bleeding is present, there

may be bruising in the flanks or a bluish discoloration around the umbilicus. There may be signs and symptoms of respiratory distress (secondary to atelectasis, pleural effusion, or respiratory distress syndrome) or shock, tachycardia, leukocytosis, and fever. Serum amylase may be two times normal and will remain elevated for 72 hours. Serum lipase remains elevated for several days. If biliary obstruction is involved, mild jaundice may be present. Laboratory values will indicate hypoglycemia, hypocalcemia, and hypokalemia.

Diagnosis

Diagnosis is based on the symptoms, risk factors, and results of tests performed to rule out other disorders. An abdominal ultrasound, CT scan, and serum and urine amylase studies are usually ordered.

Treatment and Nursing Management

Pain evaluation and control are primary nursing responsibilities. Vital signs are taken frequently, urinary output is monitored, and the patient is monitored for signs of shock. Observe for signs of restlessness, use of accessory muscles for breathing, irritability, confusion, or dyspnea, which indicate respiratory distress, and administer oxygen as ordered. Monitor laboratory values and note changes. Monitor administration of fluids and observe for electrolyte imbalances. The patient is kept NPO during the acute phase to prevent stimulation of digestive enzymes from the pancreas and further aggravation of the inflammation. Nasogastric intubation with suction may be employed to empty the stomach and duodenum. IV fluids are given until the edema of the pancreas and the pancreatic duct has subsided. If the patient is receiving total parenteral nutrition (TPN), blood glucose needs to be checked regularly, and insulin may be necessary. As soon as pain and nausea are managed, oral feeding with a low-fat solid diet may be provided. Nutritional support is important to healing. Most patients with acute pancreatitis recover after receiving this type of treatment.

Assess for tolerance of the diet as the patient resumes foods. If abscess or pseudocyst are present, they will be surgically drained. Intravenous meperidine or morphine via PCA pump may be needed to control pain. Histamine (H_2)-receptor antagonists or a proton pump inhibitor may be given to decrease the hydrochloric acid secretion that stimulates pancreatic activity. Administration of antispasmodics such as dicyclomine (Bentyl) or propantheline bromide (Pro-Banthine) is helpful.

Clinical Cues

When a powdered form of pancreatic enzymes must be taken, it should be mixed in nonprotein food, such as applesauce. Care must be taken not to let any of the medication remain on the lips or skin because it will cause irritation. Supplementation of pancreatic enzymes is used for chronic pancreatitis.

Think Critically

Your patient with acute pancreatitis has a nasogastric tube in place. The patient says, "I want this tube taken out, and I want to eat." What will you say to the patient?

Chronic Pancreatitis

Etiology and Pathophysiology

Chronic pancreatitis is most commonly seen in men who have been drinking alcohol for many years. Repeated bouts of inflammation cause progressive fibrosis of the gland, stricture of the ducts, and eventual calcification.

Signs and Symptoms

Abdominal pain is the major symptom. There may be periods of acute pain, but chronic pain at intervals of months or years is more common. Other symptoms are related to pancreatic insufficiency as less and less pancreatic tissue is functional. Malabsorption with weight loss and steatorrhea, constipation, mild jaundice with dark urine, and diabetes mellitus develop.

Diagnosis

Determination of bicarbonate, protease, amylase, and lipase concentration and output in the duodenum after stimulation with secretin is a helpful test for chronic pancreatitis. This test is done in conjunction with ERCP. Ultrasound may be utilized via the endoscope. Other helpful diagnostic tests are fecal fat determination, fasting blood glucose, arteriography, and radiographic examinations of the pancreas. Pancreatic cancer or a liver disorder can produce the same results on these tests. The differential diagnosis is difficult. Serum amylase and lipase may be elevated slightly or not at all. There may be increases in serum bilirubin and alkaline phosphatase. Leukocytosis and an elevated sedimentation rate are present. Advanced disease is best identified by CT scan.

Treatment and Nursing Management

Treatment during an acute episode of chronic pancreatitis is the same as for acute pancreatitis. Help your patient by reinforcing information about the disease process and the therapeutic regimen, which will include prescribed pancreatic enzymes to be taken with low-fat meals. Long-term pain control presents problems. The patient is switched to nonnarcotic pain medications to try to prevent addiction, but these are often insufficient for pain control. Complications such as diabetes mellitus must be addressed, and diet requirements and medications should be reviewed with the patient. Chronic pancreatitis interferes with the patient's usual lifestyle and often is accompanied by depression, so your patient should be periodically assessed for signs of depression, and appropriate referrals should be made. A **major nursing action is to be supportive of efforts to abstain from alcohol.** Table 30-6 presents problem statements and specific interventions appropriate for patients with pancreatitis.

Table 30-6

Common Problem Statements, Expected Outcomes, and Nursing Interventions for Patients With Pancreatic Disorders

PROBLEM STATEMENT	EXPECTED OUTCOMES	NURSING INTERVENTIONS
Acute pain due to pancreatic inflammation	Patient's pain level will decrease as measured on the pain scale within 1 hr of instituting nursing measures. Patient will state that pain is controlled within 8 hr.	Medicate with analgesic as ordered. Instruct in use of PCA pump if ordered. Encourage relaxation techniques to decrease discomfort. Assess q2h for adequate pain relief. Administer adjunctive medications as ordered. Assist into knee-chest position for comfort. Maintain NPO status and NG tube for decompression as ordered and explain how these two therapies decrease the pain.
Potential for altered breathing pattern due to irritation or to diaphragm pressure from ascites or pancreatic abscess/pseudocyst	Patient will maintain adequate oxygen levels as evidenced by oxygen saturation within normal limits.	Observe for signs of respiratory distress. Auscultate lungs for crackles or abnormal lung sounds. Monitor oxygen saturation with pulse oximeter. Administer supplemental oxygen as ordered. Encourage use of incentive spirometer as ordered. Place in semi-Fowler's position as tolerated to promote better lung expansion.
Potential for bleeding due to potential autodigestion or rupture of abscess resulting in circulatory collapse	Patient will not experience shock symptoms while hospitalized.	Monitor laboratory values for liver enzymes, ammonia, albumin, sodium, potassium, calcium, and magnesium daily. Observe for subtle changes in mental status. Monitor vital signs closely. Observe stool for signs of bleeding. Monitor urine output. Report frank bleeding promptly.
Insufficient knowledge about pancreatitis and its treatment and prevention of recurrence	Patient will verbalize understanding of disease process within 2 wk.	Instruct in patient-specific causes (i.e., alcohol, ulcer, gallstones) and disease process (i.e., eating triggers digestive enzymes which act directly on the tissues).
	Patient will verbalize understanding of treatment regimen within 1 wk.	Explain all aspects of treatment (e.g., NPO and NG decompression decrease the release of enzymes, and therefore pain is decreased) and reason for each medication (e.g., dicyclomine decreases GI tract spasms).
	Patient will verbalize ways to prevent recurrence of pancreatitis before discharge.	Teach ways to prevent recurrence of pancreatitis (i.e., abstain from alcohol).
Fear due to possibility of disability or death	Patient will verbalize that fear has decreased before discharge.	Establish trusting relationship by attentive, caring attitude. Encourage verbalization of fears; actively listen. Encourage contact with minister, hospital chaplain, or spiritual advisor. Point out any encouraging signs of improvement.

GI, Gastrointestinal; NG, nasogastric; NPO, nothing by mouth; PCA, patient-controlled analgesia.

Cancer of the Pancreas

Etiology

The cause of pancreatic cancer is unknown. It is estimated that 48,960 new cases of cancer of the pancreas and 40,560 deaths will occur in the United States in 2015 (American Cancer Society, 2015). It is more common in men than in women and occurs more often in people older than 55 years. Diets high in red meats and fats may increase the risk. Cancer of the pancreas is often fatal within 1 year. It is usually in an advanced state when discovered because it is asymptomatic in the early stages.

Cultural Considerations

Pancreatic Cancer Deaths

More African American men die of pancreatic cancer than do men from any other ethnic group ([American Cancer Society, 2015a](#)). Alcohol use and abuse is a major factor. Working with community leaders to discourage the immoderate use of alcohol might decrease the problem.

Pathophysiology

Cigarette smoking is the major risk factor for pancreatic cancer; 2 to 3 of every 10 cases are linked to tobacco use. Obesity and dietary factors also contribute to pancreatic cancer. Other risk factors include diabetes and chronic pancreatitis. Adenocarcinoma arising from the epithelial cells in the ducts is the most common form of pancreatic neoplasm. Tumor in the head of the pancreas obstructs biliary and pancreatic flow. Cancer in the body and tail of the pancreas usually remains asymptomatic until it is well advanced and invades the liver, stomach, lymph nodes, or posterior abdominal wall and nerves. Metastasis occurs early. Biliary obstruction usually causes liver failure.

Health Promotion

Smoking Cessation

Most people are aware of the relationship between smoking and lung cancer; however, it is also necessary to teach patients the effects on other vital organs, such as the pancreas. Provide referral to community resources for smoking cessation and written materials with options on how to quit.

Signs and Symptoms

Epigastric pain and weight loss are the main symptoms of pancreatic cancer. Anorexia and vomiting may occur, and the patient may develop a dislike for red meat. When the disease is advanced, jaundice appears along with dark urine and clay-colored stools. There is glucose intolerance. There is a high incidence of clot formation with pancreatic cancer.

Safety Alert

Deep Vein Thrombosis

Because of the increased risk of clot formation in patients with pancreatic cancer, it is important to assess for signs and symptoms of deep vein thrombosis (DVT): pain, heat, or swelling in the calves. One leg may be swollen; measure the calf and ankle and compare to the other leg. Check for signs of pulmonary embolus as well: restlessness, apprehension, chest pain, decreased oxygen saturation, and shortness of breath. Should these signs and symptoms occur, report them to the provider immediately. The Joint Commission's National Quality Core Measures require rigorous prevention of DVT for all patients.

Diagnosis

Diagnosis is made by ultrasonography, imaging techniques, and fine-needle biopsy. Elevated carcinoembryonic antigen levels occur 80% to 90% of the time when pancreatic cancer is present. However, serum beta-human chorionic gonadotropin and carbohydrate antigen (CA) 72-4 are the strongest indicators of pancreatic cancer. The tumor markers CA 19-9 and CA 242 are used to monitor for potential spread or recurrence.

Treatment

High doses of opioid analgesics are usually required to keep the patient comfortable. Drug dependency should not be a concern. Treating or preventing malnutrition is a major goal. Enteral feedings may need to be given into the jejunum (**jejunostomy**). TPN may be needed to provide

adequate nutrition (see [Chapters 3 and 28](#)).

Surgical treatment is appropriate for resectable tumor in about 15% to 20% of patients but has not been highly successful in curing the disease. It provides a 5-year survival rate of less than 5%. Surgery is used mainly to relieve symptoms of obstructive jaundice, severe pain, or other complications. A Whipple procedure, or radical pancreaticoduodenectomy, may be done for cancer of the head of the pancreas. The head of the pancreas, the gallbladder, the duodenum, part of the jejunum, and all or part of the stomach are removed. The spleen may also be removed. The remaining structures are anastomosed to the jejunum. Another option is total pancreatectomy. The patient will usually go to the surgical critical care unit after surgery. Nursing care is the same as for any abdominal surgery, but there are many complications that can occur; vigilance is essential. The patient will need enteral feedings, perhaps for life. A stent may be placed in the pancreatic duct to promote exit of pancreatic secretions and enzymes.

Other treatments include radiofrequency ablation and microwave therapy, which use heat to destroy tissue, and cryosurgery, which uses cold. Embolization therapy can be used to cut off the blood supply to the tumor. Cyberknife treatment—an image-guided radiosurgery that helps target pancreatic tumor without disrupting other tissue—is an option. Intensive external beam radiation therapy may offer pain relief, alleviate duct obstruction, and improve food absorption. Radioactive iodine (^{125}I) seeds may be implanted in combination with systemic or intra-arterial administration of floxuridine.

Gemcitabine (Gemzar) and 5-FU are common for treatment of nonresectable or metastatic tumors ([American Cancer Society, 2015](#)). Outcomes for advanced cases are better when erlotinib is added. A combination of drugs has proven most effective, and other commonly used drugs include irinotecan (Camptosar), docetaxel (Taxotere), capecitabine (Xeloda), oxaliplatin (Eloxatin), and cisplatin (Platinol). Other drugs that may be used include the targeted-therapy drug sunitinib, which blocks the growth signal, and octreotide and lanreotide, which suppress the hormone release from the tumor. Ongoing trials are showing promise in new treatment options.

Nursing Management

Nursing care is geared toward managing the severe pain and managing the side effects of treatment. Postoperatively, observe for hyperglycemia, hemorrhage, bowel obstruction or paralytic ileus, wound infection, and intra-abdominal abscess. Monitor the NG tube for clear, colorless, bile-tinged drainage or frank blood with an increase in output because this may indicate leakage at an anastomosis site. Postoperative care is similar to that for any patient who has had abdominal surgery (see [Chapter 5](#)). [Chapter 8](#) discusses care of patients undergoing chemotherapy or radiation for cancer.

Community Care

Nurses in the community should promote immunization against hepatitis B virus in all persons at risk. Teenagers and adults should be counseled about the possibility of transmission of hepatitis B virus by sexual contact and advised of measures for protection. The hepatitis A vaccine should be recommended for those traveling in areas where this disorder is prevalent and for those at risk of liver problems. Nurses should be aware of policies and procedures for reporting new cases of hepatitis to local health departments. All health care workers should be tested for the presence of hepatitis C virus.

Nurses in extended care facilities should be alert to signs of jaundice in patients. Dark-colored urine is a common early sign of a problem. Cancer and gallstones are both more prevalent in older adults, and when abdominal pain occurs these disorders must be considered. Home care nurses must be particularly alert to the possibility of liver or pancreatic problems caused by medications the patient is taking. Encourage regular laboratory work as recommended when the patient is taking a drug known to be potentially damaging to the liver.

Get Ready for the NCLEX® Examination!

Key Points

- Factors that are associated with cholelithiasis and cholecystitis include hemolytic disease, surgical treatment of Crohn disease, rapid-weight-loss diets or starvation, multiple pregnancies or hormonal replacement therapy, major trauma, burns, and cardiac surgery.
- Signs and symptoms of acute cholecystitis include acute pain, fever, anorexia, nausea and vomiting, dehydration, and mild jaundice.
- Typical symptoms of chronic cholecystitis are indigestion, flatulence, nausea after eating fatty foods, and intermittent pain referred to the back.
- There are five main types of hepatitis: A, B, C, D, and E (see [Table 30-2](#)). Hepatitis is treated by rest, a nutritious low-fat diet, and avoidance of substances that are harmful to the liver (see [Box 27-1](#)).
- Signs and symptoms of liver disorders are fatigue, weakness, anorexia, abdominal pain, nausea and vomiting, skin rashes, itching, fever, dark urine, light-colored stools, peripheral edema, bruising, and jaundice.
- Chronic inflammation causes fibrosis and cirrhosis of the liver cells. Diagnosis of cirrhosis includes liver biopsy, liver function tests, prothrombin time, and albumin levels.
- Bleeding esophageal varices and hepatic encephalopathy are complications of cirrhosis.
- Chemotherapy, radiation, and ablation therapies are used for treatment of liver cancer.
- In acute pancreatitis, inflammation and damage are caused by escape of pancreatic digestive enzymes, causing hemorrhage, autodigestion, and necrosis. Symptoms include acute, steady pain in the epigastrium or left upper quadrant. Serum lipase and amylase are elevated. Treatment consists of pain control, reduction of pancreatic secretions, restoration of fluid and electrolyte balance, and treatment for complications such as shock or diabetes.
- Chronic pancreatitis is related to alcoholism. Long-term pain control is an issue.
- Signs and symptoms of pancreatic cancer are weight loss, anorexia, vomiting, and signs of pancreatic dysfunction. Not smoking reduces the risk of pancreatic cancer by 50%.
- Treatment of pancreatic cancer includes pain management and chemotherapy and radiation, which may improve food absorption, relieve pain, and alleviate duct obstruction.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

- Online Resources
- Recommended Adult Immunization Schedule,
<http://www.cdc.gov/vaccines/schedules/hcp/adult.html>

Review Questions for the NCLEX® Examination

1. Before being discharged to home, a patient with gallbladder disease is given instructions regarding the care of the drain and the T-tube. Which patient statements indicate successful teaching? (*Select all that apply.*)

1. “I must empty the bag at the same time each day.”
2. “Loose-fitting clothes must be worn.”
3. “I will have yellowish skin discoloration the rest of my life.”

4. "Passing brown stools indicates return to normal function."

NCLEX Client Need: Reduction of Risk Potential

2. If the patient has a history of chronic cholecystitis, which comment is cause for greatest concern?

1. "I have back pain at the level of the shoulder blade."

2. "I had nausea after eating a hamburger and fries."

3. "I have generalized abdominal pain and fever."

4. "I have discomfort in the right upper part of my abdomen."

NCLEX Client Need: Physiological Adaptation

3. A nurse is caring for a 57-year-old patient with ascites resulting from liver disease. The nurse anticipates that the provider will use which therapeutic regimen to reduce portal hypertension?

1. Vascular shunting of the portal venous systems

2. Repeated abdominal paracentesis

3. Diet restrictions and nutrient supplementation

4. Fluid replacement therapy

NCLEX Client Need: Reduction of Risk Potential

4. A patient with high levels of serum ammonia asks, "Why do I have to continue taking lactulose?" What is the best response?

1. "It destroys ammonia-producing bacteria in the intestines."

2. "It reduces intestinal absorption of ammonia."

3. "It corrects vitamin B₁ deficiency."

4. "It is used in preparation for a diagnostic test."

NCLEX Client Need: Pharmacological Therapies

5. A nurse is caring for a patient who underwent a recent liver transplantation. The nurse reinforces the teaching related to self-care. Which teaching topics are most important to address before discharge?

1. Reporting of any kind of pain associated with fever and changes in stool color
2. Location and meeting time of local support groups
3. Use of strict hand hygiene in changing dressings
4. The life-long need to take antirejection medications

NCLEX Client Need: Reduction of Risk Potential

6. A nurse is caring for a patient who underwent radical pancreaticoduodenectomy. Which postoperative complication would be the most likely to occur and cause the greatest concern?

1. Hypoglycemia
2. Adhesions
3. Hemorrhage
4. Anorexia

NCLEX Client Need: Reduction of Risk Potential

7. Which instructions should be given to a patient regarding preventing the spread of hepatitis A? (Select all that apply.)

1. Bleach solutions must be used to clean the bathroom.
2. Somebody else should be doing the cooking right now.
3. No vaccination is available for hepatitis A.
4. Good hand hygiene prevents the likelihood of passing the virus.

NCLEX Client Need: Safety and Infection Control

8. A patient has cirrhosis of the liver and ascites. The nurse should question which order?

1. Bed rest with bathroom privileges
2. Discontinue furosemide (Lasix) 80 mg
3. Give 2-g sodium diet

4. Fluid restriction 1500 mL/24 hr

NCLEX Client Need: Pharmacological Therapies

9. A patient with acute pancreatitis has a bluish discoloration around the umbilicus. What actions should the nurse take? (*Place in priority order.*)

1. Place head flat and feet elevated.
2. Notify provider.
3. Assess vital signs.
4. Verify patency of IV line.

NCLEX Client Need: Physiological Adaptation

10. One goal of nursing care for a patient during the acute phase of pancreatitis is reduction of pain. Which nursing interventions help alleviate pain? (*Select all that apply.*)

1. Reinforce use of the PCA pump.
2. Maintain IV fluids as ordered.
3. Provide a bland diet with additional fluids.
4. Administer dicyclomine (Bentyl).
5. Give pancreatic enzymes.
6. Place the patient in a supine position.

NCLEX Client Need: Physiological Adaptation

Critical Thinking Questions

Scenario A

Mr. Moser is admitted to the hospital with a diagnosis of cirrhosis of the liver. He is 59 years old and has been hospitalized several times for his condition. He has shortness of breath as a result of a swollen and enlarged abdomen, is anemic because of minimal but constant esophageal bleeding, and appears jaundiced. He has severe abrasions on his arms, legs, and abdomen from repeated scratching to relieve his pruritus. Mr. Moser is very depressed and will not converse with you when you enter his room with his breakfast tray the first morning you are assigned to his care. He refuses to eat and indicates his attitude by pushing the tray away and turning on his side to face the wall.

1. What nursing measures might help relieve some of Mr. Moser's problems?
2. Why do you think he is mentally depressed?

3. How would you go about helping him emotionally?
4. What special observations must you make while caring for Mr. Moser?
5. How would you explain a paracentesis to Mr. Moser if one were ordered for him?

Scenario B

Mrs. Lincoln, age 46 years, is admitted to the hospital for a laparoscopic cholecystectomy. She is extremely obese and enjoys eating rich, fatty foods, even though she knows this will add to her obesity and precipitate attacks of cholecystitis. You are assigned to care for Mrs. Lincoln when she returns from surgery.

1. How will you position this patient?
2. What would you need to assess to determine whether complications are occurring?
3. What would you need to teach the patient and family before discharge?
4. What problems might occur after discharge? What should be the diet for Mrs. Lincoln?
5. How soon will Mrs. Lincoln probably be able to resume most of her usual activities?

Scenario C

You are working in an employee health clinic and taking a health history from Mr. Austin, who is 52 years old. He reports that he has chronic pancreatitis.

1. What physical signs and symptoms should you ask about?
2. What questions should you ask about diet and lifestyle?

UNIT X

Musculoskeletal System

OUTLINE

Chapter 31 The Musculoskeletal System

Chapter 32 Care of Patients With Musculoskeletal and Connective Tissue Disorders

CHAPTER 31

The Musculoskeletal System

Objectives

Theory

1. Describe the normal anatomy of the musculoskeletal system.
2. Show how the musculoskeletal system provides the function of movement.
3. Discuss how the musculoskeletal system provides protection for the body.
4. Illustrate causes of disorders of the musculoskeletal system and ways to prevent them.
5. Compare the procedure and nursing care for the following diagnostic tests: bone scan, arthroscopy, electromyography.
6. Distinguish ways in which older adults can increase musculoskeletal strength and protect bones.

Clinical Practice

7. Perform an assessment on a patient with a musculoskeletal disorder.
8. Assist in the development of a nursing care plan for a patient with a musculoskeletal disorder.
9. Use measures to reduce the chance of contracture for patients with musculoskeletal injuries.
10. Assist patients with musculoskeletal injuries with active or passive range of motion.
11. Provide care for a patient who has undergone magnetic resonance imaging (MRI) with contrast.
12. Teach a patient to properly use an assistive device.

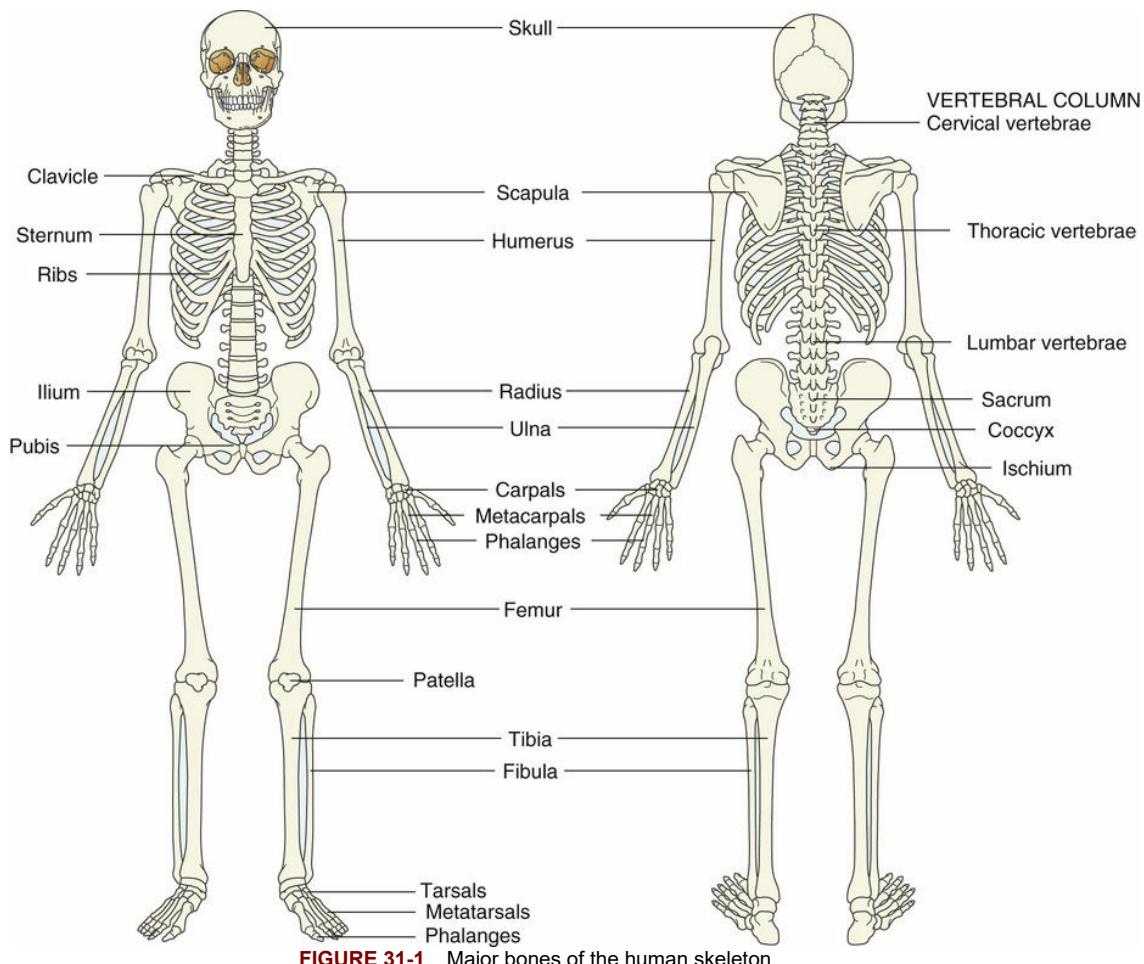
KEY TERMS

- ankylosis** (ăng-kĭ-LŌ-sĭs, p. 732)
- cartilage** (KĂR-tĭ-lăzh, p. 719)
- contractures** (kōn-TRĀK-chûrz, p. 732)
- crepitation** (KRĒP-ĕ-tā-shŭn, p. 721)
- isometric exercises** (ī-sō-MĒT-riks, p. 729)
- kyphosis** (kī-PHŌ-sĭs, p. 726)
- ligaments** (LĬG-ă-mĕnts, p. 719)
- orthopedic** (ör-thō-PĒ-dik, p. 721)
- ossification** (ös-ĕ-fi-KĀ-shŭn, p. 721)
- tendons** (TĚN-dōnz, p. 719)

Anatomy and Physiology of the Musculoskeletal System

Structures of the Musculoskeletal System

- The musculoskeletal system consists of the bones, joints, cartilage, ligaments, tendons, and muscles.
- There are two distinct groups of bone cells; those that are transformed into mature cells and those bone cells that form cartilage first, and then are gradually replaced by mature bone cells as the person grows older.
- A total of 206 bones make up the human skeleton ([Figure 31-1](#)).



- Bone is either compact or spongy. Spongy bone contains red bone marrow ([Figure 31-2](#)).

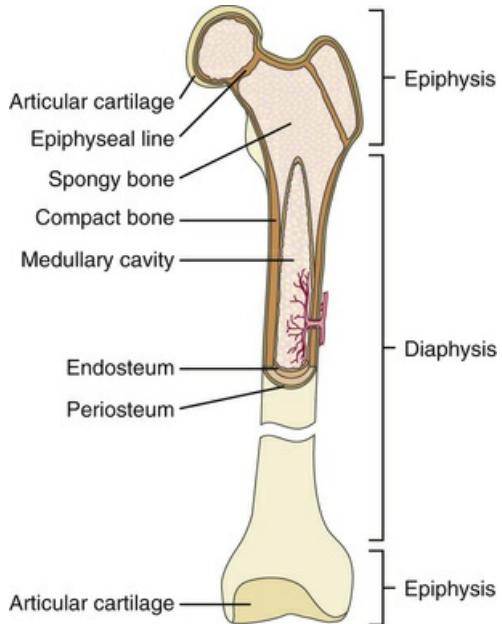


FIGURE 31-2 General features of long bones. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

- Bones are classified as long, short, flat, or irregular.
- Each bone has markings on its surface that make it unique (see Table on Evolve[®]).
- The haversian system is a canal system that runs through the bone and contains the blood and lymph vessels.
- A joint is the articulation point between two or more bones of the skeleton. There are immovable, slightly movable, and freely movable joints ([Table 31-1](#)).

Table 31-1
Types of Moveable Joints and Examples

TYPE OF JOINT	EXAMPLE	MOVEMENT
Hinge	Elbow	Bidirectional to flex and extend
Pivot	Head of radius around ulna	Rotational to supinate and pronate
Saddle	Thumb	Circular clockwise and counterclockwise
Ball and socket	Shoulder and hip joints	Ball rotates within socket and moves up and down
Condyloid	Head to neck joint	Up and down and side to side
Gliding	Articulating surfaces of vertebrae	Lateral and up and down

- **Ligaments** join the bones of a joint together.
- **Tendons** are connective tissues that provide joint movement.
- **Cartilage** is a type of connective tissue in which fibers and cells are embedded in a semisolid gel material. Cartilage acts as a cushion. The meniscus in the knee joint is a type of cartilage.
- A bursa is a fluid-filled sac that provides cushioning at friction points in a freely movable joint.
- Skeletal muscle is made up of hundreds of muscle fibers bundled together and surrounded by a connective tissue sheath.
- Fascia is a connective tissue that surrounds and separates the muscles.
- The muscle coverings contain blood vessels and nerves.
- Muscle has properties that allow it to be electrically excited; cause it to contract, extend, or stretch; and provide elasticity.
- Skeletal muscles are attached to bones by tendons.

Functions of the Bones

- Bones provide shape to the body.
- The skeleton provides a rigid framework that supports the internal organs and the skin.

- The skeleton protects the internal organs of the body.
- The skeleton provides attachments for tendons and ligaments and contributes to movement of the body.
- The red bone marrow in the spongy bones forms red blood cells, white blood cells, and platelets.
- The bones store and release minerals, such as calcium and phosphorus.
- The blood and lymph vessels in the canals transport nutrients to the bone cells and remove wastes.
- Bone is maintained by remodeling: existing bone is resorbed into the body and new bone is built by osteoblasts to replace it.

Functions of the Muscles

- Contraction of skeletal muscles is produced by synchronized contraction of many muscle fibers.
- Skeletal muscles contract, thereby providing movement and joint stability, maintaining posture, and producing body heat.
- By shortening and stretching, opposing muscle groups provide movement of the joints.

Aging-Related Changes in the Musculoskeletal System

- **Ossification**, or replacement of cartilage by more solid bony tissue, is not completed throughout the body until age 20 to 25 years.
- Bone density decreases in older adults because of the resorption of minerals.
- The loss of bone mass, or osteoporosis, occurs with aging and is more severe in women.
- The bones of older adults are brittle and less compact; thus they break easily.
- The bones of older adults do not heal readily after a fracture because the physiologic exchange of minerals decreases with advancing age, making the process of repair much slower.
- Thinning of the intervertebral cartilage and collapse of the vertebra result in kyphosis (dowager's hump). This is partially responsible for the decrease in height in older adults.
- Joint cartilage thins and erodes from years of use and results in stiffness and **crepitus** (a grating sound) of the joints.
- Joint motion may decrease, limiting mobility; swelling may occur.
- Ligaments become calcified and lose their elasticity.
- Older adults have a decrease in muscle mass; cells decrease in number and the muscles atrophy. Consequently, older adults have less strength and endurance than younger people.
- Tendons shrink and become sclerotic, slowing muscle movement.
- Muscle cramping, especially at night, increases because of impaired circulation and accumulation of metabolic wastes.

Musculoskeletal Disorders

Causes

Disease, trauma, malnutrition, and aging all contribute to musculoskeletal problems. Trauma may cause bruising, strain, sprain, or fracture. Poor nutrition may deprive the body of sufficient calcium and phosphorus to build strong bones. Inadequate protein intake can cause muscle wasting. Malignant tumors place a large nutritional demand on the body, and nutritional imbalances may occur that cause muscle wasting. Tumor may invade bone as either a primary or metastatic cancer. The decrease in estrogen production after menopause in women is believed to be a contributing factor to the occurrence of osteoporosis.

Prevention

Preservation of motion and mobility are important to prevent long-term **orthopedic** (refers to the function and structure of the musculoskeletal system) disability. Weight-bearing exercise throughout life is needed to maintain bone mass and can decrease the incidence of osteoporosis and increase muscle strength, mass, agility, balance, and coordination, thereby preventing falls and consequent fractures. A *Healthy People 2020* objective is to reduce hospitalizations related to osteoporosis-related hip fractures.

Complementary and Alternative Therapies

Benefits of Tai Chi

Research in older community-dwelling adults has shown that tai chi has beneficial effects for increasing mobility, strength, balance, and flexibility ([Malone, 2013](#)).

Lifting and moving objects correctly using large muscle groups helps prevent muscle strain and sprains. Seat belt use in an automobile reduces the incidence of trauma to bone and muscle during accidents. Wearing bicycle, motorcycle, and other sports helmets reduces the incidence of skull fractures. Consuming recommended amounts of calcium throughout the life span, obtaining sufficient vitamin D from sunshine or supplements, and maintaining adequate protein intake all help build healthy bone and muscle ([Dugdale, 2012](#)). Refraining from using steroids on a long-term basis helps prevent osteoporosis and fractures.

Nutrition Considerations

Nutrition for Bone Growth and Density

Adequate amounts of calcium and phosphorus are essential for bone growth and density. Although green vegetables are a source of calcium, that calcium is not readily absorbed. Dairy products such as cheese, yogurt, and milk are better choices. Nondairy sources of calcium include canned sardines, salmon, tofu, figs, and dried apricots. Magnesium and vitamin K are required for healthy bones as well. These are provided by a healthy diet containing meat and green vegetables, such as spinach.

Health Promotion

Smoking and Musculoskeletal Health

Smoking has a significant effect on the bones and joints; smoking:

- Increases the risk of developing osteoporosis

- Increases the risk of a hip fracture with advancing age
- Increases the risk of developing exercise-related injuries
- Has a detrimental effect on fracture and wound healing
- Has a detrimental effect on athletic performance
- Is associated with low back pain and rheumatoid arthritis

Data from American Association of Orthopedic Surgeons, 2015.

Think Critically

What could you do now to promote healthy bones during your later years?

Diagnostic Tests and Procedures

Laboratory blood tests are performed on the minerals needed for bone growth (calcium and phosphorus), to detect bone disorders such as bone metastasis (alkaline phosphatase), detect muscle damage (creatine phosphokinase [CPK]), detect gout (uric acid), or to diagnose rheumatoid arthritis or other connective tissue diseases (Table 31-2). Specific diagnostic tests of the musculoskeletal system are listed in Table 31-3.

Clinical Cues

Diagnostic tests for musculoskeletal disorders (and other disorders) often use contrast media or radiation. Before diagnostic testing, all patients should be assessed for allergies, and women of childbearing age may need a pregnancy test.

Table 31-2
Laboratory Blood Tests for Musculoskeletal Disorders

TEST	NORMAL VALUE	ABNORMAL SIGNIFICANCE
Calcium	8.4-10.6 mg/dL 2.0-2.65 mmol/L	Elevated in extended immobilization and metastatic bone disease.
Phosphate (phosphorus)	3.0-4.5 mg/dL 1.0-1.5 mmol/L	Elevated when calcium level is high.
Alkaline phosphatase (ALP)	35-150 U/L	Elevation may indicate Paget disease or bone metastasis.
Creatine kinase (CK)	Male: 55-170 U/L Female: 30-135 U/L Isoenzymes ≤5% of total CK activity	Elevated levels of CPK isoenzymes may indicate muscle damage.
Myoglobin	<90 mcg/L	Elevation indicates muscle damage such as from trauma.
Uric acid	Male: 4.0-8.5 mg/dL 0.24-0.51 mmol/L Female: 2.7-7.3 mg/dL 0.16-0.43 mmol/L	Elevation indicates presence of gout.
Rheumatoid factor (RF)	<1 : 120 titer	>1 : 160 titer may indicate rheumatoid arthritis.
Antinuclear antibodies (ANA)	<1 : 40 dilution	Elevation may indicate rheumatoid arthritis or other autoimmune disease.

Table 31-3
Diagnostic Tests and Procedures for Musculoskeletal Disorders

TEST	PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
X-ray films of the bones or joints	To detect fracture, avulsion, joint damage	Part to be x-rayed is positioned by technician, and x-ray films are taken.	Assess for pregnancy before testing.
Computed tomography (CT)	To detect musculoskeletal problems, especially of the spine and skull	The patient is placed on a hard table and the part to be studied is positioned inside the machine; the procedure takes 30-60 min. Contrast material may be used. There is a clicking sound as the machine rotates to take the next view. A computer enhances the radiographic findings.	Patient must lie very still. Assess for allergies to contrast media.
Magnetic resonance imaging (MRI)	To diagnose musculoskeletal disorders	Magnetic fields and radio waves are used to visualize tissue densities by the density of hydrogen ions. Computer enhancement depicts normal and abnormal tissue.	There must be no metal on the body and no metal implants because of the strong magnetic fields used. The patient must lie still for 15-60 min.
Dual energy x-ray absorptiometry (DEXA)	To measure bone density of spine, hip, femur, or forearm To monitor changes in bone density and to diagnose metabolic bone disease	Uses minimal radiation exposure. Patient will lie supine on the imaging table with the legs supported. The scintillator camera is passed over the patient and projected onto a computer screen.	Height is measured. All metallic objects must be removed. Test takes about 30 min.
Bone scan	To detect tumor, metastatic growths, bone injury, or degenerative bone disease	An IV injection or oral dose of a radioisotope is given, and after a specified time for the substance to be taken up by the bone, the area is scanned by scintillation camera.	Check for allergies and pregnancy. Patient will be asked to lie quietly for 30-60 min during the scanning. All metal must be removed from the area to be scanned. Ensure patient that she will not be "radioactive."

Gallium/thallium scans	To detect bone problems, especially tumor invasion	The radioisotope gallium citrate (GA-70) or thallium-201 is administered 1-2 days before the scan.	The isotope is eliminated from the body in 6-24 hr. The procedure takes 30-60 min, during which lying still is required; sedation may be given.
Arthrography (arthrogram)	To provide radiographic pictures of a joint showing the outline of the joint cavity and soft tissue structures not visible on routine x-ray films	Fluid may be aspirated from the joint space. A contrast agent, air, or both are aseptically injected into the joint after the area is anesthetized. The joint is manipulated to disperse the contrast agent. X-ray films are taken with the joint held in various positions.	Informed consent is often required. There will be feelings of pressure and some discomfort. Administer an analgesic after the procedure, if needed. Observe for swelling; apply ice as ordered. Advise patient that crackling sounds may be heard or felt in the joint after the test and usually disappear in a day or two. Instruct patient to report any increasing pain or swelling to the provider.
Arthroscopy	To inspect the interior aspect of a joint, usually a knee, with a fiberoptic endoscope to diagnose problems of the patella, meniscus, and synovium; also used to evaluate the progress of arthritis or effectiveness of treatment	After injection of local anesthesia, an incision is made and the arthroscope is introduced into the interior of the joint; instruments for tissue biopsy or surgical procedure may be passed through the arthroscope.	A sedative may be administered. Ambulation is encouraged when patient recovers from sedation, but without overuse or strain of the joint for a few days. Observe for bleeding or swelling; ice packs may be used in the immediate postprocedure period. Assess for swelling, circulation, and sensation periodically to detect any complications.
Arthrocentesis	To extract synovial fluid for analysis or to reduce swelling	A needle is inserted into the joint space and synovial fluid is aspirated. Corticosteroid may be injected after aspiration of fluid. The joint may be immobilized afterward. Ice packs are applied to relieve pain and reduce swelling.	The elastic bandage, if present, should be worn for 2-3 days. Patient should avoid overuse of the joint until pain and swelling have subsided. Administer ordered analgesics PRN.
Culture of synovial fluid	To determine organism responsible for infection	Synovial fluid is aspirated and sent for culture and sensitivity to determine appropriate antibiotic for therapy. Results take 48-72 hr to determine.	Have specimen of fluid transported to laboratory immediately.
Biopsy	Bone: to detect tumor cells Muscle: to obtain tissue for cellular analysis	Under local anesthesia, a piece of bone or muscle is excised and sent for pathologic analysis.	Offer emotional support during the procedures. Afterward, medicate for discomfort as needed, apply ice packs to decrease swelling, observe for bleeding; perform circulation and sensation checks distal to the area biopsied.
Electromyelography (EMG)	To detect abnormal nerve transmission to the muscle and abnormal muscle function; helps determine rehabilitation progress	Needle electrodes are inserted in affected muscles, and, as the muscles are stimulated, the electrical impulses generated by the muscle contractions are amplified and displayed on an oscilloscope; tracings also are made on graph paper. The test usually takes about an hour.	Obtain a signed consent form. Caffeine-containing drinks and smoking are restricted 3 hr before the test. Withdraw muscle relaxants, anticholinergics, and cholinergic drugs before the test as ordered. There may be slight discomfort when the electrodes are inserted; explain that she will be asked to relax and contract her muscles.

CPK-MM, Creatinine phosphokinase isoenzyme; IM, intramuscular; IV, intravenous; PRN, as needed.

Range-of-motion (ROM) testing involves both active and passive maneuvers. In active testing, the part being measured must be moved by the patient. In passive testing, the evaluator moves the body part while the patient is relaxed.

The measurement of ROM in a joint is called *goniometry* (Figure 31-3). One system of measurement commonly used is based on a full circle of 360 degrees. Each joint is evaluated in terms of the number of degrees it can be moved from the 0-degree position.



FIGURE 31-3 Measurement of joint motion with a goniometer. (From Mourad LA: *Orthopedic disorders*, St. Louis, 1991, Mosby.)

Muscle strength is measured on the basis of the ability of a muscle to move the part to which it is attached, working against the force of gravity. A grading system is used, ranging from grade 5 (normal strength) to grade 0 (complete paralysis).

Other techniques used to evaluate musculoskeletal function include inspection, palpation, and tests for stability of a joint under stress.

Think Critically

How would you explain the difference between a bone scan and a dual energy x-ray absorptiometry (DEXA) scan to a patient considering the purpose of each test and the difference in the procedures?

❖Nursing Management

Data Collection

History Taking

When reviewing the patient's past history, keep in mind the significance of disorders that primarily affect other systems but secondarily affect the bones and muscles. For example, sickle cell disease and hemophilia can cause bleeding into the joints and muscles, and psoriasis is sometimes the first sign of psoriatic arthritis, which is an inflammatory condition that affects the spine and the peripheral joints. Nutritional deficiencies can affect the mineral composition of bone and muscle, making them more susceptible to trauma and loss of function.

Family history may be significant because some bone and muscle disorders are either inherited or have a familial tendency. For example, about 30% of those who have psoriatic arthritis have a family history of psoriasis ([National Psoriasis Foundation, 2014](#)).

Focused Assessment

Data Collection for the Musculoskeletal System

- What do you see as your current problem?
- When is the pain the worst? What seems to bring it on? What relieves it?
- Do you have any pain in your wrists, elbows, knees, hips, or feet?
- Have you noticed any changes of sensation in your hands, feet, or elsewhere?
- Do you have any joints that are stiff, swollen, or painful?
- Do you have any restriction of movement in any joint?
- Do you have trouble sleeping because of muscle or joint pain?
- Do you have any joint deformity? Bunion? Hammer toe? Deformed knuckle?
- Have you ever had an injury to a bone?
- Have you ever experienced a severe muscle strain or muscle problem?
- Is there a history of osteoporosis or arthritis in your family?
- Do you have diabetes, sickle cell disease, psoriasis, systemic lupus erythematosus, or any other chronic metabolic disease?
- Are you taking any steroid medications regularly?
- Do you find that your fatigue level has increased?
- Do you have any problems with bathing, dressing, grooming, toileting, eating, ambulation, or going on social outings?
- Can you easily arise from a seated position?

- Do you have difficulty opening containers?
- What do you eat or drink that contains calcium? How much of it do you eat or drink?
- What is your daily (weekly) sunshine exposure? Do you take a vitamin D supplement?
- Do you use any alternative therapies or any other type of self-care measures? Are those self-care measures helping?
- Tell me about your work; do you lift, pull, or push? Are you sitting for prolonged periods or doing repetitive motions?
- Does your home have stairs or other features that are causing problems for you?
- Are you able to independently do home maintenance tasks (e.g., mow the lawn)?
- What type of physical activities or exercise do you routinely do (e.g., sports, gardening)? How often do you participate in these activities?

Physical Assessment

Observe the patient for signs of joint pain, such as limping, poor posture, awkward gait, difficulty in arising or walking, and wincing on movement. Watch the patient during performance of activities of daily living (ADLs), noting problems of movement, and changes in facial expression to pick up signs of problems. If the patient is admitted with a fracture, obtain a history of the precipitating event so that an assessment can be made of other areas that may have been injured. Sometimes it is necessary to consult family members or someone who lives with the patient about the patient's true ability to perform the ADLs. A **self-care deficit** is one of the primary issues for patients who have a problem with mobility.

Focused Assessment

Physical Assessment of the Musculoskeletal System

Note the following points:

- *Posture:* Is there evidence of **kyphosis**, such as a rounded upper back, also called a *dowager's hump*? Are the knuckles swollen or deformed, indicating arthritis?
- *Gait:* Is it steady and even? Awkward?
- *Balance:* Is the patient able to sit, stand, and walk with a good center of balance?
- *Mobility:* Is any supportive device being used, such as a cane, brace, splint, or elastic bandage?
- *Range of motion:* Is the patient able to move the neck, shoulders, arms, legs with full range of motion?
- *Strength:* Are grips in hands and push-pull in arms equal bilaterally? Is straight-leg raising against resistance equal bilaterally?
- *Spine:* Any tenderness of the vertebrae on palpation?
- *Appearance of joints:* Is there any redness, deformity, or loss of motion in elbows, hands, knees, ankles, and feet?
- *Skeletal muscle appearance in arms and legs:* Is there any degree of atrophy?
- *Ability to perform ADLs:* Is the patient independent or need assistance to dress, bathe, toilet, eat?

Older Adult Care Points

Approximately 30% to 40% of inpatient safety incidents are related to falls, and older adults are particularly vulnerable because of changes related to aging, such as decreased strength, unsteady balance, loss of endurance, slow reflexes, gait disturbances and increased postural sway, and chronic diseases such as arthritis. Conduct a fall risk assessment (see [Box 9-4](#)) and initiate fall precautions ([Centers for Disease Control, 2014](#)).

Nutrition Considerations

Vitamin D Associated With Decreased Risk for Falls

In a Cochrane review of 41 trials that included 25,422 subjects, higher vitamin D level was associated with a lowered risk for falls among older adult nursing home residents ([Cameron et al, 2010](#)).

Think Critically

After a hip replacement, can you trust a statement of “I can shop, cook, clean, and do everything I need to do by myself”? If you cannot trust the statement, why not? How would you gather data about an older adult patient’s ability to perform self-care activities at home before she is discharged?

Nursing Diagnosis and Planning

Caring for immobile patients requires careful planning. Making beds for bed-confined orthopedic patients is best done by two people. Bathing and grooming are more time consuming when the patient has an immobilized limb or has some other orthopedic device. **Planning for toileting needs at regular intervals is important for the well-being of a patient who is unable to get out of bed unassisted.** Neglecting such needs may cause incontinence and the time-consuming task of changing the bed and cleaning up the patient; incontinence is also demoralizing for the patient and increases the risk of tissue breakdown from the moisture and irritation of urine or feces.

Repositioning the patient at 2-hour intervals is included in the daily work plan to prevent pressure ulcers.

Common problem statements and example outcomes and interventions for patients with musculoskeletal problems are presented in [Table 31-4](#). Several other secondary problem statements may be appropriate for patients who are immobile. Constipation, altered tissue integrity, social isolation, potential for injury, and other problems caused by immobility may occur ([Box 31-1](#); see also [Chapter 9](#)).

Table 31-4

Common Problem Statements, Expected Outcomes, and Interventions for Patients With Musculoskeletal System Disorders

PATIENT PROBLEM	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Altered physical mobility due to immobilization, loss of limb, stiffness, pain, weakness, or inability to bear weight.	ROM of unaffected joints will be maintained. No signs of joint contractures will be present at discharge.	Active ROM at least tid for all unaffected joints while on bed rest. Passive ROM on affected joints as ordered. Ensure that joints are in correct alignment when at rest and after turning. Maintain body in proper alignment. Assess immobilizer for correct fit and positioning every shift; assess for signs of complications related to pressure or pins. Supervise exercise to prepare muscles for ambulation. Instruct in use of ambulatory devices appropriate; supervise practice; assess for proper “fit” of device. Encourage use of prosthesis for ambulation; assist with practice. Assess for signs of complications in stump and assess that prosthesis is attached correctly. Maintain abduction pillow between legs if one is ordered.
Limited activity intolerance due to stiffness, pain, limited mobility, fatigue.	Patient will space activities and rest to conserve energy. Patient will use assistive devices to conserve energy.	Determine factors that increase fatigue. Space activities with rest periods throughout the day. Assist to set goals for slow, steady increase in exercise and activity during periods of remission of arthritis symptoms. Perform exercises after heat treatments to decrease discomfort; apply in safe manner. Apply cold as needed after exercise for discomfort. Administer medications to decrease inflammation and pain, allowing greater level of activity. Advise of assistive devices that might make ADLs easier and help conserve energy. Assist in obtaining needed devices.

Pain due to injury, surgery, or joint disorder.	Pain will be controlled as evidenced by patient verbalization. Pain will be decreased with medication.	Supervise practice with assistive device. Assess for factors contributing to pain level, such as increased pressure, infection, positioning, or swelling. Assess pain in systematic, objective manner and track course of pain and effectiveness of pain control (see Chapter 7). Instruct in relaxation, distraction, and imagery techniques to decrease pain. Instruct in use of various heat and cold treatments to decrease pain. Administer analgesic, anti-inflammatory, and steroid medications, as ordered, to decrease pain. Instruct in use and side effects of each drug. Assist to an anatomically correct position to enhance circulation and alignment. Advise of alternative methods of pain control, such as transcutaneous electrical nerve stimulation (TENS). Monitor patient-controlled analgesia (PCA) use for effectiveness of pain control.
Potential for infection due to trauma or surgical incision.	No signs of infection will be present, as evidenced by normal white blood cell (WBC) count and normal temperature; wounds will be kept clean and dry.	Follow Standard Precautions and strict Contact Precautions when performing patient care, and use strict aseptic technique for wound or pin care. Assess for signs of infection every shift; assess wound for redness, swelling, and tenderness. Administer prophylactic antibiotics as prescribed. Assess temperature trends and trend of WBC values for signs of infection. Assess patient for subjective signs of malaise. Sniff around cast for signs of foul odor indicating infection.
Altered tissue perfusion due to swelling and pressure.	Patient will have no evidence of seriously decreased circulation distal to site of trauma. No evidence of nerve compression from swelling will be present.	Perform neurovascular assessment hourly for 8 hr, then q2h for 48 hr. Question patient regarding sensation distal to site of trauma or surgery. Apply cold to area of injury or surgery, as ordered, to reduce swelling; elevate extremity to slightly above heart level. Immediately report signs of compartment syndrome (i.e., severe, unrelenting pain; numbness) to provider and obtain order for measures to relieve pressure.
Altered self-care ability due to immobilization.	Patient will receive assistance for all ADLs, as needed.	Assess degree of inability to perform various self-care activities. Formulate plan to assist patient with ADLs. Answer calls for assistance with toileting promptly; do not leave on bedpan longer than necessary. Open food containers and cut food as needed for self-feeding with one hand. Do not serve extremely hot liquids to patients who have difficulty with coordination or with holding drinking containers or to immobilized patients. Provide assistive devices and help patient to be as self-sufficient as possible without incurring undue fatigue when performing ADLs. Caution patients about change in body's center of gravity when a limb is casted or amputated.
Altered body image due to change in appearance and/or loss of mobility or function.	Patient will begin adaptation to change in appearance or loss as evidenced by verbalization of feelings of self-worth; maintenance of relationships with significant others; active interest in personal appearance; willingness to resume usual roles and participate in social activities; and making plans to adapt lifestyle to meet restrictions imposed by loss.	Assess degree of body image disturbance, noting verbal or nonverbal clues to negative response to changes. Assist to verbalize feelings about effect of loss on usual roles and lifestyle. Be present and supportive during initial dressing changes on stump after amputation. Assist patient to identify strengths and abilities and positive coping mechanisms. Clarify misconceptions about limitations on mobility and activity. Promote activities that require patient to confront the body changes that have occurred, such as bathing, ADLs, or dressing changes. Demonstrate acceptance of patient and encourage significant others to do the same with touch and affection. Encourage as much independence as possible; allow to do things for self. Assist patient to explore viable options for changes in lifestyle and career. Refer for vocational retraining if needed. Encourage maximum participation in planning of care and self-care to provide a sense of control over life. Encourage participation in social activities and in a support group. Refer for psychological counseling if adaptation does not occur within 6 mo and patient is depressed or in denial.
Decreased ability for home maintenance due to immobility or limited self-care ability.	Patient will obtain needed assistance with home maintenance.	Assess degree of self-sufficiency and ability to perform ADLs before discharge. Contact social worker for coordination of home care if needed. Obtain bathing and homemaker assistance as needed. Assess continued need for in-home services weekly. Instruct in home adaptations that could aid in efforts at self-care, such as grab bars in bathroom, alterations in counter spaces for food preparation, transportation options for grocery shopping and appointments, or assistive devices for self-feeding and grooming. Assess degree of assistance family members can provide for patient in home environment. Determine safety of home environment for patient.
Potential for disuse syndrome due to immobility or trauma.	Patient will not suffer permanent joint deformity or muscle atrophy.	Position joints as ordered; keep rest of body in correct alignment. Begin exercise of affected joint as soon as provider orders. Encourage active exercise of unaffected joints tid. Perform passive ROM as ordered tid. Assist with use of CPM machine, as ordered. Medicate regularly for pain while CPM machine is in use. Use heat and cold treatments before and after exercising stiff or deformed joints. Assess joints for contractures and muscles for atrophy q24h. Encourage participation in ADLs to exercise joints.

ADLs, Activities of daily living; CPM, continuous passive motion; ROM, range of motion; tid, three times a day.

Box 31-1

Physiologic Consequences of Immobility

- **Cardiovascular system:** Decreased cardiac output with reduced force of cardiac contraction results from a lack of physical activity. Immobility causing decreased use of leg muscles leads to venous stasis and potential formation of blood clots.
- **Respiratory system:** Reduced lung expansion and consequent reduced gas exchange with potential

for atelectasis and pooling of secretions occurs with immobility. Reduced cough effort along with pooled secretions predisposes to stasis pneumonia.

- *Musculoskeletal system:* Prolonged immobility leads to reduced muscle mass and atrophy. Demineralization of bones occurs with lack of weight bearing; osteoporosis may occur.
- *Integumentary system:* Skin breakdown may occur from a reduced flow of oxygenated blood from pressure on the skin resulting from immobility. Combined with lack of appetite from immobility and poor nutritional status, pressure ulcers may develop.
- *Gastrointestinal system:* Slowing of peristalsis and decreased muscle strength occur with decreased physical activity. Decreased appetite and an inability to assume an upright position for defecation also contribute to the constipation that can occur with immobility.
- *Urinary system:* Calcium from bone increases in the blood from immobility, bladder tone decreases, and more time in a supine position from immobility leads to urinary stasis. Infection, renal calculi, and urinary tract infection may occur.
- *Psychological effects:* Feelings of helplessness or hopelessness, boredom, depression, and disturbed body image may be accompanied by anger or anxiety and loss of self-esteem during extended periods of immobility. Social isolation may also occur.

Interventions and outcomes are designed in collaboration with the patient and other members of the health care team. **The physical therapist and occupational therapist are especially important and act as resources for the patient and the nurse.**

■ Implementation

Positioning

Patients with musculoskeletal problems must change their body position frequently and get up in a chair to prevent pressure ulcers, circulatory stasis, and respiratory and urinary complications. **It also is necessary to change joint positions to prevent joint deformity.**

When repositioning the patient, watch for early signs of muscle tightness and resistance to joint motion. Observe during routine ROM exercises; if any tightness or resistance to joint motion is noticed, position the joint extended so that muscles are stretched to normal limit to prevent the development of contractures.

Patients with flaccid paralysis are not necessarily positioned in the same way as those with spastic paralysis. For example, a footboard is appropriate for proper positioning of the feet to prevent footdrop in a patient with flaccid paralysis. In contrast, putting the soles of the feet of a patient with spastic paralysis in contact with a footboard could trigger muscle contraction and aggravate the spasticity. Use a bed cradle to relieve pressure of the bedclothes to help prevent footdrop in these patients.

Preventing ankylosis. Ankylosis is the result of injury or disease in which the tissues of the joint are replaced by a bony overgrowth that completely obliterates the joint. Proper positioning and movement of the joint passively can help prevent this. Sometimes it is extremely difficult to prevent this process (as, for example, in some types of arthritis). In these cases, the joint may be braced in the position that will be most useful to the patient, even though there is no motion in the joint.

Lifting and turning the patient. When working with orthopedic patients, all movements must be *gentle and firm*. When moving or turning the patient, obtain sufficient help from adequately trained personnel. Each person involved, including the patient, should understand exactly what is to happen and how the move will be accomplished. If the patient can help without damaging the diseased joint or limb, encourage her to do so. If she is unable to help, explain the procedure and instruct her to relax completely. Many times the patient is afraid that moving and turning will cause pain. Explaining the long-term benefits, such as preserving skin integrity and decreasing respiratory problems, will increase cooperation.

Exercise

ROM exercises, both passive and active, are planned and carried out as soon as feasible after

decreased mobility occurs as a result of disease, injury, or surgery. The exercises are done to maintain connective tissue within the joint and thereby ensure that every joint retains its function and mobility. **ROM exercises should be done three or four times a day.** Other kinds of exercises are planned according to each patient's needs and the amount of motion allowed by the provider. **Isometric exercises** involve generating tension between two opposing sets of muscles, for example, trying to flex the lower arm while using the opposite hand to try to extend it.

Safety Alert

Caution With Isometric Exercises

Isometric exercise may be contraindicated in patients with hypertension, increased intracranial pressure, or congestive heart failure because isometric exercise causes a significant increase in blood pressure and heart rate.

Gradual mobilization. Progressive mobilization involves assessing the patient's ability to move her limbs, turn herself in bed, transfer herself from bed to chair and back again, and stand and walk. These measurable signs of independent movement represent various stages to which the patient can gradually progress. According to The Joint Commission's National Patient Safety Goals, it is a nursing responsibility to recognize that these patients are at risk for falls while they are learning to regain mobility.

Clinical Cues

The provider's orders should include level of activity (i.e., bed rest, out of bed to chair, physical therapy); however, if this order is not included—or if your assessment finds that the patient either cannot accomplish the orders or has already surpassed the ordered level of activity—notify the provider so that a reevaluation of the patient's abilities and new orders occur.

Setting goals for progressive mobilization must take into account the pathologic condition causing immobility, any contraindications to movement of a body part, and the ability of the patient to understand and take part in carrying out the rehabilitation activities. In some cases, passive exercises and positioning may be necessary until the patient is able to carry out exercises and positioning on her own. If the patient is to be cared for by family members once back at home, it is essential that they be included in planning and setting goals of intervention to prevent disability and promote mobilization.

Health Promotion

Gentle Stretch for Upper Back

Patients who are kyphotic (or those who hunch over their books while studying!) can develop discomfort and tension in the upper midback. Encourage periodic and conscientious attempts to sit upright with the shoulders pulled back. Another exercise is to stand in a corner, place palms on the opposing walls or use an open door frame and gently lean into the corner or the opening. This may feel uncomfortable at first, so encourage the patient to go slow.

Patients suffering from intense joint pain as a result of rheumatoid arthritis will need proper timing of exercises to follow administration of analgesic and anti-inflammatory drugs. If possible, the schedule for drug administration should be adjusted so that the patient receives her first dose of medication in the morning 30 to 60 minutes **before** beginning exercises.

Sometimes after joint surgery, especially after a total knee replacement, the surgeon will order attachment of an apparatus to the affected limb that provides continuous passive motion (CPM) of the joint within set limits. The apparatus is driven by a motor and requires no effort on the part of the patient or nurse to move the limb ([Figure 31-4](#)). It usually is left on all day and is discontinued at night while the patient sleeps. When this type of apparatus is used, the nursing care plan should

include specific instructions regarding its proper application and setting and regular assessment of adequacy of pain relief.



FIGURE 31-4 A continuous passive motion machine encourages joint mobility.

Exercises to recondition muscles for ambulation after injury or immobilization include quadriceps setting and gluteal setting.

Patient Teaching

Quadriceps and Gluteal Muscle Exercises

Quadriceps Setting

- Instruct the patient to straighten the leg out while lying down and to tense the leg muscles and straighten the knee, while raising the heel slightly.
- The contraction is held for a count of five and released for a count of five.
- The exercise is done on each leg 10 to 15 times hourly while the patient is awake.
- Commercial breaks on television are a good reminder to do this.

Gluteal Setting

- Instruct the patient to contract the buttocks and pinch them together for a count of four, then relax for a count of five.
- Repeat 10 to 15 times hourly.

Think Critically

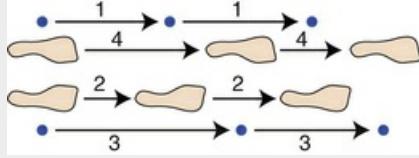
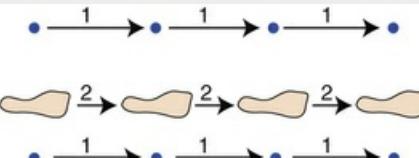
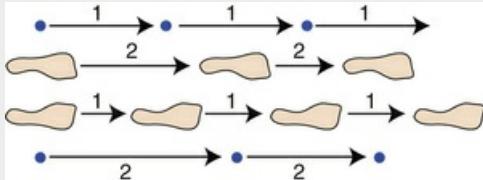
You are working in a long-term care facility. Your patient is in a coma because of a head injury that occurred 3 months ago, but her husband visits every day. How could the husband participate to prevent contractures?

Teaching Ambulation With Assistive Devices

For convalescent patients or those who may always need support while walking, crutches can mean the difference between freedom to move about and confinement to one location. Before attempting to walk with crutches, the patient should be instructed in their use and manipulation to ambulate safely and effectively.

Patient Teaching

Crutch Gaits

GAIT	SEQUENCE	PATTERN
Four-point gait	Advance left crutch. Advance right foot. Advance right crutch. Advance left foot. Advantages: most stable crutch gait. Requirements: partial weight bearing on both legs.	
Three-point gait	Advance both crutches forward with the affected leg and shift weight to crutches. Advance unaffected leg and shift weight onto it. Advantages: allows the affected leg to be partially or completely free of weight bearing. Requirements: full weight bearing on one leg, balance, and upper body strength.	
Two-point gait	Advance left crutch and right foot. Advance right crutch and left foot. Advantages: faster version of the four-point gait, more normal walking pattern (arms and legs moving in opposition). Requirements: partial weight bearing on both legs, balance.	

The type of crutch to be used will depend on the extent of disability or paralysis and the patient's ability to bear weight and maintain balance. If the crutches are too short or too long, patients will have problems with moving and shifting their weight. When walking, the patient should straighten the elbow and the wrist during weight bearing. The muscles of the arms, shoulders, back, and chest are all used in the manipulation of crutches. Therefore many physical therapists start the patient on special exercises to strengthen these muscles several weeks before the patient begins to use the crutches.

Safety Alert

Crutch Safety

Height is considered when fitting crutches to the patient. When in the standing position with axillary crutches, the axillary bar should be two finger breadths below the axilla. The elbow should be flexed at a 30-degree angle when the palms of the hands rest on the handgrip. It is important that the patient not rest her body at the axilla on the top of the crutch; body weight should be borne by the arms on the hand rests of the crutches. If crutches are too long, pressure on the axilla will occur and can cause nerve damage.

To measure for crutches, the patient stands wearing shoes and positions the crutch tips at a point 4 to 6 inches (10 to 15 cm) to the side and 4 to 6 inches in front of the feet. Although the physical therapist supervises the preparation and instruction of patients before they start to use crutches and then evaluates their ability to use them correctly, nurses are sometimes responsible for assisting a patient with crutch walking while she is in the hospital.

Patient Teaching

Special Maneuvers on Crutches

MANEUVER	SEQUENCE
Walking up stairs	Stand at the foot of the stairs with weight on the good leg and crutches. Put weight on the crutch handles and then lift the good leg up onto the first step of the stairs. Put weight on the good leg and lift the injured leg and crutches up to that step. Repeat for each step.
Walking down stairs	Stand at the top of the stairs with weight on the good leg and crutches. Shift weight completely onto the good leg and put the crutches down on the next step. Put weight on the crutch handles and transfer the injured leg down on the step with the crutches. Bring the good leg down to that step. Repeat for each stair step.
Sitting down	Crutch-walk to the chair. Turn around slowly so that the back is to the chair and the backs of the legs touch the seat of the chair. Transfer both crutches to the side with the injured leg and grasp both handgrips with that one hand. As weight is supported on the crutches and the good leg, reach back with the free hand and grasp the arm of the chair. Lower slowly onto the chair seat, using the support of both the crutches and chair. Sit back in the chair and elevate the leg. Keep the knee slightly flexed when elevated because too much extension can decrease the circulation. To get up, bring both crutches along the side of the injured leg and grasp the handgrip firmly. Make sure the crutch tips are firmly on the floor. Place the other hand on the arm of the chair and push up. After becoming upright, transfer one crutch to the other hand for walking.

When teaching a patient to ambulate with a cane, be certain that the cane has an intact rubber tip. The cane is the right length if the handgrip is at hip level and the elbow is bent at a 30-degree angle when weight is placed on the cane. **It should be used on the good side unless the provider orders otherwise.** The tip of the cane should be placed 6 to 10 inches (15 to 25 cm) to the side and 6 inches (15 cm) in front of the near foot when walking. The patient should look straight ahead, rather than down, when ambulating. **The cane is advanced at the same time as the affected leg.** “Go up the stairs with your stronger leg first, then your weaker leg, then the cane. If you are going down the stairs, start with your cane, then your weaker leg, then your strong leg” (www.nlm.nih.gov/medlineplus/ency/patientinstructions/000343.htm).

Walker height is correct when the person's elbow is bent at a 15- to 30-degree angle while standing upright and grasping the handgrips. The walker is lifted or rolled on its wheels slightly in front of the patient while leaning the body slightly forward. A step or two is taken into the walker, and then it is lifted and placed in front of the person again.

▣ Older Adult Care Points

Many older adults are hospitalized with injuries they sustain from inability to maneuver crutches, a cane, or a walker. It is essential that older adults be taught proper methods of using assistive devices and that they receive supervised practice before they are discharged.

Psychosocial Care

Unfortunately, many orthopedic conditions require prolonged periods of confinement to bed or, at best, immobilization of a part of the body and restricted physical activities. This leads to frustration and a feeling of hopelessness and despair on the part of the patient. When the patient is young and unaccustomed to depending on others for personal care, a reaction of anger and bitterness may occur. If the patient is a wage earner or a member of the family on whom others are dependent, there is the additional burden of financial and role problems (see Chapter 9). If there has been an amputation or extensive scarring from an injury, the patient's self-image may suffer.

■ Evaluation

Determining the effectiveness of interventions to treat pain is based mainly on subjective information given by the patient, but also be alert to nuances of body language. Observation of the patient's ability to accomplish ADLs gives clues to improvement in mobility and activity tolerance.

Diagnostic test data from radiographs and laboratory reports are used to determine the effectiveness of treatments. For example, radiographs show whether fractures are healing, whereas laboratory reports help to determine how well rheumatoid arthritis is controlled.

Common Problems Related to the Musculoskeletal System

Common problems specific to musculoskeletal disorders are those related to immobility, pain, and self-care deficit.

Immobility. There are many systemic responses and problems that result from extended immobility (see Box 30-1). These problems are more common with neurologic injuries or disease that cause long-term immobility. For shorter periods of immobility that occur with sprains and strains, joint injury and replacement, fractures, back pain, or arthritis, the goals are for quick ambulation and rehabilitation with a return to an active lifestyle. Many interventions can prevent

disability during the period of immobility.

Preventing Disability

The formation of **contractures** (shortening of skeletal muscle tissue causing deformity), loss of muscle tone, and fixation of joints can be prevented in most cases by consistent nursing intervention. The major components of the intervention are gradual mobilization, an exercise program, proper positioning, and instruction of the patient and family. **Within a matter of a few days, the structures of immobilized muscles and joints begin to undergo changes.** If no effort is made to prevent these changes, the patient will become permanently disabled. The pathologic changes most commonly associated with lack of motion include:

- Contractures
- Loss of muscle tone
- **Ankylosis** (permanent fixation of a joint)

Preventing contractures. Joint motion is the result of a shortening and stretching of opposing muscles. For example, when the flexor muscles of the leg contract and shorten, the opposing extensor muscles relax and lengthen. When skeletal muscles are not regularly stretched and contracted to their normal limits, they attempt to adapt themselves to this limited use by becoming shorter and less elastic. An “adaptive shortening,” or **contracture**, begins to form within 3 to 7 days after immobilization of a body part, and the process usually is complete in 6 to 8 weeks. This means that planning and implementing nursing measures must begin immediately to prevent permanent and crippling disability. The most common contractures that occur in patients immobilized for long periods are footdrop, knee and hip flexion contractures, wrist drop, and contractures of the fingers and arms ([Figure 31-5](#)).

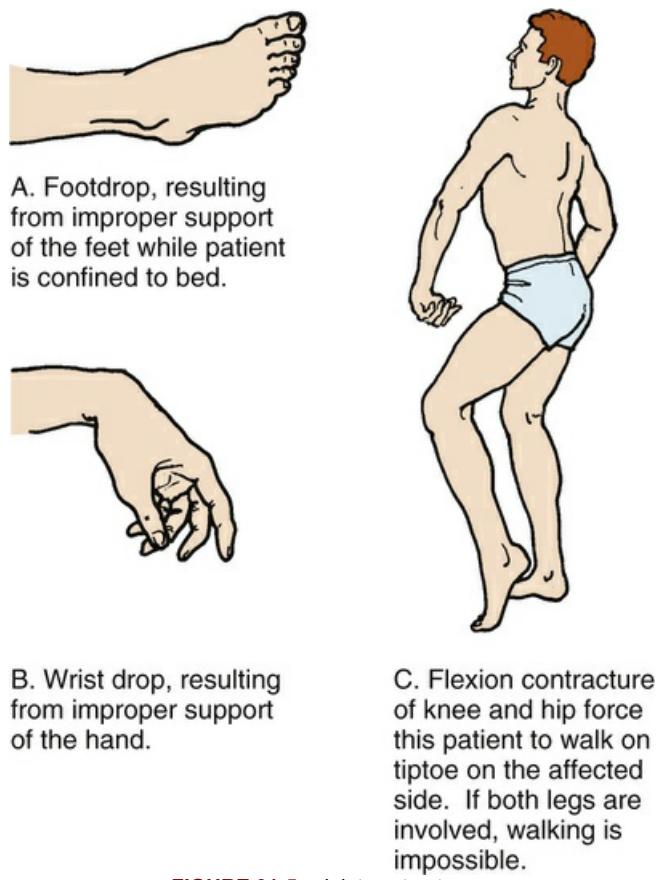


FIGURE 31-5 Joint contractures.

Preventing loss of muscle tone. *Muscle tone* is defined as the readiness of the muscle to go to work—to contract and relax as needed. If a muscle is not regularly stimulated to action or if it is

stretched beyond its normal limits for an extended time, it will lose its ability to contract and relax. For example, in footdrop, the calf muscles are shortened while the opposing flexor muscles are stretched. The result is loss of muscle tone and inability to produce motion. Performing ROM exercises helps prevent this.

Pain. Pain occurs with most musculoskeletal disorders. Immobilization with slings, splints, and braces helps to decrease pain by limiting movement of joints or muscles. Analgesics, muscle relaxants, heat, cold, topical pain-relieving substances, electrical stimulation, acupuncture, acupressure, massage, or chiropractic manipulation also are used to treat pain.

Clinical Cues

Alteration in Self-Care Ability

A patient with a musculoskeletal problem may need a little or a lot of help with activities of daily living. For those with a fracture, bathing help is typically needed. If an arm is immobilized, help with a meal tray and possibly with feeding will be required. Assistance may be needed for repositioning or transferring when the patient is in a leg cast, immobilizer, or external fixation device. A functional assessment should be performed to determine what assistance is necessary.

Common Therapeutic Measures

Special beds. Most hospital beds now have a built-in pressure-relieving mattress to help prevent skin breakdown. Another type of bed for patients who are on bed rest many hours each day has areas that inflate and deflate to deflect pressure from sequential areas of the body. An air fluidized bed is used for various types of immobility and is very helpful in preventing pressure sores because it conforms to the body's weight, and the air shifts as the body's weight is redistributed ([Figure 31-6](#)).

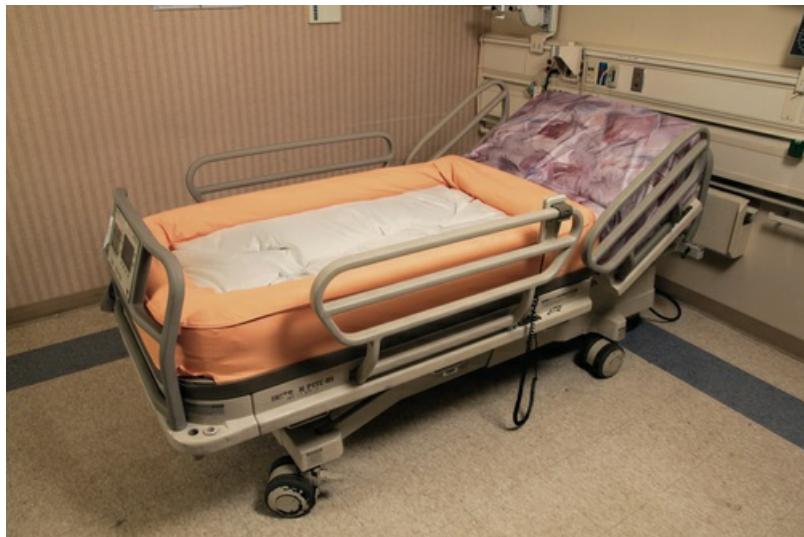


FIGURE 31-6 Clintron Rite Hite air fluidized therapy bed.

A type of bed that often is used for patients in cervical traction is the Roto-Rest bed (see Figure 23-12). This bed very slowly turns the patient about 300 times each day. It provides passive exercise and stimulates peristalsis without risk of injury to the patient. The bed has many other advantages, including several hatches that provide access to all of the common pressure points on the patient. There is a hatch for bowel and bladder care so that a bedpan can be placed without moving the patient. The back side of the patient can be bathed through the various hatches also. Once you are familiar with the bed, it greatly simplifies care of immobilized patients.

Use of slings, splints, and braces. A sling used to support the wrist or elbow should support both joints of the arm. The sling should be positioned so that the fastening at the neck area does not

rub the neck or press on a neck vessel. When a splint is applied to an extremity, it should support the joint that is to be immobilized, fit properly without impeding circulation or slipping out of place, and not cause increased pain ([Figure 31-7](#)). If in doubt about how a particular splint is to be applied, seek help from an experienced nurse or the physical therapist.

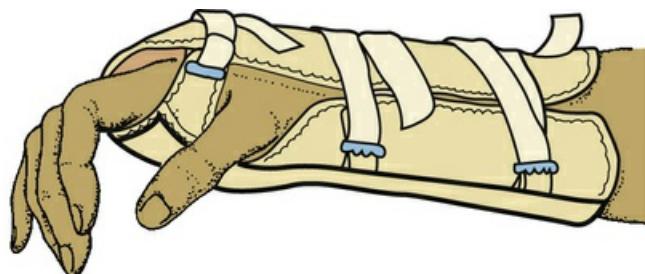


FIGURE 31-7 Wrist splint.

A splint may be used on an extremity to limit motion while healing takes place in the bone, joint, tendon, or muscle. Be certain to check the instructions for application of the splint. Inspect the skin under the splint each shift. Assess circulation after application of the splint.

A brace or immobilizer may be used on a leg during healing of an ankle injury or during the healing phase of a fracture. The device must be applied correctly, and the skin beneath it must be assessed for friction or injury each shift.

Physical therapy. Physical therapy sessions are often prescribed by the provider to assist the patient to regain mobility, increase strength after immobility, decrease pain, and prevent injury. Specific exercises, ultrasound, electrical stimulation of muscles, massage, kinetic taping, and heat and/or cold may be used. The patient is to perform the exercises regularly at home between sessions and after a course of therapy is over. The proper way to use crutches, a cane, or a walker are taught and supervised until the patient is deemed “safe” to use the equipment.

Occupational therapy. The occupational therapist assists patients to perform activities of daily living using adaptive equipment or alternate movements. Learning new ways of getting out of a sitting position, getting in and out of a vehicle, moving in bed, cooking, eating, dressing, and other activities helps the patient regain or maintain independence.

Get Ready for the NCLEX® Examination!

Key Points

- The main functions of the musculoskeletal system are motion, support, and protection.
- Disease, trauma, disuse, malnutrition, and aging all contribute to musculoskeletal problems.
- Exercise and weight training throughout life can decrease musculoskeletal problems late in life.
- Using safety equipment for sports, during exercise, when driving, and while at work is very important in preventing trauma to the musculoskeletal system.
- Nurses teach patients about diagnostic tests and procedures for the musculoskeletal system.
- Self-care deficit, impaired physical mobility, and pain are primary problems for patients with musculoskeletal injuries or disorders.
- Nurses use many interventions to prevent disability during periods of immobility.
- Contractures can permanently impair a patient's ability to perform ADLs. Positioning must be performed correctly, and ROM exercises should be performed three or four times a day to promote function and preserve movement.
- Nurses assist with supervising and teaching ambulation with assistive devices.
- Physical and occupational therapists are part of the collaborative team for musculoskeletal care and rehabilitation.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- Arthritis Foundation, www.arthritis.org
- Back Injury Prevention Guide, www.dir.ca.gov/dosh/dosh_publications/backinj.pdf
- National Association of Orthopedic Nurses, www.orthonurse.org

Review Questions for the NCLEX® Examination

1. When explaining the structure of the knee to a patient who has knee swelling, the nurse states:
(Select all that apply.)

1. "Ligaments provide movement of the joint."
2. "The meniscus in the joint acts as a cushion."
3. "The tendons are needed for movement and can be injured."
4. "The fascia may have deteriorated."
5. "Muscles attach to the bones to help provide movement."

NCLEX Client Need: Physiological Integrity

2. The purpose of the skeleton is to provide a rigid framework that _____ and the skin. *(Fill in the blank.)*

NCLEX Client Need: Physiologic Integrity

3. What action should the nurse perform for the postprocedural care of a patient who just had an

arthroscopy?

1. Follow up on the results of the serum enzymes that were drawn before the test.
2. Prepare an ice pack and obtain an elastic bandage.
3. Check vital signs and pulse every 15 minutes for the first hour.
4. Encourage the patient to take fluids to decrease the swelling.

NCLEX Client Need: Physiologic Integrity

4. When a 76-year-old female patient has a complaint of pain and soreness in the back, a first step in the assessment specific to this patient should include:

1. family or personal history of osteoporosis or arthritis.
2. physical examination of muscle strength of the extremities.
3. history of fracture during the patient's lifetime.
4. appearance of joints in the extremities.

NCLEX Client Need: Physiologic Integrity

5. A nurse is teaching an older adult patient how to increase musculoskeletal and bone strength. Which interventions would be helpful? (*Select all that apply.*)

1. Walk at least 30 minutes a day 5 to 7 days a week.
2. Eat more protein and vitamin C to build muscle.
3. Walk up stairs as often as possible.
4. Perform strength training exercises at least three times a week.
5. Use 10-lb weights for various exercises at least three times a week.

NCLEX Client Need: Safe and Effective Care Environment

6. A nurse is working on a busy orthopedic floor. Which task(s) can be assigned to the UAP? (*Select all that apply.*)

1. Assist an older adult who has an arm sling to perform ADLs.

2. Report the presence of contractures on a bedridden patient.
3. Supervise a patient who is beginning to use crutches.
4. Escort a patient in a wheelchair to the radiology department.
5. Perform passive ROM on a patient who needs a bed bath.
6. Instruct a patient to reapply a prescribed wrist splint to prevent contracture.

NCLEX Client Need: Safe and Effective Care Environment

7. A nurse evaluates a patient's ability to use a cane. Which action indicates proper use of the cane?
1. The cane is advanced at the same time as the good leg.
 2. The handgrip is at the hip level.
 3. The cane is used on the affected side.
 4. The patient looks down while ambulating.

NCLEX Client Need: Safe and Effective Care Environment

8. A 56-year-old man complains to the nurse of joint pains, difficulty rising, and limping. He demonstrates poor posture and uncoordinated gait. The nurse sees the priority problem on his care plan as:
1. Limited ability for self-care.
 2. Altered physical mobility.
 3. Limited coping ability.
 4. Altered activity tolerance.

NCLEX Client Need: Safe and Effective Care Environment

9. The nurse recruits the assistance of adequately trained personnel to turn an immobile patient. To prevent injury to the patient and the nursing staff, which measure should be taken before repositioning the patient?
1. Encourage movement of all joints.

2. Explain the details of the move.
3. Discourage patient participation.
4. Medicate the patient for anxiety.

NCLEX Client Need: Safe and Effective Care Environment

10. To manage joint discomfort associated with movement for a patient with severe rheumatoid arthritis, the nurse should:

1. encourage deep-breathing exercises.
2. administer pain medications immediately after exercise.
3. schedule pain medication administration before exercise.
4. provide a continuous infusion of pain medications.

NCLEX Client Need: Physiologic Integrity

11. A nurse assesses the condition of a patient with a splint applied to the right arm. Which clinical finding is cause for the greatest concern?

1. Warm skin under the splint
2. Redness of skin under the splint
3. Itching under the splint
4. Palpable distal pulses

NCLEX Client Need: Safety and Infection Control

Critical Thinking Questions

Scenario A

Ms. Johnson has had trouble with her left knee for several years. She is scheduled for an arthroscopy and asks you about the procedure.

1. How would you describe the procedure to her?
2. What care is necessary after this procedure?
3. How long is she likely to be immobile after the procedure?

Scenario B

Mrs. Hamid has been experiencing muscle weakness in her right leg for a few weeks. Her health

care provider has scheduled her for an electromyogram (EMG). She asks you about this procedure.

1. Is an informed consent needed for an EMG?
2. How would you describe the test to Mrs. Hamid?
3. What care is needed after the procedure?

Scenario C

Mrs. Green, age 67 years, sustained a fracture of the right humerus when she fell this morning. A cast has been applied.

1. What would you tell her she needs to do at home to keep her joints mobile?
2. What should she do to protect the muscle mass?
3. What nutritional teaching would you provide?

Scenario D

You are caring for Mr. Morgan, a 40-year-old self-employed carpenter. He is a large man with a heavy full-leg cast. He is having a lot of pain and expresses fear that moving will increase the pain.

1. Discuss some important considerations in turning, moving, bathing, and toileting for Mr. Morgan.
2. What is the psychosocial care for a patient such as Mr. Morgan who is immobile?

CHAPTER 32

Care of Patients With Musculoskeletal and Connective Tissue Disorders

Objectives

Theory

1. Compare the assessment findings of a connective tissue injury with those of a fracture.
2. Determine the rationale for the “dos and don’ts” of cast care.
3. Outline the potential complications related to fractures.
4. Discuss the pathophysiology and implications of the six *Ps*.
5. Contrast the preoperative and postoperative care of a patient with a total knee replacement with that of a patient with a total hip replacement.
6. Relate the special problems of patients with arthritis with specific nursing interventions that can be helpful.
7. Illustrate the process by which osteoporosis occurs, ways to slow the process, and how the disorder is treated.
8. Determine important postoperative observations and nursing interventions in the care of a patient who has undergone an amputation.

Clinical Practice

9. Gather data on a patient who has a connective tissue injury.
10. Provide pin care for a patient with external fixation of a fracture.
11. Instruct a patient going home with a cast about proper care of the cast and extremity.
12. Observe a physical therapist teaching quadriceps exercise and then assist the patient to practice.
13. Assess the skin of a patient who has a prosthetic device on an amputated limb.

KEY TERMS

- arthroplasty** (ÄR-thrō-pläs-tē, p. 751)
bivalved (Bī-välvd, p. 744)
compartment syndrome (kōm-PÄRT-měnt SÍN-drōm, p. 744)
dislocation (dīs-lō-KĀ-shūn, p. 737)
fasciotomy (făsh-ē-ÖT-ō-mē, p. 744)
fracture (FRÄK-shür, p. 738)
nonunion (nōn-Ü-nyün, p. 743)
orthoses (ör-thō-sēz, p. 751)

osteogenesis (ös-tē-ō-JĚN-ě-sīs, p. 743)
osteomyelitis (ös-tē-ō-mī-ě-LĪ-tīs, p. 743)
osteopenia (ös-tē-ō-PĒ-nē-ă, p. 758)
osteoporosis (ös-tē-ō-pō-RŌ-sīs, p. 738)
sprain (SPRĀN, p. 736)
subluxation (süb-lük-SĀ-shūn, p. 737)

Connective Tissue Disorders

Sprain

Etiology and Pathophysiology

A **sprain** is a partial or complete tearing of the ligaments that hold various bones together to form a joint. A sprain occurs during trauma when a joint is forced or twisted past its normal range of motion (ROM). The ankle, knee, and wrist are most the commonly sprained joints.

Signs, Symptoms, and Diagnosis

- *Grade I* (mild): Tenderness at site; minimal swelling and loss of function; no abnormal motion.
- *Grade II* (moderate): More severe pain, especially with weight bearing; swelling and bleeding into joint; some loss of function.
- *Grade III* (severe, complete tearing of fibers): Pain may be less severe, but swelling, loss of function, and bleeding into joint are more marked.

Diagnosis is by physical and radiographic examination to rule out a fracture or other pathology.

Treatment and Nursing Management

RICE is the acronym used for treatment of sprains: **rest**, **ice**, **compression**, and **elevation**. Apply ice immediately after injury and for the next 24 to 72 hours. Apply the ice bag for 10 to 20 minutes every 1 to 2 hours during the day. Wrap the injured part snugly with an elastic bandage, being careful not to cut off circulation, and elevate. These measures can help minimize swelling and pain and stabilize the joint in proper alignment. The goal of treatment is to protect the ligament until it heals by scarring. Ligaments do not “grow” back together. Air casts, braces, or supports are used only until a joint has been strengthened. If a joint is immobilized too long and muscles are not exercised, muscle atrophy—which begins in a matter of days—can cause permanent disability. In some cases, surgical repair may be necessary. Grade III sprains often require a cast. Patients with grade II or grade III sprains need to rest the joint; crutches are needed for a lower extremity sprain. Nonsteroidal anti-inflammatory drugs (NSAIDs) should be prescribed on an around-the-clock basis for the first couple of days to decrease swelling.

Strain

Etiology and Pathophysiology

A strain is a pulling or tearing of a muscle, a tendon, or both. A strain occurs by trauma, overuse, or overextension of a joint. The most commonly strained muscles are the back muscles. (See [Chapter 22](#) for a discussion of the neurologic aspect of back problems.) Muscle strains also occur in other skeletal muscles. The most common sites are the hamstrings, quadriceps, and calf muscles.

Complementary and Alternative Therapies

Soothing Sore Muscles

Arnica applied topically is reported to soothe sore, tired muscles after extended hard work. Valerian or kava brewed as a tea is also believed to relax muscles. A little honey or apple juice will make the teas more palatable (Edelberg, 2014).

Signs, Symptoms, and Diagnosis

A history of overexertion or the presence of soft-tissue swelling and pain may indicate a strain has occurred. Bleeding (ecchymosis, hemorrhagic area) will be present if a muscle is torn.

Treatment and Nursing Management

Ice and compression should be immediately applied, and the body part should be elevated and

rested. The patient is taught to use ice for only 20 minutes each hour. When compression is used, the distal parts of the extremity must be checked for sensation and adequate circulation. Heat can be applied after 48 hours. Anti-inflammatory medications are used for discomfort; when spasm is present, a muscle relaxant may be prescribed. Time is the greatest healer. The patient is cautioned against reinjury and is taught proper ways to lift and move. Surgical repair may be necessary.

Think Critically

How would you assess for a circulation problem or nerve injury after an ankle sprain or strain?

Dislocation

Etiology and Pathophysiology

A **dislocation** is the stretching and tearing of ligaments around a joint with complete displacement of a bone. **Subluxation** is a partial dislocation. This occurs from trauma. The most common sites are the shoulder, knee, hip, ankle, and temporomandibular joint.

Signs, Symptoms, and Diagnosis

Dislocation often includes a history of an outside force pushing from a certain direction, severe pain aggravated by motion of the joint, muscle spasm, or abnormal appearance of a joint. A radiograph will reveal displacement of bone.

Treatment and Nursing Management

Reduction of displacement under anesthesia is used for most dislocations; sometimes manual reduction is used for the shoulder. Reduction can be very painful. Sometimes spontaneous reduction can be achieved. The goal is to stabilize the joint after reduction and then to rehabilitate to minimize muscular atrophy and strengthen the joint. Assess for adequate perfusion and movement of the affected part and distal to it, determine whether swelling is present, and assess the degree of pain. Nursing management is aimed mainly at pain control and encouraging rest of the affected part. Heat or cold applications may be ordered.

Rotator Cuff Tear

Rotator cuff injury usually results from repetitive activity, such as throwing or making overhead motions with the arm. Falls and trauma also may cause the injury. The rotator cuff is composed of four muscles. If the rotator cuff is torn, there is pain and the patient cannot perform abduction and external rotation of the injured shoulder. Treatment consists of rest, sling support for the shoulder, and NSAIDs for the discomfort. Some providers treat with injections of steroids or an anti-inflammatory drug. When the acute episode is over, gentle, progressive exercise is prescribed. Heat is recommended before exercising the joint. If the tear will not heal, surgical repair is indicated.

Anterior Cruciate Ligament Injury

Most anterior cruciate ligament (ACL) injuries of the knee occur from athletic activities, but falls and motor vehicle accidents also may cause such injury. Hyperextension, internal rotation, extremes of external rotation, and deceleration are involved. The ligament may be torn from the femur or tibia. Often a loud “pop” can be heard at the time of injury. There is swelling in the hours after the injury, and the knee feels unstable and can “give way.” Full extension of the leg is difficult.

Diagnosis is by physical examination, radiography, or magnetic resonance imaging (MRI).

Arthroscopy is performed, at which time repair may be done. Sometimes a tendon transplant is needed for the repair.

After injury, the knee is immobilized and measures are instituted to reduce swelling and pain. After repair, continuous passive motion (CPM) may be ordered to promote full mobility. A long leg brace with fixed knee flexion may be used as well. Isometric exercises are prescribed in the recovery period, including quadriceps setting (see [Patient Teaching: Quadriceps and Gluteal Muscle Exercises](#) in Chapter 31), bent-knee leg exercises, and foot exercises.

Meniscal Injury

The meniscus is the shock absorber of the knee and it lies on top of the tibia between the tibia and the femur. A meniscus tear may accompany an ACL injury. This type of injury often results from fixed-foot rotation in weight bearing with the knee flexed during sports activities, such as football, soccer, basketball, or skiing. After the injury, mild swelling occurs and there is joint pain. Popping, slipping, catching, or buckling of the knee can occur. Diagnosis is by physical examination to elicit a "click" and localized pain with particular movements of the joint. MRI is the most specific diagnostic test for a meniscal injury. Surgery for repair is done arthroscopically. Postoperatively, pain management is a priority. An exercise program is prescribed for muscle strengthening during recovery.

Achilles Tendon Rupture

The Achilles tendon attaches the soleus, plantaris, and gastrocnemius muscles to the calcaneus (heel bone). When overstretched, it can rupture. Sports injuries or a fall from a height are the usual mechanisms of injury. Arthritis, diabetes, and taking some antibiotics and other medications can predispose to Achilles tendon rupture. Injury most often occurs with bursts of jumping, pivoting, and running, such as occur in tennis, basketball, handball, and badminton. Symptoms include sudden pain at the back of the ankle or calf. There may be a loud "pop" or "snap" sound. A depression can be felt or seen 2 inches above the calcaneus. Pain, swelling, and stiffness, and then bruising and weakness, follow. There will be an inability to point the toes or stand on tiptoe. Diagnosis is by examination and squeezing the calf muscles while the patient is lying prone. The toes should point downward; if they do not, there is most likely an Achilles tendon injury.

Treatment may be by splinting, casting, or a combination of splinting or casting with surgery. Recovery takes 6 to 8 weeks, followed by physical therapy.

Bursitis

Bursitis is an inflammation of the bursae, the saclike structures that line freely movable joints. It occurs from injury or overuse and often appears when a person has engaged in an unaccustomed activity, such as shoulder bursitis after digging up the garden plot in the spring. Bursitis may occur in any heavily used joint, but it most commonly occurs in the elbow, shoulder, hip, or knee.

Symptoms are localized tenderness and mild to moderate aching pain that is localized to the joint and is exacerbated by activity of the joint. Swelling may be present. Diagnosis is by history of injury and physical examination. Treatment is to rest the joint by altering aggravating activity and using anti-inflammatory agents, ice, massage, and a compression wrap if there is soft-tissue swelling. If these measures—plus time—do not relieve the symptoms, an injection of cortisone into the bursa may be administered.

Bunion (Hallux Valgus)

A bunion, the most common foot problem, is a painful swelling of the bursa that occurs when the great toe deviates laterally at the metatarsophalangeal joint. It may be hereditary, or it may occur from ill-fitting shoes. Bunions are more common in women than in men. Wearing open-toed shoes of soft leather or athletic shoes that are wider in the toe area helps reduce pain. Metatarsal pads can relieve some of the pressure. Corticosteroid injections are given in the joint if active bursitis is present. Analgesics are used for discomfort. Bone realignment of the big toe with removal of bony overgrowth is performed when walking becomes too painful. Hammertoes are often fixed at the same time.

Carpal Tunnel Syndrome

Etiology, Pathophysiology, Signs, and Symptoms

Carpal tunnel syndrome is a nerve problem that occurs when the median nerve is compressed as it passes through the carpal tunnel in the wrist. It produces pain, numbness, and tingling of the hand, particularly at night. Repetitive movements of the hands and wrists, particularly with constant flexion of the wrist, are contributing causes. Such movement occurs in certain types of factory work

and in computer keyboarding. Sometimes there is no known cause.

Diagnosis, Treatment, and Nursing Management

Diagnosis is by physical examination, a compression test, and possibly electromyography to rule out other causes of symptoms. Treatment by rest, splinting, changing the angle of the wrist during repetitive movements, or steroid injection may solve the problem. If the symptoms are of long duration, muscle atrophy occurs; if sensory loss in the fingers and hands is progressive, surgery is indicated. Surgical decompression of the median nerve by transection of the carpal ligament is performed, usually as an outpatient procedure.

Postoperatively, blood flow must be assessed hourly by checking color, warmth of the fingertips, and capillary refill. After anesthesia has worn off, sensation of the fingers is assessed. The wrist is immobilized in a splint and the arm is elevated on pillows to reduce edema. The patient is warned to avoid heavy gripping and pinching for up to 6 weeks.

Fractures

Etiology and Pathophysiology

A **fracture** is a break or interruption in the continuity of a bone. Fractures occur mostly from trauma but result from a pathologic process in which bone has degenerated, such as in **osteoporosis** (metabolic bone disorder that causes a decrease in bone mass) or another metabolic problem. The **mechanism of injury**, or how the injury occurred, can provide clues about the type of fracture. For example, if a patient punches a wall or another solid surface, the fifth metacarpal commonly breaks and the patient sustains a “boxer’s fracture.” Mechanism of injury is also important to help predict injury to the neighboring tissues (see Chapter 43). Damage varies according to the type of fracture, but there is always some degree of tissue destruction, interference with the blood supply, and disturbance of muscle activity at the site of injury.

Safety Alert

Proton Pump Inhibitors and Fracture Risk

In May 2010, the Food and Drug Administration (FDA) issued a warning that proton pump inhibitors (PPIs), including over-the-counter types, increase the risk for fracture of the hip, wrist, and spine. In epidemiologic studies, the risk was highest for people older than 50 years who had used PPIs for more than a year (Ault, 2010). Calcium and vitamin D supplements should be taken when a patient is taking a PPI long term.

Signs, Symptoms, and Diagnosis

A fracture may cause minimal to severe pain depending on the type of fracture, the bone(s) involved, and the amount of displacement. Swelling usually occurs, and there may be bleeding into the tissues. Other symptoms of a fracture include pain, tenderness, deformity of the bone, ecchymoses, crepitus with any movement, and loss of function. **Box 32-1** presents the most common types of fractures. **Figure 32-1** illustrates the characteristics of a variety of fractures. Diagnosis is by physical and radiographic examination.

Older Adult Care Points

Older adults are more at risk of sustaining a fracture because of decreased reaction time, failing vision, reduced agility, alterations in balance, and decreased muscle tone, all of which predispose to falls. Nurses should assess for fall risk and initiate fall precautions as needed. Balance exercises can be very helpful in preventing fractures, as can the use of assistive devices.

Box 32-1

Types of Fractures

- **Complete fracture** is when a bone breaks into two parts that are completely separated.
- An **incomplete fracture** is when a bone breaks into two parts that are not completely separated.
- A **comminuted fracture** is one in which the bone is broken and shattered into more than two fragments.
- A **closed (simple) fracture** is one in which there is no break in the skin.
- An **open (compound) fracture** is one in which there is a break in the skin through which the fragments of broken bone protrude.
- A **greenstick fracture**, common in children, is one in which the bone is partially bent and partially broken.

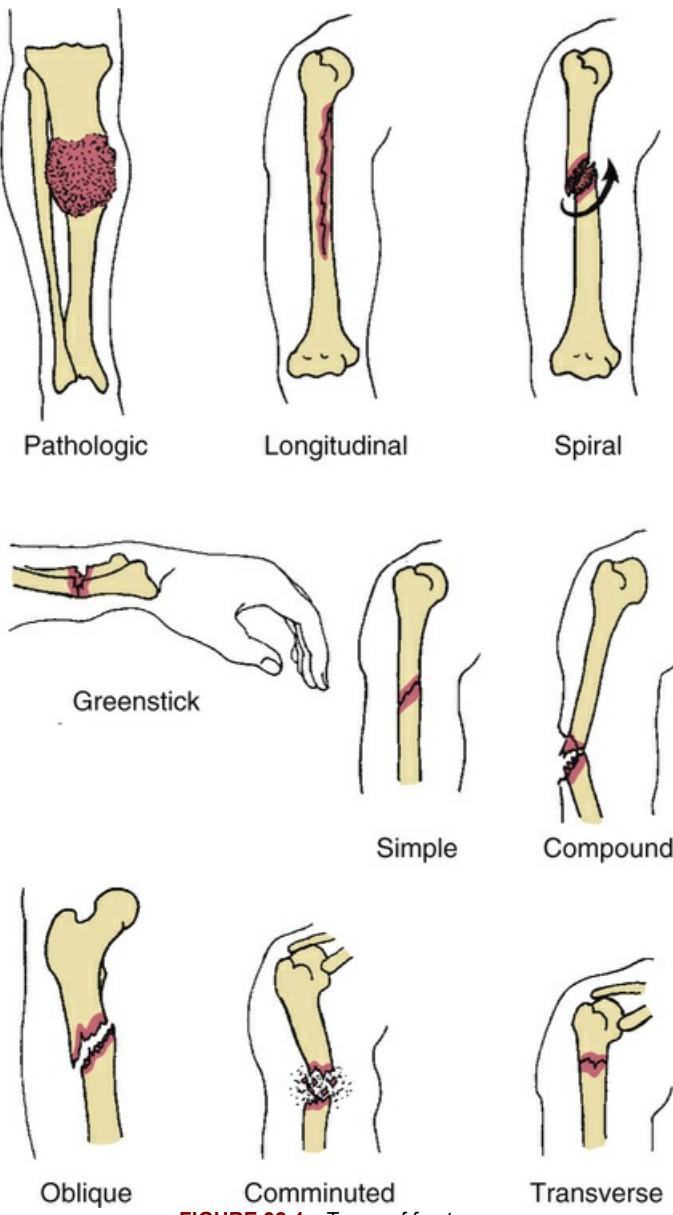


FIGURE 32-1 Types of fractures.

Treatment

The emergency treatment and nursing care of fractures consists of preventing shock and hemorrhage and the immediate immobilization of the part to prevent unnecessary damage to the soft tissue adjacent to the fracture. An inexperienced person should never attempt to straighten or set a broken bone. The injured part should be immobilized in the position in which it is found at the time of injury: "splint it as it lies." The limb should be supported firmly so that it will not be jarred when the patient is being moved. If available, ice in a plastic bag can be applied to the fracture area to help minimize swelling.

In the emergency department or clinic, the patient will be examined by a health care provider, and a radiograph will be ordered if fracture is suspected. After a radiograph of the injured part has been made and the type of fracture and extent of damage have been established, a decision is made as to which method to use in reducing the fracture and providing immobilization. Surgery may be necessary to realign the bones and to reduce the fracture. If the skin was broken when the fracture occurred, tetanus immunization is given unless immunization is current. Prophylactic antibiotics are usually administered when a compound (open) fracture has occurred.

The primary goal in the treatment of fractures is to establish a sturdy union between the broken ends so that the bone can be restored to continuity. The healing and repair of a fracture begin immediately after the bone is broken and proceed through five stages:

1. Blood oozes from the torn blood vessels in the area of the fracture; the blood clots and begins to form a hematoma between the two broken ends of bone (1 to 3 days).
2. Other tissue cells enter the clot, and granulation tissue is formed. This tissue is interlaced with capillaries, and it gradually becomes firm and forms a bridge between the two ends of broken bone (3 days to 2 weeks).
3. Young bone cells enter the area and form a tissue called *callus*. At this stage, the ends of the broken bone are beginning to "knit" together (2 to 6 weeks).
4. The immature bone cells are gradually replaced by mature bone cells (ossification), and the tissue takes on the characteristics of typical bone structure (3 weeks to 6 months).
5. Bone is resorbed and deposited, depending on the lines of stress. The medullary canal is reconstructed during consolidation and remodeling (6 weeks to 1 year).

To facilitate the process of repair and ensure proper healing of the bone without deformity or loss of function, the surgeon must bring the two broken ends together in proper alignment and then immobilize the affected part until healing is complete. The procedure for bringing the two fragments of bone into proper alignment is called *reduction of the fracture*.

Reduction, surgery, and stabilization.

There are two methods to reduce a fracture: closed reduction and open reduction. In **closed reduction**, the bone is manipulated into alignment; no surgical incision is made. A general anesthetic may be given before the fracture is reduced. An **open reduction** is performed after a surgical incision is made through the skin and down to the bone at the site of the fracture. In cases of open (compound) fractures and comminuted fractures, an open reduction is necessary so that the area can be adequately cleansed and bone fragments removed.

There are four methods of stabilizing a fracture after it has been reduced:

1. Internal fixation
2. External fixation
3. Casts, splints, or braces
4. Traction

Internal fixation.

When a fracture cannot be completely reduced by either open or closed reduction and it is impossible to guarantee adequate union of the bone fragments, the surgeon must perform **internal**

fixation of the bone. This means that pins, nails, screws, rods, or metal plates must be used to stabilize the position of the two broken ends. Internal fixation is particularly necessary to treat fractures in older adults whose bones are brittle and may not heal properly (Figure 32-2).

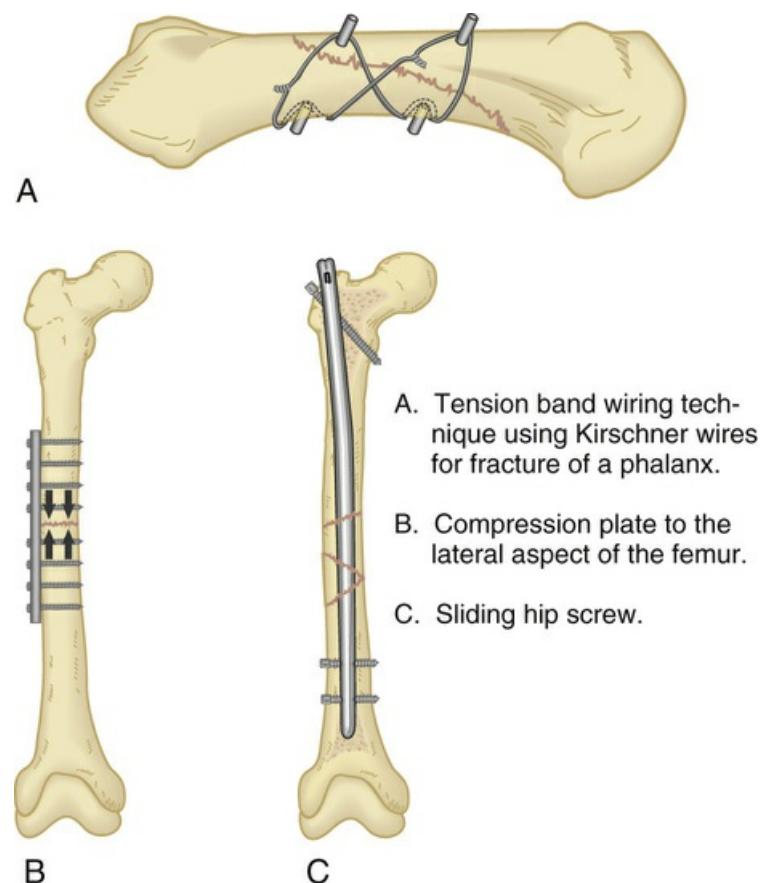


FIGURE 32-2 Examples of internal fixation. **A**, Tension band wiring technique using Kirschner wires for fracture of a phalanx. **B**, Compression plate to the lateral aspect of the femur. **C**, Sliding hip screw. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

One of the most common internal fixation procedures is performed on a fractured hip: open reduction and internal fixation (ORIF). An incision is made, the fracture is realigned, and the bone is secured with pins, screws, nails, or plates. A drain will be in place until there is scant drainage (i.e., less than 30 mL in 8 hours). If a prosthesis is implanted, there will be more blood loss and the patient may receive autotransfusion of salvaged blood after surgery. Administration of intravenous (IV) antibiotics to reduce the risk of infection is standard. Care includes maintaining good alignment of the affected leg, preventing complications of immobility, and keeping the patient comfortable with pain control measures.

External fixation.

External fixation of fractures involves the use of a device composed of a sturdy external frame to which are attached pins that have been placed into the bone fragments. Figure 32-3 shows a fixator that is applied by inserting heavy pins on either side of the fracture and then reducing the fracture by tightening nuts attached to the connecting rods.



FIGURE 32-3 External fixation.

External fixation is commonly used for fractures of an extremity or of the pelvis. Indications include:

- Massive open fractures with extensive soft-tissue damage
- Infected fractures that do not heal properly
- Multiple trauma with one or more fractures and other injuries, such as burns, chest injury, or head injury

External fixation has the advantage of allowing more freedom of movement than traction and usually is more comfortable. With good stability the patient may be able to get out of bed, although he must be assisted and advised not to bear weight on the affected limb. Physical therapy exercises will help the patient prevent many of the problems of immobility, and an occupational therapist can suggest ways to cope with activities of daily living (ADLs). Particularly if the fixator must remain in place for months or years, the patient is likely to have problems with self-image and may feel embarrassed or frustrated about being out in public with an apparatus that is large and bulky.

Casts.

Casts are used for stabilizing a fracture after a closed reduction. A cast is rigid and immobilizes the injured body part. The newer fiberglass and polyester-cotton knit casts are lightweight, dry quickly, and can bear weight within 30 minutes of application ([Figure 32-4](#)). They are less bulky, do not crumble easily, and are less likely to be damaged by wetting. However, synthetic casts cost three to seven times more than plaster casts. They are less easily molded to a body part than are plaster casts, and synthetic casts are not suitable for immobilizing the fragments of severely displaced bones or for stabilizing serious fractures. Their rough exterior surfaces can damage the skin and tend to snag clothing and other soft materials. Synthetic casts are used mostly for upper-extremity fractures. Some providers still use plaster of Paris casts for lower extremities because plaster casts can bear more weight and last longer with weight bearing. A newly applied plaster cast usually is not dry for about 48 hours. A dry plaster cast is white, has a shiny surface, and will resound when tapped. A wet plaster cast is grayish and dull in appearance and will give a dull thud when tapped. The edges of plaster casts tend to crumble, with bits of plaster dropping down inside the cast and causing the patient discomfort and skin irritation. This can be prevented by covering the rims of the cast with stockinette or applying tape in a “petal” fashion.



FIGURE 32-4 Synthetic limb cast.

There are **long-leg** and **short-leg** casts, classified by how much leg they cover. A walking **cast shoe** is a canvas sandal with a thick sole that fits over the bottom of the leg cast; this shoe can be used once the patient is allowed to bear weight. When an arm cast is applied, a sling is often used to support the arm and provide extremity elevation. A **spica** cast covers the trunk of the body and one or two extremities. There are long-leg and short-leg spicas that cover one or both legs and shoulder spicas that include the trunk and one arm.

When a surgical repair has occurred, casting is delayed for 1 to 2 weeks until the patient is seen in the office. Casts must be kept dry to prevent infection of the surgical wound. A wet cast must be changed as soon as possible.

Braces and splints.

Braces provide support for fractures that have been reduced. The advantage of a brace is that it can be easily removed for assessment and care of the skin, and then reapplied. Examples include a commercial fracture boot to support the distal tibia, ankle, and foot (Figure 32-5). A hinged brace is used for the elbow and knee, which allows for early motion of the joint. An adjustable dial allows for variations in flexion and extension during recovery. A knee immobilizer prevents motion and provides compression to reduce pain and swelling. Plaster of Paris can be used to create a “backslab” or splint (a slab of plaster that provides support, but does not completely surround the injury). The slab is useful in the early phase because of the swelling that occurs after the injury (Chow et al, 2013).

Clinical Cues

Before cast application (especially plaster of Paris), advise the patient that he will feel warmth as the cast sets and dries. Never put a fresh cast over plastic; the heat generated may burn the skin because it cannot dissipate. A fresh plaster cast should never be covered; air circulation speeds drying.



FIGURE 32-5 Walking boot. (From Roberts JR, Hedges JR: *Clinical procedures in emergency medicine*, ed. 5, Philadelphia, 2009, Saunders.)

Traction.

Traction was used more commonly in the past. Current applications of traction for adults are primarily Buck traction for a hip fracture when there is a delay in going to surgery for repair. Skeletal traction is simple, takes minutes to apply, is inexpensive, and involves no need for anesthesia. It is a good temporary measure unless the patient is undergoing anesthesia for other reasons (Scannell, 2010).

Traction is the application of a mechanical pull to a part of the body for the purpose of extending and holding that part in a certain position during immobilization. The two general types of traction are **skeletal traction** and **skin traction**. In skeletal traction, the surgeon inserts pins, wires, or tongs directly through the bone at a point distal to the fracture so that the force of pull from the weights is exerted directly on the bone. Skeletal traction uses 10 lb or more of weight, and the body acts as the countertraction. With skin traction, a bandage (such as moleskin) or a foam traction boot is applied to the limb below the site of fracture, and pull is exerted on the limb. No more than 7 to 10 lb of weight is used for skin traction. Traction may be continuous (as in the alignment and resultant immobility of fractured bones), or it may be intermittent (as in traction on the spinal column to relieve the symptoms of a slipped disk or muscle spasms).

Figure 32-6 illustrates some of the common types of traction:

- **Buck extension** is a simple skin traction that is used to treat muscle spasms from fractures of the hip or femur, preoperatively, and for dislocation of the hip.
- **Cervical traction** can be provided through the use of tongs inserted into the skull, the use of a halo device (see Chapter 22), or a head halter.
- **Balanced suspension with the Thomas splint and Pearson attachment** is used to treat fractures of the femur and pelvis. The Thomas splint supports the thigh and knee and provides countertraction. The Pearson attachment supports the lower leg, although it has generally been replaced with the use of external fixation.

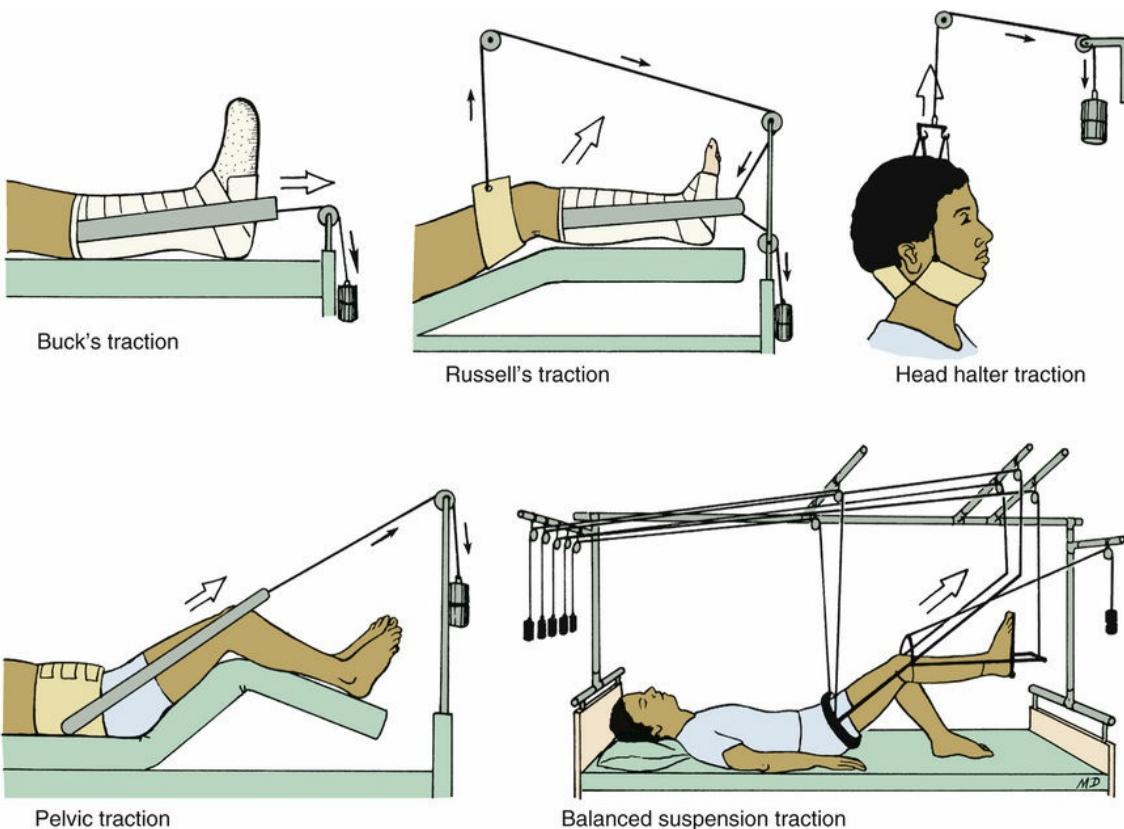


FIGURE 32-6 Common types of traction.

Pelvic traction, Russel's traction and head halter traction are only rarely used now. Skin must be checked regularly under skin traction because breakdown from pressure may occur.

Complications of Fractures

The sooner a fracture is fixed, the less likely the chance for complications. Healing of a fracture can be impeded by improper alignment and inadequate immobilization. Continued twisting, shearing, and abnormal stresses prohibit a strong, bony union. Inadequate levels of serum calcium and phosphorus, vitamin deficiency, and generalized atherosclerosis—which deprives the healing site of adequate blood supply—also can complicate a fracture by delaying healing.

Infection.

Infection of the tissue at the fracture site is probably the most serious impediment to healing. Open comminuted fractures should be surgically addressed within 6 hours to decrease the chance of infection. Prevention of infection after surgery is a 2013 National Patient Safety Goal. Typically cefazolin (Ancef) is administered within 1 hour of incision, and two doses are given postoperatively. If the wound is grossly contaminated, additional antibiotics will be prescribed. It is important to monitor the patient's temperature and white blood cell (WBC) count for elevations and assess the appearance of the area carefully for redness, swelling, heat, or purulent drainage.

Osteomyelitis.

Osteomyelitis is a bacterial infection of the bone. It is common in diabetic ulcers left untreated or that won't heal. The causative organism is most often *Staphylococcus aureus*, which enters the bloodstream from a distant focus of infection, such as a boil or furuncle, or from an open wound, as in an open (compound) fracture. It is usually found in the tibia or fibula, in vertebrae, or at the site of a joint prosthesis. Osteomyelitis has a sudden onset with severe pain and marked tenderness at the site, high fever with chills, swelling of adjacent soft parts, headache, and malaise. Diagnosis of osteomyelitis is made on the basis of:

- Laboratory findings indicating an acute infection, such as high sedimentation rate and WBC count
- Radiographs, which may show bone destruction 7 to 10 days after onset of the disease

- History of injury to the part, open fracture, boils, furuncles, or other infections
- Biopsy, in which the bone sample exhibits signs of necrosis

The earlier osteomyelitis is diagnosed and treated, the better the prognosis. Intravenous antibiotics are often needed, and antibiotics are prescribed for 4 to 6 weeks; the abscess is incised and drained. Dead bone and debris are debrided from the site. The affected limb is immobilized for complete rest. Sometimes amputation is the only cure (see [Chapter 6](#) for care related to infection).

Nonunion.

Nonunion (failure to heal) of a fracture can be treated by an electrical bone growth-stimulating device, which uses electrical coils or electrodes to induce weak electrical current in the bone to stimulate healing properties. Examples include an external electromagnetic device, a percutaneous stimulator with electrodes placed at the fracture site, or an implanted direct current stimulator with a current that stimulates **osteogenesis** (growth of bone cells). Use of such devices can prevent further surgery and bone grafting. This treatment is based on the fact that bone has inherent electrical properties used in healing.

Fat embolism.

Fat embolism is a rare but serious complication of a fracture of a bone that has an abundance of marrow fat (e.g., the long bones, pelvis, and ribs). In the early postinjury period, patients with multiple fractures resulting from severe trauma are at risk for this complication. To form an embolism, the fat globules must be large enough or sufficient in number to partially or completely occlude a blood vessel. Rupture of small venules in the area permit entrance of fat globules into the circulation. **Signs and symptoms of fat embolism include a change in mental status, respiratory distress, tachypnea, crackles and wheezes on auscultating the lungs, rapid pulse, fever, and petechiae (a fine red rash over the chest, neck, upper arms, or abdomen).** Stay with the patient; put him in a high Fowler's position, use a nonrebreather mask to give high-flow oxygen, and establish a peripheral IV line. Summon the provider immediately because there is an approximate 80% mortality rate from this complication. Anticipate hydration with IV fluids and correction of acidosis. Intubation and mechanical ventilation may also be needed if oxygen levels cannot be maintained with supplemental oxygen.

Older Adult Care Points

Older adults with a fractured hip are at high risk for fat embolism. Be especially vigilant and assess for this complication.

Venous thrombosis.

The veins of the pelvis and lower extremities are very vulnerable to thrombus formation after fracture, especially hip fracture. Immobility, traction, and casts may contribute to venous stasis. The Joint Commission's National Quality Core Measures call for aggressive prevention of thrombus formation. Compression stockings, sequential compression devices, and ROM exercises on the unaffected lower extremities are used to help prevent the problem. To meet the 2013 National Patient Safety Goals, nurses must be vigilant for the adverse effects of prophylactic anticoagulant drugs that may be prescribed, such as aspirin, warfarin, or low-molecular-weight heparin, and must be observant for instances of bleeding. Fondaparinux (Arixtra), a new class of antithrombotic drug inhibiting factor Xa, a blood clotting component, may be administered along with warfarin sodium. Rivaroxaban (Xarelto) is a new once a day drug that doesn't require blood coagulation monitoring.

Compartment syndrome.

Compartment syndrome is a restriction of blood flow that occurs in one or more muscle compartments of the extremities. Compartment syndrome is caused by external or internal pressure. External pressure can occur from dressings or casts that are too tight. Internal pressure occurs from IV fluid infiltration, inflammation, and edema (a shifting of fluid from the vascular spaces to the intracellular spaces). The increased fluid puts pressure on the tissues, nerves, and blood vessels, thereby decreasing blood flow.

Clinical Cues

Elevation is the key to preventing swelling and compartment syndrome; toes and fingers should be higher than the trunk.

The main sign of compartment syndrome is severe, unrelenting pain that is out of proportion to the injury and unrelieved by narcotics. Decreased sensation, numbness and tingling, paleness of the skin, and weakness of the extremity are other signs. Assess for the six *Ps*: pain, pallor, paresthesia, pulselessness, paralysis, and poikilothermia (cold to the touch).

Recognition and immediate notification of the provider can prevent permanent loss of function. If a cast is in place, the cast can be **bivalved** (split through all layers of the material). Dressings will be cut or replaced. Surgical **fasciotomy** (linear incisions in the fascia down the extremity) may be necessary to relieve the pressure on the nerves and blood vessels if other measures do not relieve the problem. [Figure 32-7](#) shows the fascial compartments of the calf and forearm.

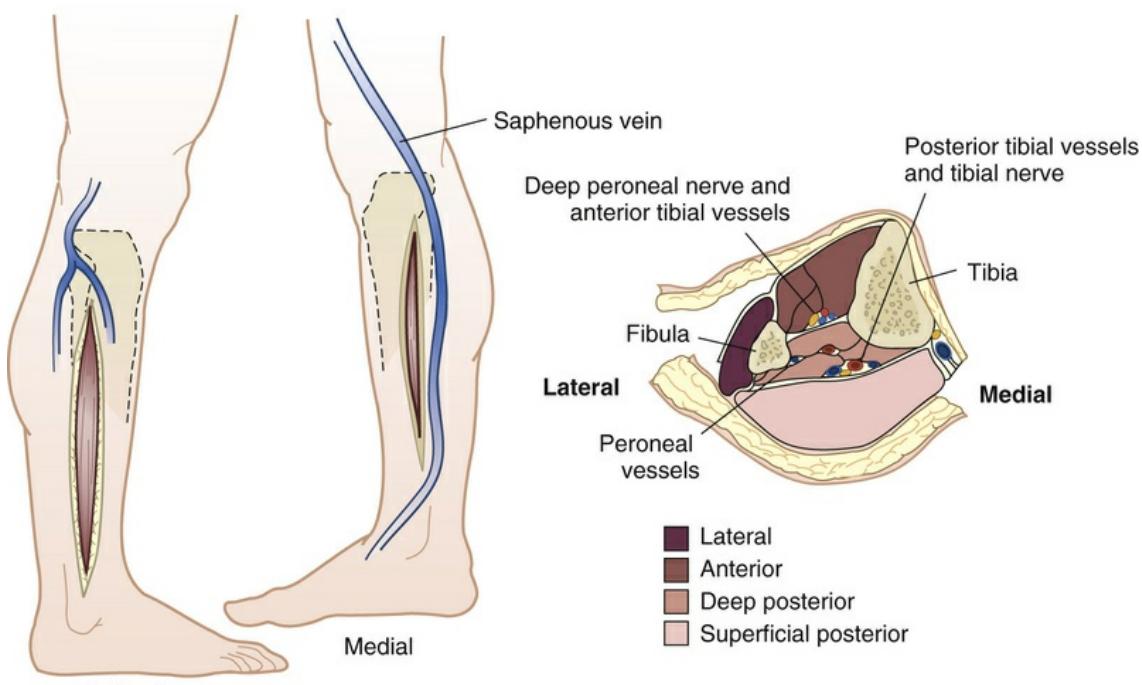


FIGURE 32-7 Fascial compartments of the calf and forearm. (From Townsend CM, Beauchamp RD, Evers BM, et al: *Sabiston textbook of surgery*, ed. 19, Philadelphia, 2011, Saunders.)

Nursing Management

Data Collection (Assessment)

Pretreatment

Ask the patient to describe the mechanism of injury. Physical assessment of a suspected fracture includes noting pain, swelling, discoloration, and deformity in the contour of the bone. With a possible extremity fracture, pulses should be bilaterally checked and compared. Nerve damage in a fractured leg is assessed by having the patient flex and extend his foot. Next obscure the patient's view and touch a toe with a sharp and then a dull object (e.g., the wooden end and then the cotton-tip end of an applicator, respectively); ask him to identify which toe was touched and to discriminate sharp and dull touch. For checking nerve damage in the arm, have the patient wave his hand, have him grip your hand, and use the sharp/dull touch test on the fingers.

Safety Alert

In-depth assessment and history must be delayed if a broken bone has pierced the skin and the bleeding is severe. Apply direct pressure over the wound. (Observe for shock and treat if necessary.) Prevent introduction of infectious agents into the wound and cover the open area with a sterile dressing (clean dressing if sterile supplies are not available).

Clinical Cues

In cases of fracture, assessment (six *P*s) of extremities should be done bilaterally. Also remember to ask if the patient is left- or right-hand dominant; dominance can account for a weaker grip, and if the dominant hand is injured it will affect performance of ADLs.

Pain is not always present when a fracture has occurred. Numbness and tingling can also accompany a fracture. **If it is unclear whether a bone has been broken, it is best to treat the injury as if it is a fracture.** To prevent further trauma and pain, splint the area without moving or manipulating bone. Apply an ice pack, if available, and notify the provider of your findings.

Think Critically

If you were in the park and you observed a child fall from a tree and obviously fracture a forearm, what would you do to assist?

Posttreatment

Attention to pain control is important, especially when the patient is adjusting to fixation devices or a new cast. If elevating the limb or giving prescribed pain medication does not relieve the patient's complaints within 30 minutes, notify the provider.

Focused Assessment

Physical Assessment of Neurovascular Status

Assessment should be performed at least once at the beginning of each shift to establish a baseline for any patient who has suffered a musculoskeletal injury and then performed as required. When a fracture is fresh, this assessment should be performed every 2 to 4 hours.

- *Skin color:* Is the skin pale (decreased blood), blue (decreased oxygenation), bruised (bleeding into surrounding tissues), or red (possible infection)?
- *Skin temperature:* Is the skin increasingly hot to the touch (infection) or cool (decreased blood flow)? Use the back of your hand to do the assessment.
- *Pulses:* Are pulses distal to the injury present and equal bilaterally?
- *Movement:* Can the patient actively move the affected area or the area distal to the injury? If active movement is not possible, passively move the area distal to the injury. How much discomfort is felt with movement?
- *Sensation:* Is numbness or tingling present (paresthesia)? Obscure the patient's view and gently touch a distal area with a paper clip. What and where does the patient feel?
- *Pain:* Where is the pain? What is the nature and intensity? Is pain increasing?
- *Capillary refill:* Does blanching occur when a nail bed distal to the injury is pressed? Assess by pushing on a nail bed, let up, and count the time it takes for color to return. Usual color should return in 3 to 5 seconds.

A thorough assessment of a patient in a cast should include the following:

- Complaints of numbness, a tingling sensation, increased pain with motion of the fingers or toes, or sharp localized pain, which can be caused by pressure from a tight cast. Notify the provider if the patient states that he can feel the bone fragments grating against each other (crepitation).
- Check frequently to determine whether the cast is properly supported or there is undue pressure on any underlying part of the body. A sharp, localized, burning pain could mean the beginning of a pressure sore. This should be reported so that the surgeon or orthopedic technician can cut a "window" in the cast to relieve pressure.
- Sniff at the edges of the cast to detect foul odors that are suggestive of infection.

Every immobilized patient should be routinely assessed for the various problems of immobility: skin breakdown, urinary tract infection, constipation, atelectasis, or deep vein thrombosis (DVT). Adequate nutrition and fluids are needed to promote healing and prevent the problems of immobility.

Nutrition Considerations

Nutrition for Immobile Musculoskeletal Patients

Protein is essential to healing, and the diet should be designed to provide 1 g/kg of body weight. Vitamins D, B, and C and calcium are included in well-balanced meals to ensure optimal soft tissue and bone healing; 500 mg of vitamin C will also help acidify the urine and prevent calcium precipitation that could form kidney stones. Fluid intake of 2000 to 3000 mL/day helps prevent bladder infection, kidney stones, and constipation. A high-fiber diet with lots of vegetables and fruits promotes good bowel function and decreases the chance of constipation. A patient in a hip spica cast or body jacket should receive six small meals a day to prevent abdominal distention and cramping.

Think Critically

During your neurovascular assessment, you note some decreased sensation and tingling in the fingers of a patient with a lower arm cast. What should you do?

Nursing Diagnosis and Planning

Problem statements for patients with fractures usually include:

- Pain due to disruption of bone and tissue.
- Altered physical mobility due to disruption of bone.
- Altered self-care ability due to inability to use an extremity.
- Potential for infection due to open fracture.

Specific nursing diagnoses can be chosen from the NANDA-I list (see inside back cover).

Implementation

Traction devices must be assessed to ensure that they are in correct position and that the weights are hanging free. The patient's body position should be assessed for proper alignment. **Box 32-2** presents points of care.

Box 32-2

Points of Care for a Patient in Traction

- Keep the patient in the center of the bed in a supine position.
- Keep the body part in traction in a straight line with the trunk. Misalignment causes pain.
- Be sure the weights are hanging free. If the weights are resting on or against any support, such as

the foot of the bed or the floor, the purpose of the traction is defeated. Be careful not to bump against the weights when walking around the foot of the bed. This can be painful to the patient and may cause damage to the healing bone. It is not necessary to lift the weights when pulling the patient up in bed. The amount of pull on the limb will remain the same as long as the weights are hanging free. Also check that the ropes run over the midline of the pulley without interference. Keep knots away from the pulleys, and arrange bedding so that it does not interfere with the ropes and pulleys.

- Check the position of the patient, making sure his body weight is counteracting the pull of the weights. Should the patient slip down in bed so that his feet are resting against the footboard, there will be a loss of force exerted on the limb.
- Observe all bony prominences for signs of impaired circulation and pressure or tissue necrosis.
- To prevent pressure sores, be sure slings and ropes are not pressing against or cutting into an area of the extremity.
- When a patient has skeletal traction, observe the sites of entry of pins, tongs, etc. for signs of infection.
- Devise a systematic routine for observing the patient and the apparatus at specified times during the day so that no aspect of the assessment will be overlooked.

The drainage from pin sites may be heavy for 48 to 72 hours after surgery involving external fixation. Meticulous cleaning of pin sites should be performed daily with a 2 mg/mL chlorhexidine solution. The goal is to reduce serosanguineous drainage and crusting that would support infection; also assess for pin loosening ([U.S. Library of Medicine, 2014](#)). Your patient will appreciate a well-organized nurse with a gentle touch who remembers to premedicate 30 minutes before wound and pin care. For a body part with external pins, daily showering is somewhat controversial because the water may wash away the protective residual chlorhexidine, and dressings would need to be changed after every shower (daily dressing changes are of no benefit in preventing infection). Weekly showering may be preferred.

When the patient is transferred from stretcher to bed, use sufficient help; casts or external fixation devices can be significantly heavy. Pillows for support should be placed on the bed **before** moving the patient onto them. Pillows are used to support the curves of large casts so that the weight of the body will not crack or flatten the cast. Patients in a body cast or spica are more comfortable if pillows are not put under their head and shoulders because the pillows push the chest and abdomen against the front of the cast, causing an uncomfortable crushing sensation and dyspnea. **Hardware of an external fixation device or brace bars between the legs of a cast are never to be used as handles for lifting and turning the patient.**

It is important to clarify with the provider how much weight the patient can bear on the affected extremity. Some fractures should have no weight placed on the affected side, whereas other patients will be encouraged to move about without any restrictions.

Care of a Patient With a Cast

While the cast plaster is damp (grayish dull appearance), use the palms of the hands or the flat surface of the extended fingers when touching the cast because fingertips can sink into the damp plaster and make impressions through the cast that rub against the tissue under the cast, predisposing to pressure sores. A plaster cast generates heat as it dries; assess the patient's subjective sensation of heat and pain because burns can occur. **During the first 24 to 48 hours after any cast has been applied to an extremity, the extremity should be elevated to minimize swelling.**

The cast should be inspected every day for flattened areas, soft spots, cracking, and crumbling. The skin around the edges of the cast should receive special attention, including massage with lotion and close observation for signs of pressure or breaks in the skin. Patients must be instructed not to use sharp objects such as pencils or rulers to scratch under the cast. These can tear the skin, leaving an open break for the entrance of bacteria. To relieve itching, use a 60-mL plunger syringe and forcefully direct air under the cast. At home, the patient can use a hair dryer on the coolest

setting to blow air into the cast.

A plaster cast will disintegrate if it becomes wet, so the patient will need assistance with bathing. Patients may have permission to shower with a synthetic cast; a plastic covering is secured over the cast and taped to the skin. Instruct the patient to avoid putting the casted area directly under the stream of water.

Depending on the injury or the type of cast, traction, or fixation device, moving or turning the patient for adequate back care may not be possible. Obtain an order for an overhead trapeze bar so that the patient can lift himself to enable back care to be given and the bottom sheet changed or tightened. Instruct the patient to lift himself straight up so that the amount of pull exerted on a limb in traction will not be altered. This same maneuver can be used when the patient is placed on a bedpan. A small "fracture" bedpan should be used and the lower back supported by a small pillow or folded blanket. When a bedpan is used by a patient in a spica, there is a possibility of a backward flow of urine under the cast unless the head of the bed is slightly elevated. Because the patient cannot bend at the hips to sit up on the pan, the head of the bed should be elevated (on blocks or other device) and the lumbar area of the cast supported to prevent cracking.

When a cast is removed, the underlying skin is usually dry and scaly. Scrubbing of the area must be avoided to prevent damage to the deeper layers of skin, especially because the cast is often reapplied after the provider does an examination. Nursing interventions for selected problems are summarized in [Table 31-4](#).

Clinical Cues

Ice bags can be used to help control swelling. However, because the weight of an ice bag could make an indentation in a wet plaster cast, the ice bags should be only about half full, and they should be laid against the cast and propped in position, rather than set on top of it.

Think Critically

Your patient has an arm cast in place and is complaining of severe itching inside the cast. What could you do to help relieve the problem?

Evaluation

Your patient's pain should be under control, and he should be progressing toward independently accomplishing ADLs at his baseline level within a specified time. There should be no problems associated with immobility (i.e., skin breakdown or constipation, atelectasis, or DVT) or complications (i.e., infection, compartment syndrome). If the outcomes are not being met, the plan must be revised.

Inflammatory Disorders of the Musculoskeletal System

Lyme Disease

Lyme arthritis occurs from a systemic infection caused by the spirochete *Borrelia burgdorferi*. The spirochete is transmitted by the bite of a deer tick. Most cases of this disease are in the New England and mid-Atlantic states, the upper Midwest, Northern California, and Oregon. The disease begins with flulike symptoms and a "bull's-eye" rash with pain and stiffness in the joints and muscles. Doxycycline, cefuroxime, or amoxicillin taken for 10 to 21 days can prevent the disease's progression. If untreated, stage II begins 2 to 12 weeks later with carditis and nervous system disorders such as meningitis, peripheral neuritis, or a facial paralysis similar to Bell palsy. Intravenous antibiotics are necessary at this point. If undiagnosed and untreated, later chronic complications may occur. The patient may experience fatigue, cognition problems, and arthralgias. In some instances the only sign of Lyme disease is arthritis. Lyme arthritis can cause permanent damage to the nervous system and to the joints.

Osteoarthritis

Etiology and Pathophysiology

Osteoarthritis is a noninflammatory degenerative joint disease characterized by breakdown of cartilage in synovial joints. The exact cause is not known, but risk factors include heredity, aging, female gender, obesity, previous joint injury, and recreational or occupational overuse of joints (Lozada, 2015). People with osteoarthritis seem to produce less collagen to strengthen cartilage and cover and protect joints in the body. With time and use, joints become thickened and withstand weight bearing poorly, with consequent damage to cartilage. The synovial cells then release enzymes that cause further cartilage degeneration.

Health Promotion

Healthy People 2020 Goals Related to Arthritis

The objectives aimed at reducing the disability caused by arthritis include:

- Reducing the mean level of joint pain, activity limitations, care limitations, effect on employment, and the proportion of those who find it "very difficult" to perform specific joint-related activities.

- Increasing health care provider counseling for weight and physical activity; increasing the proportion of those seeing a health care provider for joint symptoms and effective evidence-based arthritis education as an integral part of the managing condition.

Signs, Symptoms, and Diagnosis

Osteoarthritis occurs asymmetrically and typically affects only one or two joints. The chief symptoms are aching pain with joint movement and stiffness, with limitation of mobility. Joints may be deformed, and nodules may be present.

Treatment

Treatment consists of pain management, strengthening and low-impact aerobic exercise, weight reduction if the patient is overweight, and maintenance of joint function. Salicylates, acetaminophen, or NSAIDs may be used. Acetaminophen in doses of 1000 mg, up to 3000 mg/day, is the standard for patients with mild to moderate chronic joint pain.

Safety Alert

Acetaminophen Usage

All other medications and over-the-counter drugs should be checked for acetaminophen so that overdose does not occur. Taking more of this drug than recommended (no more than 4000 mg/day in the short term, or 3000 mg/day for longer-term use) can cause irreversible liver damage. The drug should not be taken when drinking alcohol. For older adults, the lowest effective dose should be used. Encourage an adequate intake of water, at least 2000 mL each day, to promote excretion of the drug via the kidneys.

Older Adult Care Points

NSAIDs may not be recommended for older adults because of side effects and interactions with other drugs that older adults may be taking. NSAIDs decrease effectiveness of the angiotensin-converting enzyme (ACE) inhibitors used for hypertension and heart failure, and NSAIDs increase the effects of anticoagulants. Tramadol may be prescribed.

Clinical Cues

Monitor patients taking NSAIDs for gastrointestinal (GI) intolerance. Assess liver, kidney, and central nervous system function frequently. Watch for signs of blood dyscrasias, and check for tinnitus and hearing loss regularly. The side effects of NSAIDs can be serious and sometimes permanent. If early signs of toxicity appear, they should be reported promptly to the provider.

Corticosteroid injection into the arthritic joint may be performed if oral medication does not control the problem. Exercises for joint mobility are encouraged. Surgery or joint replacement may be performed to relieve severe pain and improve mobility. The hip and knee are the most common sites for joint replacement related to osteoarthritis.

Complementary and Alternative Therapies

Therapies for Pain Relief

Yoga and massage can help to control and relieve the pain of osteoarthritis. Capsaicin cream, or ointment made from cayenne red pepper, blocks pain locally when applied topically to the inflamed joint. It can be used four times a day. It is available over the counter or by prescription. In a research study, [Shimoda and colleagues \(2010\)](#) found that red ginger has anti-inflammatory properties that relieve arthritis pain.

Complementary and Alternative Therapies

Glucosamine and Chondroitin

Glucosamine and chondroitin have been shown in a research study to decrease the pain of moderate to severe osteoarthritis in some people. This substance may slow or halt the progression of osteoarthritis. Patients may try 1500 mg of glucosamine sulfate per day as a trial dose ([WebMD, 2015](#)). Patients taking warfarin (Coumadin) should check with their health care provider before starting glucosamine.

Injections of hyaluronic acid (HA) (Euflexxa, Orthovisc, Synvisc, Supartz, and Hyalgan) into the joint can act as a lubricant and decrease pain and improve function for some patients with mild to moderate osteoarthritis. The intraarticular injections are given once a week for 3 to 5 weeks and may be repeated in 6 months. Stem cell treatments are another option being explored.

Another treatment for knee cartilage injury is the injection of autologous chondrocytes. Healthy articular cartilage cells are removed from the patient and sent to a special laboratory, where they are grown for 3 to 5 weeks and then reimplanted. Patients use crutches for 6 to 8 weeks after the surgery. The procedure is successful in about 85% of all cases. It works best in patients younger than 50 years with injury to a small focal area of cartilage ([Orozco et al, 2013](#)).

Nursing Management

Nursing interventions for osteoarthritis include teaching the patient to balance exercise and rest. Gentle exercise is very important in maintaining joint mobility. Walking, knitting, and swimming all help improve mobility and decrease pain. The patient should avoid placing stress on affected joints. Suggest the use of assistive devices to open containers and perform other household functions.

Instruct in moist heat application, and encourage the patient to maintain weight within normal limits. Weight reduction decreases joint stress. Imagery, relaxation, and diversion are helpful to reduce pain. Quadriceps strengthening exercises may relieve pain and disability of the knee (see [Patient Teaching: Quadriceps and Gluteal Muscle Exercises](#) in Chapter 31).

Think Critically

Where would you suggest a patient look for assistive devices available for those with arthritis?

Rheumatoid Arthritis

Etiology and Pathophysiology

Rheumatoid arthritis (RA) is an inflammatory disease of the joints. It can occur at any age but is most common among older women. The cause is not known, but hormonal, environmental, genetic, or infectious agents may trigger an underlying autoimmune reaction. An abnormal immune response causes an inflammatory reaction of the synovial membrane. Vasodilation, increased permeability, and the formation of exudate cause red, swollen joints. Rheumatoid factor (RF), which is an antibody against immunoglobulin G, appears in the blood and synovial fluid in many patients.

There are remissions and exacerbations of the disease. As the disease progresses, pannus is formed. **Pannus** is granulation tissue derived from the synovium that spreads over the articular cartilage. Pannus releases enzymes and inflammatory mediators that destroy cartilage. The cartilage becomes eroded, and the pannus cuts off nutrition to the cartilage. Over time, the pannus between the bone ends becomes fibrotic, causing ankylosis. Joint fixation and deformity become apparent. Along with these changes, exacerbations cause more damage, and there is atrophy of muscles around the joint. Tendons and ligaments stretch, and the joint becomes unstable. Muscle spasm draws the bones out of normal alignment. Contractures and deformity occur. Mobility becomes impaired if the knees or ankles are affected. Subcutaneous nodules may form over bony prominences, and nodules may occur in the pleura, heart valves, or eyes.

Signs, Symptoms, and Diagnosis

The signs and symptoms of RA are joint pain, warmth, edema, limitation of motion, and multiple joint stiffness in the morning lasting more than 1 hour. The joints of the hands, wrists, and feet are most commonly affected by RA, and involvement is usually bilateral. Systemic symptoms of low-grade fever, anorexia with weight loss, malaise, and an iron deficiency anemia resistant to iron therapy may also be present. Joint deformity and consequent dysfunction can occur.

RA pain or immobility of joints interferes with self-care activities necessary to lead an independent lifestyle. Maintaining mobility and controlling pain with the least amount of side effects are the goals for the older adult. [Table 32-1](#) presents a comparison of osteoarthritis and rheumatoid arthritis.

Table 32-1
Comparison of Rheumatoid Arthritis and Osteoarthritis

CHARACTERISTIC	RHEUMATOID ARTHRITIS	OSTEOARTHRITIS
Definition	A systemic disease where pathologic changes and disability result from chronic inflammation of the joints	A progressive degenerative joint disease
Pathology	Chronic inflammation of synovial membranes and formation of chronic granulation tissue (pannus) in the joint; pannus capable of eroding cartilage in joints and spreading to bone, ligaments, and tendons	Microscopic changes in the cartilage in the joint; eventually loss of cartilage, bony enlargement, and malalignment of joints
Etiology	Unknown; evidence that the pathologic changes are immunologic	Unknown; may be caused by "wear and tear" of aging
Rheumatoid factors (autoantibodies)	Usually present	Usually absent
Age at onset	30-40 yr most common, but at any age	50-60 yr; rarely before age 40 yr
Weight	Normal or underweight	Usually overweight
General state of health	Varies; often anemic, "chronically ill," with low-grade fever and slight leukocytosis	Well nourished
Appearance of joints	Early: Soft-tissue swelling	Early: Slight joint enlargement

	<i>Late:</i> Ankylosis, extreme deformity	<i>Late:</i> Enlargement more pronounced, slight limitation of motion
	Joint involvement usually symmetric bilaterally and generalized	Joints typically involved are single-sided and weight-bearing: spine, hips, knees
Muscles	Pronounced muscular atrophy, particularly in later stages	Usually not affected
Other	Morning stiffness; pain on motion; swelling and tenderness of joints; subcutaneous nodules; typical rheumatoid changes seen on radiograph	Stiffness, relieved by moderate motion; joint malalignment; symptoms increase in cold, wet weather

Diagnosis is by history of morning stiffness that lasts more than 30 minutes or arthritis pain in three or more joints that lasts more than 6 weeks (Venables et al, 2013). Blood tests for rheumatoid factor (RF), anticitrullinated peptide/protein antibody test (anti-CCP), C-reactive protein, and erythrocyte sedimentation rate are ordered. Radiographs confirm the cartilage destruction and bone deformities.

Treatment

Treatment is aimed at relieving pain, minimizing joint destruction, promoting joint function, and preserving ability to perform self-care (Table 32-2). Rest and exercise, medication, immobilization with splints and use of other supportive devices during periods of severe inflammation, and hot and cold treatments are standard treatments. Surgical joint repair or replacement can reduce pain and improve mobility.

 **Table 32-2**

Drugs Commonly Used to Treat Rheumatoid Arthritis

CLASSIFICATION	EXAMPLES	ACTION	NURSING IMPLICATIONS
Nonsteroidal anti-inflammatory drugs (NSAIDs)	Acetaminophen, aspirin, ibuprofen (Advil, Motrin), naproxen sodium (Aleve), COX-2 inhibitors (Celebrex)	Reduce inflammation and pain	May take 2 wk to obtain results; give with food or a full glass of water, but some are best taken 30 min before a meal or 2 hr afterward. May cause GI irritation. Monitor hematologic, renal, liver, auditory, ophthalmic functions, weight gain, and peripheral edema. Teach patient to report heartburn, dyspepsia, nausea, vomiting, diarrhea, or abdominal pain. Teach to avoid alcohol because of increased risk of GI irritation. Dosage in older adults may need to be reduced by half.
Corticosteroids	Prednisone, methylprednisolone (Medrol)	Reduce inflammation, decrease pain by suppressing the immune system	Usually rapid action. Instruct to take daily dose between 6 and 8 A.M. when natural steroids are released. Instruct not to stop taking this drug abruptly. Taper dosage downward as soon as symptoms improve. Monitor older adults closely for fluid retention, elevated blood pressure, and peripheral edema. Handle patients gently to prevent bruising; avoid using tape on skin. May cause osteoporosis, Cushing syndrome, mood changes, weight gain, cataracts, onset of diabetes, muscle weakness, and increased risk of infection.
Disease-modifying antirheumatic drugs (DMARDs)	Hydroxychloroquine (Plaquenil), sulfasalazine (Azulfidine), gold salts (Ridaura), D-penicillamine (Cuprimine, Depen), methotrexate (Rheumatrex), azathioprine (Imuran), leflunomide (Arava), others	Reduce inflammation and pain, suppress the immune system, and prevent joint and cartilage destruction	Plaquenil takes 6 mo to be effective; others take 1-6 mo. May cause rash, diarrhea, and retinal problems. Instruct that frequent eye examinations are necessary. Most of the drugs can cause GI symptoms and blood dyscrasias; monitor blood counts. Gold salts can cause liver toxicity; monitor liver functions. Methotrexate can cause pulmonary, renal, and liver toxicity. Imuran and leflunomide may cause birth defects or fetal death. Alcohol use increases chance of hepatic toxicity. Monitor blood and urine weekly. Check specific nursing implications for each drug.
Biologic therapies (classifications include tumor necrosis factor inhibitors, interleukin antagonists, selective costimulation modulators, or targeted B-cell therapy)	Etanercept (Enbrel), infliximab (Remicade), Certolizumab (Cimzia), Rituximab (Rituxan), Golimumab (Simponi), Anakinra (Kineret), Adalimumab (Humira), Abatacept (Orencia), Tocilizumab (Actemra)	Reduce inflammation by blocking the inflammatory response	1-2 wk for onset of action. Increased risk of serious infection and blood dyscrasias; monitor blood counts, temperature, and for malaise closely. May cause demyelinating disorders. Given IV or by subcutaneous injection; may cause injection site reaction. Do not immunize with live virus vaccines. Test for tuberculosis before starting these medications.

IV, Intravenously.

Acetaminophen is the first-line agent used for rheumatoid arthritis pain (Kelly, 2012). Other medications include salicylates, corticosteroids, hydroxychloroquine, methotrexate, gold compounds, sulfasalazine, D-penicillamine, and disease-modifying antirheumatic drugs (DMARDs). Tumor necrosis factor (TNF) inhibitors are a newer type of medication. Long-term steroid therapy increases the risk for diabetes mellitus, osteoporosis, hypertension, acne, cataracts, and weight gain; therefore long-term oral steroid preparations are reserved for patients who cannot find relief from other drugs. DMARDs provide periods of remission, but they also have some serious side effects. Patients should be tested for tuberculosis (TB) before being started on TNF inhibitors because these drugs may exacerbate TB.

Complementary and Alternative Therapies

Help Patients to Evaluate the Safety of Complementary and Alternative Therapies

Some patients find symptom relief with dietary supplements such as omega-3 fatty acids, acupuncture, tai chi, and meditation. Research study results for various supplements have been mixed and without conclusive evidence of efficacy. Patients with arthritis are particularly vulnerable to “miracle cures” or outright quackery; therefore it is the responsibility of all health care professionals to initiate a dialogue about complementary or alternative therapies or other

methods that the patient is using to evaluate their safety and to incorporate these self-care methods into the overall plan of care ([National Center for Complementary and Integrative Health Approaches, 2015](#)).

The injection of steroids directly into a joint (intra-articular administration) has been used successfully in treating painful flare-ups, shortening the period of inflammation, and relieving pain and other symptoms. When intra-articular steroid therapy is used, it is recommended that not more than two or three doses be injected into any joint within 1 year.

Older Adult Care Points

Older adults must be taught to watch for side effects of medications and promptly report them to the provider or nurse. Dizziness, which predisposes to falls, can occur with analgesics for arthritis pain, particularly if the medication contains codeine. Advise patients to arise slowly, hold on to furniture until steady, use assistive devices, and wait for dizziness to pass before walking.

Surgical intervention and orthopedic devices.

Casts or braces and splints (**orthoses**) may be used to immobilize an affected part so that it can rest during an active phase of arthritis. Devices that immobilize the affected joint should allow for motion of adjacent muscles to maintain them and improve strength and permit more independence. Braces help prevent deformities by maintaining an optimal functional position of the joints.

In the past, surgical intervention for arthritis was reserved for patients who already had severe joint deformity and loss of motion. Currently, the trend is to use surgery in the early stages of arthritis to prevent, or modify, deformities and mechanical abnormalities. One such surgical procedure is **synovectomy**, which is the excision of the synovial membrane of a joint. The goal of synovectomy is to interrupt the destructive inflammatory process that eventually leads to ankylosis and invasion of surrounding cartilage and bone tissues. Tendon reconstruction is performed most commonly on the hand to restore function. For younger patients with osteoarthritis, **osteotomy** may be an option. In this procedure a wedge of bone is removed to allow for realignment.

Joint replacement.

An **arthroplasty** (joint replacement) may be done for a knee, shoulder, elbow, finger, ankle, or hip. The hip and knee are the most commonly replaced joints. Noncemented press-fit prostheses are often used now for young, heavier, and very active patients. The cement used for bone prostheses may last 20 years.

Total hip replacement.

The primary purpose of total hip replacement (THR) is to relieve chronic pain. Hip replacement for osteoarthritis can be performed with minimally invasive surgery and a shorter hospital stay for some patients. A hip joint may be replaced with either a low-friction polyurethane socket for the acetabulum and a metallic replacement for the head of the femur or with synthetic materials combined with a porous bone implant ([Figure 32-8](#)). The porous bone implant requires 6 weeks of healing, and patients with cemented prostheses refrain from full weight bearing for 4 to 6 weeks. For some patients, full weight bearing is avoided for at least 3 to 6 months. Crutches or a walker are used for ambulation, depending on the ability of the patient. The greatest dangers to successful replacement are infection and failure to function properly. Possible dislocation when the hip is internally rotated is an issue.



FIGURE 32-8 Hip replacement prosthesis. (Image reprinted with permission from Stryker Corporation. © 2013 Stryker Corporation. All rights reserved.)

Hip resurfacing may be done for patients younger than 60 years. This procedure can help with pain, improve ambulation, and restore joint function. The procedure involves trimming the head of the femur and placing a metal cap over the end. The damaged bone in the socket is removed and replaced with a metal cup, and the capped end rotates in the cup (Manner, 2013). The advantage of this procedure is that there is greater range of hip motion than for a hip replacement, and dislocation is less of a risk.

Preoperative care.

Specific instructions about the kind of surgery to be performed, the prosthesis to be used, the postsurgical procedures, and what is expected of the patient to help achieve the goals of rehabilitation are given. Instructions for postoperative exercises and the use of ambulation equipment, such as a walker, crutches, or canes, are provided. Some patients wish to donate some blood several weeks before surgery in case a blood transfusion becomes necessary after surgery.

A surgical bacteriostatic scrub solution is prescribed for the daily shower for several days before hip replacement, as well as the night before and the morning of surgery, to decrease the chance of infection. Tell the patient that he will be placed in an orthopedic bed with an overhead trapeze bar attached after surgery. He may be transported to and from the operating room on the bed. Explain about use of an abduction pillow and turning procedures postoperatively.

Postoperative care.

A blood salvage unit may be in place to collect blood drainage that is then filtered and returned to the patient. There is usually a drain at the surgical hip replacement site with a suction device attached to it. Intravenous fluids will be administered. A Foley catheter will usually be in place. Immediately after surgery, nursing intervention includes all the measures required to prevent respiratory and circulatory complications. However, extreme care must be exercised in positioning and repositioning the patient. To prevent dislocation, an abduction wedge or pillow may be secured between the legs (usually in the operating room) and is left in place when the patient is supine in bed until the surgeon requests its removal (Figure 32-9). The wedge is positioned with the narrower end between the thighs, and the straps should not go over an incision, bony prominence, or drain.

Safety Alert

Precautions With Hip Abductor Wedge

Circulation should be checked after each application of the wedge to be certain that the straps are not too tight. Skin should be assessed every shift on the surface of the legs with particular attention to areas over bony prominences.



FIGURE 32-9 Abduction wedge in place to prevent dislocation of hip prosthesis.

DVT is a possible complication of joint replacement. Low-molecular-weight heparin, enoxaparin (Lovenox), dalteparin (Fragmin), or tinzaparin (Innohep) can be administered to prevent this problem, or oral aspirin (325 mg twice daily) or rivaroxaban (Xarelto) may be used. Enoxaparin is usually given in a 30-mg dose by subcutaneous injection into the abdomen twice a day. Rivaroxaban works more quickly than sodium heparin and has a lower incidence of hemorrhage because it does not prevent platelets from aggregating at bleeding surgical sites. Daily coagulation studies are not needed with this drug because its anticoagulant action is very predictable and stable. Most patients who have had a hip replacement are allowed to stand at the bedside on the operative day, supported by a walker and two people. Weight bearing on the operated joint is sometimes allowed, but there should be a specific written order regarding this from the provider. The patient will need instruction in transferring himself from bed to chair, wheelchair, and toilet. Whenever he sits, the chair seat should be raised so that the hips are not flexed beyond a 90-degree angle. In addition to these instructions, the patient may be referred for outpatient or in-home physical therapy. Nursing interventions for selected problems related to THR are summarized in [Nursing Care Plan 32-1](#) (see also [Nursing Care Plan 5-1](#)). The rehabilitation team includes the patient, family, surgeon, nurse, physical therapist, and occupational therapist.

Patient Teaching

Total Hip Replacement Discharge Teaching

Before discharge, the patient who has undergone hip surgery should be given instructions for care at home. These include:

- It is alright to lie on your operated side.
- For 3 months you should not cross your legs.
- You should put a pillow between your legs when you roll over on your abdomen or lie on your

side in bed.

- It is alright to bend your hip, but not beyond a right (90-degree) angle (demonstrate); avoid sitting in low chairs.
- Continue your daily exercise program at home in the same way you did the exercises at the hospital.

Nursing Care Plan 32-1

Care of the Patient After a Total Hip Replacement

Scenario

Miko Yoshima, an 85-year-old woman, has just undergone a total hip replacement for a hip joint damaged by osteoarthritis. She normally lives alone but has relatives within a 30-minute driving distance. She had been actively gardening and taking care of herself until pain severely limited her mobility over the past few months. (This care plan is specific to problems of hip replacement. All usual care for a postoperative patient should also be included [wound care, respiratory care, monitoring for complications, etc.].)

Problem Statement/Nursing Diagnosis

Altered mobility/*Impaired physical mobility related to pain and activity restrictions after hip replacement.*

Supporting Assessment Data

Subjective: "I'm quite uncomfortable."

Objective: Orders for non-weight bearing and up in chair tid; abduction wedge in place when in bed.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will regain sufficient mobility to completely care for self at home within 3 mo.	Teach use of walker.	Proper use of walker will help prevent falls and injury.	PT will instruct in use of walker tomorrow.
	Encourage ROM and exercises to improve muscle strength and joint flexibility.	ROM helps prevent joint problems in unaffected joints.	Assisted to perform ROM on shoulders, upper extremities, and other leg.
		Exercises decrease muscle atrophy and help strengthen muscles for ambulation.	Encouraged ankle rotations and foot exercises on affected leg with supervision.

Problem Statement/Nursing Diagnosis

Pain/*Acute pain related to surgical incision and rehabilitation therapy.*

Supporting Assessment Data

Subjective: "My pain is at a 6 on a scale of 1 to 10."

Objective: Face appears pinched and patient is not moving in bed at all.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will experience pain control with patient-controlled analgesia (PCA) pump within 1 hr.	Reinforce instructions on PCA use.	Knowledge of how to use pump provides medication for pain control.	Reinforced instructions; encouraging PCA use as needed.
Patient will have adequate pain control on oral analgesia before discharge.	Assess for pain when vital signs are taken. Administer medication bolus per orders PRN.	Constant monitoring for pain can indicate need for more medication to keep pain from escalating. Administering a bolus of pain medication can stop pain from increasing.	Pain level is 2-6/10. Bolus administered for pain level of 6/10.
	Monitor for excessive sedation, respiratory depression, decreased level of consciousness (LOC), and confusion.	Excessive sedation, respiratory depression, decreased LOC, and confusion can indicate medication toxicity and danger for the patient.	No signs of problems of toxicity or central nervous system (CNS) depression.
	Provide comfort measures: keep linens smooth and clean, reposition q2h and PRN; keep environment quiet and orderly. Keep warm with added warmed blankets. Put on socks if feet are cold.	Comfort measures and warmth help decrease pain perception.	Provided comfort measures. Replaced warm blankets q2h, as needed. Socks with slip-resistant soles applied.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge related to precautions necessary after total hip surgery to prevent dislocation of operative hip.*

Supporting Assessment Data

Subjective: "No one I know has had this surgery."

Goals/Expected Outcome	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize movement restrictions to prevent hip dislocation within 24 hr.	Explain positional restrictions: no flexion of the hip past 90 degrees, no internal rotation, no adduction of the affected leg.	Flexion, internal rotation, or adduction of the leg may cause hip dislocation. Knowledge is necessary to comply with instructions.	Explained position restrictions.
	Advise not to cross the legs or to bend over from the hips to tie shoes or pick up something off the floor.	These maneuvers cause internal rotation and more than 90 degrees of flexion.	Advised about additional restrictions after discharge. Written instructions given.
	Instruct to only use a raised toilet seat for toileting.	Normal-height toilet seat may cause too much flexion.	States has raised toilet seat at home. Knows to use handicapped toilet stalls when out in public.
	Advise to report pain in hip, buttock, or thigh or continued limp.	Pain or continued limp may indicate dislocation.	Verbalizes understanding of symptoms to report.

Problem Statement/Nursing Diagnosis

Potential for clot formation/*Risk for ineffective tissue perfusion.*

Supporting Assessment Data

Objective: Decreased mobility and total hip replacement.

Goals/Expected Outcome	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience deep vein thrombosis (DVT) before discharge.	Encourage foot and calf exercises q2h.	Encourages circulation and helps prevent clot formation.	Performing exercises q2h while awake.
	Assist and encourage in prescribed physical therapy.	—	Working with PT.
	Administer low-molecular-weight heparin injections as prescribed.	Decreases ability of blood to clot.	Heparin injections administered into abdomen as prescribed.
	Assess for signs of thrombus formation, checking calf for warmth, swelling, and pain on foot dorsiflexion.	Finding a thrombus early aids in preventing further extension of clot and preventing embolus.	No redness, swelling, warmth, or pain in affected leg's calf.
	Monitor INR (1.5-2.0 for DVT prophylaxis).	INR indicates potential for blood clotting and thrombus formation.	INR (1.5) within desired limits.

Critical Thinking Questions

1. Besides venous thrombosis, what other complications might occur in this patient?
2. If the patient is anxious about discharge, what could you specifically do to help dispel her anxiety?

INR, International normalized ratio; *PRN*, as needed; *PT*, physical therapist; *ROM*, range of motion; *tid*, three times a day.

Total knee replacement.

Chronic, uncontrollable pain from arthritis is the main indication for knee arthroplasty. Part or all of the knee joint may be replaced. For the best postoperative result, emphasis is placed on exercise of the joint and muscles. A CPM machine may be used soon after surgery (see Figure 32-5) and may be sent home upon discharge. To tolerate the exercise, the patient must be well medicated for pain. On day 1 quadriceps-strengthening exercises and straight-leg raising are started. Quadriceps exercise is accomplished by lying supine, straightening the legs, and pushing the back of the knees into the bed. Exercises are taught by the physical therapist, and the nurse often assists the patient in performing them. The patient then progresses to ambulation with a walker or crutches. Other preoperative and postoperative care is similar to that of the patient undergoing any major surgery. After early release from the hospital, the patient continues physical therapy in the outpatient setting.

❖Nursing Management

■ Assessment (Data Collection)

Many patients who have arthritis live every day with pain, limited motion, and the chronic and incurable nature of arthritis; therefore carefully seek in-depth information about the patient's social history, his personal and family health history, current general health status, ability to do the things he wants to do, and his experience of pain and how he has been dealing with it.

Focused Assessment

Data Collection for a Patient With Rheumatoid Arthritis

During history taking, ask about:

- Pain pattern and pain medication use; other coping methods
- Degree of stiffness and duration after arising
- Family history of rheumatoid arthritis or immune disorders
- Diagnosis of accompanying disorders, such as interstitial lung disease, pericarditis, eye problems, and vasculitis
- Smoking history
- Fatigue level and degree of malaise and methods of coping
- Presence of fever
- Exercise pattern
- Ability to perform ADLs; ability to work; ability for home maintenance
- Adaptive equipment in use
- Usual roles at work, home, and community and social involvement
- Joint deformity or swelling of joints
- Symmetric involvement from one side of the body to the other
- Pain and degree of limitation with joint movement

Nursing Diagnosis and Planning

Nursing problems for patients with arthritis depend on the degree of disability the disease is causing. Common problem statements might include:

- Chronic pain due to inflamed joints.
- Altered mobility due to pain, stiffness, and joint deformity.
- Altered body image due to joint deformities.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected outcomes for these problems and subsequent surgical or nonsurgical interventions might be:

- Patient's pain will be controlled with medications, heat, and exercise within 2 weeks.
- Patient's mobility will improve with the use of assistive devices and physical therapy within 3 weeks.
- Patient will demonstrate acceptance of self and appearance by maintaining a clean, neat appearance.

Plan extra time for patients with arthritis to perform self-care and to ambulate. Rushing the patient causes frustration and embarrassment. Even simple procedures will probably take longer because the patient may not be able to move and turn as easily as a person without arthritis.

Implementation and Evaluation

Nursing interventions for arthritis are aimed at providing a balance of rest and exercise, freedom from pain, minimizing emotional stress, preventing or correcting deformities, and maintaining or restoring function so that the patient can enjoy as much independence and mobility as possible.

Rest and Exercise

The purpose of rest is to allow the body's natural defenses and healing powers to overcome the inflammatory process of arthritis. The more inflamed a joint is, the more rest is needed; this includes rest of the joint and the whole body. Fatigue is a common problem with arthritis and usually requires that the patient has rest periods during the day before he becomes too fatigued or exhausted. During periods of acute exacerbation of arthritis symptoms, the patient may need continuous bed rest. When the patient is lying down, he should maintain good body position and avoid pillows and other devices that support joints in a position of flexion. A firm mattress is recommended, with only one pillow under the head and neck.

It is necessary, however, even in the acute phase of arthritis, to balance rest with exercise. The patient should sit to do tasks whenever possible. Activities should be paced and interspersed with rest. The exercise program is prescribed on the basis of assessment of each patient's status, the severity of inflammation, the particular joints affected by arthritis, and the patient's tolerance for activity. Because anemia and other blood disorders can accompany arthritis, the fatigue experienced by a patient may be somewhat alleviated by correcting underlying blood disorders.

Enlist the patient's cooperation to increase compliance with exercises that must be continued at home. Teach the patient how to perform specific exercises so that they do not increase his pain. Each exercise should be done 3 to 10 times for each joint, with the lower number used on days when pain or fatigue is increased. When joints are inflamed, exercises should not be done. In many instances, doing the exercises in the right way can diminish discomfort. If pain persists for hours after exercises have been done, the patient's status should be reassessed and the exercise program revised. Precautions to prevent joint injury are always necessary for routine physical activities, general exercise, or a prescribed exercise program at home.

Patient Teaching

Instructions for Joint Protection

- Always stop an exercise at the point of real pain. Some discomfort can be expected, but it should be minimal. If your joints are still hurting 1 or 2 hours after exercise, you have done too much.
- Always use your biggest muscles and strongest joints. For example, push doors open with your arm instead of your hand; carry a shoulder bag instead of a hand purse.
- Try to do only those jobs that will allow you to stop and rest if you need to when pain develops. Conserve your energy for the things you really want to do.
- Exercise in a way that does not put strain on the joints. Exercising in water decreases joint strain.
- Slow down and move slowly and smoothly. Avoid rapid, jerky movements. Use the palms of the hands rather than the fingers to push up from a bed or chair when arising.
- Turn doorknobs counterclockwise (or clockwise if left handed) to prevent extensive twisting of the elbow. Do not lift weights. Pick up heavier items with two hands.
- Let swollen, red, hot, and painful joints rest as much as possible. Do not use them any more than absolutely necessary.
- Change your body position frequently, alternating standing, sitting, and lying down.

- Set your own limits and compete with yourself, not with anyone else.
- Use assistive/adaptive devices, such as Velcro closures and built-up utensil handles, to protect joints of the hands. Use a long-handled hair brush.

Applications of Heat and Cold

Either hot or cold is suitable for treating arthritic joints, depending on the patient's preference and the effectiveness of each. The purpose of either hot or cold applications is to minimize pain, increase the joint's ROM, and improve exercise performance. In general, heat is better for subacute or chronic joint inflammation and cold is more effective in the acute phase when joints are hot, red, and obviously inflamed.

Various forms of heat therapy can be used, including moist or dry heat and superficial or deep heat. For dry heat, a therapeutic infrared lamp is convenient and inexpensive for home use. For treatment of the hands, paraffin baths are effective. Wet heat can be applied by hot tub baths with the water temperature not exceeding 102° F (39° C) or by means of a towel dipped in hot water, wrung out, and applied to the joint. Whirlpool baths promote relaxation and motion with minimal pain, especially when prolonged treatment is indicated. However, immersing the whole body in warm water can cause physiologic changes in respiration and pulse rate and may be contraindicated in debilitated patients or older adults. The patient will need specific instructions on how to prevent injury to the skin and other hazards.

■ Safety Alert

Caution With Heat Application

Patients who have decreased sensation in a body part must be very careful when applying heat, or they may experience burns. Teach the family and patient to test the degree of heat being applied and to check the area after 5 minutes to make certain that burning is not occurring. A cloth should always be placed between the heat device and the skin.

■ Think Critically

If a patient asks about using a heating pad on a joint, what instructions would you give?

■ Patient Teaching

Safe Application of Heat and Cold

Heat

- Recommended for chronic or subacute inflammation.
- Heat should be used for 20 to 30 minutes at a time; repeat the application every 1 to 2 hours while awake.
- Use a shower massager for massage pulsation. Regulate water by turning on cold and adding hot water to desired temperature **before** entering the shower. Use a shower stool if balance is poor or fatigue is likely.
- Use a pad between the heat source and the skin to prevent burning.
- Use a heating pad that provides moist heat; it will penetrate best. Do not sleep on the heating pad. Use the low settings because heating pads often cause burns when turned up too high or used for too long.
- Reusable heat packs mold well to body parts because they are pliable. Follow directions explicitly, and test temperature by feeling the pack against the skin before applying it to the area in need.

Use a light pad or thin dishtowel between the pack and skin. Heat in a microwave oven. Reheat as needed.

- Heat-producing ointments and gels containing menthol, camphor, capsaicin, or papain (extract from red peppers) may be applied to the sore muscle or joint as long as they do not produce skin irritation. Covering the area after application with plastic wrap helps hold the heat in longer. Wash hands thoroughly after application to prevent eye irritation.

Cold

- Recommended for acute phase of inflammation or acute pain.
- Do not apply to one area for more than 10 to 20 minutes at a time; apply no more than once an hour.
- Discontinue when numbness occurs.
- Not recommended for patients with impaired circulation.
- An ice water bath is useful for a hand or foot. The extremity can be exercised during treatment.
- An ice pack can be made by partially filling a double plastic bag with ice. Zip-type closures work best. A thin pad or dishtowel may be used between the pack and skin.
- Commercial cold packs mold to body parts better than do ice bags but do not stay cold very long. Often two of these are needed to finish a 10- to 20-minute treatment. Commercial cold pack can be refrozen in the freezer. Disposable chemical packs that are activated when needed are also available. Bags of frozen peas make a good cold pack for some joints.
- Freeze ice in a paper cup; peel back part of cup to use so the cup provides a handgrip. Wear a rubber glove or use a pad to protect the hand from the ice. Rub ice over the body part until skin feels numb, but no longer than 10 to 15 minutes at a time.
- Dry skin well after treatment.

Diet

No special diet will cure or relieve arthritis, despite many claims to the contrary. However, some patients find that eliminating foods from the "nightshade" family, such as tomatoes, decreases their joint pain. The patient should eat an average, well-balanced diet with no excess or limitations in amount or types of foods. Explain that obesity can put additional stress on the weight-bearing joints and aggravate the arthritic condition; then help the patient review strategies for weight control.

Psychosocial Care

As deformities occur, self-esteem can be affected. Encourage verbalization of feelings. Express acceptance of the patient's appearance. Suggest clothing options that may minimize visible changes. A support group sometimes helps to reframe the disease's effects on the body. Encourage patients with arthritis to gain as much control over the disease as possible with appropriate coping mechanisms, pacing of activity, exercise, and medication.

Resources for Patient and Family Education

The Arthritis Foundation provides some excellent printed material written with the layperson in mind. Another source of information is the Arthritis Information Clearinghouse at the National Institute of Medicine (see [Online Resources](#)).

Gout

Etiology and Pathophysiology

Gout is arthritis of a joint caused by high serum levels of uric acid. Uric acid crystals precipitate

from the body fluids and settle in joints and connective tissue. Gout affects men more than women and generally occurs during middle age. It is more common among populations that consume a high-protein diet. Two factors seem to be implicated: (1) a genetic increase in purine metabolism leading to overproduction or retention of uric acid and (2) consumption of a high-purine diet. Excessive alcohol consumption causes an increased production of keto acids that inhibit uric acid excretion, causing hyperuricemia. Deposits of urate crystals occur in joints and subcutaneous tissues and can cause kidney stones. The big toe is the most common site, but many other joints can be affected. Diuretic therapy may cause a secondary gout from fluid loss that increases the serum uric acid level in the body. Certain drug therapies interfere with uric acid excretion and can cause a secondary gout.

Signs and Symptoms

Typical signs and symptoms are elevated serum uric acid and tight, reddened skin over an inflamed, edematous joint, accompanied by elevated temperature and extreme pain in the joint.

Diagnosis, Treatment, and Nursing Management

History and physical examination are usually sufficient to diagnose gout, but a blood sample to check serum uric acid level is usually ordered to confirm the diagnosis. Treatment during acute attacks consists of administration of NSAIDs for 2 to 5 days for the pain. Colchicine given orally may bring dramatic pain relief within 24 to 48 hours. Oral prednisone or cortisone injection into the joint may be used. Allopurinol (Zyloprim) or probenecid (Benemid) may be prescribed to prevent further attacks. In February 2009 the FDA approved febuxostat (Uloric), which is the first new gout medication to be approved since the 1960s. Teach the patient about gout medication side effects and dosage. Advise that dietary management includes weight control and restriction of high-purine foods, such as anchovies, sardines, sweetbreads, liver, red meats, kidneys, and meat extracts. Alcohol should be restricted. Remind patients who take allopurinol that periodic liver function testing is needed because this drug can cause liver failure. Teach the patient that a fluid intake of 2000 to 3000 mL per day is needed to protect the kidneys from urate crystal deposits and to prevent kidney stones.

Older Adult Care Points

Older adults with decreased creatinine clearance should not take allopurinol. When the patient has both hypertension and gout, losartan (Cozaar) may be a good choice for therapy. Losartan promotes urate excretion.

Osteoporosis

Etiology and Pathophysiology

Osteoporosis makes the person more susceptible to fractures because of the decrease in bone mass. Fragility fractures are often **atraumatic** (occur without trauma). Starting at age 35 years, most women lose bone mass at a rate of 1% per year; after menopause, loss of bone mass accelerates to 2% each year. In the United States 44 million people have osteoporosis, and another 34 million have **osteopenia** (low bone mass) (FORE, 2013). There is a hereditary tendency for osteoporosis. Risk factors for osteoporosis include age, chronic disease (e.g., liver, lung, kidney), medications (e.g., steroids, anticonvulsants, anticoagulants, PPIs, selective serotonin inhibitors), long-term calcium deficiency, vitamin D deficiency, smoking, excessive caffeine or alcohol intake, and sedentary lifestyle. Eating disorders and inflammatory bowel disease lead to osteoporosis because they interfere with nutrition and absorption. The risk of osteoporosis increases considerably in women after menopause because estrogen production is reduced.

Older Adult Care Points

Public awareness of osteoporosis for older women has increased, in large part because the pharmaceutical industry has marketed drugs for prevention of osteoporosis and fragility fractures. However, older adult men have hormone changes around the age of 70 years; this increases their risk for osteoporosis. Older men should be assessed for risk factors and undergo diagnostic testing

(NIH, 2013).

Signs and Symptoms

Osteoporosis is a silent disease and there are no early signs or symptoms. Once the patient has developed osteoporosis, height loss, kyphosis (excessive curvature of the spine), and back pain may occur. Compression fractures of the spine may cause debilitating pain. Osteoporosis is commonly diagnosed after the patient sustains a fracture from little or no known trauma.

Older Adult Care Points

Patients older than 60 years who sustain a nontraumatic osteoporotic fracture have an increased risk for death within 5 to 10 years after the fracture event. For older adult women, there may be some underlying risk for fracture and death. For men, there appears to be some connection to the fracture event itself. Additional research is needed to clarify risk factors (Bliuc et al, 2013).

Diagnosis

On radiographs the bone of the patient with osteoporosis appears porous. Dual-energy x-ray absorptiometry (DEXA) is used to assess loss of bone density. DEXA is reported as a T score.

- *Normal bone density:* T score of greater than 1 standard deviation from a healthy young adult
- *Osteopenia:* T score of -2.5 or more.
- *Osteoporosis:* T score of -2.5 or below

Treatment

Treatment is aimed at stopping loss of bone density, increasing bone formation, and preventing fractures. Adequate dietary or supplemental calcium and vitamin D in combination with weight-bearing exercise are standard treatments; estrogen replacement therapy may also be used for postmenopausal women. For premenopausal women, intake, preferably dietary, of 1200 mg of calcium is recommended; this recommendation increases to 1500 mg after menopause. Vitamin K is essential for calcium utilization and is provided by leafy greens in the diet.

Nutrition Considerations

Nutrition for Bone Growth and Density

Adequate amounts of calcium and phosphorus are essential for bone growth and density. Although green vegetables are a source of calcium, that calcium is not readily absorbed. Dairy products such as cheese, yogurt, and milk are better choices. Canned sardines or salmon also provide good amounts of calcium. Calcium supplementation is not recommended for the healing of fractures. It has proven not to be readily absorbed and tends to cause kidney stones.

Calcium supplements, if required, should be taken in divided doses during the day. Exposure to sufficient sunlight or vitamin D supplementation is necessary for the proper absorption and metabolism of the calcium. Current guidelines recommend 800 to 5000 units of vitamin D per day (Vitamin Council, 2015). Vitamin K is important to bone health as well, and most people obtain vitamin K by eating greens. Daily weight-bearing exercise can decrease the chance of developing osteoporosis. Walking down stairs seems to be especially helpful, but walking for 30 minutes three times a week is sufficient.

Salicylates and NSAIDs are prescribed to control back pain. A back brace may be ordered for a patient who has had vertebral compression fractures. The bisphosphonates (i.e., Fosamax or Boniva; Box 32-3), which are related to a bone resorption-inhibiting substance found naturally in the body, and hormone therapy are prescribed in addition to calcium and vitamin D supplements for those with osteoporosis. Other classes of medications include parathyroid hormone, bone formation agents, and selective receptor modulators. Miacalcin or Fortical nasal spray, which contains calcitonin, slows the rate of bone loss. It is an alternative treatment for postmenopausal osteoporosis in women who cannot take estrogens. The spray is used with adequate calcium and vitamin D

supplementation.

Box 32-3

Drugs Commonly Used to Treat Osteoporosis

Hormones

- Estrogen (women)
- Raloxifene (Evista) (selective estrogen receptor modulator)
- Testosterone (men)
- Calcitonin (Miacalcin) (synthetic hormone)
- Teriparatide (Forteo) (synthetic hormone)

Bisphosphonates

- Alendronate (Fosamax)
- Risedronate (Actonel, Atelvia)
- Ibandronate (Boniva)
- Zoledronic acid (Zometa, Reclast)
- Monoclonal antibody
- Denosumab (Prolia)

General Nursing Implications for Bisphosphonates

- Monitor bone density test results.
- Must take regularly (weekly or monthly).
- Observe for hypercalcemia (paresthesias, twitching, colic, or laryngospasm).
- Take with 8 oz of plain water in A.M. 30 to 60 minutes before eating, drinking, or taking any other medication that day (timing depends on the particular drug).
- Swallow the tablet whole. Do not suck or chew on it.
- Remain upright for 30 to 60 minutes after dose to prevent esophageal irritation (timing depends on the drug). Do not eat or drink anything during these 30 minutes to an hour.
- Store medication in a cool location out of sunlight.
- If dose is missed, skip the dose; do not take it later in the day. For the weekly dose medication, take it the next morning after your scheduled dose. Skip the dose if it has been 2 days since it was supposed to be taken and just resume the original schedule. If taking Boniva, take it the next morning after you remember you forgot to take it. Do not take two tablets in any 1 week; wait at least 7 days to take the next dose and then resume your original schedule.
- Take calcium and vitamin D supplements as recommended by the health care provider.
- Perform weight-bearing exercise to increase bone density.
- Advise health care provider if pregnant or planning a pregnancy.

Intravenous zoledronic acid (Zometa) may be used for prevention of osteoporosis and long bone fractures in patients with prostate cancer who are receiving radiation and hormonal therapy. The drug can also be used for men who do not tolerate bisphosphonates well (Ruza et al, 2013).

Safety Alert

Caution With Bisphosphonate Drugs

There have been some instances of jawbone necrosis in patients who have been taking bisphosphonate drugs. There is also some concern that bisphosphonates increase the risk of femur fracture. Esophageal irritation or erosion can occur if the patient does not remain in an upright position for 1 hour after taking a bisphosphonate drug. The FDA announced in March 2010 that patients should continue to take prescribed bisphosphonates (Lowes, 2010). Patients should be reminded that adverse side effects are varied and any new onset of unusual signs or symptoms should be reported to the provider. These drugs should be stopped after 5 years.

Treatment of vertebral fracture.

Vertebral compression fractures are common in patients with osteoporosis. These are often treated with pain medication, activity limitation, physical therapy, and bracing. There are two new minimally invasive spine procedures for those who do not respond to the conservative therapies. **Vertebroplasty** involves the percutaneous injection of polymethylmethacrylate (PMMA), a bone cement, directly into an osteoporotic spinal area under fluoroscopy. This stabilizes the bone and helps reduce or eliminate pain. **Kyphoplasty** consists of the percutaneous insertion of an inflatable device into the fractured vertebral body under fluoroscopy. The device is inflated, elevating the end plates and restoring the vertebral body toward its original height. Thick PMMA is then injected under low pressure into the cavity. The device is deflated and removed. This provides pain relief and reduces kyphosis (Cooper, 2013).

Nursing Management

Assessment (Data Collection)

Assessment for risk factors for osteoporosis should be performed with every general health assessment. Data are gathered about family history of osteoporosis, use of steroid medication, diet, exercise pattern throughout life, and history of smoking and alcohol intake.

Nursing Diagnosis and Planning

The main problem is potential for injury due to possible fracture from thinning of the bone. The expected outcome would be "Patient will not experience a fracture during his lifetime."

Implementation and Evaluation

Nursing care is focused on promoting screening for osteoporosis, teaching about the benefits of a healthy lifestyle, the need for sufficient intake of calcium and vitamin D, and the advantages of weight-bearing exercise. Educating about the harmful effects of smoking and excessive alcohol intake is also important. For the patient with osteoporosis, teach about the medications prescribed for the disorder and their side effects and measures to halt or reverse the disease process.

Paget Disease

Paget disease, more common in men, is a problem of abnormal bone resorption followed by replacement of normal marrow with fibrous connective tissue. The abnormal bone is weak and prone to fractures. The cause of Paget disease is unknown, although it does occur in clusters in some families. Often the disease is found at the time a fracture occurs when radiographs reveal the abnormality of the bone. Diagnosis is by radiograph and laboratory testing. A 24-hour urine collection for hydroxyproline, which indicates osteoclastic activity, may be performed. Serum alkaline phosphatase is elevated if the disease is active. The main problem is pain. Miacalcin or a bisphosphonate may be given to slow bone resorption. Orthopedic care is given for fractures and necessary joint replacements. A firm mattress, wearing a corset or light brace to relieve back pain,

and proper body mechanics are essential. The patient should avoid lifting or twisting.

Bone Tumors

Etiology and Pathophysiology

Bone is subject to both benign and malignant tumors. Tumors arise from several different types of tissue, including cartilage (chondromas), bone (osteomas), and fibrous tissue (fibromas). Benign tumors often are found on radiograph or at the time of fracture.

Malignant bone tumors are either primary or secondary to metastatic disease. Diagnosing and treating cancer in other parts of the body early can prevent the occurrence of metastases to the bone. Primary malignant bone tumors are most common among people 10 to 25 years of age. The most common type is osteosarcoma, or osteogenic sarcoma. The tumors grow rapidly and metastasize. More than half the cases affect the knee area. However, the distal femur, humerus, and proximal tibia are other common sites of occurrence. Osteosarcoma may occur in men older than 60 years as a complication of Paget disease. Other types of primary malignant tumors include Ewing sarcoma, chondrosarcoma, and fibrosarcoma.

Signs, Symptoms, and Diagnosis

Signs and symptoms of malignant bone tumor include pain, warmth, and swelling. Metastatic bone tumors greatly outnumber primary bone malignancies. Malignancies of the prostate, kidney, thyroid, breast, and lung commonly metastasize to bone. Sites of metastases are usually the vertebrae, pelvis, ribs, and femur. Diagnosis of bone tumor is by physical radiograph, bone scan, and biopsy.

Treatment and Nursing Management

Treatment for malignant bone tumors includes surgery, radiation, and chemotherapy. Osteosarcoma has a 60% to 80% cure rate when surgery and chemotherapy are combined for treatment. Chemotherapy is given for about 10 weeks before surgery and then for up to a year after surgery. A combination of a variety of chemotherapeutic agents are used depending on the tumor size, location, and physician decision ([American Cancer Society, 2015](#)). Zoledronic acid (Zometa) may be used to treat hypercalcemia associated with bone tumors.

Nursing management includes helping the patient with the anxiety and fear that accompanies the diagnosis of a bone tumor. Care of surgical patients is presented in [Chapters 4 and 5](#), and [Chapter 8](#) covers care of cancer patients. If a bone tumor is in an extremity, amputation may be part of the treatment.

Amputation

About 80% of all limb amputations involve lower extremities. The most common reasons for amputation of a lower limb are related to peripheral vascular disease, often associated with diabetes mellitus, and resultant gangrene. Other conditions necessitating lower-limb amputation include severe trauma, malignancy, and congenital defects. Military injuries from shrapnel and land mines often result in amputation.

About 70% of upper-extremity amputations are brought on by crushing blows, thermal and electrical burns, and severe lacerations, many from military action. Vasospastic disease, malignancy, and infection also can necessitate amputation of an upper extremity.

Patient Teaching

Care After Accidental Amputation

To care for a severed body part so that reattachment may be possible:

- Rinse the detached part only enough to remove visible debris.
- Wrap the part in a clean, damp cloth.

- Place the part in a sealed plastic bag or in a dry watertight container.
- Immerse the bag or container in a mixture of water and ice (3 parts water to 1 part ice). Do not let the part get wet or freeze.
- Alternatively, place the container in an insulated cooler filled with ice.
- If no ice is available, keep the part cool; do not expose it to heat.
- Tag the bag or container with the person's name and the name and location of the body part and take it to the hospital with the person.

The past 20 years have brought about major improvements in microvascular surgery, making reattachment or reimplantation of amputated parts possible. Teach the public what to do if an accidental amputation occurs.

Preoperative Care

If at all possible, the patient should participate in the decision to amputate a limb. He should understand the need for the amputation and what to expect postoperatively with regard to pain, immobility, and readjustment to self-care. He needs to discuss realistic goals of rehabilitation with members of the rehabilitation team.

Although the loss of a limb can be very difficult for the patient and his family to accept, it helps to know that the procedure is absolutely necessary and that every effort will be made to help the patient take full advantage of his remaining resources. The patient may experience stages of denial, anger, and so on, similar to those of the dying process. In a sense, the patient must recognize the death of his former "self," work through the grief process, and move toward acceptance of a new body image.

"Phantom sensations" in the limb that has been removed are not unusual. The current hypothesis is that phantom pain mimics preoperative pain and that the peripheral nervous system and the spinal cord send messages to the brain, which retains the memory of the pain ([Ratini, 2013](#)). The patient should be informed preoperatively that the sensations are not unusual and are not considered a psychiatric problem, and that he should ask for help should the problem arise.

Physical preparation of the patient for amputation includes muscle-strengthening exercises to facilitate activity after amputation. These exercises are the first stages of the rehabilitation process, designed to help the patient achieve independence as rapidly as possible.

Postoperative Care

When the patient returns from the surgical suite, the two most immediate problems after amputation are hemorrhage and edema. To combat these problems, the stump is sometimes elevated for 24 to 48 hours. A lower extremity is not elevated for more than 24 hours because of the danger of hip contractures, which would prohibit rehabilitation efforts to achieve ambulation. The stump is checked at frequent intervals to determine whether bleeding is excessive. Fresh bleeding on the dressing should be reported immediately. When a cast is over the incision, other measures are used to detect bleeding (i.e., pulse rate, blood pressure, increasing pain, restlessness, and pallor). A surgical tourniquet should be kept at the bedside in case of hemorrhage. Prophylactic antibiotics are given for 3 or 4 days, and wound drainage usually is handled with a wound drainage system. The incision should be dry, intact, and only slightly reddened along the suture line. The initial pressure dressing is removed by the surgeon 48 to 72 hours postoperatively (see [Chapter 5](#)).

Phantom limb sensations may or may not be painful. Intravenous infusion of ketamine early after amputation has been known to reduce or eliminate phantom pain in many patients. If the pain is severe or persists, various methods are used to control it. Another method is the use of a transcutaneous electrical nerve stimulator (TENS). A device called a *stump stocking*, which is a silicone liner interwoven with an electromagnetic shield, works by blocking external electromagnetic impulses from outside sources. Those external impulses are believed to irritate nerve endings and trigger phantom pain. A new treatment uses virtual reality goggles and a computer program to help visualize the limb as being whole ([Mayo Clinic, 2015](#)).

Three alternative modes for managing the stump after amputation are (1) soft dressing with

delayed prosthetic fitting; (2) rigid plaster dressing and early prosthetic fitting; and (3) rigid plaster dressing and immediate prosthetic fitting. Each method has its particular advantages and disadvantages. If a soft dressing is used, it is important that the stump be wrapped properly to control edema and ensure proper shrinkage of the stump for later fitting of a prosthesis. A pressure bandage wrapped in a figure-of-8 pattern is most common (Figure 32-10). The bandage is anchored to the most proximal joint. It should be rewound three times a day, or whenever it is loose. A Jobst air splint may be used instead of the pressure bandage.

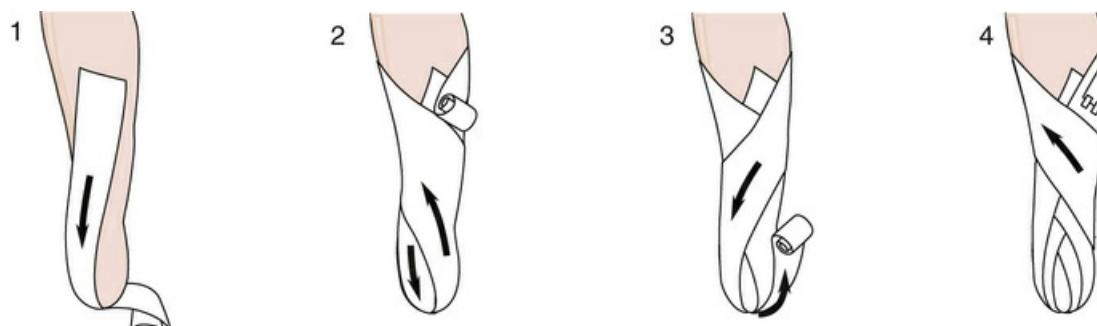


FIGURE 32-10 A common method for wrapping a below-the-knee amputation (BKA) stump. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

When the bandage is off, assess the skin for inflammation or breakdown. The skin should be pink in a light-skinned person and without discoloration. In a dark-skinned person, the skin should not be lighter or darker than other skin pigmentation. The skin should be warm but not hot. Skin breakdown on the stump is extremely serious because it interferes with prosthesis training and may prolong hospitalization and recovery. Patients with diabetes mellitus are particularly susceptible to skin complications because changes in sensation may obliterate the awareness of stump pain.

Many complications can be prevented if the patient is able to get up and about early in the postoperative period. However, weight bearing before the stump is adequately healed can cause weakening of the suture line and rupturing of the operative wound. A patient with a lower extremity amputation should lie prone for 20 to 30 minutes every 3 to 4 hours to prevent hip contracture until he is up and about regularly. The residual limb should be extended. Patients with amputations below the knee are better able to begin early walking and weight bearing than those whose limb has been amputated above the knee. The amputation of a limb displaces the body's center of gravity and interferes with the sense of balance. Adaptation to this change in the center of gravity occurs slowly, and the patient needs to be warned to move cautiously. When the prosthesis is off during the night, the patient may need assistance in turning until he adjusts to his new center of gravity.

Proper positioning is required to prevent **abduction** contractures. ROM exercises are carried out with patients with an amputation as with any patient who must be protected from the disabilities resulting from immobility.

When a lower limb has been removed, the patient must learn how to balance on one leg, how to stoop and bend over without losing balance, and how to use his back muscles to maintain good posture while wearing an artificial limb. Teaching for self-care begins as soon as possible.

Rehabilitation

With the help of computers, prostheses can be manufactured that are a much better fit than ever before. Computerization has also provided a means of controlled movement of various parts of a prosthesis, allowing greater mobility and ease of performing ADLs. Usually both a physical therapist and an occupational therapist work with the patient who has suffered an amputation to help regain mobility, confidence, and the ability to handle ADLs. Assist with practice at bathing, shaving, dressing, and other ADLs.

Older adults and patients who are chronically ill can benefit from a positive, yet realistic, approach to problems related to amputation. The focus of attention should be on what the patient can do for himself and on what strengths he has in his favor. You can be of real assistance by

helping the patient find short-range goals that can be accomplished without great difficulty and that indicate progress toward independence. For example, you can guide him toward devising ways in which personal needs such as bathing and grooming can be met. Later, give encouragement to sit up, exercise the other limbs, and assist with changing of the dressing. Finally, set a goal for wearing the prosthesis successfully and walking without assistance ([Figure 32-11](#)) (see [Chapter 9](#)).

Patient Teaching

Stump and Prosthesis Care

Instruct the patient in stump care as follows:

- Inspect the stump daily for redness, blistering, or abrasions.
- Use a mirror to examine all sides and aspects of the stump.
- Perform meticulous daily stump hygiene. Wash the stump with a bacteriostatic soap, and then carefully rinse and dry it. Allow to air dry for 20 minutes. Apply nothing to the stump after it is bathed.
- Wear only a residual stump sock that is in good condition over the stump for cleanliness and comfort. Replace the sock daily; wash with mild soap, squeeze out excess water and lie flat to dry.
- Put on the prosthesis immediately when arising and keep it on all day (once the wound has healed completely) to reduce stump swelling.
- Continue prescribed exercises to prevent weakness.
- Lay prone with hip extension for 30 minutes three or four times a day.
- For a lower extremity, replace shoes before wear becomes extreme because gait may be altered.

Care of the prosthesis:

- Remove sweat and dirt from the prosthesis socket daily by wiping the inside of the socket with a damp, soapy cloth. To remove the soap, use a clean, damp cloth. Dry the prosthesis socket thoroughly.
- Never attempt to adjust or mechanically alter the prosthesis. If problems develop, consult the prosthetist.
- Schedule a yearly appointment with the prosthetist.

Adapted from Lewis SM, Dirksen SR, Heitkemper MM, Bucher L.: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.



FIGURE 32-11 C-leg prosthesis in action. (© Ottobock HealthCare LP, Minneapolis, Minn.)

Community Care

Rehabilitation programs for patients with an amputation, arthritis, and other musculoskeletal disorders exist in most large cities and are being introduced into more communities through agencies such as the YMCA. The Arthritis Foundation has been instrumental in working with the YMCAs to bring programs for exercise to local neighborhoods.

Outpatient rehabilitation programs through clinics work with patients who are regaining mobility and the ability to perform ADLs with a prosthesis. Rehabilitation is moving to a program "without walls," indicating a shift from an inpatient institute to rehabilitation in the home and community.

Home care nurses are particularly instrumental in preventing musculoskeletal injury in home care patients. The premises of the older adult are surveyed, and recommendations are made to make it safer for the patient. Flat, nonglare surfaces for walking, well-lit walkways, absence of loose rugs, installation of grab bars in showers and bathrooms, and use of communication systems to summon help are some of the measures instituted to protect older adults.

When a home care patient is on crutches, the nurse should assess the patient's ability to go up and down stairs and to sit down and arise from the sitting position safely. Patient Teaching: Crutch Gaits in [Chapter 31](#) presents the steps for performing these maneuvers correctly. Home care nurses must assess the capability and safety of older adults who are newly using assistive devices for ambulation and determine whether alterations in pathways in the home need to be made. Scatter rugs should be removed, and furniture may need to be rearranged to offer a path wide enough to allow the patient to move from one area to another.

Long-term care facility nurses survey patient units and group spaces daily to check for obstacles to ambulation and potential safety hazards. Slowly, our communities are becoming easier to navigate for older adults, and public places are becoming more accessible for individuals with handicaps and safer for frail older adults.

Get Ready for the NCLEX® Examination!

Key Points

- Sprains are treated with rest, ice, compression, and elevation (RICE).
- Bursitis occurs from injury or overuse.
- Carpal tunnel syndrome causes numbness, tingling, and pain in the hand.
- Fractures occur from trauma or metabolic disease. Signs and symptoms include pain, swelling, discoloration, and deformity in the contour of the bone. Complications include infection, osteomyelitis, fat embolism, venous thrombosis, and compartment syndrome.
- Compartment syndrome is an emergency situation. Signs and symptoms include edema, pallor, tingling, paresthesia, numbness, weak pulse, cyanosis, paresis, and severe pain.
- Osteoarthritis occurs asymmetrically and typically affects only one or two joints. Treatment consists of pain management, weight control, exercise, and maintenance of joint function.
- Rheumatoid arthritis is an inflammatory disease of the joints. Symptoms include joint pain, warmth, edema, limitation of motion, and joint stiffness and systemic symptoms, usually bilaterally. Treatment includes relieving pain, minimizing joint destruction, promoting joint function, and preserving the ability to perform self-care functions. Medications, rest, exercise, and applications of heat and cold are mainstays of treatment.
- Postoperative care after joint replacement is very important to prevent pain, prevent infection, prevent dislocation, and promote mobilization.
- DVT is a common complication of hip and knee joint replacement.
- Gout is caused by high serum levels of uric acid. Symptoms of gout are tight, reddened skin over an inflamed, edematous joint accompanied by elevated temperature and extreme pain in the joint.
- Calcium deficiency and estrogen depletion predispose to the development of osteoporosis, which increases susceptibility to fractures. Treatment includes calcium, vitamin D supplements, bisphosphonates, and other hormonal medications (see Box 32-3).
- The most common primary bone tumor is osteogenic sarcoma; many bone tumors are from metastasis of cancer elsewhere.
- Eighty percent of amputations involve lower extremities. Hemorrhage and infection are complications of amputation. Proper stump care is essential to the success of rehabilitation.

Additional Learning Resources

 Goto your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- Arthritis Foundation, www.arthritis.org
- Arthritis Information Clearinghouse at the National Institute of Medicine, <http://www.niams.nih.gov>
- National Institute of Arthritis and Musculoskeletal and Skin Diseases, www.niams.nih.gov
- National Osteoporosis Foundation, www.nof.org

Review Questions for the NCLEX® Examination

1. A young man is admitted to the emergency department after an injury to the left leg sustained playing football. He is complaining of pain around the knee and upper tibia. Which data from the nurse's assessment would indicate a fracture of the tibia rather than a connective tissue injury of the knee?

1. Pain and soft tissue swelling around the knee and an abrasion on the knee

2. Pain, ecchymosis below the knee, and crepitation with any movement of the area
3. Pain, swelling, and loss of function of the foot
4. Limping when walking, facial grimace, and some swelling of the knee and lower leg

NCLEX Client Need: Physiologic Integrity

2. A 24-year-old woman limps into the emergency department after twisting her ankle during a soccer game. On examination, there is local swelling and difficulty maintaining balance. What immediate therapeutic measure(s) should the nurse provide? (*Select all that apply.*)

1. Application of elastic bandage
2. Application of an ice pack
3. Elevation of the ankle
4. Ankle rest and limited weight bearing
5. Application of a topical anesthetic

NCLEX Client Need: Integrated Processes: Clinical Problem Solving

3. A patient with a plaster cast of the right arm complains of itching underneath the cast. What should the nurse do to alleviate the symptom?

1. Encourage deep breaths and scratch the other arm.
2. Insert a cotton-tip applicator under the cast.
3. Forcefully inject 50 mL of air underneath the cast.
4. Administer pain medications.

NCLEX Client Need: Physiologic Integrity

4. A nurse responds to a roadside emergency and finds a middle-aged man with pain and tenderness over the left leg. The nurse notes a closed bone deformity with inability to move the leg. While waiting for the paramedics, what is the most important nursing action?

1. Immobilization of the leg

2. Realigning the bones
3. Applying warm packs
4. Elevating the extremity

NCLEX Client Need: Physiologic Integrity

5. The nurse should watch for signs of potential complications in a young adult patient with a fractured femur with internal fixation and a long leg cast, such as: (*Select all that apply.*)

1. infection or osteomyelitis.
2. compartment syndrome.
3. pneumonia or stroke.
4. pulmonary fat embolus.
5. electrolyte imbalance.
6. nonunion of bone.

NCLEX Client Need: Safe and Effective Care Environment: Safety and Infection Control

6. A difference in the postoperative care of a patient with a knee replacement compared with a patient after a hip replacement is that the patient with a hip replacement:

1. has less chance of developing a deep venous thrombosis.
2. remains on bed rest for several days.
3. is allowed to stand at the bedside on the first postoperative day.
4. has a CPM machine to exercise the joint.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving

7. A nurse has just received shift report on four assigned orthopedic patients. Which patient should the nurse check on first?

1. A young trauma patient with a below-the-knee amputation who is having phantom pain
2. An older adult woman with a total hip replacement who needs

assistance with the bedpan

3. A woman with an external fixation device who has a fever and foul odor at pin sites
4. A man with a full leg cast who reports persistent pain despite elevation and pain medication

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving

8. A nurse is assisting an older adult at home who has rheumatoid arthritis in the hands and wrists. The nurse would intervene to teach the patient about joint protection if the patient:

1. turned the doorknob counterclockwise.
2. used the palms of the hands to push up and off the bed.
3. carried groceries into the house using both hands.
4. pushed the door open with the arm.

NCLEX Client Need: Integrated Processes: Teaching and Learning

9. Early osteoporosis is treated with _____. (*Fill in the blank.*)

NCLEX Client Need: Physiologic Integrity: Pharmacological Therapies

10. A young patient returns from the operating room after a below-the-knee amputation and is alert and quiet. The stump is elevated with the dressing dry and intact. What is the priority problem for this patient?

1. Altered body image.
2. Potential for bleeding.
3. Altered mobility.
4. Insufficient knowledge.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving

11. After sustaining a rotator cuff tear, a patient's arm is placed in a sling. The patient is instructed to rest and to take ibuprofen (Motrin) for pain. Which patient statement indicates a need for further teaching?

1. "I will have less stomach upset if I take the pills with food."

2. "I will not be able to play tennis for a while."
3. "I need to rest in bed for the next 2 days."
4. "The sling must be worn most of the time."

NCLEX Client Need: Integrated Processes: Teaching and Learning

12. A nurse is assuming recovery room care of a 52-year-old patient who had carpal tunnel repair. On receiving the patient, what is the priority nursing assessment?

1. Sensation in the fingertips
2. Color, warmth, and capillary refill
3. Condition of the dressing
4. Range of motion

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

Critical Thinking Questions

Scenario A

Mr. Patel, age 56 years, has been admitted to the hospital with a diagnosis of fracture of the left tibia. You have been told that when the patient returns from surgery, he will have an external fixation device in place.

1. How would you perform a neurovascular assessment?
2. How can you support the affected extremity?
3. What can you do to decrease swelling?
4. List the observations you must make while the fixator is on Mr. Patel's leg.
5. What complications might occur?

Scenario B

Mrs. Hernandez, age 52 years, is a moderately obese woman who comes to the orthopedic clinic for treatment of arthritis of the knees and ankles. She has great difficulty walking and would use a wheelchair if she could afford one. Her daughter states that she is becoming more and more inactive and—though her mother says she does not want to become an invalid—she refuses to move about and do things for herself. Mrs. Hernandez lives alone and prefers not to live with her son because the grandchildren make her nervous. In fact, she prefers to be left alone because she feels that she cannot be of use to anyone. Her son feels that his mother could find many useful things to do in her neighborhood if she would only try.

1. How does obesity interact with arthritis in causing immobility?
2. What medications might decrease Mrs. Hernandez's pain?

3. What sort of exercise would be best for this patient?
4. How could you make Mrs. Hernandez feel more useful and motivate her to move about and get out of the house more?

Scenario C

Mr. Gerhardt is a 78-year-old who is discharged home after a total hip replacement. You are assigned as his home care nurse to do wound care, assess for complications, and monitor rehabilitation.

1. What teaching for self-care would you reinforce for Mr. Gerhardt on your first visit?
2. How would you determine whether the home environment is safe for Mr. Gerhardt?
3. Mr. Gerhardt is very depressed because he feels he will no longer be able to get out to go fishing and visit with his friends. How would you approach the psychosocial aspects of his care?

Scenario D

During your daily run, you step on an irregular surface and twist your ankle. At home, you notice tenderness at the site, minimal swelling, and loss of function but no abnormal motion.

1. What first aid will you perform?
2. How will you know if you have a sprain or a fracture?

UNIT XI

Urinary System

OUTLINE

Chapter 33 The Urinary System

Chapter 34 Care of Patients With Disorders of the Urinary System

CHAPTER 33

The Urinary System

Objectives

Theory

1. Illustrate the anatomy and physiology of the urinary system.
2. Differentiate the causes of urologic problems and disorders.
3. Discuss ways in which nurses can help patients to prevent or cope with urologic disorders.
4. Examine the psychosocial effects of urinary incontinence.
5. Compare and contrast drugs for urinary incontinence with those for benign prostatic hypertrophy.

Clinical Practice

6. Present nursing responsibilities in the preprocedure and postprocedure care of patients undergoing urologic diagnostic studies.
7. Perform initial and ongoing nursing assessment of a patient's urologic status.
8. Describe five nursing responsibilities related to the care of a patient with an indwelling catheter.
9. Write a nursing care plan for a patient with urinary incontinence.

KEY TERMS

anuria (ă-NŪ-rē-ă, p. 777)

blood urea nitrogen (BUN) (blūd ū-RĒ-ă Nī-trō-jēn, p. 770)

creatinine (krē-ĀT-ĭ-nēn, p. 768)

dysuria (dīs-Ū-rē-ă, p. 777)

hematuria (hē-măt-Ū-rē-ă, p. 775)

micturition (mīk-tū-RĪSH-ūn, p. 768)

nephrotoxic (nēf-rō-TŌK-sīk, p. 775)

nocturia (nōct-Ū-rē-ă, p. 777)

oliguria (öl-ĭ-GŪ-rē-ă, p. 777)

Polyuria (pōl-ē-Ū-rē-ă, p. 777)

proteinuria (prō-tēn-YŪR-ē-ă, p. 776)

residual urine (rē-Zī-dū-ăl Ū-rīn, p. 777)

urinary frequency (Ū-rī-nār-ē FRĒ-kwēn-cē, p. 777)

urinary hesitancy (Ū-rī-nār-ē HĒZ-ĭ-tān-cē, p. 777)

urinary incontinence (Ū-rī-nār-ē īn-KŌN-tī-nēns, p. 768)

urinary retention (Ū-rī-nār-ē rē-TĒN-shūn, p. 777)

voiding (VŌYD-īng, p. 768)

Anatomy and Physiology of the Urologic System

Structures of the Urologic System and How they Interrelate

- The kidneys, ureters, urinary bladder, and urethra are the structures of the urinary system (Figure 33-1).

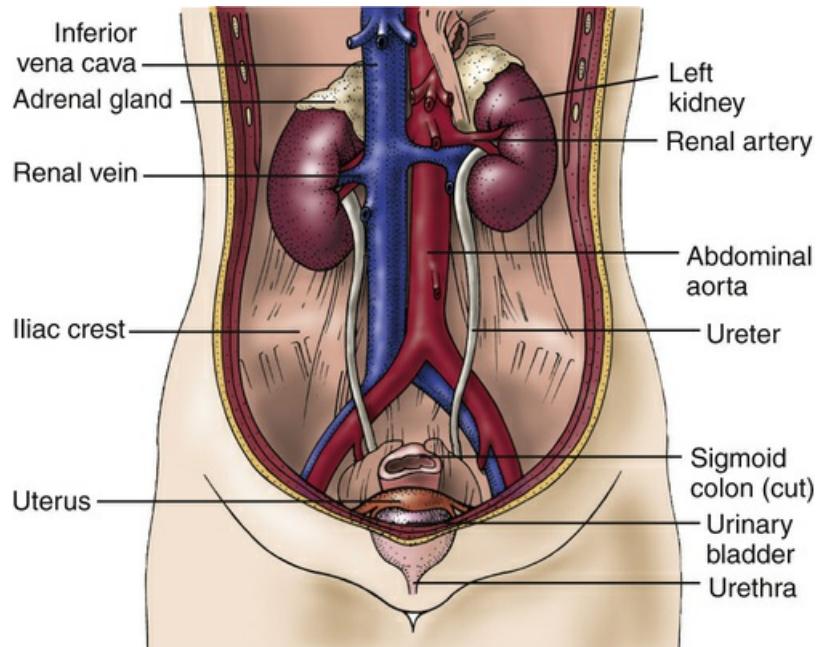


FIGURE 33-1 Structures of the urinary system. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

- The kidneys are bean-shaped organs positioned on either side of the vertebral column at the level of the first lumbar vertebra. The left kidney is slightly higher than the right.
- The kidney consists of the cortex, the outer layer, the medulla, and the renal pelvis. The cortex contains blood vessels and nephrons; the medulla contains the collecting tubules; and the renal pelvis gathers the urine and directs it to the bladder (Figure 33-2).

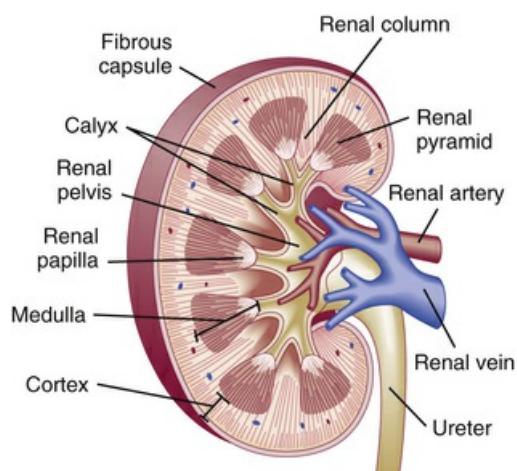


FIGURE 33-2 Structures of the kidney. (From Lewis SL, Dirksen SR, Heitkemper MM, Bucher L: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

- The nephron is the functional unit of the kidney (there are 1 million nephrons in a kidney).
- The nephron consists of the glomerulus, which is a network of capillaries encased in a thin-walled sac called the *Bowman capsule*, and the tubular system.
- The tubular system of the nephron consists of the proximal convoluted tubule, the loop of Henle, the distal convoluted tubule, and the collecting duct (Figure 33-3). Urine is carried by the ureters from the kidney to the bladder through peristaltic action.

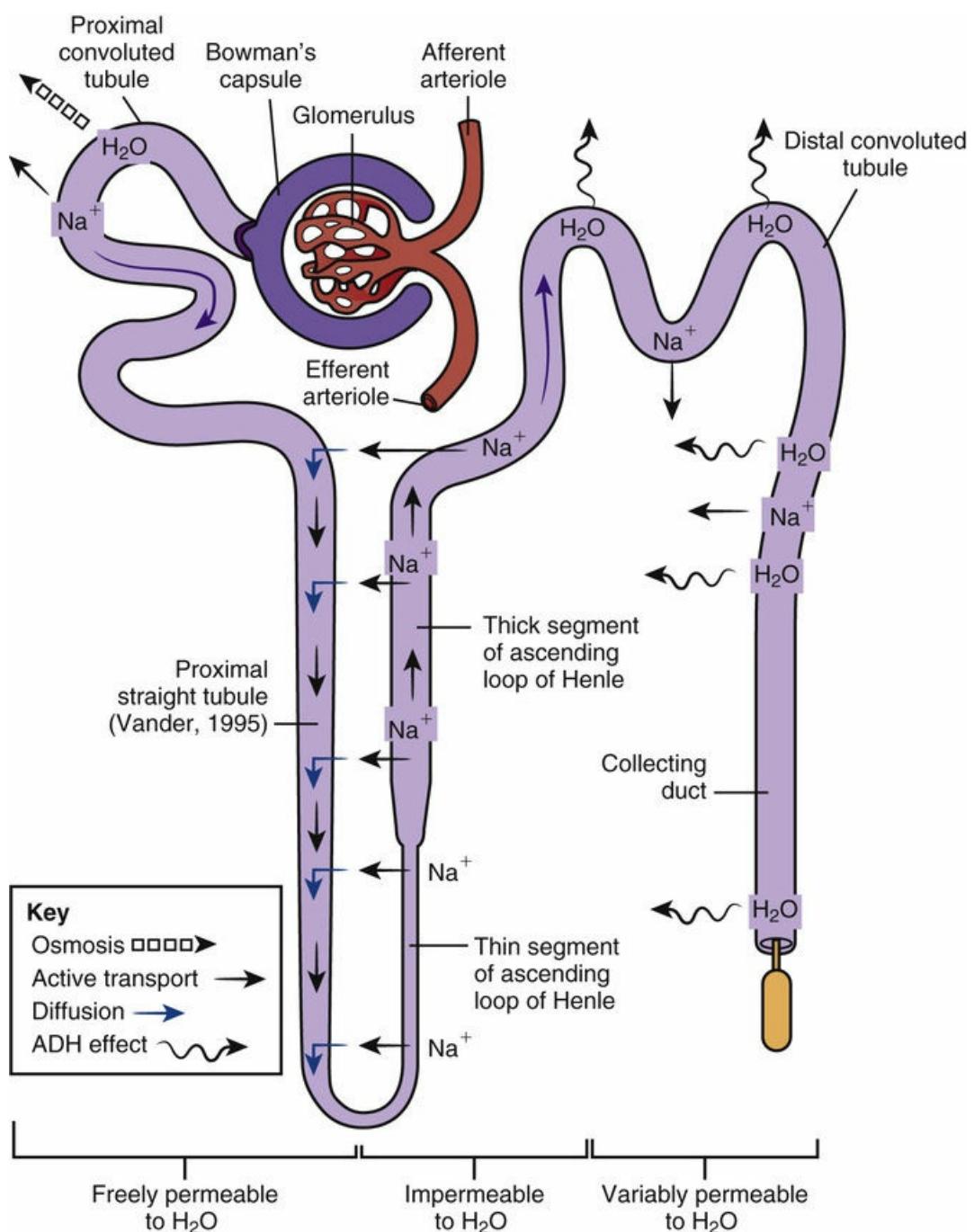


FIGURE 33-3 The nephron. ADH, Antidiuretic hormone. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

- The bladder, a hollow muscular organ, serves as a reservoir for urine; the inner lining of the bladder is a mucous membrane.
- The urine passes from the bladder down the urethra, which is approximately 3 to 5 cm long in

women and 20 cm in men.

- The internal, involuntary urethral sphincter is controlled by the detrusor muscle in the wall of the bladder.
- The external urethral sphincter voluntarily controls release of urine to the outside.
- Blood is brought to the kidney by the renal arteries that branch off the aorta. Blood is returned by veins to the inferior vena cava.

Functions of the Kidneys

- The kidneys regulate serum electrolytes by filtration and reabsorption ([Table 33-1](#)).

Table 33-1
Hormones and Metabolic Actions Associated With Kidney Function

HORMONES	ACTION
Circulating in the Blood to Influence Urine Volume and Concentration	
Aldosterone	Increases the reabsorption of sodium
Antidiuretic hormone (ADH)	Increases permeability in the tubules and reabsorption of water
Atrial natriuretic hormone	Increases the secretion of sodium
Produced by the Kidney	
Erythropoietin	Stimulates the bone marrow to increase red blood cell (RBC) production; increased production of erythropoietin is triggered by a demand for oxygen or when RBC level falls below normal
Calcitriol (active vitamin D)	Increases absorption of calcium and phosphorus
Renin	Assists in the regulation of blood pressure
Affecting Kidney Function	
Parathyroid hormone	Works in conjunction with calcitriol to increase absorption of calcium and phosphorus
Cortisol	Promotes sodium and water retention

- The kidneys eliminate metabolic wastes by filtration; they filter about one fourth of the body's blood at any one time.
- Each nephron filters blood plasma through the semipermeable glomerular membrane.
- Glomerular filtration rate (GFR) is the amount of blood filtered by the glomeruli in a given time (average GFR is about 125 mL/min).
- The kidneys regulate fluid volume by filtration, reabsorption, and excretion.
- Most of the water and some of the electrolytes are reabsorbed into the bloodstream in the descending and distal convoluted tubules.
- The kidneys assist in maintaining acid-base balance by secreting hydrogen ions into the urine.
- Unwanted substances—urea, **creatinine** (waste products of protein metabolism and skeletal muscle contraction, respectively), and uric acid—are retained in the tubules along with some water.
- Approximately 200 L of liquid are filtered in a 24-hour period; 1.5 to 2 L are excreted as urine.
- The kidneys regulate blood pressure by secreting the enzyme renin.
- The kidneys increase red blood cell production by secreting erythropoietin.
- The kidneys metabolize vitamin D into an active form.

Functions of the Ureters, Bladder, and Urethra

- Each ureter is a small tube about 25 cm long; it carries urine from the renal pelvis to the bladder.
- The bladder holds the urine; capacity varies from about 1000 to 1800 mL.
- A feeling of bladder fullness and an initial signal to void (empty the bladder) occurs when the bladder contains 150 to 200 mL of urine.
- The **micturition** (voiding) reflex is then initiated and transmitted to the bladder. Urine then passes from the bladder through the urethra during urination (**voiding**).
- The flow of urine is controlled by the internal urethral sphincter and the external urethral sphincter.

Aging-Related Changes

- Kidney function begins to degrade after age 45 years, and renal blood flow and GFR gradually decrease with each decade.
- In men, the prostate gland hypertrophies with age and can cause varying degrees of obstruction to the normal flow of urine.
- Secretion of renin, aldosterone, and vitamin D activation are decreased.
- Degenerative changes in the bladder muscles may lead to residual urine (incomplete emptying of urine) and **urinary incontinence** (involuntary passing of urine).
- Bladder capacity decreases to as little as 200 mL, and frequent emptying is needed.
- A decreased ability to concentrate urine leads to nocturia (urination during the night).
- Lowered estrogen levels in women result in tissue atrophy in the urethra, vagina, and trigone of the bladder (triangular portion at the base of the bladder), which predisposes to infection and incontinence.

The Urologic System

The kidneys and urinary tract function to maintain the proper balance of fluids, minerals, and organic substances necessary for life. Problems in the heart, lungs, or circulatory system can arise from kidney disorders or kidney failure. Likewise, generalized diseases, such as atherosclerosis, other circulatory impairments, infections, or disturbances in the metabolic processes such as diabetes mellitus, may seriously impair the proper functioning of the kidneys.

Disorders of the Urologic System

Causes

The high volume of blood that is filtered by the kidney contains some bacteria. These bacteria can colonize the kidney, causing an infection. Also, bacteria can easily enter the urinary tract through the urethra, and the infection may spread up into the kidneys.

When an immune reaction occurs in the body, the glomeruli that filter the blood are exposed to antibodies and antigen–antibody complexes contained in that blood. These antibodies and antigen–antibody complexes can cause an autoimmune inflammatory reaction known as *glomerulonephritis* that damages the semipermeable glomerular membrane and interferes with normal kidney function.

Once urine is formed, the urinary system must be patent and unobstructed for urine to be excreted. Tumors may form in the bladder, ureters, or kidney and interfere with normal function by altering cell structure or impeding urine flow. Stones in the kidney or ureters may obstruct the flow of urine. In older men, an enlarged prostate may impede flow of urine through the urethra.

Tubular necrosis can be caused by lack of oxygen or bacterial or chemical destruction of cells, which affects the functional ability of the nephron and decreases kidney function. Many drugs can be toxic to the kidney, and heavy metals such as mercury can cause considerable damage.

Hypertension is a major cause of end-stage kidney disease; conversely, renal disorders can also cause secondary hypertension. Because so much of the kidney's function is directly related to the capillaries and arterioles, any disorder, such as atherosclerosis and diabetes mellitus, that systemically affects the blood vessels can affect the kidneys. When these vessels become **sclerosed** (hardened), blood flow through the kidney is decreased; kidney function diminishes, and eventually this leads to chronic renal failure. Reduced blood circulation related to decreased volume (e.g., hypovolemic shock) or decreased cardiac output (e.g., cardiogenic shock) puts the patient at risk for acute renal failure (ARF).

Patient Teaching

Kidney Health and Healthy Blood Vessels

For patients who have hypertension or diabetes mellitus, design a teaching session that will help them recognize that the atherosclerotic changes that occur in the blood vessels also cause decreased blood flow to the kidneys and eventually reduce kidney function. In accordance with the *Healthy People 2020* goals, emphasize that compliance with the treatment plan for hypertension or diabetes mellitus helps to prevent kidney problems from occurring later in life.

Prevention

One of the best ways to prevent disorders of the urologic system is to drink an adequate amount of water. A minimum fluid intake of 2000 to 2500 mL/day is recommended to initiate good flow through the system.

Health Promotion

Bladder Health

Promote bladder and urinary tract health by encouraging patients to empty the bladder sooner, rather than waiting to urinate. Emptying the bladder prevents urinary stasis and prolonged exposure of waste toxins on the bladder wall, which may contribute to cancer of the bladder. Delayed voiding also causes the bladder wall to stretch beyond normal capacity, and places undue strain on the sphincters. Both can contribute to urinary incontinence later in life.

Controlling blood pressure and maintaining a normal serum glucose level can support healthy blood vessels. A good blood supply promotes good kidney function.

Carefully monitoring for adverse drug effects and avoiding the use of chemicals known to be harmful to the kidney help preserve optimal kidney function. [Box 33-1](#) gives examples of substances that are toxic to the kidney. When drugs that can be harmful to the kidney—such as sulfa compounds—are prescribed, increasing the fluid intake to 3000 to 3500 mL/day reduces the risk of kidney dysfunction. (Increasing fluid intake must be carefully considered when the patient has other conditions, such as congestive heart failure or cirrhosis of the liver.)

Patient Teaching

Over-the-Counter Drugs

Teach your patients to avoid routine use of over-the-counter drugs, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen, to decrease the possibility of hepatic or renal dysfunction through unnecessary exposure to chemicals. This is in accordance with National Patient Safety Goals—to actively involve patients in their own care to ensure safety.

Think Critically

What changes could you make in your dietary habits or lifestyle that might help to prevent urologic problems?

Box 33-1

Examples of Potentially Nephrotoxic Substances

- Anti-infectives
- Aminoglycosides (gentamicin, streptomycin)
- Sulfonamides (trimethoprim-sulfamethoxazole)
- Antifungals (amphotericin B)
- Antitubercular (rifampin)
- Cephalosporins (cefaclor)
- Tetracyclines (doxycycline)
- Miscellaneous (e.g., vancomycin, polymyxin B, rifampin)
- ACE inhibitors (captopril)
- Antineoplastic agents (cisplatin, methotrexate)

- Immunosuppressants (cyclosporine)
- NSAIDs (salicylates, ibuprofen, indomethacin)
- Other drugs (acetaminophen, furosemide, phenazopyridine HCl, cimetidine)
- Contrast media dye (Gastrografin)
- Anesthetics (halothane)
- Heavy metals (lithium, gold salts, lead)
- Industrial (carbon tetrachloride for cleaning)
- Environmental (pesticides, snake venom)
- Recreational drugs (cocaine, heroin)

ACE, Angiotensin-converting enzyme; NSAIDs, nonsteroidal anti-inflammatory drugs.

Diagnostic Tests and Procedures

Patients experiencing problems with the urinary system undergo urine tests, such as a urinalysis and culture and sensitivity, and general diagnostic tests, such as a complete blood count (CBC), **blood urea nitrogen (BUN)**, serum creatinine, and creatinine clearance. Urea is produced when protein breaks down; it then combines with ammonia and is carried by the bloodstream to the kidneys for excretion. Creatinine is a by-product of skeletal muscle contraction. BUN and serum creatinine are interpreted together, and laboratory values should be obtained before the use of radiologic contrast dyes. Creatinine clearance (CC) is a good measure of GFR. Cystatin C is a relatively new test used to evaluate GFR. Cystatin C is a low-molecular-weight proteinase inhibitor that is produced at a constant rate and filtered out by the glomerulus. During impaired kidney function, cystatin C levels will rise. Normal value is 0.70 to 0.85 mg/mL (depending on age). This diagnostic test shows promise of being a better indicator of GFR when measured with serum creatinine in patients with chronic kidney disease ([Shlipak et al, 2013](#)).

Clinical Cues

BUN level and serum creatinine are the two most common tests used to screen for kidney problems. The normal adult range for BUN is 10 to 20 mg/dL. Normal ranges of serum creatinine are 0.6 to 1.2 mg/dL for adult males and 0.5 to 1.1 mg/dL for adult females. An increase in BUN or serum creatinine can be a signal of decreased kidney function.

Radiologic procedures range from a single view of the kidneys, ureters, and bladder (KUB) to interventional radiology, such as balloon angioplasty. A KUB is used to locate stones and detect structural abnormalities. Angioplasty is used to open blocked vessels and increase blood flow to the organs. Urodynamic tests, such as cystometrography, are used to measure flow volume and muscle function. Biopsies of the kidney or bladder are done in combination with radiologic examinations to locate lesions ([Figure 33-4](#)).

Patient Teaching

Renal Biopsy

Teaching points for patients having a renal biopsy:

- *Explain purpose:* To diagnosis the cause of kidney disease, to detect cancer, or to evaluate kidney transplant rejection.
- *Explain procedure:* Local anesthetic is given. Needle is inserted through skin into the kidney to

obtain a small sample under fluoroscopy. Total procedure time is 10 minutes.

- **Explain preparation:** Nothing by mouth (NPO) for 6 to 8 hours before procedure; blood tests will be performed before procedure (e.g., hemoglobin and hematocrit, prothrombin time, partial thromboplastin time).
- **Explain postprocedure care:** Must lie on back for 6 to 24 hours (time varies according to facility protocols and provider orders), avoid activities that increase abdominal pressure (e.g., sneezing, laughing), expect that urine will have blood for first 24 hours. Drink 3000 mL of fluid to flush urinary system (unless otherwise contraindicated).
- **Give home care instructions:** Avoid strenuous activity (heavy lifting or contact sports) for 2 weeks. Report bleeding (e.g., bright red or with clots) immediately. Report fever, malaise, or dysuria.

From Pagana KD, Pagana TJ: *Mosby's diagnostic and laboratory test reference*, ed. 11, St. Louis, 2013, Mosby.

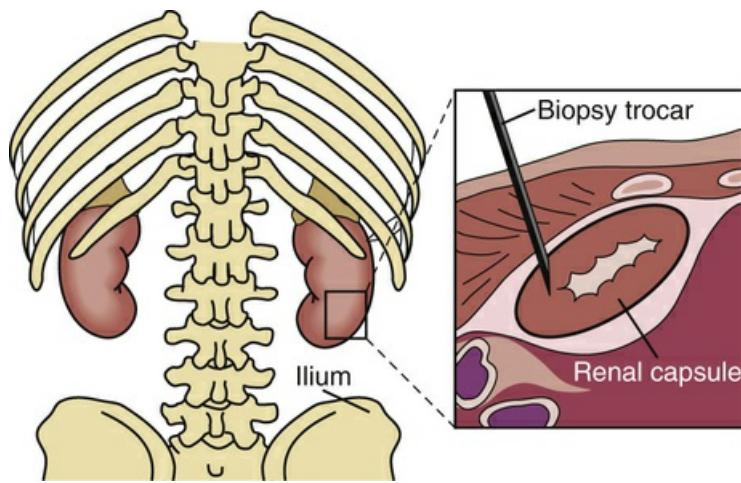


FIGURE 33-4 Renal biopsy. A needle is inserted through the skin to obtain a tissue sample. (From Pagana KD, Pagana TJ: *Mosby's diagnostic and laboratory test reference*, ed. 11, St. Louis, 2013, Mosby.)

General nursing responsibilities for diagnostic testing include assessing for allergies to contrast media and ruling out pregnancy before radiologic procedures and scans. **Table 33-2** lists common diagnostic tests and procedures, along with nursing implications.

Think Critically

What is the rationale of having the patient use the clean-catch method, rather than just simply voiding into a collection container?

Older Adult Care Points

Older kidneys have less ability to concentrate urine. This predisposes the patient to dehydration when fluid intake is restricted for diagnostic tests. The contrast agents used for radiographic tests, in conjunction with dehydration, can cause acute renal failure in older adults. Older adults should be carefully rehydrated by encouraging several ounces of oral fluid (preferable to intravenous [IV] administration, if possible) every 1 to 2 hours and monitoring vital signs, urinary output, lung sounds, and respiratory effort to prevent fluid overload.

Clinical Cues

A 24-hour urine collection is usually started first thing in the morning. Have the patient void and discard the urine, note the time on the laboratory slip and in the nurses' notes, and then put each successive voiding into the collection container. At the time when the test is to end, have the patient void, and add this last urine to the collection bottle. Check with the laboratory as to

whether the container must be kept on ice during the collection period. Place a sign on the patient's door and over the toilet stating "24-hour urine test in progress" so that everyone will save the urine properly.

Table 33-2
Diagnostic Tests for Urologic Disorders

TEST	PURPOSE	DESCRIPTION	NURSING IMPLICATIONS
Urine			
Urinalysis	To detect bacteria, blood, casts, and other abnormalities of the urine	Normal urine is clear, straw to dark amber in color, has a pH of 4.5–6.0, has a specific gravity of 1.010–1.030, and is negative for protein, glucose, ketones, and bilirubin. It should have only a rare RBC, no more than 0–4 WBCs, and an occasional cast.	Obtain a fresh 10-mL morning specimen. Send specimen to laboratory immediately. If vaginal bleeding is reported, provider may order a catheterized specimen.
Urine culture and sensitivity (C&S) (clean catch midstream)	To verify UTI and to determine the specific infectious organism and the sensitivity to specific antibiotics	Normally, urine is sterile in the bladder. Several drops of urine are placed in a culture medium. After incubation (several days), the colonies are counted. If >100,000 organisms per milliliter are counted, there is a UTI. Sensitivity test: bacteria are exposed to various antibiotics to determine which is most effective in killing the organism.	Instruct patient to perform the clean-catch method for specimen collection. A sterile specimen can also be obtained via urinary catheterization. Send specimen to laboratory immediately to prevent change in pH, which can affect bacterial growth.
Urine osmolality	To determine whether the kidneys can concentrate urine; reflects hydration status	Normal findings for fasting specimen: >850 mOsm/kg. Increases in osmolality can indicate dehydration, azotemia, or chronic renal disease. Decreases in osmolality can indicate low-salt diet, excessive water intake, or diabetes insipidus.	Give a high-protein diet for 3 days before the urine collection. Restrict foods and fluids for 8–12 hr before obtaining fasting specimen. To collect a fasting urine specimen, have the patient empty bladder at 6 A.M., discard, then collect specimen at 8 A.M. Label as a fasting specimen and send to laboratory.
Uric acid	To check for renal failure, gout, kidney stones	Uric acid is an end product of protein metabolism. Normal findings: 250–750 mg/24 hr (normal diet). Level is elevated in renal failure.	Take a diet history; specifically ask about purine-rich foods (e.g., liver, beef kidneys, or sardines). Patient needs to fast the night before specimen collection. Instruct on a 24-hr urine collection. (Serum uric acid may be ordered.)
Creatinine clearance	To determine how well kidneys can excrete creatinine	Normal creatinine clearance: 15–25 mg/kg body weight in 24 hr. Elevated serum creatinine with decreased urine creatinine indicates decreased kidney function.	Collect a 24-hr urine specimen. A 5-mL venous blood sample is collected sometime during the 24-hr collection period. Instruct patient to avoid rigorous exercise (according to laboratory protocol: avoid meat, tea, coffee, or drugs) during the collection period.
Urine cytology	Detects presence of bladder cancer noninvasively	Identifies cellular structures indicating bladder cancer.	Obtain a fresh urine specimen (not first morning specimen). Transport to laboratory within the hour.
Blood			
Blood urea nitrogen (BUN)	To evaluate kidney function and hydration status	High BUN levels can indicate poor kidney function, dehydration, or increased breakdown of body protein (i.e., severe burns or excessive exercise). Lower BUN levels are found in severe liver damage, excessive hydration, and protein deficiency. Normal BUN levels average 7–20 mg/dL (depending on sex and age).	No fasting or patient preparation is required. Take a drug history; many drugs can alter results. (Record drugs on laboratory slip as appropriate.) Requires 5 mL of venous blood. When drawing specimen, make sure it is not hemolyzed.
Serum creatinine	To evaluate kidney dysfunction when there are a large number of nonfunctional nephrons	Creatinine is a waste product of skeletal muscle activity. It is produced in fairly constant amounts and is excreted through the kidneys. Normal serum creatinine is 0.8–1.2 mg/dL (depending on gender).	Meats, tea, or coffee may be restricted 6 hr before the test. Cephalosporins may be stopped before the test. Record baseline height and weight. Instruct patient to avoid strenuous exercise before test. Requires 5–10 mL venous blood; may include a 24-hr urine collection.
Cystatin C	To detect renal disease in early stage	Cystatin C in the blood binds to specific anti-cystatin C antibody, causing agglutination.	No special preparation needed. Requires a blood draw of 3 mL in lavender-top tube.
Radiology Studies			
Kidneys, ureters, bladder (KUB)	To visualize the urinary structures or radiopaque stones	Single radiographic view of the lower abdomen done without contrast medium.	Patient needs an x-ray gown that has no radiopaque fasteners. Test for pregnancy before any radiologic study.
Intravenous pyelogram (IVP)	To visualize the kidneys, ureters, and bladder To detect obstructions related to stones or tumors	An iodine-based dye is given via IV injection, then radiographs are taken at timed intervals, showing the flow of the dye through the renal system.	Check for allergy to iodine-based dye; verify BUN and creatinine results; inform provider. Bowel preparation and NPO status may be required. Patient may feel a hot flush or nausea when dye is injected. After procedure, encourage PO fluids for rehydration.
Retrograde pyelogram	To visualize the kidneys, ureters, and bladder	During cystoscopy: catheters are threaded into the ureters to inject the dye backward into the kidneys.	Check for allergy to iodine-based dye, verify BUN and creatinine results; inform provider. Bowel preparation and NPO status may be required.
Cystogram	To visualize the contour of the bladder	Radiographs are taken before and after sodium iodide is instilled into the bladder through a urethral catheter.	Check for allergies to iodine-based dyes. Give a clear liquid breakfast on the day of test. A Foley catheter is usually inserted before the procedure. Patient's bladder may feel very full during the examination, but bladder is drained after the radiographs are taken. Postprocedure, encourage PO fluids for flushing.
Magnetic resonance imaging (MRI)	To detect trauma or tumors in soft tissues	Noninvasive imaging uses a powerful magnetic field to scan radiowave frequencies and form 3D images. Can be done without contrast.	Considered relatively safe. Metal objects are forbidden during the procedure. Pacemakers and implants are contraindicated.
Computed tomography (CT) scan	To determine presence of a cyst, tumor, or renal calculi	A combination of radiologic and computer techniques yields cross-sectional information and indicates the density of tissues.	Contrast medium may or may not be given; check for allergy to iodine. Patient may need to be NPO before examination. Procedure lasts about 30 min; patient must remain quiet and cooperative.
Renal ultrasonography	To show size, shape, and location of kidneys, ureters, and bladder and obstructions to flow	A handheld transducer is passed over the skin, and high-frequency sound waves create visual images of the structures.	Patient may be asked to drink fluid to fill bladder before sonogram; other laboratories may require NPO for 8–12 hr before the procedure. Test takes approximately 30 min.
Renal angiography	To assess renal arterial system function and identify areas of obstruction to blood flow	Under local anesthesia, a catheter is threaded through the femoral artery and up the aorta to the renal artery, and a contrast agent is injected. Fluoroscopy is conducted during the injection to observe for filling of blood vessels. Angiography is performed to detect complications in a transplanted kidney, to evaluate a mass, or to check the extent of kidney trauma.	Requires a signed permission form. Check for allergy to iodine-based dye. Bowel preparation or NPO status for 6–8 hr may be ordered. Postprocedure care includes direct pressure applied to the puncture site for 20 min, followed by a pressure dressing and additional mechanical pressure. Patient remains flat in bed for 4–12 hr or more. Vital signs and popliteal and pedal pulses are checked q15min for the first hour and q2–4h, as ordered, for signs of bleeding or shock.
Radionuclide renal scan	To detect perfusion and function; can detect abnormal areas of kidney tissue (e.g., tumors or cysts)	A radioisotope is injected into the blood, and a scintillation scanner is passed over the area of the kidney. This yields a pattern of isotope uptake. Procedure may take 1–4 hr to complete.	Explain that low-dose radiation is used and is quickly eliminated from the body, and that the procedure is not painful, but patient must lie very still. There are no dietary restrictions, but the patient should drink 2–3 glasses of water before the test.
Endoscopy			
Cystoscopy	To examine the interior of the bladder	Under short-acting or local anesthesia, a cystoscope is passed up the urethra into the bladder. The scope can be guided into a ureter to extract a stone or to biopsy lesions in the bladder.	Requires a signed permission form. Patient is usually NPO for several hours before the procedure. Give preoperative medication as prescribed. Postprocedure: burning, frequency, and pink-tinted urine may occur. Frank bleeding should be reported. Warm sitz baths and mild analgesics are given for voiding discomfort.
Urodynamics			
Cystometry (CMG)	To measure bladder capacity, pressures, and sensations	A urinary catheter is inserted and attached to a cystometer. Fluid is instilled, and the patient reports when the need to void is first noted, then mild urgency, and finally when bladder feels very full. Readings of bladder capacity and pressure are recorded and plotted.	Sterile technique must be used for catheter insertion and bladder fluid instillation. The patient is monitored for signs of postprocedure infection.
Urethral pressure study	To determine urethral pressure needed to maintain urinary continence	A catheter with pressure-sensing capabilities is inserted into the bladder. As the catheter is withdrawn, the varying pressures of the smooth muscle of the urethra are	Sterile technique must be used for catheter insertion. The patient is monitored for signs of postprocedure infection.

		recorded.	
Electromyography of the perineal muscles	To evaluate the quality of the voluntary muscles used in voiding	Electrodes are placed either in the rectum or the urethra to measure contraction and relaxation of the muscles involved in voiding.	Inform the patient that there is mild discomfort during electrode placement and nerve conduction testing. Analgesics may be given before or after the procedure to relieve discomfort.
Miscellaneous			
Bladder scan	Noninvasive method to measure postvoid residual volume or urinary retention	Portable handheld scanner uses ultrasound to create an image and calculate bladder volume. Can be done at the bedside.	Clean the probe. Palpate for the symphysis pubis and apply gel about 1 inch above. Ensure that the probe makes good contact with the gel-covered skin. Point the probe toward the coccyx. Press the scan button for the bladder volume readout.

CBC, Complete blood count; *NPO*, nothing by mouth; *PO*, by mouth, orally; *PRN*, as needed; *RBC*, red blood cell; *UTI*, urinary tract infection; *WBC*, white blood cell.

❖ Nursing Management

■ Assessment (Data Collection)

History and Present Illness

At the time of admission, obtain a personal history of previous disorders of the urinary tract such as frequent urinary tract infections (UTIs), illness or injury to any system, or problems that required surgery. A family history of diabetes, cardiovascular disease, or kidney stones is relevant to an assessment of kidney function.

Many substances can be toxic to the kidneys (**nephrotoxic**); obtain a patient history that includes use of prescription or over-the-counter drugs or illicit substances and any occupational exposure to hazardous materials. The complete drug history should be communicated to all health care professionals and conveyed if the patient is transferred to another facility; on discharge, the patient should receive a copy of the information in accordance with National Patient Safety Goals.

▣ Clinical Cues

If the patient appears hesitant to disclose illicit drug use, use a matter-of-fact approach and explain that the information is important because of potential drug–drug interactions and adverse effects on organs such as the kidneys, heart, or liver.

▣ Focused Assessment

Data Collection for the Urinary System

Ask the following questions when assessing a patient with a urologic problem:

- Do you or your family have a history of hypertension, cardiovascular disease, diabetes, kidney stones, frequent urinary tract infections, or other kidney problems?
- Have you ever had genital herpes or another sexually transmittable infection?
- Do you have any pain when urinating? Any abdominal or flank pain?
- Do you have any difficulty in starting the stream of urine?
- Do you feel as though you empty your bladder completely when you urinate?
- Have you noticed any change in the appearance or smell of your urine?
- Have you needed to empty your bladder more frequently than usual?
- Have you been experiencing any urgency, accompanied by dribbling or leaking urine?
- How many times do you need to get up at night to urinate? (Once a night is average.)

- Have you had any episodes of urinary incontinence?
- Has there been a change in urinary output, in voiding pattern, or in the characteristics of the urine?
- Do you have pain or discomfort in the bladder or kidney areas?
- Have you ever noticed blood in your urine (other than when menstruating [for women])?
- Do you have any problem with sexual dysfunction?
- Are you experiencing excessive fatigue?
- Have you noticed any itching of the skin?
- How much fluid do you drink in a day?

Clinical Cues

Collecting information about sexual health, sexually transmittable infections, and other genital and reproductive disorders is important, because these may be a source of infection or blockage. You may find that it will be easier for you and the patient to talk about these issues toward the end of the interview, after a sense of rapport has been established.

Physical Assessment

Perform a general physical assessment, including a complete set of vital signs and a baseline weight. Observe for signs of generalized or facial edema. Gently palpate the abdomen and the bladder for distention or tenderness. Visually inspect the external genitalia, particularly if there are complaints of pain, discharge, bleeding, or prolapse or if there is an indwelling or recently removed catheter.

Focused Assessment

Physical examination should include the following:

- Inspect the abdomen for any visible abnormalities.
- Palpate all four quadrants for areas of tenderness.
- Palpate above the pubic bone for evidence of bladder distention.
- Inspect genitals as appropriate (e.g., reports of bleeding, discharge, presence of or recent discontinuation of indwelling catheter).
- Examine the urine for color, clarity, volume, and smell.

Nursing responsibilities in the daily assessment of urinary function include (1) measuring intake and output; (2) evaluating abnormal flow of urine; (3) noting the character of urine (i.e., color, odor, clarity); (4) noticing changes in the pattern of voiding; and (5) assessing pain and discomfort.

Documentation includes objective observations of amount and characteristics of urine and the patient's subjective reports of pain, discomfort, and abnormalities.

Characteristics of urine. The color of urine can give helpful information about the status of the patient and the functioning of the kidneys. [Table 33-3](#) lists color variations in urine and the significance of abnormal coloration.

Table 33-3

Common Causes of Variations in Color of Urine

COLOR	MEDICATION	OTHER CAUSES
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Colorless or pale yellow	Diuretics	Dilute urine because of diabetes insipidus, diabetes mellitus, overhydration, chronic renal disease, nervousness, alcohol
Bright yellow	Riboflavin (multiple vitamins)	None
Dark amber to orange	Phenazopyridine HCl (Pyridium) Nitrofurantoin (Macrodantin) Sulfasalazine (Azulfidine) Thiamine (multiple vitamins)	Concentrated urine because of dehydration or increased metabolic state (e.g., fever) Urobilinogen (a by-product of bilirubin normally excreted through stool and urine) Bilirubin (a component of bile normally metabolized and excreted via stool and urine) Foods: excessive carrots
Pink to red	Phenothiazines (e.g., Compazine) Docusate calcium (Surfak) Phenolphthalein (Doxidan) (in alkaline urine) Phenytoin (Dilantin) Rifampin Cascara (in alkaline urine) Senna (Senokot)	Fresh red blood cells Menstrual contamination Myoglobin (a by-product of excessive exercise or skeletal tissue damage) Porphyria (porphyria is a hereditary metabolic disorder) Foods: beets, blackberries, red food dyes
Brown	Cascara (in acid urine) Metronidazole (Flagyl) (if left standing) Phenothiazines (e.g., Compazine)	Extremely concentrated urine because of dehydration or increased metabolic state Red blood cells (old blood) Bilirubin Urobilinogen Myoglobin Porphyria
Blue or green	Triamterene (Dyrenium) Amitriptyline (Elavil) Methylene blue	Bilirubin Biliverdin (a blue-green pigment that occurs in bile) Pseudomonas infection
Dark brown to black	Nitrofurantoin (Macrodantin) Iron preparations (if left standing) Levodopa (if left standing) Methocarbamol (if left standing) Quinine Senna (X-Prep, Senokot) Methyldopa (Aldomet)	Melanotic tumors Addison disease Porphyria Red blood cells (old blood)

Another characteristic that should be noted is **odor**. Normal urine develops an ammonia-like odor after it has stood for a length of time, but this odor should not be present in freshly voided urine. A foul smell may indicate infection. Acetone in the urine, which occurs during metabolic acidosis, causes it to have a sweet, fruity odor. Various supplements can affect urine odor, as can asparagus.

Hematuria means blood in the urine. Microscopic hematuria occurs when blood in the urine is not visible to the naked eye. Gross hematuria is a sign of bleeding from some point in the urinary tract. Red blood in the urine is not easily missed, but if the blood has been in the bladder or kidney for a long time, it will deteriorate and cause the urine to be a smoky gray or dark brown. If the blood is noticed as soon as voiding starts, it is likely that the blood is from somewhere in the urethra. If it is noticed at the end of urination, the site probably is near the neck of the bladder. Bleeding throughout voiding indicates that the blood is coming from a site above the neck of the bladder, because the blood has been well mixed with the urine in the bladder.

Proteinuria is the abnormal presence of protein in the urine. Proteins are too large to pass through the structure of the glomerular membrane; therefore presence of protein is suggestive of damage to the membrane that occurs in renal disease, such as nephrotic syndrome or glomerulonephritis. Proteinuria is also seen in other conditions such as preeclampsia, multiple myeloma, and diabetes mellitus (Pagana and Pagana, 2013). Specialized assays are required to detect **microalbuminuria** (presence of albumin in the urine), which is suggestive of **early** kidney disease. This test could be considered essential for those at high risk for renal disease, such as persons with diabetes or hypertension. **Pneumaturia** means gas in the urine. This can occur if there is a fistula (abnormal passage) between the bladder and the bowel or vagina.

Changes in voiding pattern. Ask about or observe urinary frequency during the day and night. Other alterations include the size and force of the urinary stream, feeling of fullness even after voiding, and change in the amount urinated each time. Increased frequency can be a manifestation of some abnormality in the urinary drainage system, particularly in the bladder and urethra. The frequency with which a person feels the urge to urinate can be related to psychological as well as physiologic factors. Excitement, anxiety, and fear can produce increased frequency of urination. Caffeine and other diuretics found in foods and drinks and an increased intake of fluid can increase the number of times a person must urinate. Pathologic conditions that can cause increased frequency include inflammation of the bladder (cystitis) or urethra (urethritis).

Patient Teaching

Urgency can be symptomatic of inflammation. *Urgency* refers to an almost uncontrollable desire to void. Incontinence sometimes occurs because the patient is not able to get to a toilet quickly enough after the urge to urinate occurs. Box 33-2 defines terminology related to changes in urine output and flow.

Box 33-2

Terminology Related to Urine Output and Flow

- **Anuria:** Absence of urine. This rarely occurs but may be associated with acute renal failure.
- **Oliguria:** Diminished or abnormally decreased flow of urine; may result from dehydration, renal failure, or obstruction.
- **Polyuria:** Abnormally high and dilute urine output; the result of excessive solutes and increased excretion of water. Possible causes include hypercalcemia, diabetes insipidus, uncontrolled diabetes mellitus, and increased fluid intake.
- **Nocturia:** Urination that occurs during the night; may be related to the decreased ability of the aging kidney to concentrate urine.
- **Urinary frequency:** Voiding more often than every 2 hours. This can be the result of inflammation, decreased bladder capacity, psychological disorders, pregnancy, or increased fluid intake.
- **Urinary hesitancy:** A delay in starting the stream of urine; may be related to partial obstruction.
- **Urinary retention:** Retaining or holding urine in the bladder; various causes include neurologic, psychological, medication, obstruction, or anesthesia.
- **Residual urine:** That which is left in the bladder after voiding; related to poor muscle tone or partial obstruction.

Pain and discomfort. In general, the locations in which the patient with a urinary problem is most likely to experience discomfort are either the bladder area or the region over the kidney.

Bladder pain can be caused by the stretching of an overfull bladder. Assessment of the size and location of the bladder is indicated when a patient reports pain in the bladder region. Normally the bladder cannot be felt. If a smooth, rounded mass is felt on palpation in the area above the pubic bone, the bladder is distended. Bladder pain can also be caused by spasms of the bladder musculature as it attempts to empty itself of clots, bits of tissue, and other cellular debris. This can occur postoperatively or when there is moderate to severe inflammation and bleeding in the urinary tract. Relief sometimes can be obtained by irrigating the bladder to remove the clots and debris.

Flank (side and back area of the body below the ribs and above the hips) pain can also be caused by obstruction and distention; in this case the affected organs are the ureters and kidney pelvis. Spasmodic peristaltic contractions along the ureter can be caused by stones, clots, a tumor, inflammatory swelling, or any other condition that prevents the flow of urine from the kidney to the bladder. When evaluating flank pain, note the location and assess for radiation of pain from the kidney or ureter to the genitalia and thigh.

Another kind of discomfort may be painful urination, or dysuria. **Dysuria** usually is caused by inflammation in either the bladder or the urethra. It often is described as burning and can range from mild to severe. Ask the patient when the pain occurs and whether it is felt immediately before, during, or after voiding.

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Think Critically

What characteristics of a fresh urine specimen might indicate an infection? Why should UTIs be treated promptly?

■ Nursing Diagnosis

Problem statements commonly associated with urologic problems and disturbances in urinary flow include the following:

- Altered urinary elimination due to inflammation.
- Fluid volume excess due to inability of kidneys to produce urine.

- Pain due to ureteral spasm, bladder spasm, or inflammation.
- Fatigue due to effect of the accumulation of waste products.
- Insufficient knowledge due to prevention of UTI.
- Fear due to potential cause of hematuria or possibility of malignancy.
- Altered body image due to urinary diversion.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning

Expected outcomes for these problems might be:

- Patient will void spontaneously, with decreased symptoms (e.g., urgency, dysuria, hematuria), within 48 hours after starting antibiotics.
- Patient will have no signs of fluid volume overload (e.g., weight gain, edema, or crackles in lungs) within 2 days.
- Patient will report bladder pain level less than 3/10 during this shift.
- Patient will have adequate energy to independently perform activities of daily living (ADLs) before discharge.
- **Patient will identify four or five ways to prevent recurrent UTIs before leaving the clinic today.**
- Patient will verbalize concerns or fears about signs and symptoms (e.g., hematuria) during this shift.
- Patient will demonstrate acceptance of stoma as evidenced by looking at stoma and handling ostomy equipment within 1 week.

Planning care for a patient with a disorder of the urologic system involves considering the effect of the disorder on the other body systems. **Fatigue and irritability are common when kidney function is impaired because of the buildup of waste products in the body and their effect on body cells.** In addition, educate the patient and the family to maximize participation in treatment goals and prevent complications. General nursing goals for addressing urologic disorders include:

- Absence of infection
- Absence of pain
- Restoration of normal urinary output
- Return to normal fluid balance
- Assimilation of knowledge for appropriate self-care
- Promoting resolution of body image disturbance
- Prevention of complications

■ Implementation

Caring for patients with urologic problems includes monitoring intake and output, body weight, and signs of edema. Monitoring the drug combinations for potential nephrotoxicity and for possible urinary retention is also very important.

You must use strict aseptic technique when catheterizing patients, emptying drainage bags, handling drainage tubes and stents, and performing peritoneal dialysis or hemodialysis.

Care of Urinary Catheters

The catheter should be fastened to the upper leg with tape or a catheter-securing device ([Figure 33-5](#)). Connecting tubing should be positioned so that there is no pulling on the catheter when the patient turns, moves in bed, or arises to ambulate; this prevents pulling on the balloon that holds the catheter in place, which would cause tissue irritation and predispose to infection. Irrigation of the bladder is not recommended unless there is an obstruction or a special solution needs to be instilled. Irrigation can be done with a closed system or by opening the indwelling catheter system. If open irrigation is performed, strict asepsis must be maintained ([Perry et al, 2012](#)). See [Table 34-3](#) for common urinary catheters and tubes used for urologic disorders. [Box 33-3](#) reviews principles of catheter care.

Legal and Ethical Considerations

Urinary catheters are one of the common causes of health care-associated infection. In 2011 there were 93,300 UTIs in hospitalized patients, and 75% of those were catheter related ([Centers for Disease Control and Prevention, 2014](#)). Alternatives to catheterization should always be considered to prevent infection, and the care should be carefully documented. When a patient dies of a health care-associated infection, the death is investigated to determine how the infection developed and contributed to the death of the patient. The purpose of the investigation is to prevent future incidents.

Clinical Cues

You can collect a urine specimen from a new drainage bag immediately after the catheter is inserted. If the catheter has been in place for several hours or days, you should not take the specimen from the drainage bag, because the urine specimen must be fresh. The tube must temporarily be clamped, and the specimen must be drawn from the upper port. Do not forget to unclamp the tube after you have obtained the specimen.

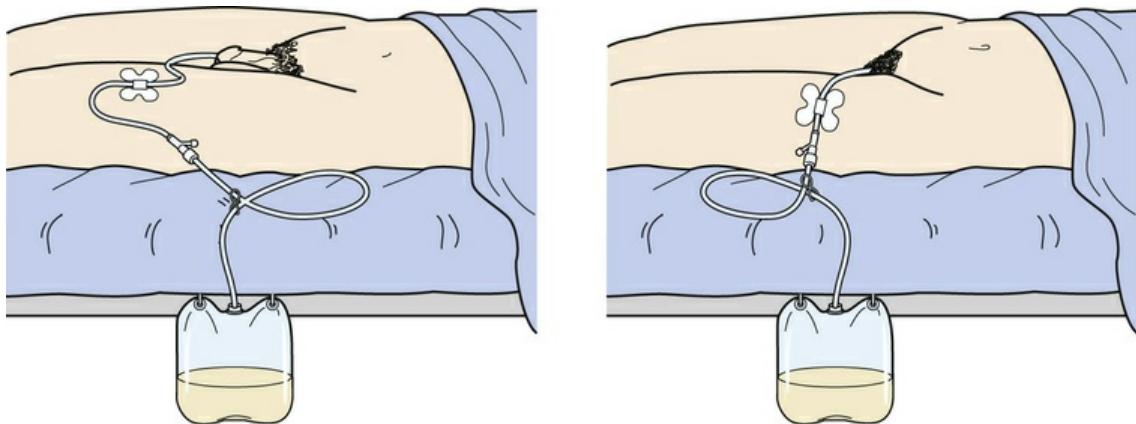


FIGURE 33-5 Catheter tubing attached to a collection bag and secured to the thigh.

Box 33-3

Principles of Urinary Catheter and Tube Care

- Use aseptic technique and gentle handling when caring for any urinary drainage tube.
- Insert urethral catheters using sterile technique.
- Do not open a urinary drainage system unless there is no alternative (e.g., the drainage bag must be changed for some reason).
- Empty the drainage bag by opening the drainage port at the bottom of the bag; use aseptic technique and do not allow the drainage tube to touch the collection container. After reclamping the tube, wipe away residual urine from the tube with an antiseptic swab before securing it.
- Use patient's individual collection container for draining the urine storage bag.
- Observe all tubes and level of drainage in the collection bag each time the patient is seen.
- Keep the drainage bag below the level of the catheter or insertion site (indwelling catheter drainage bags should have a backflow valve, but keeping the bag lower prevents backflow). If the bag must be raised above the insertion site, clamp off the tube briefly while repositioning the patient.

- Perform perineal care at least twice daily, cleaning the urinary meatus and catheter with soap and water; rinse well, just as the area would be cleansed if the patient were bathing normally (see agency's policy).
- Keep an intake and output record to help monitor kidney function.
- Encourage fluids of 3000 mL/day unless contraindicated.
- When irrigating, use the correct amount of sterile solution (according to agency policy, or the amount of solution determined by provider's order for nephrostomy tubes, ureteral tubes, or catheters).
- Use a steady, gentle stream to irrigate. Avoid exerting pressure that may traumatize or cause discomfort.
- Do not pull back forcefully on an irrigating syringe attached to a urinary catheter or tube; this creates negative pressure that may damage delicate tissues or collapse the tube.
- When discontinuing an indwelling catheter, never cut the catheter. Use a syringe to deflate the balloon.

Measuring Intake and Output

The quantity of fluids entering the body, by whatever route, has a direct bearing on fluid balance (see [Chapter 3](#)). Patients with urologic disorders are very likely to suffer fluid imbalances, and therefore their intake and output should be measured and the totals recorded every 8 hours during hospitalization or acute illness. In critically ill patients, the urinary output is typically measured hourly. **Urine output should be at least 30 mL/hr. For total output, measure all urine excreted, drainage from all tubes, any emesis, and watery stools.** An estimate of the amount of fluid lost through perspiration should also be considered if perspiration is excessive (e.g., sweating with fever). Any fluid used to irrigate catheters and tubing must be measured, and the amount should be added to the total intake and subsequent output.

■ Evaluation

Compare intake and output data over time to determine clinical improvement or the presence of problems. The frequency of comparison will be hour-to-hour for critical patients or over a period of days for patients with chronic conditions. Laboratory data, such as BUN, creatinine, potassium, and urinalysis results, provide further information to evaluate the effectiveness of treatment. A decrease in subjective symptoms, such as flank pain or dysuria, also indicates resolution of the problem.

Common Urologic Problems

Urinary Incontinence

Etiology

In the United States 65 million adults experience transient or chronic incontinence; 75% of those people are women (Markland et al, 2011). On average women wait 6.5 years to obtain a diagnosis. Men are more reluctant to talk about the problem or seek help. An estimated 53% of homebound older persons are incontinent. A large percentage of the residents in nursing homes are incontinent, and it is the leading cause of admission to a long-term care facility (National Association for Continence, 2014). Women who have had several children may have anatomic changes that make incontinence more likely. Men may experience the problem because of an enlarged prostate. Other contributing factors include spinal cord injury, neurologic disorder (e.g., dementia), or functional disorder (e.g., difficulty manipulating clothing fasteners).

When incontinence is occurring, the first step is to identify factors that may be contributing to the problem. Immobility; UTI; atrophic urethritis or vaginitis associated with menopause; stool impaction; prostate surgery; delirium or confusion; endocrine problems; and various types of medication, such as alpha-adrenergic agents, beta-adrenergic agonists, and calcium channel blockers, may contribute to the problem of incontinence. Obesity also is a factor, because it causes increased pressure on the bladder.

Pathophysiology

Urine flow out of the bladder is controlled by two circular muscles called *sphincters*. The internal sphincter lies close to the lowermost part of the bladder, and the external sphincter surrounds the urethra. Many factors can cause loss of sphincter control. Unconsciousness, UTI, paralysis, interference with nerve transmission to and from the brain, and loss of muscle tone of the bladder and sphincters are some of the common causes of incontinence.

Signs and Symptoms

There are several types of incontinence: urge, stress, mixed, overflow, functional, or incontinence caused by neurologic dysfunction. **Urge incontinence** is the involuntary loss of urine when there is a strong urge to urinate (urinary urgency). **Stress incontinence** occurs when the urethral sphincter fails and there is an increase in intra-abdominal pressure, caused by such things as sneezing, laughing, coughing, or aerobic exercise. **Mixed incontinence** is a combination of different types, such as stress and urge incontinence. **Overflow incontinence** occurs when there is poor contractility of the detrusor muscle or obstruction of the urethra, as in prostate hypertrophy in the male or genital prolapse in the female. **Functional incontinence** is caused by cognitive inability to recognize the urge to urinate or a self-care deficit caused by extreme depression. Inability to reach the bathroom because of restraints, side rails, or an out-of-reach walker can also result in functional incontinence. **Neurologic incontinence** is caused by disorders of the neurologic system (e.g., multiple sclerosis or spinal cord injury).

Diagnosis

Diagnosis of incontinence is based on a careful history, and the patient must be able to report symptoms accurately (Table 33-4). The patient may be asked to keep a bladder diary. Routine urinalysis is also performed. When conservative measures do not improve continence, the provider may choose to evaluate the condition with a series of diagnostic tests, including measuring the postvoid residual volume, stress testing, urodynamic studies, cystogram, or cystoscopy.

Table 33-4

Common Problem Statements, Expected Outcomes, and Nursing Interventions for Patients With Incontinence

PROBLEM STATEMENT	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Altered urinary function due to decreased muscular strength and fine motor coordination.	Patient will be able to physically get to the toilet (or commode chair) and accomplish toileting (i.e., undo clothing and sit on toilet) with assistance during this shift.	Assess abilities to stand, walk, and sit. Instruct patient to call for help when needing to go to the toilet. Offer assistance q2-4h.

		Obtain bedside commode as needed. Suggest clothing with elastic waistband or Velcro fasteners to eliminate zippers and buttons. Encourage independence, as appropriate (consider strength and motor ability).
Altered urinary function due to weak pelvic muscles.	Patient will increase control over incontinence within 8-12 wk.	Assess pattern of incontinence and identify actions associated with incontinence (e.g., laughing, coughing). Teach Kegel exercises. Teach to avoid bladder irritants such as coffee, nicotine. Refer to nutritionist for weight loss diet if overweight. Discuss use of incontinence pads or undergarments. Supply information about vaginal cone therapy.
Altered urinary function due to bladder spasms.	Patient will experience urge to void and be able to get to the toilet in time to prevent loss of urine.	Instruct patient to keep a voiding diary, or observe for incontinence if unable to self-report. Help patient establish a voiding schedule (e.g., q3-4h). Give antispasmodic medications (e.g., tolterodine) as ordered. Teach patient about side effects of medication (e.g., possible urinary retention).
Altered self-care ability for toileting due to impaired cognition.	Patient will participate in a routine toileting schedule during hospitalization.	Assess cognitive deficits related to toileting (e.g., unable to remember to go to toilet; senses urge to go, but cannot find the toilet). Observe for odors, stains, or wetness on clothing and linens. Assist (or remind) patient to go to the toilet q2-3h. Provide visual cues to prompt toileting (e.g., commode chair at bedside, large arrows pointing toward bathroom, picture of toilet on the bathroom door). Give positive feedback for efforts.
Potential for altered skin integrity due to moisture and irritation of urine on skin.	Patient's skin will remain dry and intact without breakdown during hospitalization.	Assess for patterns of urinary incontinence (e.g., if patient cannot self-report, check q2-3h). Give fluids primarily during the day and space fluids (e.g., q2-3h) for predictability of voiding. Provide (or assist) with skin care (e.g., clean with mild soap and warm water; use skin barrier creams). Consult with enterostomal therapist (ET nurse) as needed (skin breakdown is progressive). Turn q2h if patient is bedridden or immobile. Ensure adequate nutrition for healing and skin integrity (e.g., high-quality proteins).
Disrupted sleep pattern due to nocturia.	Patient will rest and sleep at least 6 consecutive hr each night during hospitalization.	Assess for medication (e.g., calcium channel blockers) side effects that may be contributing to incontinence. Teach patients to avoid taking fluids in late evening hours. Assist (or instruct patient) to ambulate for at least 10 min 1-2 hr before bedtime, then instruct to void before going to bed. Use incontinence pads or undergarments for women and condom catheters for men during the night.
Insufficient knowledge regarding management of incontinence.	Patient will verbalize two or three methods to manage incontinence before leaving the clinic today.	Teach patient about medication side effects (e.g., if on estrogen, patient should report vaginal bleeding or signs of deep vein thrombosis, calf pain, or swelling). Teach Kegel exercises; reinforce that results may take up to 3 mo. Teach bladder training; remind that accidents are expected during training period.
Potential for social isolation due to embarrassment.	Patient will maintain usual social contact with friends and family.	Encourage verbalization of feelings (e.g., shame or embarrassment). Assist patient to identify times, settings, and activities when incontinence may occur (e.g., during exercise). Help patient make a plan to deal with incontinence during social occasions (e.g., use of incontinence briefs, mapping out toilet locations, planning fluid intake around social occasions). Refer to support groups.

Treatment

Evidence-based practice indicates that stress incontinence that occurs with exercise, laughing, or coughing may be corrected by exercises to strengthen the pelvic floor muscles (DuBeau et al, 2010).

Vaginal weight training with a set of five small, cone-shaped weights that are used along with pelvic muscle exercise is another therapeutic option for incontinence. The lightest cone, which has a string attached, is inserted into the vagina and held in place by muscle tightening for 15 minutes twice a day. When there is no problem holding this cone in place, the next heaviest cone is used. This continues until the heaviest cone can be held in place for the 15-minute period. Maintaining normal weight and using topical estrogen therapy after menopause also decrease the incidence of this disorder.

Various medications have been found to be helpful in treating incontinence. Table 33-5 provides additional information about selected drugs for urinary incontinence.

Patient Teaching

Kegel Exercises

- To locate the correct muscle, stop the flow of urine while urinating on the toilet by tightening the anus as if preventing a bowel movement.
- Practice for several days each time you urinate. Then begin the exercise program.
- While lying down, slowly count 1-2-3 while tightening the pelvic muscles.
- Release pelvic muscles slowly to the count 1-2-3. Do this 15 times.

- While sitting, repeat this sequence 15 times, tightening pelvic muscles while counting 1-2-3, and then slowly releasing to the count 1-2-3.
- Stand and repeat the sequence 15 times; tighten to the count 1-2-3, and slowly release to the count 1-2-3.
- Do the pelvic muscle exercises once a day. If you can do them twice each day, improvement in continence will occur more quickly.
- Improvement may be noted in 6 to 8 weeks, but may take as long as 3 months.

 **Table 33-5**

Drugs Commonly Used to Treat Urinary Incontinence and Retention

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Urinary antispasmodics, antimuscarinics Oxybutynin (Ditropan), solifenacina (Vesicare), tolterodine (Detrol), trospium (Sanctura), darifenacina (Enablex), fesoterodine (Toviaz)	Used to relieve spasms of the bladder; treats overactive bladder and incontinence	Give mouth care, as needed. Monitor I&O. Auscultate bowel sounds. Side effects include dry mouth, increased heart rate, dizziness, abdominal distension, and constipation.	Increase fiber-containing foods and fluids to prevent constipation. Do not drive if dizzy or drowsy. Use ice chips or hard candy for dry mouth. May need eyedrops to moisten dry eyes.
Bladder stimulant Bethanechol (Urecholine)	Used to treat urinary retention	Monitor for orthostatic hypotension and bradycardia. Give 1-2 hr after meals or with food for GI complaints. May cause diarrhea, cramping, or increased salivation.	Immediately report severe dizziness or difficulty breathing. Rise slowly from a lying to standing position.
Medication for benign prostatic hyperrophy Tamsulosin (Flomax), doxazosin (Cardura), terazosin (Hytrin), alfuzosin (Uroxatral)	Relieves symptoms of urinary retention associated with obstruction from an enlarged prostate	May cause orthostatic hypotension. Side effects include back pain, chest pain, cough, diarrhea, nausea, dizziness, headache, weakness.	May take 6 mo for symptom relief. Do not crush, chew, or open the capsule. Immediately report a prolonged erection.
Tricyclic antidepressants Imipramine (Tofranil), amitriptyline (Elavil)	Reduce overactive bladder contractions; reduce sensory urgency and burning pain of interstitial cystitis	May cause dry mouth, blurred vision, or constipation.	Do not use within 14 days of MAOI drugs; observe for hypotension.

GI, Gastrointestinal; I&O, intake and output; MAOI, monoamine oxidase inhibitor.

Bulking injections into tissue surrounding the urethra are an option. An old assistive device is a pessary, a stiff ring, that is worn in the vagina during the day to support the bladder. A newer treatment for overactive bladder is botulinum toxin type A (Botox) injections in the bladder muscle.

Further treatment options for urinary incontinence include biofeedback therapy or an implanted electrical stimulation device called *InterStim* ([Mayo Clinic, 2015](#)). A clamp-type device across the penile urethra can be used for men, or occlusive devices can be inserted into the vagina or urethra for women; patients or caregivers must be able to apply and remove these devices to prevent tissue damage. Periurethral bulking is a procedure performed under local anesthesia in which collagen is injected into the urethra to increase resistance.

Complementary and Alternative Therapies

Transvaginal Electrical Stimulation

In transvaginal electrical stimulation (TES), the nerves and muscles of the pelvic floor are stimulated by an electrically charged probe. Stimulation must be done in two 15-minute sessions twice a day for 12 weeks ([Seifert, 2012](#)).

Surgeries to correct incontinence.

A variety of procedures may be performed to correct the anatomic position of the bladder, such as bladder neck suspension. These surgeries are most often performed to correct urinary incontinence in women. The **retropubic suspension** (Marshall-Marchetti-Krantz) procedure is performed to correct a cystocele (prolapse of the bladder into the vagina) and urinary incontinence. A low abdominal incision is made, and the urethral position is elevated in relation to the bladder. Urethral and suprapubic catheters are in place for several days postoperatively. For a pupovaginal sling placement, a low transverse incision is used to correct stress incontinence in women. Alternatively a bulking agent can be injected underneath the mucosa of the urethra. An **artificial sphincter implant** is used more commonly to correct incontinence for males than for females. A mechanical device is placed around the urethra to open and close it. After incontinence surgical procedures, monitor for

urinary tract infection and difficulty voiding.

When these measures do not solve the problem, incontinence is managed by intermittent catheterization, indwelling urethral catheterization, a suprapubic catheter, an external collection system (such as condom catheters), protective pads and garments, or pelvic organ support devices such as a pessary.

Clinical Cues

Your patient may develop leaking around the suprapubic catheter. If leaking persists and urine is continuously leaking onto the skin, this could mean that the tube is too small. If the tube has been there a long time, the tissue contours may have changed since the initial insertion. Notify the provider for evaluation.

Nursing Management

Use a gentle and matter-of-fact approach when taking an incontinence history. Evidence-based practice supports the use of protocols or guidelines for screening for urinary incontinence (Dowling-Castronovo and Specht, 2009). The patient experiencing urinary incontinence may be embarrassed by the symptoms, but will likely welcome the help and suggestions. Observe the clothing for stains and odors and perform a general physical assessment that includes palpation of the bladder. Inspect the genitalia if there is reason to suspect a prolapse, or if there is a catheter present or recently removed.

Focused Assessment

Assessment for Urinary Incontinence

- What kinds of problems are you having with your bladder?
- Are you having trouble holding your urine (water)?
- When did the urine leakage problem start?
- How often do you leak urine?
- Are you soiling your clothing or bed linens?
- When do the leaks occur? Does it happen during the day or the night? Both?
- How often do you wear a pad or other protective device?
- What activities or situations are associated with leakage? For example, does laughing, coughing, sneezing, or exercising cause leakage?
- Are you having difficulty getting to the bathroom in time?
- Are there things about your house that are preventing you from getting to the bathroom in time? For example, do you have to climb stairs or walk a long distance?
- Do you have (or need) assistive devices (e.g., handrails) in the bathroom?

Older Adult Care Points

Assess older adults for gross motor strength, fine motor dexterity, and ability to balance and independently ambulate. An older adult may be having trouble walking to the bathroom or sitting on or rising from the toilet seat. In addition, clothing fasteners may be problematic.

When incontinence is not remedied by correcting an underlying cause, attempt to help the patient by setting up a voiding and fluid schedule. Assess when the patient is experiencing incontinence.

Evidence-based practice suggests that a voiding diary is a useful tool for patients who can self-report (Dowling-Castronovo and Specht, 2009). Box 33-4 provides guidelines for establishing a toileting schedule.

Box 33-4

Assisting Patients to Establish a Toileting Schedule

- Assess pattern of incontinence or instruct patient to keep a voiding diary.
- Assist (or remind) patient to go to the toilet at set times (just before the time when incontinence usually occurs).
- Space fluid intake and give most fluids during the day.
- Discourage intake of bladder stimulants, such as alcohol and caffeine.
- Help the patient ambulate at least 10 minutes an hour or two before bedtime, because activity helps to mobilize fluid.
- Apply a condom catheter for males and moisture-proof pants or incontinence pads for women at night; it is not practical to continue a voiding schedule (every 3-4 hours) at night.
- Give positive reinforcement for any small successes.

Toileting assistance can be offered at set times just before incontinence usually occurs. Getting the patient on a voiding schedule takes a great deal of patience and persistence on the part of the nurse and the patient. Accidents will happen during the retraining period, and patients need to be assured that this is expected. (See Chapter 22 for care of patients with incontinence related to spinal cord injury.)

Assignment Considerations

Bladder Training

When planning and implementing a bladder training program for a confused patient who is unable to self-report, there are several ways the nursing assistant (UAP) can provide valuable help. Ask the UAP to record and report any fluids that are offered and consumed and the number of times that clothes, wet bed linens, or incontinence pads need to be changed. Once the schedule is established, direct the UAP to help the patient follow the schedule by assisting her to the toilet at the designated times.

Patients may experience transient incontinence or urinary retention after removal of an indwelling catheter that has been in place for several days. Usually the catheter is clamped for intervals and then opened to drainage before it is removed to help rebuild bladder muscle tone. After this has been done for 12 to 24 hours, the catheter is removed. The patient should then be instructed to void every hour to prevent incontinence. **Any bleeding, dribbling, or incontinence of urine or inability to void within 4 to 6 hours (maximum of 8) after removal of the catheter should be reported to the provider.** It takes time to retrain the bladder to hold greater capacity. Gradually the interval between voidings is lengthened to 2, 3, or 4 hours.

Health Promotion

Drinks and Substances to Avoid

Advise patients that avoiding caffeine, alcohol, carbonated beverages, and aspartame may help bladder control. These substances may stimulate or irritate the bladder.

Urinary Retention

Urinary retention is retaining or holding urine in the bladder. It can be acute after a surgical procedure, after removal of an indwelling catheter, or with certain medications (e.g., atropine), or it may be a chronic condition related to anxiety, neurologic disorders, or obstruction of urine flow through the urethra, as in enlargement of the prostate gland. A straight catheter is used for a single "in-and-out" catheterization for temporary inability to empty the bladder. Also, patients who have permanent paralysis may use intermittent catheterization to empty the bladder.

Urinary retention will not cause the bladder to rupture, but urine will begin to dribble out of the urethra. Retention of urine stretches the bladder walls, causing extreme discomfort. Assess the degree of bladder distention using gentle palpation before and after intervention. Assist the patient by providing privacy and adequate time for voiding efforts. A caffeinated drink, followed by a warm bath, may help. Instruct the patient to double void: void, sit on the toilet for several minutes, and void again. Schedule a trip to the toilet every 3 to 4 hours. Obtain an order for catheterization if other measures do not relieve the problem. A medication for urinary retention is bethanechol (Urecholine). See [Table 33-5](#) for examples of medications that relieve the symptoms produced by benign prostatic hypertrophy (enlarged prostate gland).

Poor bladder tone or partial obstruction of the urethra can result in dribbling of urine or passing only the overflow, leaving the bladder partially full. During bladder retraining, residual urine can be measured by having the patient void as much urine as possible and then performing a bladder scan or immediately inserting a catheter (see [Table 33-2](#)). One hundred milliliters is considered a normal amount of residual urine. Any amount more than this can become stagnant and concentrated over time, predisposing the patient to bladder infection and the formation of stones.

Think Critically

The provider ordered removal of an indwelling catheter. Three hours later the patient complains of bladder fullness with inability to void. What should you do?

Get Ready for the NCLEX® Examination!

Key Points

- The urologic system is responsible for maintaining proper balance of the fluids, minerals, and organic substances necessary for life.
- The nephron is the functional unit of the kidney. It consists of the glomerulus, which is a network of capillaries encased in a thin-walled sac called the Bowman capsule, and the tubular system.
- Kidney function, GFR, bladder capacity, ability to concentrate urine and secrete renin, and aldosterone all decrease with aging.
- Infection, immunologic disorders, metabolic disorders such as diabetes mellitus, and reduced blood flow secondary to shock or atherosclerosis can result in kidney damage.
- Stones, an enlarged prostate, or tumors may obstruct the flow of urine.
- Tubular necrosis affects the functional ability of the kidney. It can result from lack of oxygen or bacterial or chemical destruction of the nephron.
- Hypertension is a major cause of end-stage kidney disease; conversely, renal disorders can also cause secondary hypertension.
- To promote healthy kidneys, advise patients to drink plenty of water, to empty the bladder at regular intervals, to obtain prompt treatment for bladder infection, to practice good hygiene, to maintain normal serum glucose, and to take blood pressure medication as prescribed.
- BUN and serum creatinine are the most common screening tests for kidney function.
- Monitor intake and output, weight, and signs of edema; monitor drugs for nephrotoxic effects.
- Nursing measures for incontinence include assisting in determining and correcting underlying cause, establishing a voiding and fluid schedule, coaching Kegel exercises, giving medications for incontinence as prescribed, and advising to decrease bladder irritants.
- Medications to treat incontinence, urinary retention, and BPH are listed in [Table 33-5](#).
- Many medications can affect the urinary system (see Online Resources).
- Nursing measures for urinary retention include assessing for bladder distention, providing privacy, instructing to double void, and obtaining an order for catheterization as needed.

Additional Learning Resources

evolve Go to your Evolve website (<http://evolve.elsevier.com/deWit/medsurg>) for the following FREE learning resources:

- Animations, audio, and video
- Answers and rationales for questions and activities
- Glossary with pronunciations in English and Spanish
- Interactive Review Questions and more!
 - Online Resources
 - Medications that affect the bladder, www.nafc.org/bladder-bowel-health/types-of-incontinence/urge-incontinence/index.php?page=medications/#MedicationsAffectBladder
 - National Association for Continence (NAFC), www.nafc.org
 - Urinary incontinence, www.mayoclinic.com/health/urinary-incontinence/DS00404
 - Urinary catheters, www.nlm.nih.gov/medlineplus/ency/article/003981.htm

Review Questions for the NCLEX® Examination

1. What information should a nurse give to a community group about prevention of urologic problems?

1. Drinking orange juice every morning prevents urinary tract

infection.

2. Drinking several glasses of fluid a day helps to preserve kidney function.
3. Emptying the bladder prevents prolonged exposure to toxins.
4. Eating spinach, chocolate, or strawberries may cause kidney stones.

NCLEX Client Need: Health Promotion and Maintenance: Health Promotion/Disease Prevention

2. A night shift nurse is planning care for four patients. Which patient is most likely to have nocturia related to a decreased ability to concentrate urine?

1. A patient with a high BUN
2. A pregnant patient
3. An older adult
4. A patient who had a bladder scan

NCLEX Client Need: Safe and Effective Care Environment: Coordinated Care/Establishing Priorities

3. When starting a 24-hour urine collection, what is essential to ensure correct results?

1. Include the first void of the 24-hour period.
2. Record the time of initial void as the start time of the test.
3. Discard the last void of the 24-hour period.
4. Encourage fluid intake before starting the test.

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

4. A patient is scheduled to have a renal biopsy. What is included in the preoperative care for this patient? (*Select all that apply.*)

1. Administer bowel preparation.
2. Report abnormal coagulation studies.
3. Enforce nothing by mouth (NPO) for 6 to 8 hours before the procedure.

4. Check for allergy to contrast media.
5. Insert indwelling urinary catheter.

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

5. A nurse is trying to console an older adult who is embarrassed about wetting the bed. Which patient comment is consistent with functional incontinence?

1. "I knew that I needed to go, but I couldn't get out of bed by myself."
2. "Every time I laugh, cough, or sneeze I pass a little bit of urine."
3. "When I need to pee, I really have to go right away!"
4. "My doctor says that my enlarged prostate is causing the problem."

NCLEX Client Need: Psychosocial Integrity: Therapeutic Communication

6. After placing an indwelling urinary catheter, the nurse performs several interventions. Place the interventions in order of priority.

1. Secure the drainage bag below the level of the bladder so that it hangs freely.
2. Secure the catheter to the patient's leg.
3. Check that the catheter tubing is unimpeded and is looped above the drainage bag.
4. Use aseptic technique when emptying the drainage bag.
5. Observe the amount of urine drainage in the bag whenever in the patient's room.

NCLEX Client Need: Safe and Effective Care Environment: Establishing Priorities

7. What is the first action that the nurse should take to assist a patient to develop a toileting schedule?

1. Encourage use of condom catheters or incontinence pads
2. Assess pattern of incontinence
3. Schedule trips to the bathroom

4. Provide positive reinforcement for small successes

NCLEX Client Need: Safe and Effective Care Environment: Coordinated Care/Establishing Priorities

8. When writing a nursing care plan for a patient with stress incontinence, what interventions should the nurse include? (*Select all that apply.*)

1. Instruct patient to keep a voiding diary.
2. Teach patient Kegel exercises.
3. Offer patient assistance every 3 to 4 hours.
4. Obtain bedside commode as needed.
5. Teach patient to avoid bladder irritants, such as coffee and nicotine.

NCLEX Client Need: Safe and Effective Care Environment: Establishing Priorities

9. In determining the presence of stress urinary incontinence, what signs are characteristic?

1. Involuntary loss of urine when the urge to urinate occurs
2. Discomfort and burning frequently when urinating
3. Inability to recognize the urge to urinate because of cognitive impairment
4. Loss of urine when coughing, sneezing, or laughing or during aerobic exercise

NCLEX Client Need: Physiological Integrity: Physiological Adaptation/Alterations in Body Systems

10. Fesoterodine (Toviaz) prescribed for a patient with urinary urgency must be administered very cautiously if the patient already has _____.

NCLEX Client Need: Pharmacological Therapies: Medication Administration

Critical Thinking Questions

Scenario A

Mr. Jones, 65 years old, has a history of difficulty passing urine. The provider orders placement of a retention catheter. You attempt to insert a 14-Fr Foley catheter, but you meet resistance and the catheter will not pass. The patient reports an uncomfortable sensation in his genital area during the attempt.

1. What is your initial action?

2. Based on your knowledge of pathophysiology, what would you suspect is preventing the passage of the catheter?
3. Why is it important to keep the drainage bag below the level of the bladder once the catheter has been successfully inserted?
4. How would you perform daily catheter care for Mr. Jones?
5. Discuss four or five general principles that you would use while caring for Mr. Jones's catheter.
6. Which tasks would be appropriate to delegate to UAP? Select all that apply and give a rationale.
 - a. Gathering the equipment for the catheterization procedure
 - b. Inserting the Foley catheter
 - c. Emptying the drainage bag at the end of the shift
 - d. Checking the urinary meatus for complaints of bleeding

Scenario B

Mrs. Russlyn, a 56-year-old woman, reports that she has to run to the restroom quickly when she feels the need to urinate. She makes a joke about needing to be close to a restroom when in public.

1. What type of incontinence is associated with losing urine when feeling the need to urinate?
2. What questions will you ask to collect additional data about Mrs. Russlyn's incontinence?
3. What kinds of treatment options are likely to be recommended for Mrs. Russlyn?

Scenario C

You are working in a long-term care facility and caring for Mrs. Mendez, an 86-year-old with Alzheimer disease. She has developed urinary incontinence.

1. What factors might be contributing to your patient's incontinence?
2. Explain how to develop a toileting and fluid intake schedule for Mrs. Mendez.

CHAPTER 34

Care of Patients With Disorders of the Urinary System

Objectives

Theory

1. Examine the signs and symptoms of selected urologic inflammatory disorders (e.g., cystitis, urethritis, and pyelonephritis) and nursing interventions for these patients.
2. Explain nursing management for patients with acute or chronic glomerulonephritis.
3. Analyze types of patient conditions that create a risk for acute renal failure.
4. Compare the needs of patients on long-term hemodialysis with patients who use peritoneal dialysis.
5. Present the benefits and special problems associated with kidney transplantation.

Clinical Practice

6. Provide postoperative nursing care of patients after surgery of the kidney.
7. Select specific nursing responsibilities for the care of patients with kidney stones.
8. Provide postoperative nursing care of patients after surgery for urinary diversion.
9. Perform interventions to increase patient compliance in the treatment of chronic kidney failure.
10. Devise a nursing care plan for a home-care patient with renal failure.

KEY TERMS

acute renal failure (ă-KŪT RĒ-năl FĀL-yür, p. 796)

anuria (ă-NŪ-rē-ă, p. 791)

azotemia (ă-zō-TĒ-mē-ă, p. 804)

chronic renal failure (CRF) (KRŌN-īk, p. 803)

cystitis (sīs-Tī-tīs, p. 787)

end-stage renal disease (ESRD) (ĒND-stāj RĒ-năl dī-ZĒZ)(p. 800)

glomerulonephritis (glō-mĕr-ū-lō-ně-FRĪ-tīs, p. 791)

hemodialysis (hē-mō-dī-ĀL-ī-sīs, p. 802)

hydronephrosis (hī-drō-ně-FRŌ-sīs, p. 792)

lithiasis (līth-ī-ă-sīs, p. 793)

lithotripsy (LĪTH-ō-trīp-sē, p. 795)

nephrectomy (něf-RÖK-tō-mē, p. 792)

nephrostomy (ně-FRŌS-tō-mē, p. 792)

nephrotic syndrome (něf-RÖ-tīk SĪN-drōm, p. 792)

oliguria (öl-ī-GŪ-rē-ă, p. 791)

peritoneal dialysis (pě-rí-tō-NĒ-ăl dī-ĀL-ĭ-sĭs, p. 802)

pyelonephritis (pī-ă-lō-ně-FRĪ-tīs, p. 790)

renal stenosis (RĒ-năl stē-NŌ-sĭs, p. 793)

uremia (ū-RĒ-mē-ă, p. 804)

uremic syndrome (ū-RĒ-mik SĬN-drōm, p. 804)

urethritis (ū-rě-THRĪ-tīs, p. 787)

urinary diversion (ūr-ĕ-NĀ-rē dī-VŌR-shūn, p. 797)

The kidneys play a role in maintaining fluid balance, regulating the electrochemical composition of body fluids, providing protection against acid-base imbalance, forming red blood cells, regulating calcium levels, and eliminating waste products. The kidneys also help to control blood pressure, in conjunction with the endocrine system. Circulatory disorders, metabolic disorders such as diabetes mellitus, immunologic disorders, obstruction, bacterial infections, or toxic substances can all cause kidney dysfunction.

Inflammatory Disorders of the Urinary Tract

Cystitis

Etiology and Pathophysiology

Cystitis is an inflammation of the urinary bladder. It is one of the most common urinary tract infections (UTIs) in women because the female urethra is shorter and the urinary meatus is exposed to contamination from the vagina and anus. The *Escherichia coli* bacterium normally resides in the intestinal tract as a nonpathogenic microorganism; it accounts for about 80% of all UTIs in females.

Cystitis and **urethritis** (inflammation of the urethra) are common in women after they have become sexually active. *Honeymoon cystitis* is a term sometimes used to refer to bacteria that have entered the urethra by way of friction during intercourse. In older women, the incidence of cystitis and urethritis increases as the decreased muscle tone in the urinary tract prevents complete emptying of the bladder. Urine that sits in the bladder (urinary stasis) provides a good medium for bacterial growth. The estrogen depletion that occurs with aging results in structural atrophy and urinary dysfunction.

In addition, many older adults purposely restrict fluid intake to decrease the incidence of incontinence, and the thirst sensation is often reduced in older adults (“[Provision of Adequate Hydration](#),” 2014).

Older Adult Care Points

In older adult women, the urethra sometimes becomes displaced because of decreased muscle tone and atrophy of surrounding tissues and opens into the vaginal outlet. This increases the risk for infection.

Others restrict fluids to help control heart failure, renal failure, or other disorders that cause fluid retention. Restricting fluid intake decreases urine flow and makes the person more susceptible to urinary tract infection.

Signs, Symptoms, and Diagnosis

The most common symptoms of cystitis are **painful urination, frequent and urgent urination, and low back pain**. The urinary meatus may appear swollen and inflamed. Cystitis has a tendency to recur, producing less-acute symptoms such as fatigue, anorexia, and a constant feeling of pressure in the bladder region between flare-ups. The urine may appear cloudy or even bloody and have a foul smell. Urinalysis and urine cultures are used to establish a definite diagnosis and to identify the specific causative organism.

Older Adult Care Points

Confusion may be one of the first signs of cystitis or UTI in older adults. If a patient who is normally alert becomes confused, assess the urine for cloudiness, foul odor, or hematuria (blood in the urine), and check for signs of infection (fever, increased white blood cell [WBC] count).

Treatment and Nursing Management

Treatment and nursing care of cystitis and urethritis (see description of urethritis on p. 787) are similar. First, specimens are collected for tests to identify the causative organism: urinalysis, urine culture and sensitivity, smear and Gram stain, or culture of the discharge. Specific antibiotics, such as trimethoprim-sulfamethoxazole (Bactrim), are used to combat infection and are combined with urinary analgesics such as phenazopyridine (Pyridium) to relieve discomfort.

Postmenopausal women may benefit from topical estrogen. [Table 34-1](#) shows the most commonly used drugs and their nursing implications. The patient is encouraged to drink large amounts of fluids (eight to twelve 8-oz glasses unless contraindicated) to flush the bladder and to continue the habit once the acute symptoms subside. Evidence-based practice indicates that cranberry-based products, which alter urine pH, also have been used to prevent or treat urinary tract infections.

(Jepson and Craig, 2012). Measures to relieve the discomfort include sitz baths and hot water bottles on the back or directly over the bladder region.

Patient Teaching

Preventing Urinary Tract Infections

The patient should be taught the following to prevent recurrence of urinary tract infections:

- Always wipe the anal area from front to back after a bowel movement.
- Avoid wearing nylon pantyhose, tight slacks, or any clothing that increases perineal moisture.
- Do not wash underclothing in strong detergents or bleaches; rinse clothing repeatedly until water is clear.
- Change wet bathing suits or wet clothing as soon as possible.
- Wear white cotton underwear or with cotton crotch.
- Showering may be preferable over bathing for women.
- Do not use bubble bath, perfumed soap, feminine hygiene sprays, or over-the-counter vaginal douche products.
- Prolonged bicycling, motorcycling, horseback riding, or travel involving prolonged sitting can contribute to urethritis and cystitis.
- Drink at least eight full glasses of water each day.
- Do not ignore vaginal discharge or other signs of vaginal infection. *Candida* and *Trichomonas* infections should be treated promptly to prevent their spread to the bladder.
- Empty the bladder (urinate) promptly after sexual intercourse and drink two glasses of water to help flush out microorganisms from the urethra and bladder.

Complementary and Alternative Therapies

Vitamin C and German Chamomile

Vitamin C can help acidify the urine and decrease the frequency of cystitis. German chamomile is used topically for its anti-inflammatory and antibiotic properties to soothe the inflamed genital area.

Table 34-1

Drugs Commonly Used for Urinary Tract Infections

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING	
Sulfonamides	Trimethoprim-sulfamethoxazole (Bactrim, Septra) Sulfisoxazole (Gantrisin) Sulfamethoxazole (Gantanol)	Active against gram-negative and gram-positive organisms Assess for allergies to sulfonamides. Record I&O. Fluid intake is a minimum of 3000 mL daily. Monitor laboratory results and symptoms related to anemia, blood dyscrasias, and renal dysfunction (e.g., hemoglobin, hematocrit, WBCs, BUN).	Drink at least 12 large glasses of water each day to prevent crystallization of urine. Immediately report rash, abdominal pain, blood in urine, confusion, difficulty breathing, or fever.	
Fluoroquinolones	Ciprofloxacin (Cipro) Levofloxacin (Levaquin) Newer agents: Moxifloxacin (Avelox) Trovafloxacin (Trovan)	Bactericidal Considered second-line drugs; are used as alternatives to other antibiotics	Can be taken with or without food, if antacids are ordered, wait 2 hr after giving Cipro. Monitor WBCs for decreased leukocytes. Can potentiate warfarin and increase theophylline levels. Use cautiously in those patients with history of seizure disorder or alcoholism.	Take all of medication. Drink at least 8 full glasses of water/day to prevent crystalluria.
Cephalosporins				
First Generation	Cefazolin (Ancef)	Bactericidal; used to treat infections that do not respond to penicillin	Use cautiously in those with allergy to penicillin. <i>Candida</i> can cause dizziness or light-	

	to other, less-expensive drugs	(yeast) vaginitis is a common side effect.	headedness.
Second Generation			
Cefdin (cefuroxime axetil) Zinacef (cefuroxime sodium)	Bactericidal; inhibits cell wall mucopeptide synthesis Bactericidal; inhibits cell wall muopeptide synthesis	Use cautiously in those with allergy to penicillin; caution if seizure disorder or renal impairment. Use cautiously in those with allergy to penicillin; caution if seizure disorder or renal impairment.	Increased vaginal candida infections; increased diarrhea. Report excessive diarrhea, exhaustion.
Third Generation			
Cefazidime (Fortaz) Cefixime (Suprax)	Bactericidal; inhibits cell wall muopeptide synthesis	May interfere with vitamin K metabolism; therefore may reduce prothrombin levels.	Immediately report rash, restlessness, gastrointestinal symptoms, confusion, or irregular heartbeat.
Fourth Generation			
Cefepime (Maxipime)	Bactericidal; used to treat infections that do not respond to previous cephalosporin-generation drugs	Monitor I&O, BUN, serum creatinine.	Avoid alcohol.
Aminoglycosides			
Tobramycin Gentamicin	Effective against resistant infections; use cautiously, because they are nephrotoxic, ototoxic and can cause agranulocytosis and thrombocytopenia	Monitor BUN, electrolyte, and creatinine levels. Older adults are especially vulnerable to problems with hearing, balance, and kidney dysfunction caused by aminoglycosides.	Use sunscreen and avoid direct exposure to sunlight. Report nausea, vomiting, tremors, or tinnitus. Take extra fluid unless contraindicated.
Penicillins			
Extended Spectrum			
Carbenicillin (Geocillin) Ticarcillin/clavulanic acid (Timentin) Piperacillin/tazobactam (Zosyn)	Bacteriostatic and bactericidal	Carbenicillin PO only. Ticarcillin/clavulanic acid IV only. Watch for signs of hypersensitivity (e.g., rash, itching, difficulty breathing). Do not give to patients with known allergy to penicillin. May decrease effectiveness of oral contraceptives and warfarin.	Take full course of prescribed medication. Take with water 1-2 hr after meals to increase absorption. Immediately report abdominal pain, decreased urine, or watery or bloody diarrhea.
Miscellaneous Urinary Antibiotics			
Nitrofurantoin (Macrodantin, Furadantin)	Wide range of antibacterial action against gram-negative and gram-positive organisms, especially <i>Escherichia coli</i>	Monitor I&O. Liquid form can stain teeth; rinse mouth after administration.	Tints urine brown. Take with food and increase fluids. Can cause drowsiness; therefore avoid driving. Report numbness or tingling.
Fosfomycin tromethamine (Monurol)	Effective against most gram-negative and gram-positive organisms	Single-dose treatment. Not for use in children younger than 12 yr.	Can cause headaches and diarrhea.
Doripenem (Doribax) for complicated UTIs, including pyelonephritis	For serious infections caused by gram-positive and gram-negative bacteria	Injection only. Can reduce valproic acid levels to a subtherapeutic level, so level should be monitored.	The most common side effects include headache, nausea, diarrhea, rash, and phlebitis.
Urinary Analgesics			
Phenazopyridine (Pyridium)	Has analgesic effect on urinary mucosa	Is nephrotoxic, hepatotoxic, and can cause gastrointestinal disturbance and anemia.	Colors urine orange and can stain fabric. Discontinue if sclera becomes yellow. Maximum 2 days' use.

BUN, Blood urea nitrogen; I&O, intake and output; UTIs, urinary tract infections; WBCs, white blood cells.

Urethritis

Urethritis is an inflammation of the urethra that can be caused by many different organisms. It is a common symptom of gonorrhea and should be investigated as soon as it is first noticed. Inflammatory involvement of the urethra from the herpes virus is found in males and females. Nonspecific urethritis (NSU) is a sexually transmitted inflammation of the urethra caused by a variety of organisms other than gonococci; although it may be sexually transmitted, it is not a reportable disease in the United States. NSU usually responds to treatment with antibiotics. In women, trauma during childbirth and the proximity of the urethra to external genitalia and the anus predispose the urethra to infection and inflammation. Chemical irritation caused by use of spermicidal jellies, bath powders, feminine hygiene sprays, and bubble bath may also cause urethritis.

The chief symptoms of urethritis are **burning, itching, frequency in voiding, and painful urination**. There is a discharge that becomes increasingly more purulent if gonorrhea is present. The urinary meatus is swollen and inflamed. Diagnosis of urethritis is based on the presence of symptoms and a patient history that includes possible exposure to sexually transmissible infections (STIs). Culture and sensitivity of urine are obtained to identify causative organisms, and culture specimens are used to rule out STIs. The treatment and nursing management for urethritis are similar to cystitis. In addition, be especially aware of the possibility of a gonorrheal infection (until a definite diagnosis has been established) and should carry out the necessary teaching to prevent spread of the infection to the eyes.

Think Critically

A young man is diagnosed with NSU. As you are handing him his prescription, he wants to know what he should tell his wife. What would you say to him?

Pyelonephritis

Etiology and Pathophysiology

Acute **pyelonephritis** is an infection of the kidneys. It is thought to occur when bacteria (such as *Escherichia coli*) from a bladder infection travel up the ureters to infect the kidneys. A common cause

of pyelonephritis is an obstruction, causing stasis of urine and stones that cause irritation of the tissue. When bacteria enter the renal pelvis, inflammation and infection occur. After the infection is treated, the inflammation subsides; however, scar tissue is left in the place of healthy tissue. With chronic infection and inflammation, more scar tissue develops, and eventually kidney function becomes impaired.

Signs and Symptoms

In acute pyelonephritis, symptoms include fever (often 103° F or higher), chills, headache, malaise, nausea and vomiting, and pain in the flank (lateral abdomen) radiating to the thigh and genitalia. Eventually the urine becomes loaded with bacteria, blood, and pus. The chronic phase is often subtle, with weight loss, low-grade fever, weakness, and gradual scarring of the kidney tissues.

Diagnosis

Diagnosis is based on manifestation of symptoms, physical assessment, and urine culture and sensitivity. Special diagnostic tests—such as a radiograph of the kidneys, ureters, and bladder (KUB), an intravenous pyelogram (IVP), or a renal computed tomography (CT) or magnetic resonance imaging (MRI)—may be obtained to determine the location of the obstruction if one is suspected.

Treatment

Prompt treatment of cystitis and prevention of recurrence can help prevent acute pyelonephritis. Bed rest, analgesics, and antipyretics are prescribed. Specific drugs to destroy the bacteria are usually chosen according to the sensitivity of the causative organism, so that the most effective antibiotic is given—for example, gentamicin, ciprofloxacin (Cipro), or trimethoprim-sulfamethoxazole (Bactrim). Doripenem (Doribax) is used for complicated UTIs, including pyelonephritis. The most common side effects include headache, nausea, diarrhea, rash, and phlebitis (see [Table 34-1](#)).

With chronic pyelonephritis, the patient may live for years without significant symptoms before renal damage leads to hypertension or kidney failure. Correction of obstruction, removal of stones, and prevention of stone formation are essential to correct chronic pyelonephritis and to prevent destruction and scarring of the kidney cells.

Nursing Management

Encourage fluid intake, record intake and output (I&O), monitor the urine for changes, and keep the patient comfortable. Intravenous (IV) fluids may be given to flush the kidneys, especially if the patient has nausea and vomiting.

Acute Glomerulonephritis

Etiology and Pathophysiology

Glomerulonephritis is primarily seen in children and young adults and affects males more than females. It most commonly occurs about 2 to 3 weeks after a group A beta-hemolytic streptococcal infection, such as “strep throat” or impetigo; however, it can occur in response to bacterial, viral, or parasitic infections elsewhere in the body. It is an immunologic problem caused by an antigen-antibody reaction. Antigen-antibody complexes are deposited in the glomerular basement membrane, causing cell damage and altered permeability. Renal tissue becomes scarred, and function is impaired.

Signs, Symptoms, and Diagnosis

A patient with acute glomerulonephritis usually becomes suddenly ill with fever, chills, flank pain, widespread edema, puffiness around the eyes, visual disturbances, and marked hypertension. Diagnosis is based on physical findings. Presence of marked hypertension is a late manifestation. Diagnostic tests include urinalysis, creatinine, blood urea nitrogen (BUN), and complete blood count (CBC). The urine may be smoky, will contain red blood cells and protein, and will have an increased specific gravity. Serum creatinine and BUN levels rise above normal. If the condition is severe, hematocrit and hemoglobin will indicate anemia.

Treatment

A sodium-restricted diet is indicated if the patient has edema, and fluids may be limited if there is **oliguria** (diminished urine secretion in relation to intake) or **anuria** (absence of urine). A low-protein, high-carbohydrate diet also may be ordered.

Plasmapheresis is a blood cleansing procedure used in autoimmune disorders, such as acute glomerulonephritis or myasthenia gravis (see [Chapter 24](#)). If treatment is not successful, the disease will rapidly progress to kidney failure and death.

Nursing Management

Obtain a history of past illnesses, particularly infections, or autoimmune disorders such as lupus. Perform a general physical assessment, including vital signs and a baseline weight, and observe for fluid retention or edema. Edema that is obvious from external signs may be present in the internal organs. For this reason, mental status must be checked frequently for indications of cerebral edema with increased intracranial pressure. Cardiac failure or pulmonary edema may develop; therefore observe for extreme restlessness, increased respiratory difficulty, or cyanosis and be alert for sudden changes or worsening trends in blood pressure, pulse, and respiratory rate.

Decreasing the work of the kidney is a primary goal in treating acute glomerulonephritis. **Absolute bed rest usually is ordered until the clinical signs of hematuria, proteinuria, and hypertension are gone.** If the patient responds quickly to treatment and wishes to be more active, you must emphasize the need for continued rest. Low-protein diets may be ordered if the BUN is elevated to reduce nitrogenous waste by-products. Low-sodium or fluid-restricted diets may be ordered to reduce the edema.

Patient Teaching

Sodium

Help your patient to recognize that a low-sodium diet involves more than avoiding the salt shaker. Demonstrate how to read food labels to identify hidden sources of sodium in items such as catsup, canned soups and food, salad dressing, baked goods, and packaged meats.

Antihypertensives and diuretics also are ordered to control edema and hypertension. Plasmapheresis and corticosteroids may be used to reduce the antigen response and the inflammatory process. If the patient has plasmapheresis therapy, you should monitor for bleeding at the puncture site every 2 to 4 hours. Also monitor for potential complications, such as hypovolemia or electrolyte imbalance. The prognosis for acute glomerulonephritis varies, depending on the extent of permanent damage done to the kidneys or other vital organs.

Chronic Glomerulonephritis

Etiology and Pathophysiology

Chronic glomerulonephritis may develop rapidly or progress slowly over 20 to 30 years or longer. The exact cause is unknown; however, in chronic glomerulonephritis, the kidney atrophies; there is a decreased number of functional nephrons and eventual kidney failure. The prognosis for this disease is poor, and the progress to renal failure varies with the individual.

Signs and Symptoms

Generalized edema, headache associated with hypertension, fatigue, dyspnea, weight loss, loss of strength, increasing irritability, and nocturia are symptoms of glomerulonephritis. Proteinuria, hematuria, and kidney failure occur as the kidney function becomes impaired. Some patients who develop chronic glomerulonephritis may have acute exacerbations.

Diagnosis

Diagnostic testing may be prompted by findings on a routine examination, for example, retinal hemorrhage discovered during an eye examination. Testing includes urinalysis, creatinine, BUN,

CBC, and electrolytes. Abnormal laboratory values include proteinuria, urinary casts (protein plugs secreted by damaged tubules), elevated creatinine and BUN levels, anemia, hyperkalemia, hypermagnesemia, increased phosphorus, and decreased serum calcium and albumin.

Treatment and Nursing Management

The treatment for chronic glomerulonephritis in the latent stage is primarily symptomatic, with emphasis on avoiding fatigue and infections, particularly of the upper respiratory tract. When renal failure develops, dialysis (filtration of the blood) and possibly a kidney transplant are the only alternative therapies. Care of the patient with chronic renal disease is discussed on pp. 805 to 812.

Nephrotic Syndrome

Etiology and Pathophysiology

Nephrotic syndrome sometimes occurs after the glomeruli have been damaged by glomerulonephritis or some other disease. This damage results in increased membrane permeability and excretion of protein and decreased serum albumin (hypoalbuminemia). Hypoalbuminemia causes fluid to shift out into the body tissues and the result is severe edema. Some patients recover without further incidence, whereas others experience repeated episodes and eventual kidney failure.

Signs, Symptoms, and Diagnosis

Nephrotic syndrome is characterized by extensive proteinuria, hyperlipidemia (elevated blood lipids), hypoalbuminemia (low blood albumin), and severe edema. Facial edema, especially periorbital edema, may be present in the morning, whereas lower extremity edema is more evident at the end of the day. Ascites (accumulation of serous fluid in the abdominal cavity) may also occur because of fluid retention. The patient may be irritable, tired, or lethargic. Diagnostic tests include urinalysis and serum tests for protein and lipids. A renal biopsy may be used to verify the diagnosis or to evaluate the extent of kidney damage.

Treatment and Nursing Management

Treatment for nephrotic syndrome consists of an adequate-protein, low-fat, low-sodium diet, diuretics, supplemental multiple vitamins and minerals, and antibiotics if infection is present. Some patients are treated with cortisone and cyclophosphamide (Cytoxan).

Nursing care includes monitoring I&O, recording daily weight, encouraging rest, providing skin care, and encouraging compliance with dietary and medication regimen.

Obstructions of the Urinary Tract

Hydronephrosis

Etiology and Pathophysiology

Whenever the normal flow of urine is obstructed (e.g., kidney stone or enlarged prostate), there is a potential backward flow of fluid into the renal pelvis. **Hydronephrosis** occurs if the obstruction is not resolved; the renal pelvis and ureters will become dilated and continue to fill with fluid. Soon, the kidney cells will atrophy until all normal function ceases and the kidney becomes a thin-walled cyst. Hydronephrosis may be unilateral or bilateral (one or both kidneys). If it occurs on one side, the other kidney may enlarge and efficiently carry on the work of two kidneys. This is called *compensatory hypertrophy*.

Signs, Symptoms, and Diagnosis

Severe pain is present only if hydronephrosis develops rapidly. Otherwise, there are no outstanding symptoms, and the patient may develop signs of kidney failure only after serious damage has occurred. A definitive diagnosis is obtained by extensive urologic examination and detailed radiographic studies of the kidney and ureters, which usually reveal the site and cause of obstruction and distention of the renal pelvis.

Treatment

The primary goal of treatment for hydronephrosis is to remove the obstruction so the kidney may drain properly. The ideal remedy is to drain the kidney in the early stages with a **nephrostomy** tube or ureteral stent. Nephrostomy is a surgical incision into a kidney to drain the kidney artificially. This procedure may be performed to correct obstructions from large stones or strictures of the ureters. It is also used to drain purulent material from an infected kidney. If the damage is irreparable, surgery is necessary to remove the kidney (**nephrectomy**).

Safety Alert

Verify the Purpose and Type of Tube or Drain

DO NOT confuse urinary drainage systems with gastrointestinal feeding or drainage systems! They can look very similar. When working with tubes and drains, trace all tubes down to the patient's body surface **before** irrigation or instillation of fluids, feedings, or medications. Verify the purpose and type of tube or drain with the charge nurse if you are unsure.

Nursing Management

Postoperative nursing care.

In nephrectomy the surgical incision may be lumbar, transabdominal, or thoracic. When the patient returns from surgery, you must carefully check for the location of the surgical wound and the presence of any drains or tubes that may have been inserted during the operation. Nursing interventions focus on promoting unimpeded urine flow by properly caring for catheters and tubes.

Clinical Cues

A nephrostomy tube should never be clamped or irrigated without a specific provider's order that defines the circumstances and the amount of irrigation fluid.

Hemorrhage is a danger after surgery of the kidney, because the kidneys have a very rich supply of blood directly from the aorta and vena cava. The vital signs are frequently monitored, and any indication of shock or hemorrhage is immediately reported. It is expected that the drainage on these dressings will be blood-tinged at first, but if bright red blood appears or if there is a sudden change

in the amount of drainage, the surgeon should be notified. Dressings over the surgical wound may be reinforced. **Extreme care must be taken when changing dressings to ensure that the drains or tubes are not dislodged or pulled from the surgical incision.** If the tube dislodges, you must contact the surgeon immediately.

Positioning of the patient depends on the surgeon's orders, such as to have the patient lie only on the affected side. Turning may be difficult at first because movement is usually painful and the patient may be reluctant. You should explain the need for frequent turning and deep breathing, so that complications may be prevented.

Adequate drainage from the opposite kidney after surgery is of great importance. Urinary output must be very carefully measured and recorded. Fluids are usually restricted immediately after surgery and then gradually increased as the remaining kidney compensates. If a nephrostomy has been done, fluids are restricted until the affected kidney can sufficiently recover to resume function.

Renal Stenosis

The renal artery can become blocked or narrowed (**renal stenosis**) because of atherosclerosis or scarring. This blockage can result in hypertension or **chronic renal failure** (gradual loss of kidney function). The patient may be asymptomatic, but blood pressure should be monitored. MRI or CT scan or ultrasound may show a decreased kidney size. Anticipate that the patient will be prescribed antihypertensives to control elevated blood pressure. Balloon angioplasty or stent placement can improve blood flow to the kidney.

Renal Stones

A renal or kidney stone (**lithiasis**) is a crystalline mass that forms in the urinary system[®] and, depending on the size and location, may obstruct the flow of urine. Stones can be as small as a grain of sand or large enough to fill the renal pelvis. This enlarged stone formation is called a *renal staghorn calculus* (Figure 34-1). Renal stones also vary in composition and in the environment in which they form. Some stones form more readily in acidic urine, whereas others occur in alkaline urine. There are four major types of renal stones, one of which is hereditary. Table 34-2 shows the risk factors and dietary interventions for each type. Identifying the type and cause of particular kinds of stones can be very effective in preventing further formation and deciding the appropriate method of treatment for each patient. However, in about half the cases, the precise cause of stone formation cannot be identified.



FIGURE 34-1 **A**, A renal staghorn calculus. The renal pelvis is filled and resembles the horn of a stag ("S" on the figure marks the calculus). **B**, Staghorn calculus as seen on an intravenous pyelogram. (A, From Stevens A, Lowe JS, Scott I: *Core pathology: Illustrated review in color*, ed 3, London, 2009, Mosby Ltd. B, From Bullock N, Doble A, Turner W, Cuckow P: *Urology: An illustrated colour text*. London, 2008, Churchill Livingstone.)

Table 34-2**Risk Factors and Treatments for Renal Stones**

STONE TYPE	RISK FACTORS	INTERVENTIONS
Calcium oxalate (most common type)	An increased intake of protein, sodium; inadequate fluid intake, prolonged immobility	Increase fluid intake. Medications to bind oxalate (cholestyramine) or calcium (e.g., cellulose phosphate). Diuretics (e.g., hydrochlorothiazide) to encourage flushing. Avoid oxalate sources such as spinach, chard, parsley, peanuts, chocolate, and strawberries.
Calcium phosphate	An increased intake of protein, sodium; inadequate fluid intake, primary hyperparathyroidism	Limit intake of foods high in protein and sodium. Treat underlying hyperparathyroidism.
Uric acid	Excess dietary purine (e.g., organ meats, gravies, red wines, and sardines) Gout (primary or secondary)	Decrease intake of purine sources. Alkalinize urine with potassium citrate or lemonade. Administer allopurinol for gout (decreases production of uric acid).
Struvite (more common in women)	Urinary tract infections	Administer antibiotics for infection and acetohydroxamic acid (inhibits the chemical action of bacteria that contributes to struvite stone formation) as prescriptions.
Cystine	Hereditary cystine crystal formation	Encourage oral fluids, up to 3 L/day. Medications to prevent crystallization (e.g., tiopronin). Alkalinize urine with potassium citrate or lemonade.

Etiology and Pathophysiology

Certain conditions predispose a person to having renal calculi. Among the most common causative factors are (1) supersaturation of the urine with crystalloids that do not readily dissolve (e.g., calcium, uric acid, and cystine); (2) urinary infections, which can produce bacteria and other debris that form a core for stone formation; (3) inadequate fluid intake, which results in concentrated urine and inadequate flushing of the urinary tract; (4) sluggish flow of urine, as may occur with bed rest or immobility; and (5) certain substances in the urine (e.g., urate, a salt of uric acid), which encourage the formation of crystals of calcium oxalate or calcium phosphate. In the past, patients with calcium oxalate stones were encouraged to decrease dietary calcium; however, evidence-based practice now indicates that these patients should actually be encouraged to increase fluids and dietary calcium, but decrease protein and sodium intake and foods that are high in oxalate, such as spinach and nuts (NIH, 2014).

A small percentage of patients with calcium stones have a tumor of the parathyroid. This gland produces a hormone that raises the level of serum calcium, and thus calcium in the urine. Treatment of the parathyroid condition removes the cause of the stones. Risk factors for kidney stone formation include:

- Male gender
- A family history of renal stones
- History of intestinal bypass surgery for obesity (these patients have an increased absorption of oxalate from foods)
- Immobility for any reason, which contributes to urinary stasis and calcium loss from bones
- History of recurrent urinary tract infections

Prevention

A continuous flow of dilute urine flushes the tract and removes substances that could form stones. **Ideally, adults must put out at least 3500 mL of urine every 24 hours to prevent stone formation; likewise, preventing urinary infections and maintaining adequate drainage through tubes and catheters is also necessary.** In those cases in which the urine pH is causing stone formation, changing the urine pH can prevent or reduce the incidence of renal calculi. Ascorbic acid or dietary modifications (e.g., cranberry juice, prunes, or lemon juice) can be used to acidify urine.

Signs and Symptoms

Some renal stones do not cause noticeable symptoms and can be passed without the person being aware of them. Others may lodge in the renal pelvis and cause symptoms only after the destruction of kidney cells. The kidney stones that cause severe pain are those that are small enough to move along the ureter with the urine. As the stone rolls along, sharp little spikes scrape the ureteral lining, causing excruciating pain and bleeding. Pain is typically felt in the flank over the affected kidney and ureter and radiates downward toward the genitalia and inner thigh. Nausea and vomiting often occur because of the severity of the pain. **Moving stones can get trapped along the ureter, causing obstruction of flow and swelling of the ureter.**

Think Critically

A colleague tells you that your patient is seeking narcotics and is “faking” kidney stone pain and intentionally introducing blood into his urine sample. How would you respond to this?

Diagnosis

Diagnostic tests include urinalysis for blood in the urine and a kidney, ureters, bladder (KUB) study to locate stones that are radiopaque (materials such as metal will appear as a white area on the radiograph); an IVP will show a gap (nonradiopaque stone) in the stream of dye being excreted in the urine. Further studies of the blood and urine might be done to determine the levels of substances, such as calcium, uric acid, and cystine, that can contribute to stone formation.

Treatment

At first, the provider may try to flush the stone out by increasing the patient's IV fluids or oral fluid intake and managing pain by prescribing opioid analgesics or nonsteroidal anti-inflammatory drugs (NSAIDs) and antispasmodics, such as propantheline bromide (Pro-Banthine) or oxybutynin chloride (Ditropan). If there is pus in the urine, an antibiotic is prescribed to deal with infection.

Some stones can be flushed by irrigation through a ureteral catheter or percutaneous nephrostomy tube or crushed by ultrasound. Usually, a stent will be placed in the ureter to allow the stone fragments to pass more freely. Extracorporeal shock wave **lithotripsy** (ESWL) has largely replaced surgery for renal stones. For this treatment the patient is placed in a water bath; newer machines use a water-filled mat. Shock waves are generated, pass through the water, bounce off a reflector, and break the stone. Sedation is used to help the patient remain calm and still during the 30- to 45-minute procedure, or the patient may be given general anesthesia. After the procedure, the patient may experience cramping pain and is given pain medications (e.g., hydrocodone-acetaminophen [Vicodin]) if this occurs. A fluid intake of 3000 to 4000 mL is necessary to help wash the stone fragments from the kidney. A tube may be placed into the kidney either through the bladder or through the back that will drain the fluid and the stones from the body ([Miller, 2013](#)).

Think Critically

Based on your knowledge of anatomy and physiology, what is the difference between a **urethral** catheter and a **ureteral** catheter? (Note the spelling difference!) Why is it important to know the difference between these two catheter sites?

Adjunctive therapy for ESWL includes corticosteroids and calcium channel blockers and alpha antagonists (e.g., tamsulosin), which increase the rate of stone passage. Percussion, diuresis, and inversion (PDI) therapy is used after ESWL. In this procedure, diuresis is promoted, and the patient is placed in a prone, reverse Trendelenburg position and massaged or percussed to encourage stone movement.

When the stone is not passed spontaneously, cystoscopy or surgical intervention is necessary. Nephrolithotomy (incision into the kidney to remove a stone) or pyelonephrolithotomy (surgical removal of a stone from the renal pelvis) can be performed for large stones that will not pass. These procedures may be done percutaneously or, rarely, with an open procedure. A special forceps is introduced through the nephroscope to retrieve the stone. A nephrostomy tube is inserted as the scope is removed and remains in place for 1 to 5 days. A fluid intake of 3000 to 4000 mL/day is required to flush any residual stone fragments out of the kidney. The patient is monitored for infection, hemorrhage, and leakage of fluid into the retroperitoneal cavity. When a stone cannot be retrieved by a percutaneous procedure, an open procedure is used. If a stone is lodged in a ureter and will not descend after fluid increases, a ureterolithotomy (surgical removal of a stone from a ureter) is performed.

If the stone is 5 mm or larger, the patient may also receive a ureteral stent (usually a soft flexible silicone tube), which is inserted through a cystoscope or nephrostomy tube, or during surgery. The purpose of a ureteral stent is to maintain the patency of the ureter to allow stones to pass through. Stents are not visible on the outside of the body. They are usually removed in 4 to 6 weeks in an outpatient setting. Nursing interventions include monitoring for infection, bleeding, urine output, and pain. Once stones have been removed, chemical analyses of the urine, blood, and the stone itself are necessary to plan effective preventive measures. [Table 34-3](#) provides additional information about common catheters and tubes used for urologic disorders.

Table 34-3
Common Catheters and Tubes Used for Urologic Disorders

TYPE	PURPOSE
Urethral catheter	Drains urine from the bladder
Foley catheter	Indwelling catheter for continuous urine drainage from the bladder
Suprapubic catheter	Continuous drainage of urine from the bladder; inserted in suprapubic area of abdomen through abdominal and bladder wall
Ureteral catheter	Drains urine directly from the ureter or kidney
Ureteral stent	Tube placed in ureter to hold it open during healing; not visible on the outside of the body
Nephrostomy tube	Placed into the pelvis of the kidney to provide drainage of urine directly from the kidney

Nursing Management

During initial assessment of a patient with kidney stones, the patient may have extreme pain, so use concise questions to gather information about pain, changes in urinary output, and characteristics of the urine. Asking family about risk factors and history may be appropriate.

Attempts are made to have the patient pass the stone spontaneously, and all urine is strained to recover the stone or fragments for analysis. This is accomplished by having the patient void into a urinal or collection device and then pouring the collected urine through a fine mesh filter. Fluids are encouraged during this time to facilitate flushing of the stone.

Urologic System Trauma

Trauma to Kidneys and Ureters

Etiology and Pathophysiology

Accidental injury to the kidneys, ureters, bladder, or urethra should always be considered whenever there has been trauma to the abdominal cavity, lower back, or thoracic cage. Injury to the kidneys is usually caused by blunt trauma that is sustained during a motor vehicle, sports, or occupational accident. Damage can occur as a result of a direct blow, laceration from an adjacent rib or vertebra fracture, or from sudden deceleration, which shears and tears the body tissue. Ureteral injuries are mostly associated with penetrating trauma; the right side is three times more likely than the left side to be involved. Trauma to the urinary system can range from minor contusion to severe hemorrhage that leads to hypovolemic shock.

Signs, Symptoms, and Diagnosis

Signs and symptoms characteristic of trauma to the kidneys include massive hemorrhage, hematuria, abdominal or flank pain, and possibly an enlarged mass in the kidney area. Diagnostic tests include serial urinalyses, hemoglobin and hematocrit tests, and measurements of electrolytes. Rising BUN and serum creatinine levels indicate diminishing renal function. Radiologic studies (KUB, IVP, or CT scan) can demonstrate the extent of damage to the urinary system. MRI or angiography is used in high-risk cases or if CT scan is indeterminate. Hourly measurements of urinary output and observation of the characteristics of the urine can help determine the type and extent of injury.

Clinical Cues

When a patient sustains significant trauma to skeletal muscle tissue, he may develop rhabdomyolysis. Damaged muscles release myoglobin into the bloodstream, and these large muscle proteins can cause **acute renal failure** (sudden loss of kidney function); however, the condition is reversible. Be alert for brown or tea-colored urine after trauma, strenuous exercise, or extensive burns, and report your findings to the provider.

Treatment

Bleeding in the kidney is often self-limiting. Lacerations and contusions without interruption of urinary function usually can be treated conservatively by bed rest. For this reason, the nephrologist may advocate a period of watchful waiting to see whether the kidney can be saved. If the kidney is severely damaged, the patient may undergo a nephrectomy. The remaining kidney then enlarges and is usually able to carry on the work formerly done by two kidneys.

Nursing Management

Preoperative nursing care.

Patients with kidney trauma are likely to have damage to the colon, spleen, or pancreas. A comprehensive plan for dealing with problems associated with multiple trauma is usually necessary. Preoperatively, the patient is monitored closely for signs of hypovolemic shock, cardiovascular changes, urinary output, and size of the flank hematoma. Grey Turner sign is bruising over the flank or lower back and suggests retroperitoneal bleeding. For most trauma patients, a urethral catheter is inserted into the bladder. An indwelling catheter allows for close observation of urinary output—for example, critically ill patients may need hourly urine output measurements, and a drainage bag with a urometer should replace the standard drainage bag.

Postoperative nursing care.

Postoperative nursing care for nephrectomy or nephrostomy is described on p. 793.

Trauma to the Bladder

Etiology and Pathophysiology

Any violent blow or crushing injury to the lower abdomen may result in rupture or perforation of the bladder wall, with resulting leakage of the urine into the pelvic tissues or peritoneal cavity. This results in severe inflammation (peritonitis). Bladder trauma is more likely to occur if the bladder is full at the time of an accident, rather than if it is empty.

Signs and Symptoms

Early symptoms of bladder injury are painful hematuria or inability to void, marked tenderness and spasm in the suprapubic area, or the development of a large mass in that area.

Clinical Cues

In cases of pelvic or perineal trauma, bleeding at the urethral meatus, inability to void, or a distended bladder may indicate a urethral tear. Notify the provider before inserting a catheter, because catheter insertion can increase the damage by extending the tear.

Diagnosis and Treatment

Diagnosis is based on presence of gross hematuria, suprapubic pain, and difficulty voiding. Retrograde or CT cystography is obtained if bladder injuries are suspected. If the bladder has ruptured or is perforated, treatment consists of a suprapubic cystostomy to drain blood and urine.

Nursing Management

Patient care requires meticulous attention to drains and dressings to prevent infection and maintain good drainage. Cold applications to the surgical site both before and after surgery may be ordered. Observe the patient carefully for postoperative shock and massive hemorrhage. Any mass formation in the suprapubic area before or after surgery, or any change in vital signs, should be reported immediately.

Urologic System Cancers

Cancer of the Bladder

Etiology and Pathophysiology

It is estimated that approximately 74,000 new cases of bladder cancer will be diagnosed in 2015, to result in death for 11,510 men and 4490 women ([American Cancer Society, 2015](#)). Bladder cancer is more common in men (ages 60 to 80 years) than in women. **Smokers have double the risk of developing this cancer.** People living in urban areas or with occupational exposure to nitrates, dyes, rubber, or leather processing (e.g., painters, hairdressers, or textile workers) are at higher risk. The bladder wall is exposed to these carcinogenic chemicals in the urine. Tumors of the bladder usually start in the superficial transitional cell layer and are considered to be papillomas (benign tumors on the epithelial tissue). Bladder tumors are removed—even though they are papillomas—because there is a high risk for invasion into the deeper tissues and metastasis.

Signs, Symptoms, and Diagnosis

The main symptom of a bladder tumor is hematuria. Frequency, urgency, or dysuria also may be present. Diagnosis is confirmed by IVP and by examining the bladder wall with a cystoscope and biopsy of the tumor.

Complementary and Alternative Therapies

Healthy Bladder

Smoking cessation and including cruciferous vegetables such as cabbage or broccoli in the diet contribute to a healthy bladder and a decreased risk of bladder cancer ([Movva, 2014](#)).

Treatment

Treatment for bladder cancer is surgery, either alone or in combination with chemotherapy or radiation. The type of surgical treatment depends on the clinical stage of the tumor. Every effort is made to preserve the bladder if the tumor is confined to the mucosa or submucosa. In this case a partial cystectomy or transurethral resection of the bladder tumor (TURB or TURBT) is performed and followed by intravesical immunotherapy (bacille Calmette-Guérin [BCG] instillations [Intravesical, TheraCys]) or chemotherapy. The drugs that are used most often for intravesical therapy are mitomycin and thiotepa, but combinations of other drugs such as valrubicin, doxorubicin, and gemcitabine may be used ([ACS, 2014](#)). BCG was originally used as a vaccine against tuberculosis. It has helped patients with bladder carcinoma in situ (site of origin) by reducing tumor recurrence and by eliminating residual malignant cells after surgery. The solution is instilled into the bladder via a urinary catheter. The catheter is clamped for 2 hours, and the patient's position is changed every 15 to 30 minutes. Treatments are continued weekly for 6 weeks with possible maintenance doses. Advise patients that BCG intravesical therapy is likely to cause future tuberculin skin tests to result in a false positive.

Clinical Cues

In addition to using Universal Precautions, for 6 hours following a BCG treatment the patient's toilet should be disinfected with bleach each time it is used for the disposal of the patient's urine.

Photodynamic therapy can be used for superficial tumors. In this therapy, a solution of light-sensitive molecules is injected IV. These molecules adhere to cancer cells longer than they do to normal cells. A cystoscope with a red laser light can then be used to activate the photosensitizers that destroy tumor cells.

Surgeries for urinary diversion.

Bladder surgery may be minor, such as removing polyps from the bladder interior using a cystoscope, or major, such as cystectomy (removal of the bladder) for bladder cancer. After cystectomy, there is always the danger of hemorrhage and infection. There are also problems in devising a satisfactory arrangement for urine collection. When the bladder is surgically removed, the surgeon performs a **urinary diversion** to handle the excretion of urine and creates an artificial opening (stoma) on the skin surface. Diversions also can be performed for neurogenic bladder, congenital anomalies, strictures, or trauma. There are several ways in which urinary diversion can be accomplished ([Figure 34-2](#)), including by ileal conduit or ileal loop, cutaneous ureterostomy, vesicostomy, uretersigmoidostomy or sigmoid conduit, and ileal reservoir (i.e., Kock, Indiana, Mainz, or Florida pouch). The difference in these various procedures is the segment of bowel that is used.

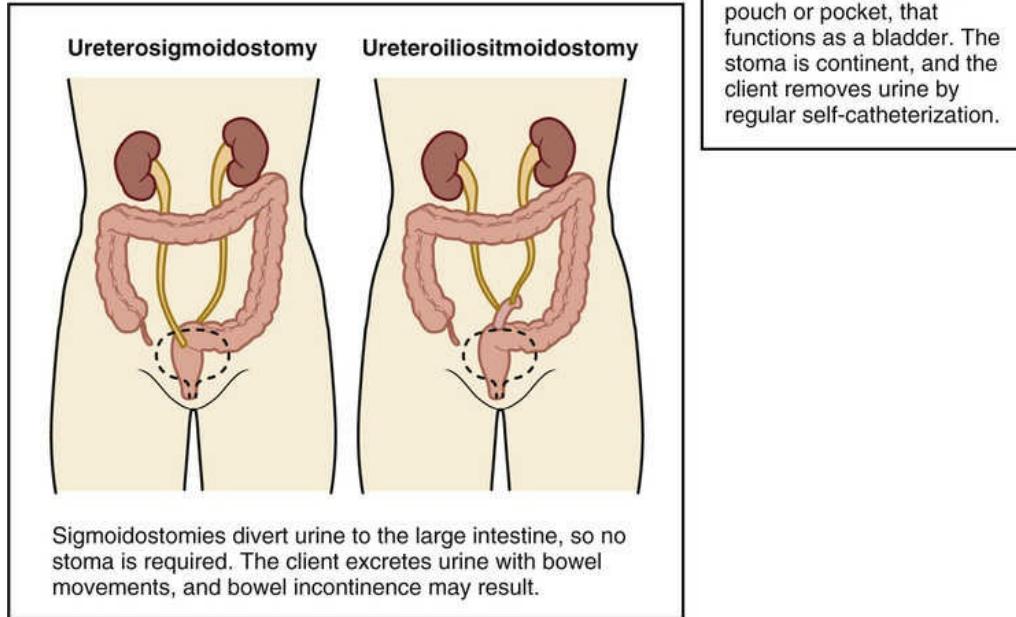
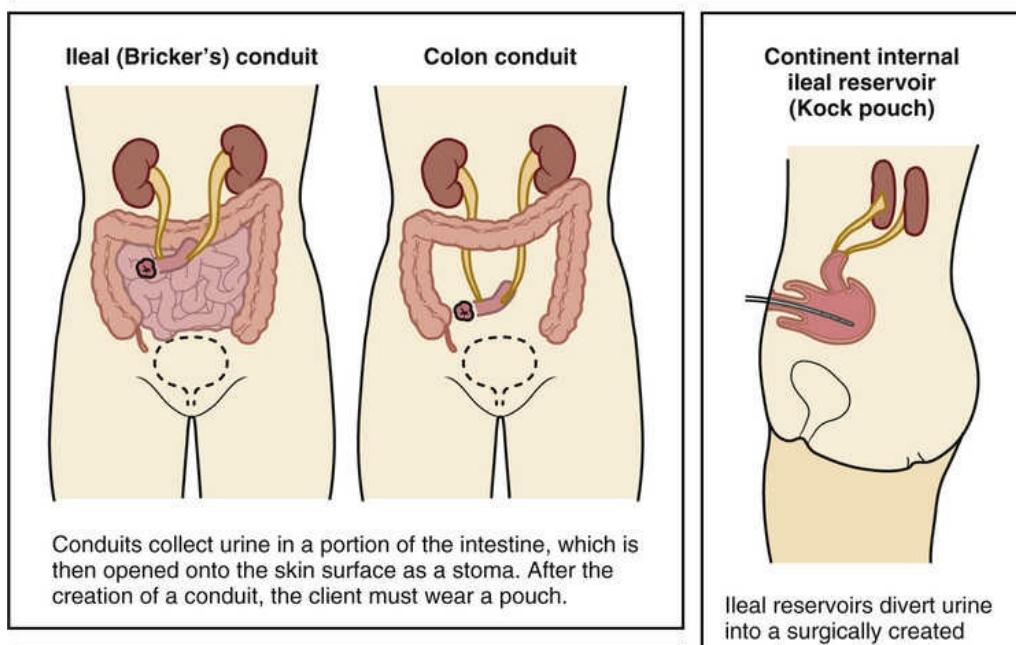
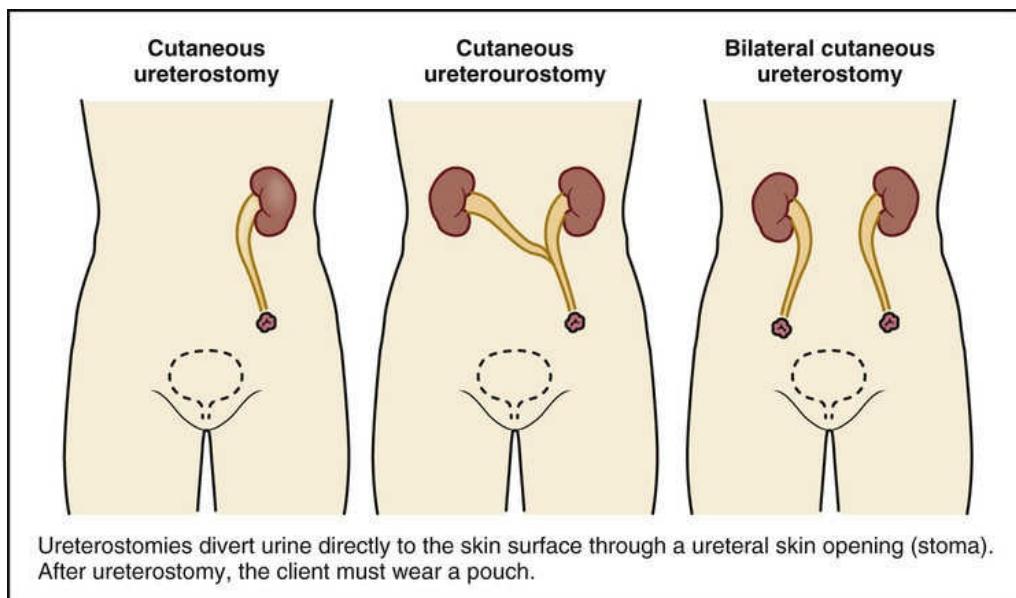


FIGURE 34-2 Surgeries for urinary diversion. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2010, Saunders.)

Cutaneous ureterostomy and vesicotomy.

Ureterostomy is a surgical incision into the ureter that diverts the flow of urine. In a cutaneous ureterostomy, the surgeon detaches one or both ureters from the bladder and brings them to the surface of the body, usually in the region of the flank. The patient may have one or two stomas. If the patient has a cutaneous ureterostomy with two stomas (one from each ureter), the flow of urine from each stoma must be measured. Any tubing leading from the ureterostomy should be kept open so that urine can flow freely. The tube is checked frequently for signs of obstruction by mucus or blood clots. A vesicotomy is an incision into the bladder just above the pubic area. After incising the bladder, the surgeon moves it forward and sutures the cut edges to the skin, forming a stoma.

Ileal conduit.

An ileal conduit is also called *urinary ileostomy and ileal loop* or a *Bricker procedure*. A portion of the ileum is used as a tube or conduit through which urine flows to the outside. The section of ileum is separated from the intestinal tract. Urine does **not** flow through it to the intestines, as when the ureters are sutured to the sigmoid. The two open ends of the intestines where the section of ileum was removed are rejoined by anastomosis (operative union of structures). The surgeon cuts out a portion of the ileum, leaving nerve and blood supply intact so that it remains a viable tissue. The “borrowed” section of ileum is sutured together at one end to form a pouch, and the other end is brought outside to form a stoma. The ureters are attached to the ileal conduit so that urine can flow through the conduit to the outside.

Ureterosigmoidostomy or sigmoid conduit.

A sigmoid or colonic conduit is similar to an ileal conduit, except that a portion of the sigmoid colon is used to form the conduit. The ureters are implanted in the conduit.

Continent diversion (Indiana pouch).

Typically either ileum or a terminal ileum combined with ascending colon is used for continent urinary diversion. These segments are detubularized and then refashioned into a spherical shape to prevent problems such as high pressure reflux and eventual renal failure. The spherical shape has an increased capacity and decreases luminal pressure greatly ([Costa, 2013](#)) and is used as a reservoir. A one-way valve mechanism is created at the insertion site that then leads into an external stoma through which the internal pouch can be irrigated with normal saline. There is no external storage system.

Noncontinent diversion.

Noncontinent diversion is considered the standard for urinary diversion because it has the fewest postoperative complications. Ileum (15 to 25 cm) and possible jejunum segments are used to anastomose the ureters at the proximal end and create a stoma on the abdominal wall at the distal end to attach to an external storage system. The urine flows in a peristaltic manner through the bowel segment ([Costa, 2013](#)).

Clinical Cues

There are significant differences in the irrigation of tubes, drains, and stomas for the urinary system, so make sure to **clarify orders**. For example, the Indiana pouch may be irrigated one to four times a day with 30 to 60 mL of normal saline (size and maturity of the pouch will vary) ([UOAA, 2015](#)), whereas ureteral stents or ureteral catheters are usually not irrigated. If the provider does order irrigation of a stent or ureteral catheter, the amounts of sterile normal saline are much smaller (3 to 10 mL).

Orthotic bladder substitutes.

Bladder substitutes or neobladders can be created using a portion of the patient's own intestine; they are more commonly used for male patients with cancer of the bladder, when the sphincter is

intact and there is no cancer in the urethra or bladder neck. The advantage is normal micturition. Examples include hemi-Kock, Studer, and ileal W-neobladder.

Nursing Management

Postoperative nursing care.

After surgery, observe for pain, abdominal rigidity, fever, and bleeding. Assess the amount and characteristics of the urine and mucus and record accurate output of urine every hour for the first 24 hours and then every 4 to 8 hours. **Regardless of which surgical procedure the patient has had, the urine should never stop flowing.**

The urine should initially be light red or pink and progress to clear within 3 days or less. Bright red bleeding or clots should be reported immediately. The stoma should be pink or red. A pale, dark, or dusky stoma suggests decreased blood flow, which should be reported immediately. Skin irritation and breakdown can be a problem, and every effort is made to keep urine from touching the skin when the patient has an external stoma. A well-fitted and properly adhering collection appliance is essential. A thin gauze roll or tampon is placed into the stoma during appliance changing and cleaning to prevent leakage of urine onto the skin. For a permanent ostomy, the bag can be used for 3 to 7 days. The bag should be emptied when it becomes one third to half full, to prevent the weight of the urine from pulling the bag loose. At night the bag can be connected to a larger urine container. The bag should be changed in the morning when there is less urine flow. The area around the stoma is washed with a solution of 1 : 1 vinegar and warm water to remove any crystals. If no crystals are present, warm, soapy water may be used. The area is thoroughly rinsed and patted dry with a towel before a new bag is attached, because any remaining moisture may interfere with the seal of the new appliance. A bath or shower may be taken with the bag on or off.

Most appliances contain an odor barrier; however, odor may be a problem because of poor hygiene; alkaline urine; normal breakdown of urine when it is exposed to air; and the ingestion of certain foods, such as asparagus. Dilute urine is also less odorous and can be accomplished by increasing fluid intake. Reusable appliances must be washed with soap and water and soaked in a dilute white vinegar solution or a commercial deodorizing product for 20 to 30 minutes. The pouch is then rinsed and allowed to dry. Deodorant tablets may be placed in the appliance to decrease odor.

Complementary and Alternative Therapies

Reduce Odor of Urine

For patients with a urinary diversion, a diet that includes whole grains, nuts, plums, prunes, and cranberry juice will help to acidify the urine and decrease odors.

Psychological care of a patient facing malignancy and an operation that will radically change his body image should be a primary nursing concern, and there are always sexual concerns when a urinary diversion is performed. Some of the more radical procedures will produce impotence in the male. Encourage the patient and spouse to talk about fears and concerns, and provide emotional support. Help the patient and family to identify appropriate community resources, and make referrals as needed for specialized counseling.

Cancer of the Kidney

Etiology and Pathophysiology

Cancer of the kidney, known as renal cancer, is relatively uncommon; however, these tumors are extremely difficult to treat in the later stages. Neoplasms of the kidney occur in men (ages 50 to 70 years) twice as often as in women. Risk factors include smoking and exposure to lead or phosphate.

The tumors usually begin growing in the renal cortex. They can become very large, but they are well defined and press into the renal structures rather than invade the tissue. The blood vessels also can become constricted by the tumor growth.

Signs, Symptoms, and Diagnosis

The principal symptoms of malignant tumors of the kidney are hematuria, palpable abdominal or flank mass, and flank pain (although pain and a mass may not be present in the early stages). Other symptoms that may occur are fever, fatigue, weight loss, decreased appetite, and hypertension. Renal angiogram, arteriogram, CT, MRI, or ultrasound may be performed to determine whether the symptoms are being caused by a cyst (nonmalignant) or by a tumor.

Treatment and Nursing Management

The only treatment that has any success is surgical removal of the affected kidney (nephrectomy) before metastasis takes place. Unfortunately, the patient usually does not have severe symptoms until metastases have occurred. Chemotherapy with a variety of drug regimens is used for metastatic cancer (see [Chapter 8](#)). Immunotherapy may be used for recurrent tumors.

Interleukin 2 (IL-2), an immunotherapy, is the only therapy that has a long-lasting response ([ACS, 2014](#)). However, it can cause serious side effects, so it is reserved for those with advanced cancer who are strong enough to withstand this treatment or do not respond to targeted drugs. Sunitinib (Sutent), sorafenib tosylate (Nexavar), temsirolimus (Torisel), everolimus (Afinitor), bevacizumab (Avastin), pazopanib (Votrient), and axitinib (Inlyta) are targeted drugs for advanced kidney cancer. They act to deprive the tumor cells of blood and nutrients. Temsirolimus and everolimus inhibit tumor cell growth and proliferation; these drugs are available to patients who failed to respond to sunitinib or sorafenib. Pazopanib interferes with the growth of new blood vessels that would supply the tumor.

Chemotherapy is not a standard treatment for renal cancer, because kidney cancer cells are usually resistant. Chemotherapy is only attempted after immunotherapy and targeted therapy have failed. Drugs used in this case are vinblastine, floxuridine, 5-fluorouracil (5-FU), capecitabine, and gemcitabine.

Nursing care of patients with renal cancer after nephrectomy is the same as that for other cancer patients after nephrectomy (see [Chapter 8](#) for care of patients with cancer).

Renal Failure

Renal failure is the inability of the kidneys to maintain normal function. Renal failure is classified as acute or chronic. The final stage of chronic and irreversible renal failure is called **end-stage renal disease (ESRD)**.

Acute Renal Failure

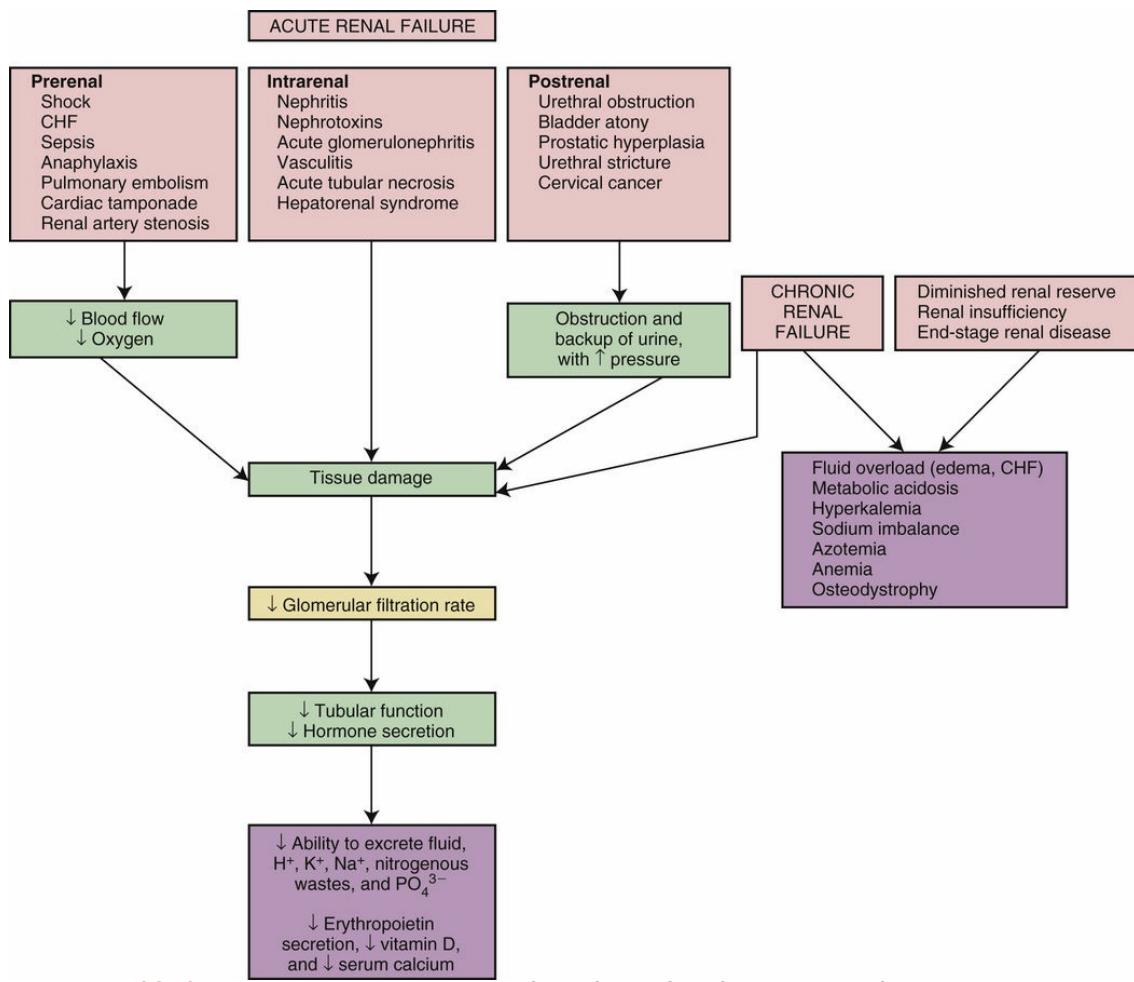
Etiology

Acute renal failure (ARF) occurs suddenly as a result of physical injury, infection, inflammation, or damage from toxic chemicals. Nephrotoxic agents are those that are poisonous to kidney cells and include many drugs, iodine substances used as radiographic contrast media, heavy metals, snake venom, or exposure to industrial chemicals. These toxins may inflict damage on the renal tubules, causing acute tubular necrosis (ATN) and loss of function. They can also indirectly harm the tubules by causing severe constriction of blood vessels that serve the kidney, producing renal ischemia. ATN is responsible for 90% of acute renal failure. Other causes of renal ischemia include circulatory collapse, severe dehydration, and prolonged hypotension in compromised surgical or trauma patients.

Pathophysiology

The pathophysiology of ARF is not well understood. One theory is that cellular or protein debris in the tubules blocks the flow of urine and filtration stops. Another theory is that decreased blood flow results in oxygen deprivation, which causes cellular death and tubular necrosis.

There are three types of acute renal failure, depending on the cause. **Prerenal ARF** is caused by decreased blood flow, such as in hypovolemic shock, or decreased cardiac output, as in cardiogenic shock. **Intrarenal ARF** occurs from glomerular damage, ATN caused by ischemia or toxins, or vascular disease that affects the vessels in the kidney. **Postrenal ARF** is caused by obstruction in the ureters, bladder, or urethra—for example, an enlarged prostate—that causes eventual backup of urine into the kidney, which in turn leads to tissue damage. ARF is potentially reversible, especially if identified early; patients often regain kidney function. [Concept Map 34-1](#) shows the pathophysiology of renal failure.



Think Critically

During your clinical experience, which of your patients may have been at risk for ARF? What factors placed these patients at risk?

The course of acute tubular necrosis is divided into three phases: oliguric/nonoliguric, diuretic, and recovery phases. In the oliguric/nonoliguric phase, the patient puts out either a great deal of or very little urine. Oliguria is a urine output of 100 to 400 mL in 24 hours. This phase usually occurs immediately or within 1 week after an ischemic event and lasts for an average of 10 to 14 days; however, it can go on for weeks to months, and prolonged oliguria worsens the prognosis. BUN and creatinine levels rise. When this occurs, there may be volume overload, which can precipitate heart failure, multiple electrolyte imbalances, metabolic acidosis, catabolism (destructive breakdown of body tissue), and end-stage renal disease (ESRD); dialysis is needed.

Older Adult Care Points

Because of the overall decreased kidney function related to aging, older adult patients may experience oliguria even though urine volumes are as high as 600 to 700 mL/day.

Nonoliguric ATN is often caused by nephrotoxic agents. Urine output is greater, but the kidneys cannot eliminate waste products efficiently; BUN and creatinine levels rise, and electrolyte imbalances occur. Dialysis is needed less often or for shorter periods, and the prognosis is better than for oliguric failure.

The diuretic phase only occurs if dialysis has not been started early and extracellular fluid

volume has built up. In this phase, the kidney is unable to concentrate urine, and output can be between 1000 and 2000 mL/day. With this increased output, there is a danger of dehydration, hyponatremia, and hypokalemia. Approximately 25% of deaths related to ARF occur during this phase.

The recovery phase begins as the kidney function begins to normalize. The concentration of urine, urine output, and electrolyte balance begin to recover. There are 1 to 2 weeks of rapid improvement and then a period of slower recovery lasting between 3 and 12 months. About one third of ARF patients are left with residual renal insufficiency, and about 5% must continue dialysis.

Signs and Symptoms

Renal failure will have an effect on the entire body, and the signs and symptoms will vary according to the phase and response to treatment. Carefully observe for any of the following:

- Changes in urine output and urine results (e.g., specific gravity, proteinuria)
- Electrolyte imbalances (e.g., hyponatremia, hyperkalemia, hypocalcemia)
- Fluid imbalance (e.g., hypotension, hypertension, edema, pulmonary edema)
- Acid-base imbalance (e.g., metabolic acidosis)
- Gastrointestinal effects (e.g., nausea, vomiting, anorexia, constipation)
- Mental status changes (e.g., lethargy, memory impairment)
- Anemia and platelet dysfunction (e.g., fatigue, bleeding signs, bruising)
- Impaired wound healing and susceptibility to infection (e.g., elevated WBC)

Diagnosis

Diagnostic testing includes urinalysis, creatinine, BUN, CBC, electrolytes, and arterial blood gases. In addition, radiologic studies (such as ultrasound, IVP, CT, or MRI) can be performed if an obstruction is suspected. A renal biopsy may be obtained to assist in determining the cause or to evaluate the extent of kidney damage.

Treatment

Treatment of ARF is aimed toward correcting the underlying cause and preventing or controlling complications and maintaining a tolerable internal environment until the kidneys are able to recover and resume their normal functions. Symptomatic treatment includes correction of fluid and electrolyte balances, management of anemia and hypertension, and cleansing the blood and tissues of waste products with **hemodialysis** (filtration of blood across a semipermeable membrane) or **peritoneal dialysis** (filtration of blood across the peritoneal membrane). Volume overload is treated with diuretics and sometimes low-dose dopamine to promote better kidney perfusion. Dialysis is also used to reduce volume overload if it cannot be reduced with drugs. Electrolyte imbalances (hyperkalemia, hypocalcemia, hyperphosphatemia, and mild hypermagnesemia) are monitored and treated. Metabolic acidosis, if severe, is treated with IV sodium bicarbonate. Dialysis with buffer in the dialysate may be used.

Other problems include malnutrition, anemia, and potential for infection. The catabolic state is treated with nutritional management through total parenteral nutrition (TPN). Potassium, phosphate, and magnesium are omitted from the solution while the patient is oliguric. Anemia occurs because the kidney cannot produce normal amounts of erythropoietin. The life span of red blood cells is shortened because of both the toxic wastes circulating in the blood and the hemodilution from fluid overload. To treat this anemia, the provider may order epoetin alfa (Epogen), a synthetic substance that stimulates red blood cell production. Infection is common with ARF and is the leading cause of death in these patients. Nurses must be vigilant in monitoring for signs of infection that could be associated with IV access sites, drains and tubes, and a lowered immunity state.

Continuous renal replacement therapies (continuous hemofiltration).

Continuous renal replacement therapies (CRRTs) can be used for patients in the intensive care unit (ICU) who have ARF and multisystem organ involvement or for those who are hemodynamically unstable. A double-lumen catheter is typically inserted into the subclavian or internal jugular vein. The blood is removed from the arterial lumen of the catheter and passed through a semipermeable

membrane and returned to the venous lumen of the catheter (Dirkes and Hodge, 2008). This method filters out wastes much more slowly than hemodialysis but does not cause such rapid fluid and electrolyte shifts. Continuous arteriovenous hemofiltration (CAVH) uses the patient's own blood pressure to pump the blood. Continuous arteriovenous hemodialysis (CAVHD) combines hemodialysis and hemofiltration, thus removing waste and fluid. Continuous venovenous hemofiltration (CVVH) and continuous venovenous hemodiafiltration (CVVHDF) are both controlled by a pump (Clin-eGuide, 2009). Slow continuous ultrafiltration (SCUF) is primarily used for fluid removal, such as for patients with pulmonary edema (Dirkes and Hodge, 2008).

❖Nursing Management

■ Assessment (Data Collection)

When taking a patient's history, include questions that relate to fluid imbalance (e.g., changes in voiding patterns, weight gain, muscle cramps, cardiac arrhythmia or palpitations, vomiting, or edema) and potential risk factors (e.g., patient or family history of renal disease or hypertension; recent surgery, trauma, or anesthesia; and exposure to nephrotoxic substances or any medications). The patient should also be encouraged to describe specific symptoms (e.g., fatigue, lethargy, weakness, or pain).

All patients need a complete head-to-toe assessment and complete vital signs at the beginning of every shift. Acutely ill patients who are at risk for ARF need frequent reassessment for signs of fluid retention (e.g., skin turgor, edema, lungs sounds, weight, and strict I&O monitoring) and for imbalances in electrolytes (e.g., change of mental status or cardiac dysrhythmias).

■ Nursing Diagnosis and Planning

Examples of problem statements frequently associated with ARF include:

- Fluid volume excess due to decreased kidney function.
- Altered nutrition due to nausea and loss of appetite.
- Altered activity tolerance due to metabolic changes.
- Potential for infection due to indwelling urinary catheter.

Specific nursing diagnoses can be chosen from the NANDA-I list (see inside back cover).

Examples of expected outcomes include:

- Patient will have no signs of fluid overload (e.g., weight gain, edema, crackles in lungs, decreased urinary output) for the next 2 hours.
- Patient will metabolize sufficient calories (based on dietitian's calculation) to prevent catabolism (destructive breakdown of body tissue) during this shift.
- Patient will maintain bed rest and participate in activities of daily living (ADLs) as much as possible (e.g., brushes own teeth) during this shift.
- Patient will not have any signs or symptoms of infection (e.g., fever, cloudy urine) during hospitalization.

■ Implementation

Carefully monitor for signs of fluid imbalance. This includes physical assessment of edema, daily weights, and lung sounds. Strict measurement of I&O is essential. In the acute phase, hourly measurements of urine output are necessary.

Equipment, such as IV control pumps, should be used for accurate and safe delivery of IV fluids. In intensive care settings, arterial or central venous monitoring provides additional information about fluid status. Electrolytes should be monitored and may manifest as changes in the patient's mental status or cardiac dysrhythmias. The patient may be too ill to eat and may require TPN or enteral feedings. Even if the patient is unable to eat, make efforts to reduce noxious stimuli that exacerbate nausea, and administer antiemetics. Provide assistance with ADLs as needed during the acute phase, and progressively provide opportunities for the patient to participate once fatigue resolves. To prevent infection, be vigilant for signs and symptoms of infection. Perform hand hygiene frequently and encourage others to do so. Surgical aseptic technique should be used for procedures such as Foley catheter insertion and central line dressing changes. Help the patient and the family cope with the stress of this serious condition by allowing them to express concerns and

fears, by providing accurate information about ARF, and by making appropriate referrals.

Evaluation

Evaluation of outcomes for acutely ill patients must occur often, because the plan of care may need frequent revision. For example, **if there are sudden changes or if the hourly urine output drops below 30 mL/hr, the provider must be immediately notified.** The patient should be assessed for signs of worsening, such as shortness of breath and lung crackles associated with pulmonary edema, or decreased cardiac output associated with heart failure. The patient must be transferred from a general medical-surgical unit to the ICU if the condition becomes unstable.

Chronic Renal Failure

Etiology

Chronic renal failure (CRF) is a progressive loss of kidney function that develops over the course of many months or years. CRF is caused by destruction of the nephrons. All of the factors that can cause ARF may also cause CRF. Hypertension, diabetes mellitus, sickle cell disease, glomerulonephritis, nephrotic syndrome, lupus erythematosus, heart failure, and cirrhosis of the liver may also contribute to CRF.

The most common causes of CRF are glomerulonephritis and nephrosclerosis. **The primary causes of nephrosclerosis are hypertension and atherosclerotic disease of the small arteries in the kidneys.** As the blood supply decreases, the kidney cells degenerate and lose their ability to function, resulting in ESRD.

Health Promotion

Diabetes Mellitus

Diabetic nephropathy (kidney disease and dysfunction secondary to diabetes mellitus) is the most common cause of death in patients with diabetes mellitus. In keeping with the *Healthy People 2020* goal “to reduce kidney failure due to diabetes,” help your patients to understand the interrelationship between diabetes and kidney health. For example, you could say, “Mr. Smith, with your hypertension, when your blood sugar goes up, protein starts to leak into your urine. This causes an increased pressure in the kidney vessels, which eventually leads to kidney damage.”

Nephrosclerosis is classified as benign or malignant, depending on the severity of the disease and the speed with which hypertensive and atherosclerotic changes occur. The symptoms of nephrosclerosis are similar to those of chronic glomerulonephritis and renal failure. Treatment is the control of hypertension.

Pathophysiology

In the early stages of the disease, renal function can be adequate, but the waste products will begin to accumulate in the plasma. The patient does not experience symptoms until about 65% of the kidney tissue is damaged. As the disease progresses, nitrogenous waste products, such as urea nitrogen and creatinine, build up to higher levels in the blood. In the final or end stage of renal failure, 90% or more of kidney function is lost. **Azotemia** is the accumulation of nitrogenous products, which is signaled by an increase in BUN and serum creatinine. The patient may experience nausea and vomiting and changes in mental awareness and levels of consciousness. **The kidney is not able to excrete potassium; therefore be alert for high levels of serum potassium (5 to 7 mEq/L), which can adversely affect the heart, causing dysrhythmia and cardiac arrest.**

There are three stages of CRF. In stage 1 there is diminished renal reserve but no accumulation of metabolic wastes. The healthier kidney works harder. Urine concentration is decreased, and polyuria and nocturia occur. Stage 2 is renal insufficiency and is signaled by a rise in circulating metabolic wastes; therefore BUN and serum creatinine levels begin to rise. The glomerular filtration rate falls, and oliguria and edema occur. Stage 3 is ESRD. Circulating metabolic wastes accumulate in the blood, homeostasis cannot be maintained, electrolyte and fluid imbalances are serious, and dialysis or kidney transplant is necessary to maintain life.

Signs and Symptoms

The symptoms of CRF do not appear early in the disease. A high-normal elevation of BUN is an early warning sign, and the patient is likely to be asymptomatic. **One of the earliest signs of renal impairment is the inability of the kidneys to concentrate urine. This produces polyuria and very dilute urine, and the patient may report nocturia.** Renal insufficiency, which occurs before renal failure, can produce occasional headaches and fatigue, but these symptoms usually either go unnoticed or unreported by the patient. At this point, the kidney function is about 20% to 40% of normal. When symptoms do become apparent, kidney function can be as little as 5% to 10% of normal. As renal insufficiency progresses, the kidneys may not be able to produce much urine at all. This causes oliguria and eventually anuria.

Uremia or **uremic syndrome** includes the clinical signs and symptoms that affect the entire body during ESRD. Uremia signs generally appear when BUN concentration passes 100 mg/dL. The presence of uremic signs is the absolute indicator for initiating dialysis, and the goal is to maintain BUN below 100 mg/dL and to keep creatinine below 8 mg/dL.

The skin becomes dry, scaly, and a pallid yellowish gray. Pruritus (severe itching) occurs. Uremic frost (a late sign) appears as evaporated sweat leaves urea crystals on the eyebrows, face, axilla, and groin. Calcium is not absorbed from the intestinal tract, and this leads to the loss of calcium from the body and a corresponding drop in serum calcium. If the hypocalcemia is not corrected, the patient will eventually suffer from muscle cramps, twitching, and possibly seizures. As kidney cells cease to function, they are progressively less able to secrete phosphorus in the urine. An elevated serum phosphate level (hyperphosphatemia) serves to exaggerate the problem of inadequate calcium absorption; phosphate binds with calcium, decreasing its absorption from the intestinal tract. The patient is hypertensive from fluid overload, and body weight increases. Pulmonary edema and heart failure may occur. Metabolic changes occur, including triglyceride elevation and carbohydrate intolerance. Dietary protein is restricted in an attempt to decrease the waste products that the kidney can no longer handle; therefore serum protein decreases. Anemia is present because of decreased production of erythropoietin. Anorexia, nausea, and vomiting occur because of gastrointestinal mucosa irritation from waste products circulating in the blood. Constipation from drug therapy and fluid restriction is common. Patients may complain about restless leg syndrome, and the leg discomfort may interfere with sleep. When circulating wastes are increased, the nervous system cells become irritated, and the patient can become irritable and short-tempered. [Figure 34-3](#) shows the manifestations of uremia.

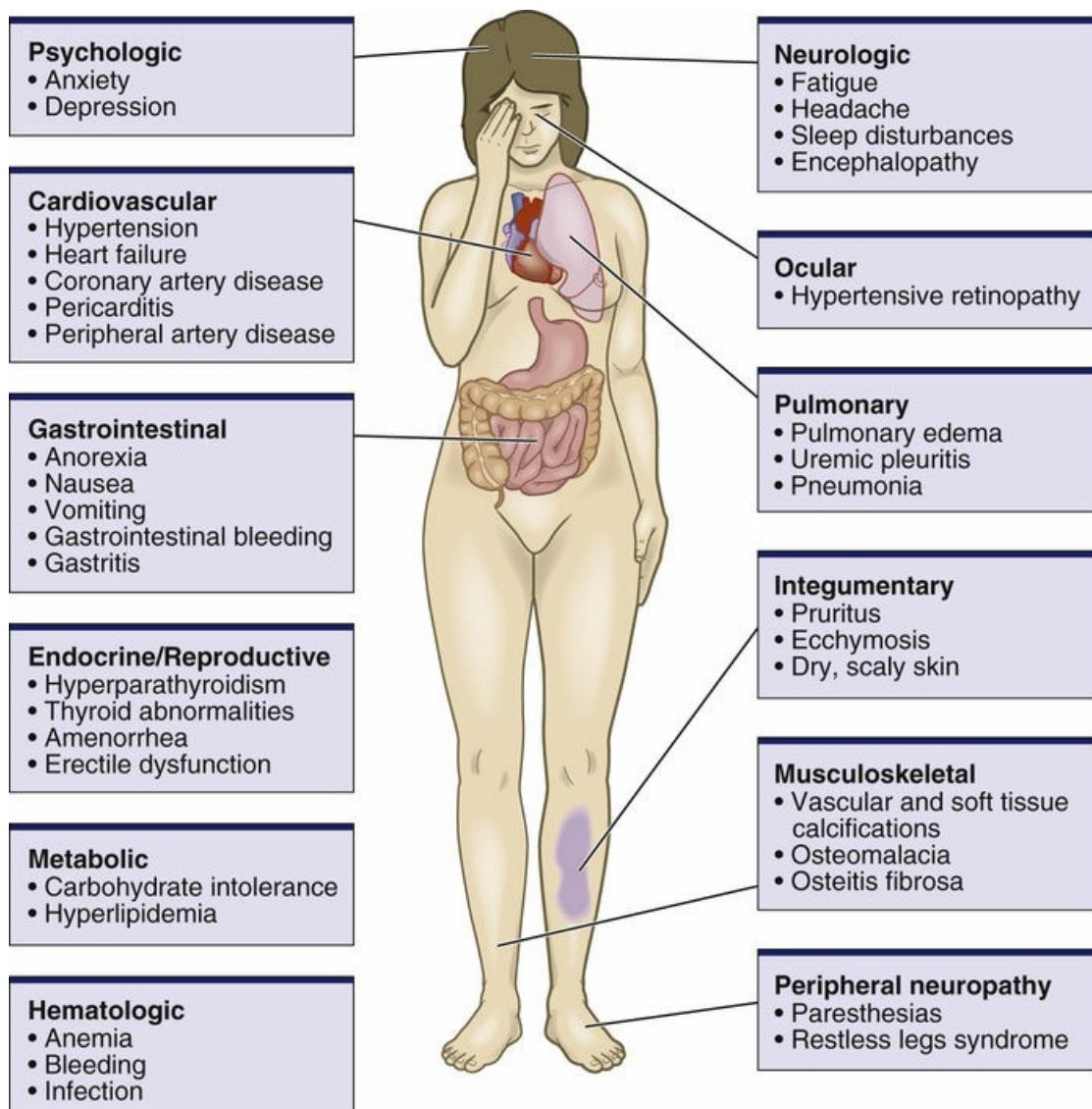


FIGURE 34-3 Systemic effects of uremia. (From Lewis SL, Dirksen SR, Heitkemper MM, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Diagnosis

Creatinine is a stable by-product of skeletal muscle activity that is excreted completely by the kidneys; therefore creatinine clearance (CC) is a good measure of GFR. CC depends on the amount of blood passing through the kidney; narrowing of the renal arterioles, shock, or dehydration decreases the volume that is available to the kidney for filtration. CC is also affected by the functional abilities of the glomeruli. Urine is collected for a 24-hour period. Urinalysis with culture and sensitivity, hematocrit, and hemoglobin provide additional information. A renal ultrasound, renal scan, CT scan, and renal biopsy are additional diagnostic tests.

Treatment and Nursing Management

Medical treatment and nursing intervention include measures to correct fluid and electrolyte imbalance and acid-base imbalance. Decreasing protein in the diet of patients with beginning renal insufficiency may help slow the disease process. A variety of drugs, such as antacids, antihypertensives, antilipemics, epoetin alfa therapy, and vitamin and mineral supplements, are used to counteract the fluid and electrolyte imbalances, treat metabolic acidosis, and control the complications (Table 34-4). Diuretics are used while there is some remaining kidney function (renal insufficiency) but are not useful during ESRD. Inotropic agents, such as digitalis or dobutamine, are used in severe cases of heart failure. Antiseizure medications, such as phenytoin (Dilantin) or

diazepam (Valium), also may be needed, because uremic toxins can irritate the nervous system. Dialysis and kidney transplant are two major alternatives that offer hope for patients with ESRD. The Chronic Renal Insufficiency Cohort Study (CRIC) was initiated in 2001 to further the understanding of kidney disease and has published many discoveries ([National Institute of Diabetes, 2014](#)).

 **Table 34-4**

Common Drugs Used to Treat Chronic Renal Failure

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Diuretics			
Furosemide (Lasix)	Promotes urine flow; rids body of excess fluid; used in early stages of chronic renal failure (CRF)	Potentially nephrotoxic and ototoxic. Strict I&O recording is necessary. Monitor laboratory values for blood dyscrasias. Side effects: vomiting, headache, constipation, and dizziness.	Report fever, sore throat, bleeding, bruising, difficulty swallowing, rash, or change in hearing.
Antihypertensives			
ACE inhibitors Enalapril (Vasotec)	Reduces angiotensin II and aldosterone, which decreases peripheral resistance and sodium reabsorption	Monitor for hypotension, blood dyscrasias, signs of infection, or bruising. African Americans have a higher incidence of angioedema (facial swelling, hoarseness), which can be fatal.	Immediately report cough, difficulty breathing, rash, tremors, blood in stool, or bleeding after brushing teeth. Report persistent dizziness or numbness and tingling.
Vitamins			
Calcitriol (Rocaltrol)	Active form of vitamin D	Monitor serum calcium; normal level 8.4–10.6 mEq/L. Monitor for hypocalcemia.	Report signs of hypocalcemia (e.g., twitching of mouth, numbness of fingers, laryngeal spasm, carpopedal spasm).
Folic acid and vitamin B ₁₂	For red blood cell formation	Give with food to promote absorption. Side effects not expected.	Store in dry, light-protected container.
Minerals			
Iron (ferrous sulfate)	Used to treat anemia	Give with water or juice to promote absorption. Do not give with milk products.	Take with food if gastric distress occurs. Sit upright for 30 min after taking. <i>Stool may turn black; this is a harmless side effect.</i>
Ferumoxytol (Feraheme)	Treats iron deficiency anemia of CRF	Administer by IV injection.	The most common adverse reactions include diarrhea, nausea, dizziness, hypotension, constipation, and peripheral edema.
Calcium Supplements			
Calcium carbonate	Prevents problems of calcium loss	Monitor serum calcium.	Constipation is a common side effect.
Calcium acetate (also binds phosphate)	Give with meals to bind phosphate	Monitor ECG changes for potential dysrhythmias.	Nausea, vomiting, drowsiness, or headache may occur.
Hematopoietic Growth Factors			
Epoetin alfa (EpoGen) Darbepoetin (Aranesp)	Treatment of anemia; promotes red blood cell formation	Can cause hypertension; monitor blood pressure. May need increased doses of heparin. Subcutaneous route is preferred.	Report nausea, vomiting, edema, fatigue, or chest pain.
Resins			
Sodium polystyrene (Kayexalate)	Treatment of hyperkalemia	Can be given mixed with food or in an enema. Monitor electrolytes. Side effects: nausea, vomiting, constipation, and anorexia.	Report any muscle weakness, irregular heartbeat, or stomach pain.

ACE, Angiotensin-converting enzyme; ECG, electrocardiogram; I&O, intake and output.

Renal dialysis.

Dialysis is indicated for acute renal failure or for renal insufficiency when diet, medications, and fluid restriction have failed. It may also be used for patients with ESRD, drug overdose, hyperkalemia, fluid overload, or metabolic acidosis ([Neligan, 2010](#)). Hemodialysis and peritoneal dialysis rely on diffusion to remove waste elements normally excreted in the urine. The principle of **diffusion** states that solute molecules that are in constant motion tend to pass through a semipermeable membrane from the side of higher concentration to the side of lower concentration.

Hemodialysis.

During hemodialysis, blood moves from the arterial circulation through a dialysate bath and back to the venous circulation. A dialysis membrane separates the blood from the dialyzing solution. The molecules of waste pass through this membrane out of the blood and into the dialyzing solution until the two solutions are equal in concentration ([Figure 34-4](#)).

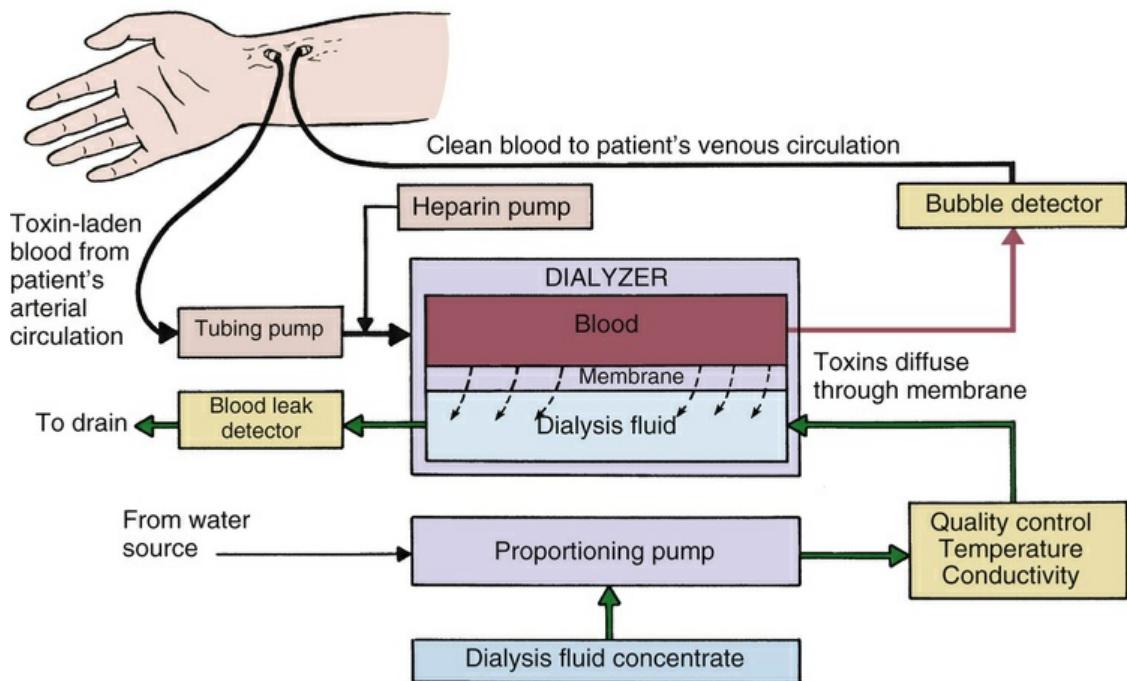


FIGURE 34-4 Hemodialysis. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

A temporary access for hemodialysis can be achieved by inserting a jugular or femoral vein dialysis catheter. The jugular site has a low incidence of thrombosis; it can be used for 1 to 3 weeks and is preferred over the femoral site. Only trained dialysis staff should use these temporary access sites for medication administration or blood draws.

Two kinds of internal access are used for ongoing hemodialysis. An arteriovenous fistula (AVF) is formed by joining an artery and a vein together (Figure 34-5, A). The vein is made into a large superficial vein with an arterial supply that is easily accessible by venipuncture. Typically the radial or brachial artery is joined to the cephalic vein in the arm. A period of 6 to 8 weeks after surgery is needed for the vessel walls to become thickened and usable for the repeated insertion of the hemodialysis needles. Although the AVF has fewer complications and better patency, it requires relatively healthy blood vessels; therefore patients with diabetes, prolonged IV drug use, or peripheral vascular disease may need an alternative access site.

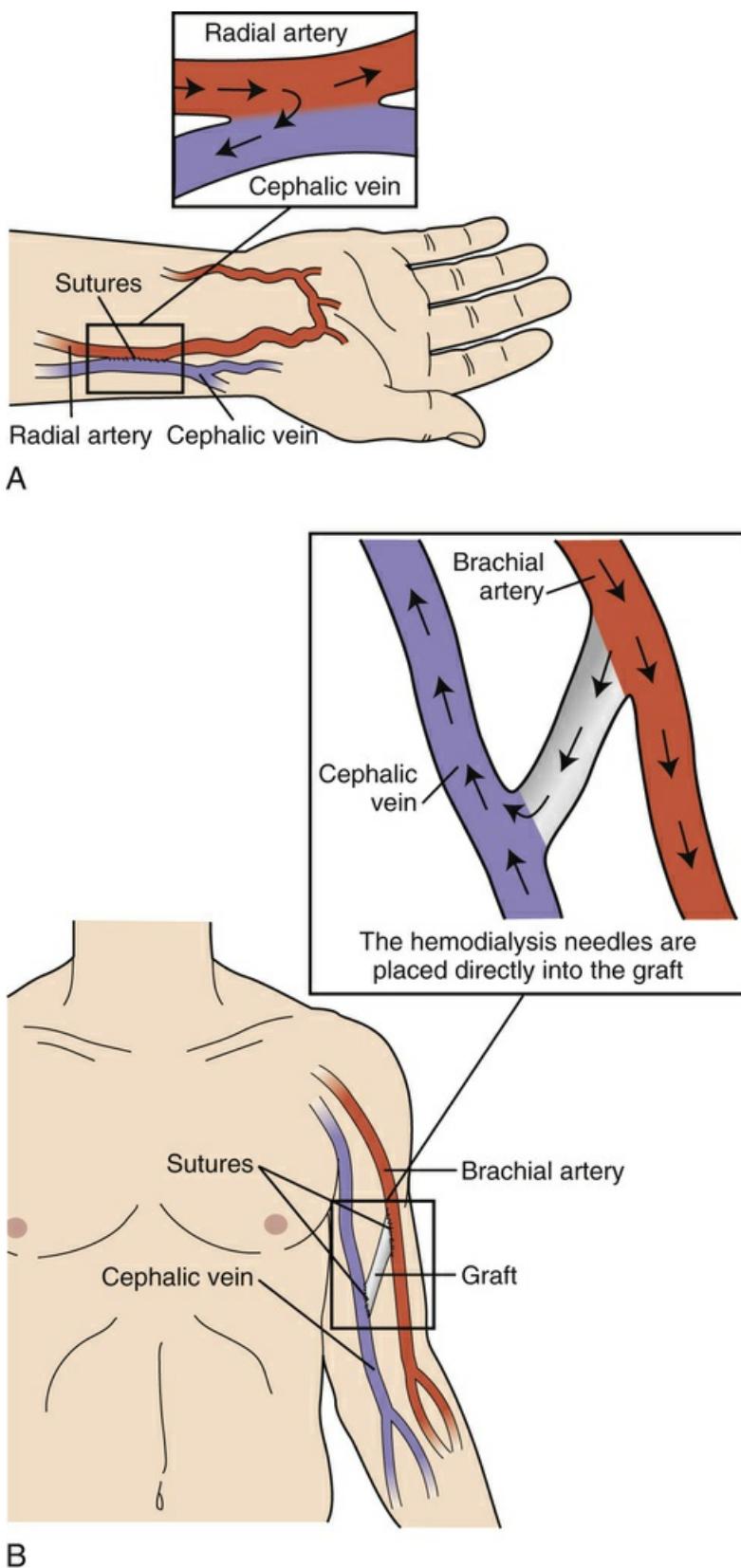


FIGURE 34-5 **A**, Arteriovenous fistula. **B**, Vascular graft access for long-term hemodialysis. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2010, Saunders.)

The arteriovenous (AV) access is accomplished by connecting an artery and a vein with a graft of a piece of synthetic material. The hemodialysis needles are then placed directly into the graft (see Figure 34-5, B).

Clinical Cues

To assess for a bruit, gently auscultate the shunt with your stethoscope. You should hear an intermittent soft swishing sound that will correlate with the rhythm of the patient's pulse.

Medications commonly prescribed for patients undergoing dialysis include multivitamins, antacids, iron and calcium supplements, antihypertensives (especially angiotensin-converting enzyme [ACE] inhibitors), epoetin alfa, phosphate binders, and possibly anticonvulsants. Darbepoetin (Aranesp) is a newer and longer-acting form of erythropoietin therapy (see [Table 34-4](#)).

Complications.

A patient on hemodialysis may experience fluid overload, electrolyte imbalance, alterations in blood components leading to anemia, and platelet abnormalities that produce bleeding tendencies. Patients also may develop dialysis disequilibrium syndrome. This may occur because of a rapid decrease in fluid volume and is more likely after the first several treatments. Observe the patient for changes in mental status, headache, vomiting, or seizures. Be alert for cardiac dysrhythmias, signs of air emboli, or hemorrhage. Other major problems are systemic infections or localized infections at the access site.

Hepatitis C and acquired immunodeficiency syndrome (AIDS) are dangers because of blood access and risk of contamination. Patients who had multiple blood transfusions during the early to mid-1980s may have been exposed to the human immunodeficiency virus (HIV). (Hepatitis B is also possible but is less of a concern thanks to vaccination, antibody testing, and strict body fluid precautions. Patients and dialysis staff should receive hepatitis B vaccine.)

Nursing management.

When caring for a hospitalized patient who has an arteriovenous graft or an AVF, it is important to check the site and protect it from injury. The site should be observed at least four times a day for signs indicating clotting or infection, and the peripheral circulation distal to the graft should also be checked (capillary refill and color of nail beds). Palpate for a thrill (vibration in the vessel) by gently laying your fingers on the enlarged vessel. You should be able to feel a buzz or vibration. A **bruit** (soft swishing sound) should be clearly heard on auscultation, and the rhythm of the sound should coincide with the patient's pulse. When a graft has been inserted, the extremity is elevated postoperatively and kept at a level above the heart for 24 to 72 hours. Thereafter, the patient should sleep with that extremity free (i.e., not on the side with the arm tucked underneath the body). Care is taken never to compress the extremity containing the vascular access.

Clinical Cues

The arm or leg in which the arteriovenous shunt has been created should never be used for checking blood pressure or performing venipuncture (peripheral IV lines or blood draws). Post a sign above the bed to alert other members of the health care team.

Antihypertensive drugs are not given the morning of dialysis, because they can cause severe hypotension during the treatment. Nitroglycerin (NTG) patches, digitalis, and anticoagulants also are held. Consult with the dialysis nurse to coordinate the timing of medications. Before the patient goes to dialysis, do a physical assessment, check for bruit and thrill at the access site, and obtain a complete set of vital signs and a weight. These measurements will be compared with post-treatment results.

Patients undergoing hemodialysis will have considerable fluid volume shifts that affect homeostasis. Plan to assess these patient more frequently in the hours after dialysis treatment is completed. Postdialysis nursing care includes monitoring the access site for bleeding for 1 hour after the treatment. Assess the patient for signs of confusion or disorientation, hypotension, nausea or vomiting, headache, dizziness, or muscle cramps. Monitor and compare vital signs to pretreatment values and continue assessment of the access site for patency and signs of infection. **Invasive procedures are postponed for 4 to 6 hours after dialysis, because the clotting time is extended from the heparin used during dialysis, and prolonged bleeding could occur.**

The scheduling of hemodialysis sessions varies from patient to patient, but treatments usually are

done two or three times a week. Stable patients can be treated on an outpatient basis at a dialysis center.

Peritoneal dialysis.

Peritoneal dialysis is an alternative procedure that can be used instead of hemodialysis to remove waste products or toxins that have accumulated as a result of ARF or CRF. During peritoneal dialysis, dialyzing fluid that is equal in osmolality and similar in composition to normal body fluid is introduced into the peritoneal cavity via a Tenckhoff catheter by gravity or pump (Figure 34-6). Medications such as heparin, insulin, potassium, or antibiotics may be added to the solution. The solution is left in the peritoneal cavity for a specified time (dwell time) until the concentration of the solutions on either side of the peritoneal membrane is equalized.

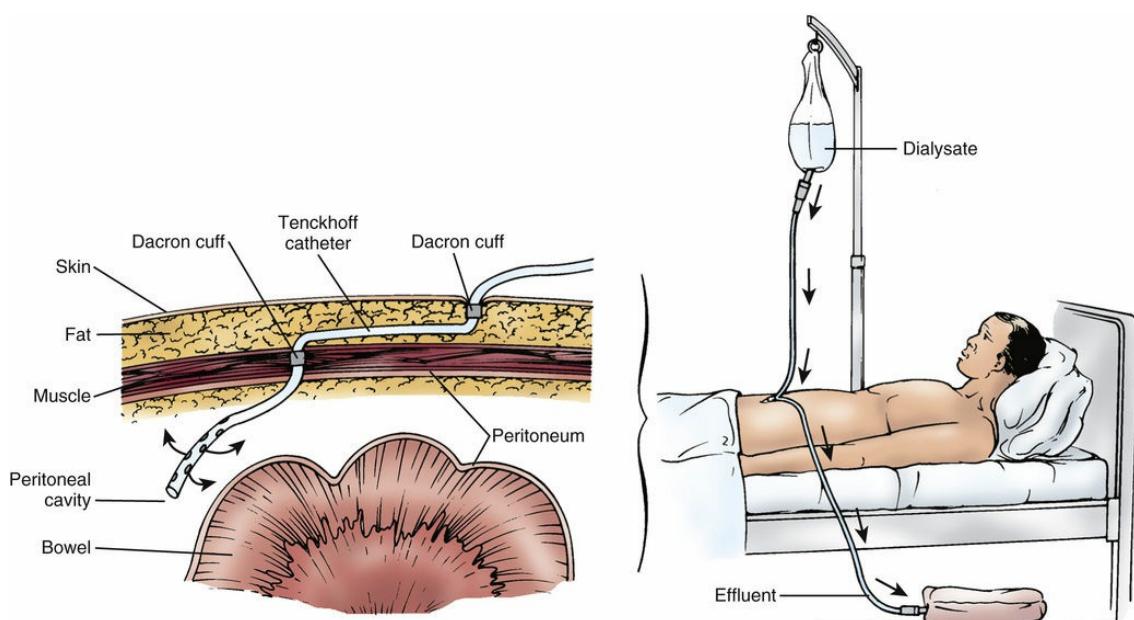


FIGURE 34-6 Peritoneal dialysis through an abdominal catheter. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 7, Philadelphia, 2010, Saunders.)

After the fluid is infused, the patient can move about during the dwell time. At the end of the dwell time, the dialysate solution containing waste products is drained from the abdominal cavity. The drainage should be colorless or straw-colored unless the catheter was recently inserted (the drainage may be bloody for the first several treatments).

Peritoneal dialysis has several advantages: (1) treatment can be started more quickly than hemodialysis, (2) anticoagulants are not necessary, (3) maturation of the access site and canalization of blood vessels is not required, (4) there is less stress on the cardiovascular system because fluid exchanges occur more slowly, and (5) some patients with renal failure fare better on a gentler therapy. Peritoneal dialysis cannot be done when there is severe trauma to the abdomen; after multiple abdominal surgeries; if there are adhesions in the abdominal cavity; or if the patient has a severe coagulation defect, paralytic ileus, or diffuse peritonitis.

There are several types of peritoneal dialysis. The basic principles are the same, but the dwell times, schedule of frequency, and use of a control pump versus gravity flow will vary. The first type is **continuous ambulatory peritoneal dialysis (CAPD)**. The CAPD process goes on 24 hours a day, 7 days a week. As a self-dialysis method, CAPD may be the easiest for the patient, and it requires no machinery. For CAPD, the bag of dialyzing solution is suspended above the level of the abdomen, and tubing is attached to the permanently implanted peritoneal dialysis catheter. The clamp on the CAPD tubing is opened and the dialysate solution is allowed to run into the abdomen by gravity flow. After the dwell time (4 to 8 hours), the fluid is drained. A second type is **nocturnal intermittent dialysis**, which is accomplished either with or without use of a control pump and is performed three to five times per week for 10 to 12 hours at night. This allows the patient to be free between treatment times. A third type, **continuous cycling peritoneal dialysis**, combines CAPD

with nocturnal intermittent dialysis for home use. An automated cycling machine allows the patient to do three exchanges at night while sleeping, then during the day there is one exchange, but the dwell time lasts all day long. The last type, **automated peritoneal dialysis**, is regulated by machinery and can be used in acute care settings, in clinics, and at home during the night.

Complications.

Potential complications of peritoneal dialysis include peritonitis, leakage, obstruction or other problems with the catheter, respiratory problems, and fluid overload or hypertriglyceridemia (disturbance of lipid metabolism).

Think Critically

What signs and symptoms might indicate that a patient undergoing peritoneal dialysis has peritonitis?

Nursing management.

Nursing care for a patient undergoing peritoneal dialysis includes obtaining the patient's weight before and after the treatment; maintaining careful I&O records; maintaining strict aseptic technique in handling the dialysate bags, peritoneal catheter, and all equipment; monitoring vital signs; observing for complications such as peritonitis; and keeping the patient as comfortable as possible. The dialysate solution should be at room temperature and must be instilled slowly. In accordance with National Patient Safety Goals, the patient and family are taught all the steps of the procedure before discharge, to ensure safety and prevent infection.

Kidney transplant.

An alternative to dialysis is to transplant a kidney from a blood relative of the patient, another tissue-compatible donor, or from a cadaver whose kidney tissue is compatible with that of the recipient.

Tissue typing to determine donor-recipient compatibility is performed, along with extensive psychological assessment and counseling for both the live donor and the recipient. Transplant candidates must be free from medical problems that might increase the risks of the procedure or jeopardize the success of the transplant. Malignancy, IV drug abuse, severe obesity, active vasculitis, and severe psychosocial problems eliminate some candidates.

Legal and Ethical Considerations

Organ Donation

There are 58 organ procurement organizations in the United States (HHS, 2015). Medicare, Medicaid, and The Joint Commission mandate that the local organ procurement organization (OPO) must be notified about brain death of a patient so that a well-trained representative of the OPO can evaluate the suitability of the potential donor and approach the family in a timely manner. Currently, research on increasing donation is being promoted, and grants are available ([U.S. Department of Health and Human Services, 2014](#)).

A significant factor in transplant therapy is the shortage of organs. In the United States more than 100,000 people are on the waiting list at any moment in time. Stable patients who are waiting for a transplant must live close to a transplant center and be ready immediately when an organ becomes available. Hypertension is brought under the best possible control, any infection is treated, and the patient is dialyzed immediately before transplantation. One of the *Healthy People 2020* goals is to increase the proportion of patients who receive a kidney transplant within 3 years after being put on the waiting list.

There are three types of immunosuppressive drugs to prevent organ rejection: (1) cytokine inhibitors (e.g., cyclosporine [Sandimmune], tacrolimus [Prograf]); (2) antiproliferative agents (e.g., azathioprine [Imuran]); and (3) antibodies (e.g., muromonab-CD3 [Orthoclone OKT3]). A recently approved drug is everolimus (Zortress), which inhibits the growth of cells that would ordinarily

contribute to rejection of the transplanted kidney (Clin-eGuide, 2010). Long-term problems for transplant patients are increased susceptibility to infection and a higher risk of malignancy.

Renal transplant patients are transferred to critical care or specialty units after surgery, where they are closely monitored for signs of rejection: fever, increased blood pressure, and pain over the iliac fossa where the new kidney was placed (Figure 34-7). Ongoing assessment includes watching for the signs of renal failure, particularly oliguria, anuria, and rising BUN levels and serum creatinine. Protection from sources of infection is a top priority. Once the new kidney is functioning properly, the primary provider may lift any previous dietary restrictions.

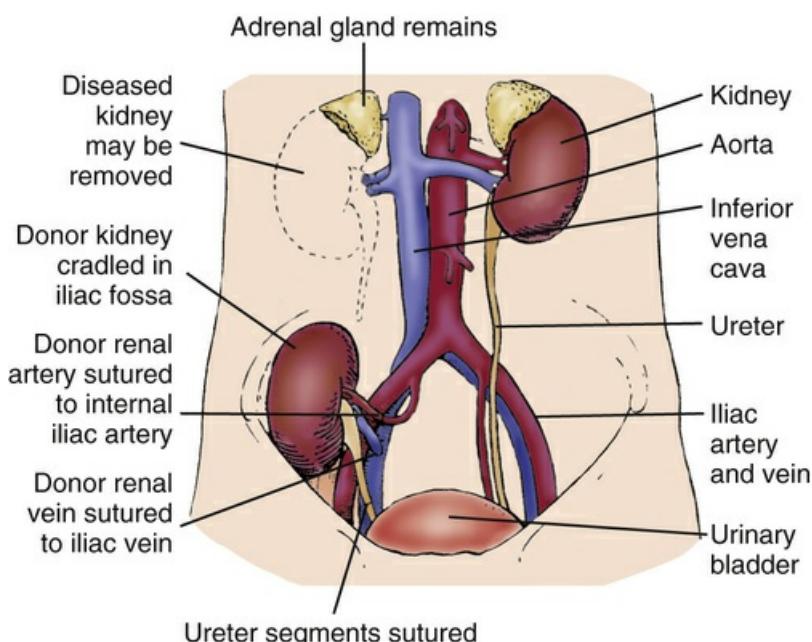


FIGURE 34-7 Placement of transplanted kidney. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

Renal failure and dialysis are very expensive for the patient and family. However, lack of funds does not exclude anyone from needed care. Since July 1973, an amendment to the Social Security Act allows Medicare to pay for most of the cost of treating ESRD, including dialysis and renal transplant. Medical expenses continue after transplant, because the drugs needed to prevent rejection are very expensive.

❖Nursing Management

■ Assessment (Data Collection)

The assessment findings will vary because of the slow but progressive development of kidney failure and the effect that kidney disease has on other body systems. Take a past medical history that includes medication, previous illness and surgeries, family history of illness, and a report of current complaints and concerns.

Perform a general head-to-toe assessment including complete vital signs and a baseline weight. Observe for changes and symptoms that include:

- Neurologic changes (e.g., lethargy or irritability)
- Cardiovascular abnormalities (e.g., dysrhythmias or hypertension)
- Respiratory abnormalities (e.g., shortness of breath or fluid in lungs)
- Gastrointestinal distress (e.g., nausea, vomiting, or constipation)
- Musculoskeletal discomfort (e.g., muscle cramps, twitching, or restless legs syndrome)
- Skin changes (e.g., itching or uremic frost)

Monitor BUN, serum creatinine, electrolytes, and urinalysis. As the disease progresses, assess for impaired urine concentration, decreased output, and anemia.

Clinical Cues

Although it is common to weigh patients in the morning with the same scale and the same amount of clothing, use your clinical judgment to initiate weights more frequently than once per day if needed. Watch for signs of fluid overload (e.g., facial or peripheral edema, shortness of breath, or crackles in lungs). One kilogram, or 2.2 lb, of weight gain is equal to approximately 1 L of fluid.

In addition, assess patients for sexual difficulties or concerns. Patients may experience medication side effects, such as impotence. Weight gain, peripheral edema, or presence of a shunt may alter body image or feelings of attractiveness. Fatigue caused by anemia or hormonal imbalance can result in decreased libido (sexual desire). Partners may fear that the patient is too ill to participate in sex or that the hemodialysis shunt will be damaged.

Clinical Cues

Help your patient to verbalize concerns about sexual problems by using a matter-of-fact approach (e.g., "Mr. Smith, have you or your partner noticed any changes in your sexual relations since you started your new medication?"). It is possible that you may not be able to directly solve the problem, but giving the patient the opportunity to talk about it is helpful. In addition, once you have assessed the problem, you can refer the patient to the appropriate resource if the problem is beyond your expertise (e.g., the provider may be able to change medication or the family may need psychological counseling).

Nursing Diagnosis

Patients with renal disease will have problems related to anemia, bleeding tendency, susceptibility to infection, nausea, vomiting, anorexia, gastrointestinal bleeding, and fluid overload that exacerbates conditions such as congestive heart failure. Examples of problem statements commonly associated with chronic renal disease and dialysis include:

- Altered nutrition due to dietary restrictions and loss of appetite.
- Fatigue due to anemia.
- Potential for infection from invasive procedures (e.g., dialysis shunt).
- Acute confusion due to accumulation of toxins.
- Altered sexual function due to stress and medication side effects.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Examples of expected outcomes include:

- Patient will eat at least 50% of all meals during this shift.
- Patient will have adequate energy to independently perform ADLs before discharge.
- Patient will not have any signs or symptoms of infection (e.g., fever, redness, or swelling at shunt site) during hospitalization.
- Patient will demonstrate ability to make safe judgments (e.g., calls for help as needed) and orientation to person, place, and time before discharge.
- Patient will verbalize concerns or fears about sexual dysfunction.

Planning

In planning care for a patient with chronic renal disease, consider the stress of prolonged intensive treatment, the frustrations of dealing with an incurable illness, rigid dietary restrictions, fatigue, malaise, occasional limited mobility, and possibly sexual difficulties, all of which take their toll on both the patient and family. Consider the family's needs as well as the patient's when planning nursing intervention.

General nursing goals for care of patients with chronic renal disease include:

- Positive adaptation to therapeutic regimen (i.e., dietary and fluid modifications, dialysis)
- Maintaining fluid and electrolyte balance
- Prevention of complications
- Ensuring knowledge for appropriate self-care

- Assisting with resolution of body image disturbance
- Prevention of caregiver role strain and family dysfunction related to chronic illness

Think Critically

What kinds of behaviors would suggest caregiver role strain for the spouse of a patient who has CRF?

Implementation

Daily weight, measurement of I&O, determining the pattern of urination, and restricting fluid as ordered by the provider (generally calculated as intake of 500 to 700 mL plus the amount of output from previous 24 hours) are essential to the well-being of a patient with renal damage. In addition to these basic procedures, there should be ongoing monitoring of electrolytes, BUN, and creatinine. Hyperkalemia and a sodium imbalance will occur, as will hypocalcemia and hyperphosphatemia (see Chapter 3).

Because of the buildup of nitrogenous wastes from protein metabolism, restriction of protein intake is necessary; only high-quality protein foods (e.g., meat and eggs) are encouraged (Figure 34-8). Potassium is also restricted. Sodium intake often is restricted, especially if the patient is hypertensive. Previously, aluminum carbonate (Basaljel) was used as a phosphate binder; however, concern over elevated aluminum levels has prompted the use of calcium carbonate, which acts as a phosphate binder and a calcium supplement. The complexity of diet restrictions and modifications makes understanding and compliance very difficult for the patient and the family (Table 34-5).

THERE ARE TWO DIFFERENT TYPES OF PROTEIN		THE HEMODIALYSIS AND THE PERITONEAL MEMBRANE ARE NOT SELECTIVE, WHICH MEANS THAT VITAL AMINO ACIDS AND VITAMINS AS WELL AS UNWANTED WASTES ARE REMOVED			
One is called animal or high-biological protein, which contains ALL essential amino acids	The other type is vegetable or low-biological protein, which contains SOME amino acids	If you are on HEMODIALYSIS, you should aim for 1.2 g of protein per kg of body weight; e.g., if you weigh 65 kg (143 lb), your protein intake should be about 78 g/day	If you are on PERITONEAL DIALYSIS, you should aim for 1.3 g of protein per kg of body weight; e.g., if you weigh 70 kg (154 lb), your protein intake should be about 91 g/day		
EXAMPLES OF PROTEIN SOURCES					
3.5 oz of extra-lean ground beef has 24 g of protein, whereas ribeye has 28 g of protein	Half of a chicken breast (3.5 oz) has 29 g of protein, turkey white meat (3.5 oz) has 30 g of protein	One can of Ensure has 13 g of protein, whereas 1 scoop of Promod has 5 g, and one egg has 6 g of protein	15 large cooked shrimp have 17 g of protein; a 3 oz can of white tuna in water has 22 g of protein	One cup of milk has 8 g of protein, whereas 1/2 cup of regular tofu has 10 g, and one slice of white bread has 2 g of protein	One cup of cooked corn, peas, potato, pasta, or rice has about 4 g of protein

FIGURE 34-8 Tips for protein intake. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders. Modified from Darlene Michl, Victoria, BC, Canada, www.personalhealthcoaching.ca.)

Table 34-5

Dietary Restrictions for a Patient With Renal Failure

DIETARY COMPONENT	WITH CHRONIC UREMIA	WITH HEMODIALYSIS	WITH PERITONEAL DIALYSIS
Protein	0.55-0.60 g/kg/day	1-1.5 g/kg/day	1.2-1.5 g/kg/day
Fluid	Depends on urinary output, but may be as high as 1500-3000 mL/day	500-700 mL/day plus amount of urinary output	Restriction based on fluid weight gain and blood pressure
Potassium	60-70 mEq/day	70 mEq/day	Usually no restriction
Sodium	1-3 g/day	2-4 g/day	Restriction based on fluid weight gain and blood pressure
Phosphorus	700 mg/day	700 mg/day	800 mg/day

Assess the patient's health status and learning needs throughout the illness and provide information to manage symptoms and prevent further damage whenever possible. The expertise of other professionals, especially nutritionists, is needed to help accomplish the goals of (1) minimizing uremic toxicity; (2) maintaining acceptable electrolyte levels; (3) controlling hypertension; (4) providing sufficient calories; and (5) maintaining good nutritional status.

Encourage communication between patient and spouse to elicit feelings about changes in sexual activity, role reversal, and family responsibilities. Patients with kidney failure commonly have self-care deficits that affect self-esteem and create an increased caregiver burden. Encourage the family to achieve a balance between supporting the patient and allowing as much independence as possible.

Communication

Noncompliant Hemodialysis Patient

John is a 48-year-old man who has end-stage renal disease and is on hemodialysis twice a week. He has not been compliant with his diet and fluid restrictions and has been increased to three dialysis treatments a week. He gained 5 lb over the weekend.

Nurse: "John, I see that you gained five pounds since Friday. Tell me about your weekend."

John: "I never have any fun or do normal things with my friends, so I went fishing with some buddies and we drank a lot of beer. We barbecued fish and some sausage. It was a real feast!"

Nurse: "How are you feeling today?"

John: "I feel rotten. I don't have any energy, and my thinking is slow. My legs are really swollen, and I'm having trouble breathing."

Nurse: "Do you think that might have something to do with the beer and food?"

John: "I suppose it does, but can't a guy have a little fun?"

Nurse: "John, I am concerned. You know that fluid and waste overload puts your whole body out of balance and causes damage in other organs. It's especially hard on the heart."

John: "Yeah, I know you've told me. It's just so hard. You don't understand what it is like."

Nurse: "You are right. I don't have kidney disease or the strict diet and fluid restrictions. I think it would be very difficult, but I would want to take care of myself for my family and friends."

John: "Well, you know that my wife left me and I don't see much of the kids, but I sure do enjoy my granddaughter. I really enjoy my times with the guys at the Lodge, too."

Nurse: "Do you have any friends who are in a similar situation who you can talk to?"

John: "No, none of my friends has kidney disease."

Nurse: "There is a young man who comes here for dialysis treatments who is always talking about fishing. Maybe the two of you could give each other some encouragement and support."

John: "Well, I don't know. I don't make new friends very easily."

Nurse: "He will be here on Wednesday. How about if we schedule your treatment for the same time? Perhaps you could get acquainted."

John: "O.K. That seems fine."

Nurse: "Next week we can talk again to see how you are doing with your diet, fluid restrictions, and medication schedule."

John: "Thanks. I will try to do better this week."

Clinical Cues

If a patient is somewhat resistant to listening to the nutritionist, support the diet teaching by showing enthusiasm and providing openings for the nutritionist to give the information. For example, the nurse says, "I'd be interested in hearing about the list of quality protein foods. This sample menu looks pretty good. Do you have more examples we could look at?"

Evaluation

For chronic renal failure, perform and compare data for daily physical assessments, weights, I&O, and laboratory reports. Monitor trends over a period of days to determine clinical improvement or the presence of problems. Daily fluctuations in subjective symptoms, such as fatigue or discomfort, along with ambivalent feelings toward the therapeutic regimen, are expected; however, if symptoms are prolonged or ongoing, the care plan should be revised. [Nursing Care Plan 34-1](#) includes problem statements/nursing diagnoses, interventions, and outcomes that are commonly used for patients with renal insufficiency and failure.

Think Critically

Your patient with CRF is withdrawn and sullen at times and is sharp and demanding at other times. How will you respond to this? How will you help the family deal with this behavior?

Nursing Care Plan 34-1

Care of a Patient With Chronic Renal Failure

Scenario

Mrs. Stevens, age 54 years, has had hypertension since her early 20s. She was diagnosed with chronic renal failure several years ago. Now she reports headaches, fatigue, and nausea. She states, "I have to sleep with three pillows and I am just exhausted." She feels that "her doctor is keeping something from her" and she is withdrawn and sullen. Tearfully, she reports, "The renal diet is so complex and my husband and son cannot manage the cooking and shopping." Her nephrologist conducted a series of diagnostic tests and recommended hemodialysis and eventual kidney transplant when an organ is available. Laboratory results include hematocrit 25%, hemoglobin 9 g/100 mL, BUN 48 mg/dL, and creatinine 3 mg/dL; admission weight: 137 lb ("normal weight around 130 lb"); 3+ pitting edema, bilateral feet and ankles.

Problem Statement/Nursing Diagnosis

Altered activity tolerance/*Activity intolerance related to anemia.*

Supporting Assessment Data

Subjective: "I am just exhausted."

Objective: Hematocrit 25%; hemoglobin 9 g/100 mL, appears tired.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will identify her activity limits for this shift.	Monitor for signs of weakness or increasing fatigue.	These signs and symptoms can signal a potential decreased RBC count and impaired oxygen-carrying capacity.	Able to independently perform basic hygienic needs this morning.
	Check vital signs for changes when activities appear stressful or overtaxing.	Marked increase in pulse or respiratory rate during routine ADLs suggests activity intolerance.	Reported feelings of fatigue and mild dyspnea after walking to the nurses' station. Vital signs at that time were BP 145/90, P 120, R 32/min. Repeat vitals after 30 min of rest: BP 140/80, P 85, R 20/min.
	Have patient use rating scale (scale 1/10) for different types of activities, such as walking to the bathroom or climbing the stairs.	The exertional scale (1/10) allows the patient (and the nurse) to rate and monitor performance and alter activities accordingly.	Ambulating in the hall was "too much"; reported an exertion level of 6/10.

	Adjust activities to allow for periods of rest.	Adequate rest facilitates recovery; activities can be increased or decreased according to the patient's level of tolerance.	Patient was assisted back to her room. Rested for 3 hr.
	Help visitors and patient to discuss what time of day and type of activities will fit the patient's current energy level (e.g., son could visit on Saturday morning and read a book with the patient).	Visitors need specific instructions to prevent overstimulating (or avoiding) the patient.	Patient's family agrees to come in midmorning hours and limit stay to 1 hr.
By discharge, patient will be able to perform ADLs independently without distress.	Assist with ADLs as required and keep personal articles within reach.	Patient's ability to do ADLs will wax and wane. Items close by and assistance as needed will help to conserve energy.	Able to independently comb hair and apply makeup when personal items are within easy reach.
Patient will demonstrate increased hematocrit value of 30% and increased hemoglobin of 11 g/100 mL.	Monitor for decreased hematocrit and hemoglobin values.	Normal range for hematocrit is 37%-47% (female). Normal range for hemoglobin is 12-16 g/dL (female).	7:00 A.M. Hematocrit: 24%; hemoglobin: 9 g/100 mL.
	Give epoetin and monitor for side effects (e.g., increased BP, dyspnea, chest pain, seizures, headaches, calf pain). Give iron, multivitamins, and folic acid as prescribed. Instruct about foods that supply iron (e.g., lean meat and vegetables) and folic acid (e.g., whole wheat bread).	Nutritional supplements and epoetin are given to help the body with RBC production.	Epoetin given subcutaneously, as prescribed. No adverse effects noted.
	Monitor infusions of packed RBCs, as ordered.	Transfusions may be needed if anemia is severe.	No transfusion ordered at this time. Outcomes partially met. Continue plan.

Problem Statement/Nursing Diagnosis

Loss of power/*Powerlessness related to perceived lack of information and stress of chronic illness.*

Supporting Assessment Data

Subjective: "Doctor is keeping something from me."

Objective: Appears withdrawn, sullen, and tearful.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will express feelings associated with chronic illness during this shift.	Encourage expression of feelings (e.g., frustration, anger).	Expression of feelings and beliefs allows the patient and the nurse to clarify how the situation affects behavior and decision making. Taking the time to listen also builds trust and rapport.	Patient stated that she was discouraged and depressed about her illness. Expresses anger toward her provider, because she thinks, "he is not telling the whole story."
	Encourage expression of beliefs about illness and outcomes.	Patient may experience strong feelings and may or may not be able to identify the source. The nurse may not be able to correct all situations, but just talking about the frustration will help some patients.	She "hates the idea of dialysis" and feels like it is "controlling her life."
	Observe for factors contributing to feelings (e.g., lack of information, loss of social roles) and correct if possible. Assist patient to identify factors that can and cannot be controlled.	Identifying factors that cannot be controlled allows the patient to realistically work on achievable goals.	Patient identified that knowing more about dialysis would be helpful.
Patient will participate in planning care and daily goals within 2-3 days.	Provide opportunities for patient to participate in activities that will increase sense of accomplishment (e.g., phoning for an appointment with social services).	A sense of accomplishment empowers the patient to act positively on own behalf.	Assisted patient in making a list of questions for her provider (e.g., "What are the steps for starting hemodialysis? How long can I live on dialysis?").
	Assist patient to identify small, achievable goals and to make realistic plans.	Small goals are more readily accomplished, and a feeling of success provides motivation to attempt larger goals.	Patient requested some written information about kidney transplantation and asked to speak to the transplant coordinator.
Patient will state hopes and plans for the future before discharge.	Emphasize that quality of life can be good for patients on dialysis (e.g., extends time to spend with friends and family).	Emphasizing positive outcomes can create a sense of hope and optimism.	She says that she is not optimistic about getting a donated kidney, but would still like to have the information and the hope that it could happen for her.
	Give positive reinforcement for statements of hope and future planning.	Positive reinforcement encourages repetition of a desirable behavior.	At the end of the shift, patient stated that making the list of questions and talking about her frustrations had helped. Outcomes partially met. Continue with plan.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge related to diet and nutrition.*

Supporting Assessment Data

Subjective: "The renal diet is so complex and my husband and son cannot manage the cooking and shopping."

Objective: Appears overwhelmed at the amount of information and seems unsure how to use it effectively.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will state willingness to learn about prescribed diet during this shift.	Assess readiness to learn, preferred learning styles, and barriers to learning.	Possible barriers for the patient include being upset, tired, uncomfortable, or anxious about her condition. Learning new information will be difficult under these conditions.	The patient identifies need for herself and her family to learn about her dietary restrictions. Patient also shows interest in attending a group class that will be conducted next month.
	Perform teaching in short sessions.	Complex information is best delivered in manageable pieces.	Limited teaching session to 10 min because of fatigue.
	Use language and terms that patient is able to understand.	Medical jargon and technical terms will not help the patient understand the basic dietary information.	Verbalized understanding of terminology related to health teaching (e.g., restricted protein).

With help, the patient will create a sample diet that is within renal diet parameters within 2-3 days.	Obtain a dietary consultation and reinforce information provided by the nutritional expert.	A renal nutritionist must be consulted to create an individual diet plan based on laboratory values, nutritional requirements, and patient's eating preferences.	Nutritionist came to see the patient and discussed overall nutritional goals and plan. Arrangements have been made with the nutritionist to meet with the family next week.
Patient will apply knowledge about diet and nutrition to reduce nitrogenous waste by-products and solute overload by next outpatient dialysis appointment.	Ensure that the patient has verbal and written instructions. Encourage expression of concerns (e.g., cost, preparation, availability of seasonal foods).	Written material can be reviewed at a later date and shared with family. Food commonly has a sociocultural base.	Written information was provided about diet and renal disease. Patient is concerned that family will need guidance in shopping.
	Invite the family (especially the person most likely to cook and shop) to attend the teaching sessions.	Costs, food preferences, and family participation should be considered to increase the likelihood of success.	Family will attend teaching session next week.
	Help patient review specific information about high-quality proteins (e.g., meat, eggs) and hidden sodium sources (e.g., canned food).	Reviewing information increases retention of new information.	The patient was able to identify high-quality protein foods but continues to be confused about how sodium, phosphorus, and calcium are affecting her kidney function. Follow-up teaching sessions will be arranged this week to address the topic. Outcomes partially met. Continue with plan.

Problem Statement/Nursing Diagnosis

Fluid volume excess/*Excess fluid volume related to retention of sodium and water from inadequate kidney function.*

Supporting Assessment Data

Subjective: "Sleeps with three pillows."

Objective: Admission weight: 137 lb (normal weight around 130 lb), 3+ pitting edema, bilateral feet and ankles.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have restricted fluid intake (500-700 mL plus output from previous 24 hr) during this shift.	Strict I&O.	Discrepancies in I&O suggest fluid retention and overload.	Fluid intake 1000 mL, output 600 mL.
	Fluid restrictions, as ordered. Assist to establish acceptable schedule for restricted fluids.	Kidneys may produce a small but inadequate output of urine. Limiting fluid prevents overload, whereas spacing fluid throughout the day helps to relieve subjective feelings of thirst.	Patient is aware of and compliant with fluid restrictions.
	Assist with good oral care and discourage mouth breathing; rinse mouth frequently; space fluids throughout the day.	Patient's subjective feeling of moist oral mucous membranes will increase compliance with fluid restrictions.	Subjective relief obtained from frequent, small quantities of ice chips and periodic mouth care.
	Instruct patient and visitors about fluid restriction.	Visitors may unintentionally offer fluid as a comfort measure if they are uninformed about therapeutic goals.	Patient actively reminds all visitors and staff "not to tempt me."
	Post a sign over the bed to alert visitors and health care team members about fluid restrictions.	Many persons can pass through a patient's room, and all should be aware of precautions to prevent inadvertently offering restricted foods and fluids.	Sign placed above bed for fluid restrictions.
Patient will demonstrate signs of decreased fluid load (e.g., lungs will be clear to auscultation, foot and ankle edema will decrease) within 24-48 hr.	Check for signs of fluid overload: edema, crackles in lungs, orthopnea, and changes in mental status.	Peripheral fluid is observed in extremities and face. Edema within body organs (e.g., lungs or brain) manifests as functional impairment.	Fine crackles noted in base of posterior lung fields bilaterally. Reports some mild shortness of breath, especially with exertion or if lying flat in bed. Subjectively feels breathing is okay "when sitting in a chair." Resting pulse oximetry 94%. 3+ pitting edema noted bilaterally in feet.
Patient's weight will return to previous level within 10 days.	Weigh daily (or more frequently if needed) and monitor trends.	An increase in weight is one of the key indicators of fluid imbalance. 1 kg, or 2.2 lb, of weight gain is equal to excess of 1 L of fluid.	Patient's A.M. weight: 137.5 lb.
Patient will demonstrate minimal peripheral edema within 7-10 days.	Administer diuretic (e.g., hydrochlorothiazide) as prescribed.	Diuretics can be given in chronic renal function to reduce hypertension and edema; usually discontinued after dialysis is initiated.	Given: hydrochlorothiazide 100 mg. No adverse side effects noted.
	Restrict sodium to 2 g/day, as ordered.	Decreasing solute load decreases fluid retention.	Compliant with 2-g sodium diet. Outcomes partially met. Continue with plan.

Critical Thinking Questions

- What diagnostic tests do you think the nephrologist would have ordered for Mrs. Stevens?
- Why might Mrs. Stevens's renal disease not have been diagnosed earlier?
- If Mrs. Stevens does not agree to hemodialysis, what other alternatives are available to her?
- What concerns do you anticipate that Mr. Stevens and their son would have?

ADLs, Activities of daily living; *BP*, blood pressure; *I&O*, Intake and output; *P*, pulse; *R*, respirations; *RBC*, red blood cell.

Community Care

A major function of nurses in the community is to assist patients who have hypertension or diabetes patients to achieve good control of their disease to help prevent damage to the kidneys. One of the *Healthy People 2020* goals is to reduce the rate^② of new cases of ESRD. All nurses can promote healthy kidney function by encouraging the intake of more water and prompt recognition and treatment of urinary tract infections. In addition, nurses can participate in community education to increase awareness of organ donation programs.

Nurses in outpatient clinics assist with urologic procedures, such as cystoscopy and removal or destruction of renal stones. Clinic nurses will also have opportunities to teach patients how to manage problems of incontinence.

Home care nurses are constantly on the alert for signs of ARF or CRF among their patients. Many illnesses and the variety of drugs that these patients receive may cause kidney damage. Many home care patients have indwelling catheters that must be periodically replaced with new ones. Home health nurses also identify problems of incontinence and have the advantage of being able to see the environmental and social factors that must be addressed.

Nurses in long-term care facilities deal with a variety of urinary problems. Bladder training for incontinence is a prime consideration. Monitoring for drug toxicities in this population is imperative, because drugs are not excreted quickly, and polypharmacy can have additive effects. Keeping residents dry and odor free is very important for physical and psychological reasons. Monitoring for urinary retention or obstruction to the flow of urine is another priority in the older adult population.

Nurses who work in dialysis centers are typically the primary nurses for patients in renal failure. These nurses must constantly assess patients for complications, watch for medication-related problems, and continue to reinforce diet and lifestyle modifications. Considerable psychosocial support and counseling may be necessary, because patients undergoing dialysis commonly experience depression, hopelessness, sexual problems, role changes, and relationship problems.

Get Ready for the NCLEX® Examination!

Key Points

- Teach prevention of infectious disorders, such as cystitis and urethritis (e.g., good hygiene, drinking plenty of water, and seeking prompt treatment for genital discharge or dysuria).
- Symptoms of pyelonephritis include fever, chills, headache, malaise, nausea and vomiting, and pain in the flank radiating to the thigh and genitalia.
- Acute glomerulonephritis is characterized by fever, chills, flank pain, widespread edema, visual disturbances, and significant hypertension. Nursing implications include encouraging bed rest; low-protein and low-sodium diet; and administering antihypertensives, corticosteroids, and diuretics as prescribed.
- Symptoms of chronic glomerulonephritis include edema, dyspnea, and headache associated with hypertension.
- In hydronephrosis flow of urine from the kidney is obstructed; the kidney dilates and fills with fluid.
- In renal stenosis the renal artery becomes blocked or narrowed because of atherosclerosis.
- Renal stones are associated with frequent urinary infections, inadequate fluid intake and concentrated urine, urinary stasis, and urate in the urine.
- Symptoms of trauma to the kidneys, ureters, and bladder may include gross hematuria, pain, or an enlarged mass in the renal or bladder area.
- Risk factors for cancer of the bladder include male gender, smoking, and exposure to industrial toxins.
- Major symptoms of cancer of the kidney include hematuria and enlargement of affected kidney.
- Prerenal ARF is caused by decreased blood flow; intrarenal ARF occurs from damage in the kidney; and postrenal ARF is caused by obstruction that causes backup of urine into the kidney.
- ATN can be caused by decreased oxygenation or blood flow or nephrotoxic substances.
- The three phases of ARF are oliguric/nonoliguric, diuretic, and recovery.
- Nephrosclerosis (hardening of renal arterioles), glomerulonephritis, and diabetic nephropathy are the most common causes of CRF.
- Treatment of CRF includes diet management, fluid and electrolyte management, hemodialysis, or peritoneal dialysis and kidney transplant.
- Hemodialysis is the use of diffusion to remove waste products normally excreted by the kidneys. Complications include fluid overload, electrolyte imbalance, anemia, platelet abnormalities, and infection.
- Nursing implications for peritoneal dialysis are to weigh the patient and take vital signs before and after treatment, measure I&O, use strict aseptic technique, and monitor for infection.
- Kidney transplant is another treatment for kidney failure. Signs of organ rejection include elevated blood pressure, fever, pain over the transplant area, fatigue, oliguria, and increased BUN and serum creatinine.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• **Online Resources**

- National Institute of Diabetes and Digestive and Kidney Diseases, <http://kidney.niddk.nih.gov/kudiseases/pubs/hemodialysis/>
- Renal Support Network, www.rsnhope.org
- The National Kidney Foundation, www.kidney.org
- United Network for Organ Sharing, www.unos.org

Review Questions for the NCLEX® Examination

1. Which patient statement indicates that she needs additional teaching regarding the discharge instructions for urinary tract infection?

1. "I will always wipe from back to front after a bowel movement."
2. "I should avoid wearing tight slacks."
3. "I won't wash my underclothing with strong detergents."
4. "I will take a shower instead of a tub bath."

NCLEX Client Need: Health Promotion and Maintenance

2. A patient with a history of throat infection becomes suddenly ill with fever, chills, flank pain, widespread edema, puffiness around the eyes, visual disturbances, and marked hypertension. The nurse would anticipate which diagnostic test?

1. Urinalysis
2. Intravenous pyelogram
3. Serum amylase
4. Prothrombin time

NCLEX Client Need: Physiological Integrity: Basic Care and Comfort

3. A patient with nephrotic syndrome is admitted with severe generalized edema, ascites, and cloudy urine. The patient is irritable and tired. What is the priority nursing problem?

1. Potential for infection
2. Fluid volume excess
3. Pain
4. Fatigue

NCLEX Client Need: Physiological Integrity: Basic Comfort and Care

4. A 45-year-old man has a history of calcium oxalate stones which can result in further renal calculi. What should you include about diet in this patient's education?

1. He should increase his protein intake, but restrict dietary calcium and sodium.

2. He should increase intake of spinach and nuts.
3. He should increase fluids and dietary calcium.
4. He should increase sodium, but decrease protein intake.

NCLEX Client Need: Health Promotion and Maintenance

5. While caring for a patient who has received ESWL (lithotripsy) for renal calculi, the nurse would anticipate what possible actions that may be taken to help the patient increase the rate of stone passage? (*Select all that apply.*)

1. Performance of PDI therapy
2. Administration of corticosteroids and calcium channel blockers and alpha antagonists, as prescribed
3. Administration of Vicodin for pain
4. Cystoscopy to retrieve the stones

NCLEX Client Need: Physiological Integrity: Basic Care and Comfort; Pharmacological Therapies

6. A nurse is assisting in administering BCG intravesically to a patient with bladder cancer. Place the steps in the correct order to accomplish this procedure.

1. Clamp the urethral catheter for 2 hours.
2. Change position every 15 to 30 minutes.
3. Aseptically insert a urinary catheter.
4. Drain urinary bladder.
5. Instill the BCG fluid.

NCLEX Client Need: Safe and Effective Care Environment

7. A patient with CRF has a BUN of 120 mg/dL. What is the primary significance of this laboratory value?

1. It is an expected laboratory result for a patient with CRF.
2. The value signifies renal insufficiency.

3. The result in conjunction with uremic signs indicates need for dialysis.
4. The patient should be referred as a good candidate for peritoneal dialysis.

NCLEX Client Need: Physiological Integrity: Basic Comfort and Care

8. What is included in the nursing care of a patient undergoing peritoneal dialysis? (*Select all that apply.*)

1. Maintain aseptic technique when accessing a peritoneal catheter.
2. Instruct the patient to remain supine until the dialysate is drained.
3. Weigh the patient before and after dialysis.
4. Monitor vital signs.
5. Check color and volume of effluent.

NCLEX Client Need: Safe and Effective Care Environment

9. A nurse is sending a patient to the dialysis clinic. What predialysis nursing intervention should be included? (*Select all that apply.*)

1. Withholding anticoagulants
2. Administering antihypertensive
3. Assessing dialysis access site
4. Checking vital signs
5. Monitoring laboratory values

NCLEX Client Need: Safe and Effective Care Environment

10. A patient with CRF is on dialysis and waiting for a kidney transplant. The patient says, "I am never going to be at the top of the list for a kidney. I wish I could just die and get it over with." What is the most therapeutic response?

1. "I am sure you are going to get a kidney. A lot of people donate these days."

2. "Are you thinking about hurting or killing yourself?"
3. "I would be discouraged too, but I have never been very good at waiting."
4. "You seem really down today. What's going on?"

NCLEX Client Need: Psychological Integrity

Critical Thinking Questions

Scenario A

Mr. Jakes, 25 years old, complains of sudden onset of fever and chills, flank pain, and "feeling full all over and peeing dark smoke-colored urine." He tells you he had strep throat 2 weeks ago, but is otherwise healthy.

1. Based on Mr. Jakes's history and complaints, what physical assessments should you perform?
2. Why is the history of strep throat 2 weeks ago significant?
3. The provider informs Mr. Jakes that he has glomerulonephritis and prescribes complete bed rest. How long must bed rest continue?

Scenario B

Mr. Mell, a 43-year-old interstate truck driver, complains of severe right lower back pain with nausea, vomiting, and pink-tinged urine. He relates a history of stones and reports, "It always feels like this until the kidney stone passes." The provider orders IV normal saline, morphine, routine laboratory tests to include BUN and creatinine, and an IVP.

1. What are three or four risk factors for kidney stones that might apply to Mr. Mell?
2. His BUN result is 17 mg/dL. What does this result indicate? What is your responsibility in reporting this data?
3. What is the care for Mr. Mell after a lithotripsy?

Scenario C

Mrs. Diaz, 35 years old, has had a nephrostomy for treatment of hydronephrosis caused by a renal stone in the pelvis of the kidney. She returns from the surgical unit with a nephrostomy tube, a urethral catheter, and a rubber Penrose drain in place.

1. Explain the purpose of the nephrostomy tube.
2. What is the specific care for these drains and tubes?

UNIT XII

Endocrine System

OUTLINE

Chapter 35 The Endocrine System

Chapter 36 Care of Patients With Pituitary, Thyroid, Parathyroid, and Adrenal Disorders

Chapter 37 Care of Patients With Diabetes and Hypoglycemia

CHAPTER 35

The Endocrine System

Objectives

Theory

1. Identify the location of each endocrine gland.
2. Diagram the principal actions and target tissues for hormones of the hypothalamus and pituitary, parathyroid, adrenal, and pancreas glands.
3. Summarize the effects of the thyroid hormones.
4. Compare care for common diagnostic tests for the endocrine system.

Clinical Practice

5. Assess for specific age-related changes of the endocrine system in an older adult.
6. Teach patients about the diagnostic tests that might be performed for symptoms of endocrine disorders.
7. Perform a focused assessment on a patient who may have an endocrine disorder.
8. Distinguish appropriate problem statements/nursing diagnoses and interventions for problems common to patients with endocrine disorders.

KEY TERMS

adenohypophysis (ă-DEN-o-hī-POF-ă-sis, p. 821)
adrenocorticotropic hormone (ă-DREN-o-KOR-ti-kō-TRŌ-pik HŌR-mōn, p. 826)
endocrine (EN-do-krin, p. 826)
exocrine (Ek-so-krin, p. 826)
fructosamine assay (FRÜK-tōs-ăm-ēn ĂS-sā, p. 832)
glucocorticoids (glü-kō-KOR-ti-koydz, p. 825)
glucose tolerance test (GLŪ-cōs TÖL-ĕr-ĕns, p. 831)
hemoglobin A_{1c} (A_{1c}) (HĒ-mō-glō-bin, p. 831)
hormones (HOR-mōnz, p. 822)
hypersecretion (hī-per-SE-KRĒ-shun, p. 827)
hyposecretion (hī-pō-SE-KRĒ-shun, p. 827)
insulin (IN-sū-lin, p. 826)
mineralocorticoids (min-er-ăl-ō-KOR-ti-koydz, p. 825)
negative feedback (p. 827)
parathormone (pär-ă-THOR-mōn, p. 824)
pressor (PRĒS-sör, p. 825)
target cells (p. 827)
target tissues (p. 827)
thyrocalcitonin (thī-rō-KÄL-si-TŌ-nin, p. 824)

thyroid panel (THĪ-royd, p. 828)

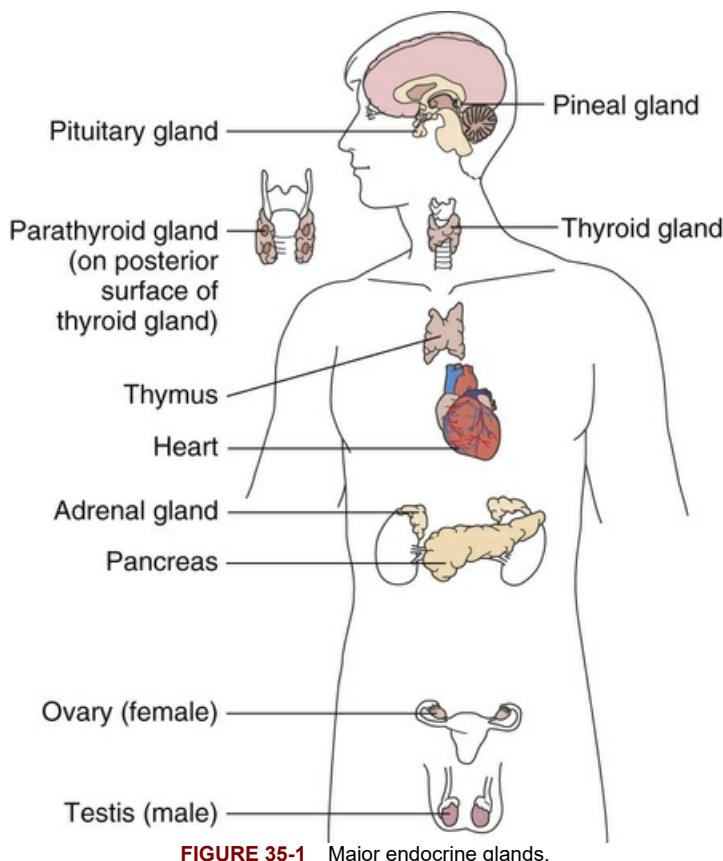
thyroxine (THĪ-rok-sin, p. 824)

triiodothyronine (trī-ī-dō-THĪ-rō-nen, p. 824)

Anatomy and Physiology of the Endocrine System

Organs and Structures of the Endocrine System (Figure 35-1)

- The pituitary gland connects to the hypothalamus via the hypophyseal stalk. The pituitary gland has two parts: the anterior pituitary (**adenohypophysis**) and the posterior pituitary (neurohypophysis).
- The thyroid gland has two lobes and lies below the larynx over the thyroid cartilage, in front of and on either side of the trachea.
- The parathyroid glands are four to six small glands that are located on the posterior surface of the thyroid gland.
- The adrenal glands are located on the anterior upper surface of each kidney; each is composed of the cortex and medulla.
- The pancreas sits in the upper left aspect of the abdominal cavity. Beta cells, which secrete the hormone insulin, and alpha cells, which secrete the hormone glucagon, are both found in the islets of Langerhans.
- The ovaries are located in the pelvic cavity in females.
- The testes hang suspended in the scrotum in males.
- The pineal gland is in the midbrain, in the cranial vault.
- The thymus gland lies at the base of the neck, in the front of the thoracic cavity.



Functions of the Endocrine System

- When the muscle is stretched the heart secretes hormones with a diuretic effect.
- The endocrine system alters chemical reactions and controls the rate at which chemical activities take place within cells.
- The hormones secreted change the permeability of cell membranes and select the substances that can be transported across cell membranes.
- The endocrine hormones activate a particular mechanism in a cell, such as the system that controls cellular growth and reproduction. The **hormones** produced by the endocrine system, the target organs on which they act, and the principal actions of each hormone are presented in [Table 35-1](#).

Table 35-1
The Principal Endocrine Glands and Their Hormones

Gland	Hormone	Target Tissue	Principal Actions
Hypothalamus	Releasing and inhibiting hormones	Anterior lobe of pituitary gland	Stimulates or inhibits secretion of specific hormones
Anterior lobe of pituitary	Growth hormone (GH)	Most tissues in the body	Stimulates growth by promoting protein synthesis
	Thyroid-stimulating hormone (TSH)	Thyroid gland	Increases secretion of thyroid hormone; increases the size of the thyroid gland
	Adrenocorticotrophic hormone (ACTH)	Adrenal cortex	Increases secretion of adrenocortical hormones, especially glucocorticoids, such as cortisol
	Follicle-stimulating hormone (FSH)	Ovarian follicles in females; seminiferous tubules in males	Follicle maturation and estrogen secretion in females; spermatogenesis in males
	Luteinizing hormone (LH); called interstitial cell-stimulating hormone (ICSH) in males	Ovary in females, testis in males	Ovulation, progesterone production in females; testosterone production in males
Prolactin		Mammary gland	Stimulates milk production
Posterior lobe of pituitary (storage only; ADH and oxytocin are synthesized in the hypothalamus)	Antidiuretic hormone (ADH)	Kidney	Increases water reabsorption (decreases water lost in urine)
	Oxytocin	Uterus; mammary gland	Increases uterine contractions; stimulates ejection of milk from mammary gland
Thyroid gland	Thyroxine and triiodothyronine	Most body cells	Increases metabolic rate; essential for normal growth and development
	Calcitonin	Primarily bone	Decreases blood calcium by inhibiting bone breakdown and release of calcium; antagonistic to parathyroid hormone
Parathyroid gland	Parathyroid hormone (PTH) or parathormone	Bone, kidney, digestive tract	Increases blood calcium by stimulating bone breakdown and release of calcium; increases calcium absorption in the digestive tract; decreases calcium lost in urine
Adrenal cortex	Mineralocorticoids (aldosterone)	Kidney	Increases sodium reabsorption and potassium excretion in kidney tubules; increases water retention
	Glucocorticoids (cortisol)	Most body tissues	Increases blood glucose levels; inhibits inflammation and immune response
	Androgens and estrogens	Most body tissues	Secreted in small amounts; effect is generally masked by hormones from ovaries or testes
Adrenal medulla	Epinephrine, norepinephrine	Heart, blood vessels, liver, adipose tissue	Helps cope with stress; increases heart rate and blood pressure; increases blood flow to skeletal muscle; increases blood glucose
Pancreas (islets of Langerhans)	Glucagon	Liver	Increases breakdown of glycogen to increase blood glucose levels
	Insulin	General, but especially liver, skeletal muscle, adipose tissue	Decreases blood glucose levels by facilitating uptake and utilization of glucose by cells; stimulates glucose storage as glycogen and production of adipose tissue
Testes	Testosterone	Most body cells	Maturation and maintenance of male reproductive organs and secondary sex characteristics
Ovaries	Estrogens	Most body cells	Maturation and maintenance of female reproductive organs and secondary sex characteristics; menstrual cycle
	Progesterone	Uterus and breast	Prepares uterus for pregnancy; stimulates development of mammary gland; regulates menstrual cycle
Pineal gland	Melatonin	Hypothalamus	Inhibits gonadotropin-releasing hormone, thus inhibiting reproductive functions; regulates sleep and wakefulness
Thymus	Thymosin	Tissues involved in immune response	Immune system development and function

Effects of the Pituitary Hormones

- The effects of pituitary hormones when secreted are illustrated in [Figure 35-2](#).

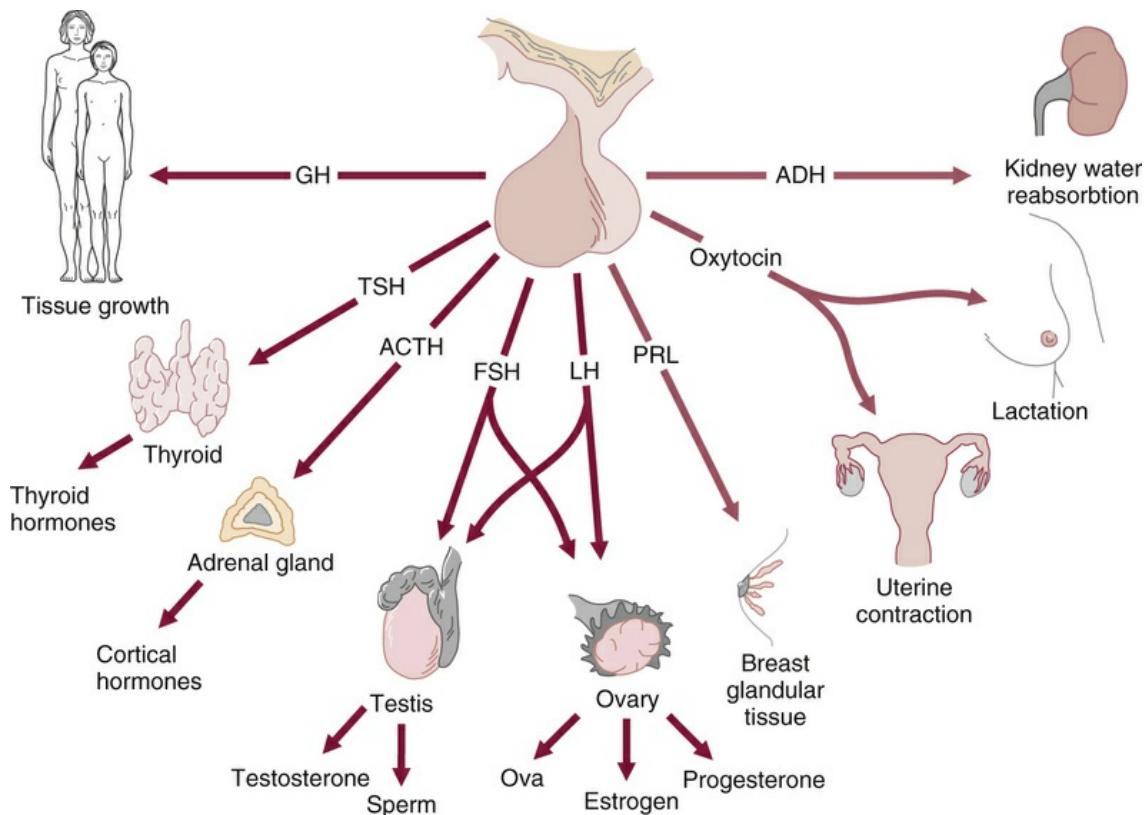


FIGURE 35-2 Effects of hormones from the pituitary gland. ACTH, Adrenocorticotrophic hormone; ADH, antidiuretic hormone; FSH, follicle-stimulating hormone; GH, growth hormone; LH, luteinizing hormone; PRL, prolactin; TSH, thyroid-stimulating hormone.

- Any type of dysfunction of the pituitary gland will affect one or more of the hormones, as well as their target organs (Figure 35-3).

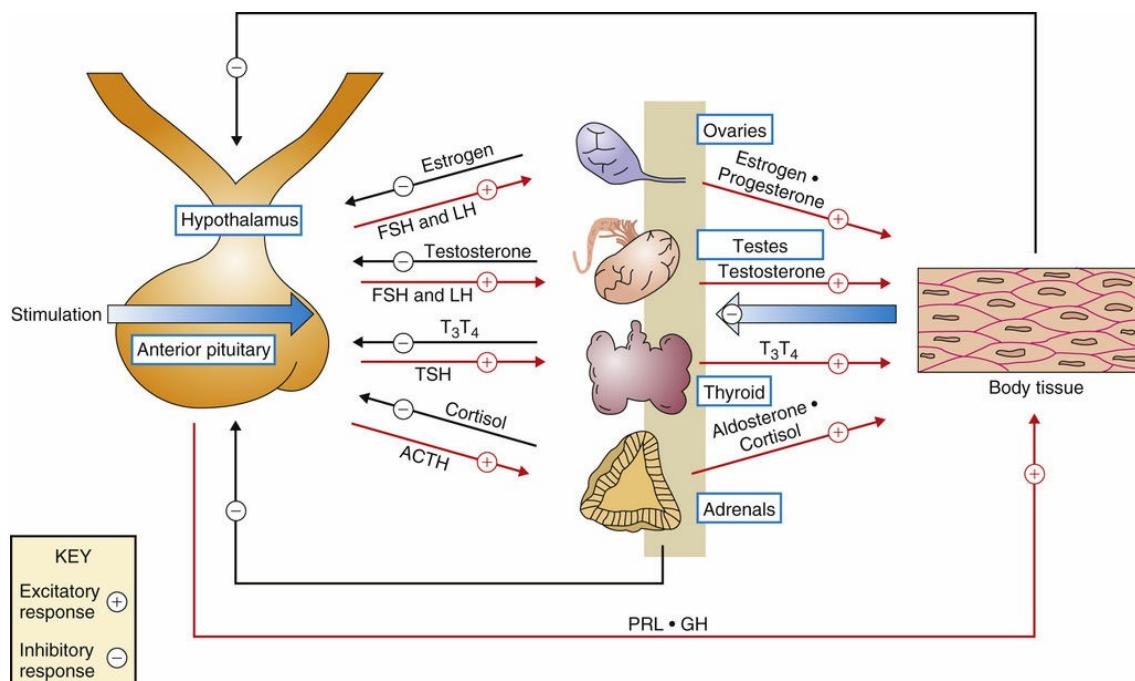


FIGURE 35-3 Feedback system of the hypothalamus, pituitary, and target glands. ACTH, Adrenocorticotrophic hormone; FSH, follicle-stimulating hormone; LH, luteinizing hormone; T_3 , triiodothyronine; T_4 , thyroxine; TSH, thyroid-stimulating hormone. (From Ignatavicius DD, Workman ML, Mishler MA: *Medical-surgical nursing: A nursing process approach*, ed. 3, Philadelphia, 1999, Saunders.)

Effects of the Thyroid Hormones

- The thyroid gland secretes the hormones **thyroxine** (T_4), **triiodothyronine** (T_3), and **thyrocalcitonin**. The 3 and the 4 indicate how many iodine atoms are attached.
- T_3 is the more potent form of thyroid hormone. T_4 is converted to T_3 by removing an iodine from the T_4 molecule.
- Intake of protein and iodine is needed to synthesize both thyroid hormones.
- Thyroid hormones activate the cellular production of heat; stimulate protein and lipid synthesis, mobilization, and degradation (breakdown); and stimulate the manufacture of coenzymes from vitamins.
- Thyroid hormones regulate many aspects of carbohydrate metabolism and affect tissue response to epinephrine and norepinephrine.

Functions of the Parathyroid Glands

- Parathormone**, or **parathyroid hormone**, is produced and secreted by the parathyroid glands.
- A low calcium level will stimulate release of parathormone, which increases the plasma level of calcium. A high calcium level will inhibit the release of parathormone.
- Parathormone acts on the renal tubules to increase the excretion of phosphorus in the urine and to stimulate the reabsorption of calcium. It also stimulates the production of the active form of vitamin D, which enhances calcium absorption in the small intestine. Parathormone also acts on bone, causing the release of calcium from the bone into the bloodstream.
- Calcitonin (released by the thyroid gland) is the balance to parathormone that causes calcium to go into the bones and allows for renal excretion to reduce calcium levels in the blood.

Safety Alert

Parathyroid Deficiency

A deficiency of parathyroid hormone produces muscle cramps, twitching of the muscles, and, in some cases, severe convulsions because of hypocalcemia.

Functions of the Adrenal Gland Hormones

- The adrenal medulla (middle portion) secretes two hormones, epinephrine and norepinephrine (called catecholamines), in response to stimulation from the sympathetic nervous system.
- Epinephrine prepares the body to meet stress or emergency situations and prevents hypoglycemia (Figure 35-4). Norepinephrine functions as a **pressor** (causing blood vessel constriction) to maintain blood pressure.

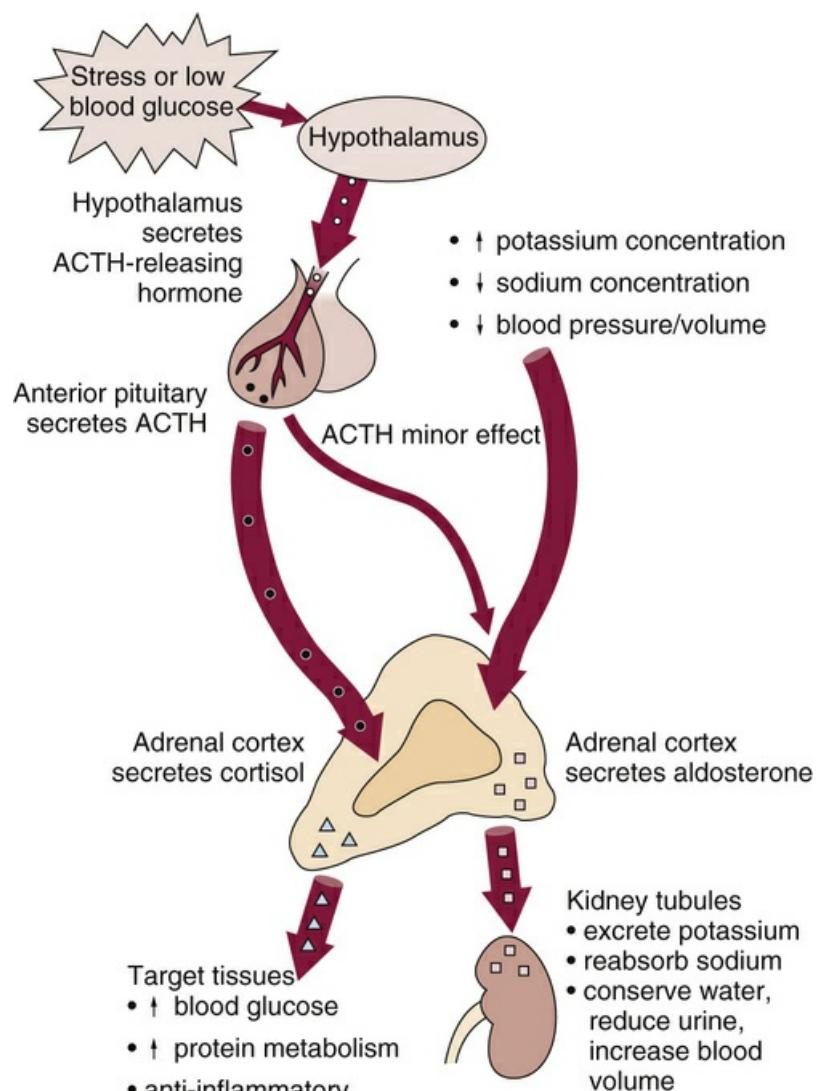


FIGURE 35-4 Effects of epinephrine and control of its secretion. (From Applegate E: *The anatomy and physiology learning system*, ed. 4, Philadelphia, 2011, Saunders.)

- The hormones secreted by the adrenal cortex are called *adrenal corticosteroids*. (The word *steroid* is sometimes used to designate an adrenal corticosteroid or a synthetic compound with similar properties.)
- The two major types of hormones secreted by the adrenal cortex are the mineralocorticoids and the glucocorticoids ([Figure 35-5](#)).

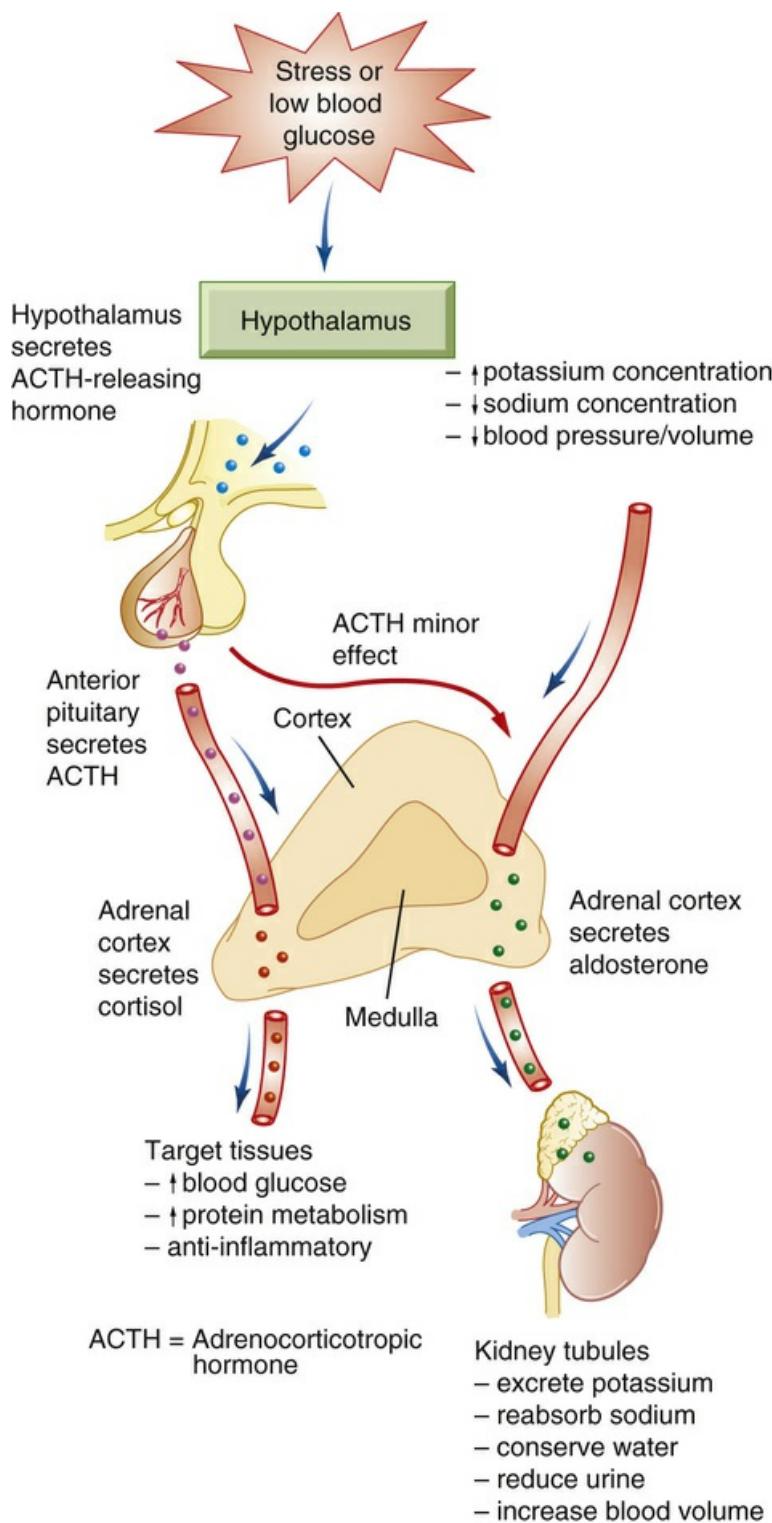


FIGURE 35-5 Regulation of aldosterone and cortisol secretion. ACTH, Adrenocorticotrophic hormone. (From Applegate E: *The anatomy and physiology learning system*, ed. 2, Philadelphia, 2000, Saunders.)

- The adrenal glands also secrete small amounts of androgenic hormones, which have effects similar to those of the male and female sex hormones.
- The **mineralocorticoids** affect the electrolytes, particularly sodium, potassium, and chloride. The primary mineralocorticoid is aldosterone, which promotes conservation of water by acting on the kidney to retain sodium in exchange for potassium. Water stays with sodium, and potassium is excreted in the urine.
- Without the mineralocorticoids, a person would die within 3 to 7 days, because these hormones

directly control fluid balance, blood volume, cardiac output, exchange of nutrients, and wastes in each cell; mineralocorticoids affect all chemical processes and glandular functions within the body.

- The **glucocorticoids** are essential to the metabolic systems for proper utilization of carbohydrates, proteins, and fats.
- The primary glucocorticoid is cortisol, or hydrocortisone. Cortisol acts to increase glucose levels in the blood. Cortisol also helps counteract the inflammatory response.
- Both aldosterone and cortisol are controlled by **adrenocorticotrophic hormone** (ACTH)–releasing hormone from the hypothalamus and ACTH secreted by the anterior pituitary (see [Figure 35-3](#)).

Hormonal Function of the Pancreas

- The pancreas is both an **endocrine** (secretes into the bloodstream) and **exocrine** (secretes through a duct to the target tissues) gland. Its endocrine function is to produce the hormones insulin and glucagon.
- The beta cells are responsible for producing and secreting insulin. **Insulin** is needed for the cells of the body to be able to use glucose as fuel. The alpha cells release glucagon, which stimulates the liver to change glycogen to glucose ([Figure 35-6](#)).

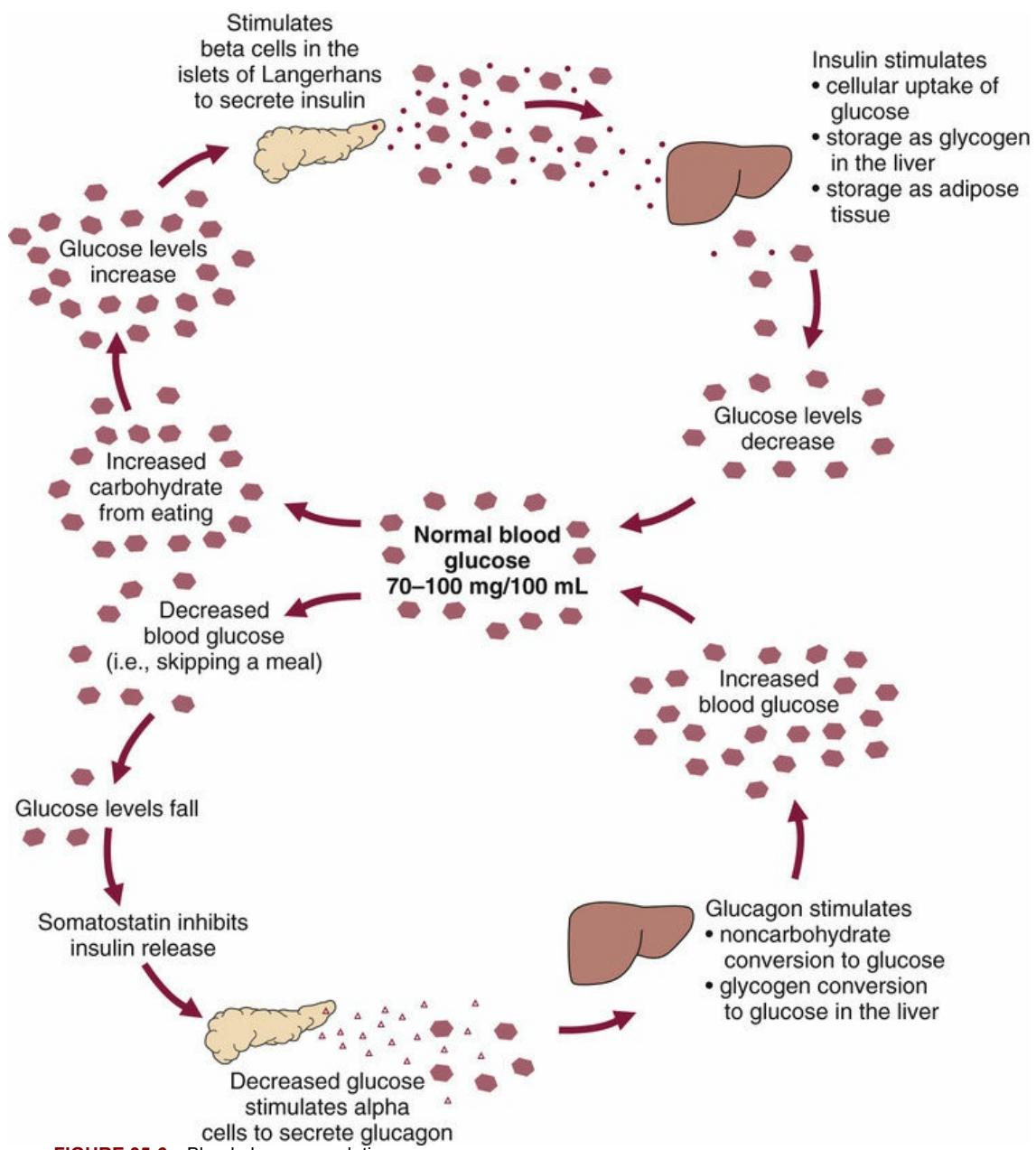


FIGURE 35-6 Blood glucose regulation. (Adapted from Applegate E: *The anatomy and physiology learning system*, ed. 2, Philadelphia, 2000, Saunders.)

Effects of Aging on the Endocrine System

- The pituitary gland becomes smaller.
- The thyroid becomes more lumpy or nodular; beginning around age 20 years, metabolism gradually declines.
- Hormones that usually decrease with older age include aldosterone, renin, calcitonin, and growth hormone; specific hormones decrease in older women (estrogen and prolactin) and older men (testosterone).
- Hormones that may increase with older age include follicle-stimulating hormone (FSH), luteinizing hormone (LH), norepinephrine, and antidiuretic hormone (ADH).
- Hormones that remain unchanged or are only slightly decreased with age include thyroid hormones (T_3 and T_4), cortisol, insulin, epinephrine, parathyroid hormone, and 25-hydroxyvitamin D.
- Blood glucose levels rise with older age, with fasting levels climbing about 1 mg/dL for each

decade after the age of 50 years and postprandial levels increasing 6 to 13 mg/dL.

- Although insulin levels remain unchanged with age, decreased glucose tolerance may occur because of changes in the cell receptor sites; older adults experience hypoglycemia more quickly than younger people and may progress to dangerously low levels of blood glucose before signs and symptoms are obvious. This decreased glucose tolerance because of cell receptor change can place older adults at risk for hyperglycemia and the onset of type 2 diabetes.
- Although thyroid hormone levels may decrease with aging, the body makes up for it by decreasing the rate at which thyroid hormone is broken down; therefore resting levels of thyroid hormone are usually normal in older adults. Thyroid disorders are, however, twice as common in older adults. Hypothyroidism is the most common thyroid disorder, especially in older women.
- The amount of hormones secreted by older adults changes, decreasing the individual's ability to adapt to stress and respond to environmental changes.
- Because of decreasing liver and kidney function in older adults, hormone replacement therapy must be done very cautiously to prevent hormone overdosage.

The Endocrine System

The endocrine system regulates metabolism, growth and development, sexual function, and reproductive processes. A primary function of the endocrine system is to synthesize and release hormones directly into the bloodstream and the body fluids. The cells and tissues that are affected by a specific hormone are called its **target cells** or **target tissues**.

Some of the endocrine hormones, such as the thyroid hormones, affect practically every cell in the body. Others, such as the sex hormones, exert their special effects on only one organ system. Moreover, hormones from one endocrine gland can affect another endocrine gland. The pituitary gland, for example, secretes several different kinds of hormones that affect other endocrine glands. For this reason, the pituitary gland is often referred to as the “master gland” of the body.

The endocrine system and the nervous system are the two major control systems of the body, and their regulatory functions are interrelated. However, the endocrine system typically controls body processes that occur slowly, such as cell growth, whereas the nervous system controls body processes that occur more rapidly, such as breathing and body movement.

The secretion of a particular hormone normally depends on the need. If an endocrine gland receives a message that its particular hormone is in short supply, it will synthesize and release more of that hormone. If, on the other hand, the hormonal need of a target tissue is being satisfied, production or secretion of the hormone will be inhibited—a concept known as **negative feedback**.

Some glands, such as the adrenal medulla and posterior pituitary, receive their information about hormone levels in the body **directly** and respond only to stimulation of nerve endings within the glands themselves. However, the posterior pituitary gland **indirectly** receives notice to either release or inhibit hormones: stimulation comes by way of the hypothalamus and the anterior lobe of the pituitary (the adenohypophysis). The hypothalamus contains special nerve endings that produce releasing and inhibiting hormones; these hormones are then absorbed into capillaries of a portal system, which transports the hormones to the adenohypophysis (the anterior lobe of the pituitary). Thus the hypothalamus controls the secretion of hormones from the pituitary. The pituitary, in turn, controls the release or inhibition of hormones from other glands. Many of the hormones of the anterior pituitary are “tropic” hormones; that is, they tend to cause a change in the endocrine gland that is the target of the specific pituitary hormone. An example is ACTH, which acts on the adrenal cortex. (If you break down this term, you can easily see that the components of *adrenal–cortex–tropic* tell you exactly where or what type of hormone this is and where it comes from.) The major endocrine glands are shown in [Figure 35-1](#); see [Table 35-1](#) for the various tropic hormones and target tissues.

Endocrine System Disorders

Causes

Endocrine disorders are caused by an imbalance in the production of hormone or by an alteration in the body's ability to use the hormones produced. Dysfunction can occur at any point in the production-secretion-feedback regulation cycle.

Primary endocrine dysfunction means that an endocrine gland is either oversecreting or undersecreting hormone(s)—situations referred to as **hypersecretion** and **hyposecretion**, respectively. Tumor or hyperplasia of the endocrine gland may lead to hypersecretion. Hyposecretion is usually the result of destruction of endocrine glandular tissue by an inflammatory process or other destructive mechanism that interferes with normal endocrine function. Infection, mechanical damage, or an autoimmune response may cause such an inflammatory response in a gland.

Secondary endocrine dysfunction occurs from factors outside the gland itself. Medications, trauma, hormone therapy, and other factors may cause secondary dysfunction. Such dysfunction may be temporary or permanent; endocrine function often returns to normal if the cause is corrected (e.g., the medication is discontinued).

Prevention

Preventing most endocrine disorders is not possible by lifestyle changes; however, there are some dietary considerations regarding the thyroid gland that may be beneficial.

Health Promotion

Preventing Goiter

Goiter, an overgrowth of the thyroid, may be prevented by sufficient intake of iodine. Iodine is available in foods grown near the ocean and in seafood. Iodized salt is the major source for most people.

Think Critically

Why might a person with an endocrine disorder delay seeking medical care?

Diagnostic Tests and Procedures

Tests of the endocrine system are performed on blood samples; on urine samples; or by scans, ultrasounds, radiographs, or magnetic resonance imaging (MRI). [Table 35-2](#) presents the various tests and procedures and their nursing implications.

Clinical Cues

Thyroid test results are altered by iodine-based contrast media for radiologic studies. Furosemide, phenytoin, heparin, aspirin, and other drugs may affect thyroid tests ([Pagana and Pagana, 2014](#)).

Table 35-2

Diagnostic Tests and Procedures of the Endocrine System

Test	Purpose	Description	Nursing Implications
Blood Tests			
Pituitary hormone levels: LH, FSH, GH, ACTH, TSH, prolactin <i>Normal value:</i> 4.5–11.5 mcg/dL	To detect oversecretion or deficiency of pituitary hormones	Sample of venous blood is drawn; requires at least 1 mL for immunoassay test; check laboratory procedure manual.	Monitor venipuncture site for bleeding; apply bandage or dressing.
Serum T ₄ (total thyroxine) <i>Normal value:</i> 4.5–11.5 mcg/dL	To assess thyroxine in blood to evaluate thyroid function	Requires a venous blood sample of at least 1 mL.	Aspirin, iodine-containing medications, contrast media, and other drugs may affect result; check with laboratory.
Serum T ₃ (total triiodothyronine) <i>Normal value:</i> 70–190 ng/dL	Used with T ₄ to evaluate thyroid function	Requires a venous blood sample of at least 1 mL.	Same as for serum T ₄ .
TSH <i>Normal value:</i> 1–10 mCU/mL	To differentiate between pituitary dysfunction and primary thyroid dysfunction; assists with diagnosis of hypothyroidism	Requires a venous blood sample of at least 1 mL.	Same as for serum T ₄ .
Antithyroid antibody titer <i>Normal value:</i> <1 : 100	To detect the presence of thyroid antibodies and distinguish between autoimmune disorders and toxic thyroid adenoma	Requires a venous blood sample.	Radioactive iodine will interfere if given within 24 hr of drawing the blood sample.
Calcitonin <i>Normal value:</i> <100 pg/mL	Used for differential diagnosis of cancer of the thyroid	Requires a venous blood sample.	If base level is within normal, the pentagastrin stimulation test may be administered by injection to test for calcitonin secretion. Blood samples are then drawn 1½ and 5 min after injection.
Cortisol <i>Normal value:</i> 8 A.M., 6–23 mcg/dL; 4 P.M., 3–15 mcg/dL; 10 P.M., <50% of 8 A.M. value	To assess cortisol production by adrenal glands	Requires sample of venous blood.	Explain that a specimen may be collected two or three times in 24 hr to evaluate circadian effects on cortisol secretion. Keep stress to a minimum. Note time collected on laboratory slip.
Adrenocorticotropic hormone (ACTH) <i>Normal value:</i> A.M., 20–100 pg/mL; P.M., 10–40 pg/mL	To assess ACTH production from pituitary gland	Requires venous blood sample. Place specimen in ice water immediately after drawing.	Prepare ice bath before venipuncture. Note collection time on laboratory slip. Single specimen is best collected in morning.
ACTH stimulation test <i>Normal value:</i> after ACTH, serum cortisol >20 mcg/dL	To assess adrenal response to ACTH To detect adrenal cortical insufficiency (Addison disease)	Baseline venous sample taken for cortisol determination. ACTH is administered IV or IM. Blood sample is withdrawn at 30 and 60 min for further cortisol determinations.	Note time ACTH is administered; note time each specimen is drawn. Instruct patient to avoid strenuous activity on the day before the test. Check with laboratory regarding food restrictions.
Dexamethasone suppression test <i>Normal value:</i> after dexamethasone, serum cortisol <5 mcg/dL	To diagnose Cushing syndrome To assess response to dexamethasone	Morning baseline serum cortisol levels are measured. Oral dexamethasone is administered at bedtime. Blood sample is collected the next morning to measure cortisol levels if an overnight test is ordered. A 24-hr urine collection is done at the same time. A 3-day test may be done which requires additional doses of dexamethasone and collection of all urine.	Explain the procedure to the patient. Check orders for drugs to be withheld. Both cortisol levels must be drawn at the same time each day. Note time specimens were drawn and patient medications on laboratory slips. Instruct patient to avoid strenuous activity the day before the test. No fasting is necessary. Collected urine should be kept cool.
CRH stimulation test	To identify if an abnormality exists in the pituitary glands, hypothalamus, or the adrenal glands. All of these play a role in cortisol secretion and this test helps pinpoint the source.	Baseline serum cortisol levels are measured. An injection of synthetic CRH is given IV. Blood samples are taken at 30, 60, 90, and 120 min after administration of the CRH.	Explain the procedure to the patient. The test may take up to 3 hr to complete. The patient should have nothing by mouth for 4 hr before the start of the test.
Thyroid Scans			
Radioactive iodine uptake (RAIU) <i>Normal values:</i> <6% uptake in 2 hr; 2%–25% in 6 hr; 15%–45% in 24 hr; 24-hr urine: 40%–80% radioactive iodine excreted in 24 hr	To assess function of thyroid gland To measure the rate of iodine uptake by the thyroid	Trace dose of radioactive iodine (RAI) is given orally. A gamma counter or scintillation counter is placed over the gland to measure the amount of RAI absorbed. Concurrent 24-hr urine specimen may be collected to assess iodine secretion.	Test must not be performed during pregnancy or lactation. Explain that the amount of radioactive iodine used is small and will not make the patient “radioactive.” Explain the procedure and the time it will take. Instruct how to collect 24-hr urine.

			specimen if required.
Thyroid scan	To determine size, shape, and activity of the thyroid gland To detect hyperactive "hot" spots and hypoactive "cold" spots	After administering RAI, a scintillation camera moves back and forth across the gland to obtain an image of iodine concentration and distribution in the thyroid gland. A computer may provide a three-dimensional image. Often done in conjunction with RAIU.	Same implications as for RAIU. Patient must lie perfectly still during the scanning. Scan takes about 20 min. Rescanning is performed at intervals of 6 and 24 hr after RAI is administered.
Urine Tests			
17-Hydroxycorticosteroids (17-OHCS) <i>Normal values:</i> females, 2-8 mg/24 hr; males, 3-9 mg/24 hr	To determine levels of glucocorticoid metabolites	Collect a 24-hr urine specimen in a container with preservative. Medications may interfere; consult with provider and laboratory about medications patient is taking.	Instruct patient in collection procedure. Note start and end time of collection on laboratory slip. Note medications patient is taking on laboratory slip.
17-Ketosteroids (17-KS) <i>Normal values:</i> females, 6-15 mg/24 hr; males, 8-22 mg/24 hr; older than age 65, 4-8 mg/24 hr	To determine amount of androgen metabolites in the urine	Collect 24-hr urine specimen. Check with laboratory regarding need to keep specimen chilled.	Same as for 17-OHCS test.
Aldosterone <i>Normal values:</i> 3-20 mcg/24 hr	To determine urinary aldosterone levels to assist in diagnosis of aldosteronism	Requires 24-hr urine specimen with preservative; specimen must be kept chilled.	Instruct in dietary and medication restrictions. Record diet and medications on laboratory slip.
Fluid deprivation test	To detect diabetes insipidus	While patient is NPO, hourly urine output, specific gravity, and osmolality are measured along with body weight and vital signs. Vasopressin is given subcutaneously; hourly measurements are continued for several hours.	Explain the procedure to the patient. Provide urine collection containers. Remind patient to void hourly.
Hypertonic saline test	To stimulate release of ADH to evaluate ADH secretion and detect diabetes insipidus	The patient is loaded with water. An infusion of hypertonic saline is administered. Urine output and urine specific gravity are measured hourly.	Tell patient to produce a urine specimen in the marked container every hour.

ADH, Antidiuretic hormone; *FSH*, follicle-stimulating hormone; *GH*, growth hormone; *IM*, intramuscularly; *IV*, intravenously; *LH*, luteinizing hormone; *NPO*, nothing by mouth; *TSH*, thyroid-stimulating hormone.

Abnormalities in thyroid gland activity are among the most common endocrine disorders. To detect abnormalities, a group of tests—called a **thyroid panel**—is performed. A thyroid panel measures TSH, T_4 , T_3 , thyroid antibodies, calcitonin, and thyroglobulin. These tests may also be ordered individually.

Laboratory testing for serum calcium and phosphate levels is usually performed to assess parathyroid function. Adrenal gland function is evaluated by laboratory testing, including electrolyte panels, glucose levels, and hormone levels; a 12-lead electrocardiogram (ECG) may be performed if cardiac dysrhythmias are suspected.

Think Critically

The provider has ordered laboratory tests to determine whether the patient has an endocrine disorder. The patient wants you to tell her the results of the tests. What will you do?

Diagnostic tests for detecting diabetes can be found in **Table 35-3**. According to the 2014 American Diabetes Association guidelines ([American Diabetes Association, 2014](#)), diagnosis of diabetes mellitus is based on one of four abnormalities:

1. Symptoms of diabetes mellitus (see [Chapter 37](#)) plus a random glucose level greater than or equal to 200 mg/dL
2. A fasting glucose level greater than or equal to 126 mg/dL
3. An A_{1c} hemoglobin level greater than 6.5%
4. A glucose tolerance test revealing a postprandial glucose greater than or equal to 200 mg/dL, 2 hours after 75 g of glucose is administered

Table 35-3
Diagnostic Tests for Detecting and Monitoring Diabetes Mellitus

Test	Purpose	Description	Nursing Implications
Serum Tests			
Fasting blood glucose <i>Normal value:</i> 70-100 mg/dL; older adult: rises 1 mg/dL per decade of age	To determine level of circulating glucose; to detect hyperglycemia or hypoglycemia	Requires a fasting venous blood sample.	Explain importance of fasting state to the patient.
2-hr postprandial blood glucose <i>Normal value:</i> <126 mg/dL; older adult: rises 5-10 mg/dL with older age	To determine need for glucose tolerance test; to determine need for change in diabetes therapy	Venous blood sample drawn 2 hr after a meal.	Explain the importance of arriving for blood sampling exactly 2 hr after finishing a meal.
Glucose tolerance test <i>Normal values:</i> Fasting <126 mg/dL; 2 hr, <200 mg/dL	To detect abnormal glucose metabolism; to assist in diagnosis of diabetes mellitus	A venous blood sample is drawn after a 10-12 hr fast; patient is given a glucose "load," usually a prepared liquid drink of 300 mL, that contains a specified amount of glucose.	Instruct patient to eat a balanced diet with at least 150 g of carbohydrate for 3 days before the test and maintain a normal level of physical activity. Instruct patient to fast for 10-12 hr before beginning the test.

		Venous blood samples are drawn at 30-min intervals for 2 hr. Phenytoin (Dilantin), birth control pills, diuretics, and glucocorticoids will adversely affect results; consult provider regarding these medications.	Explain that during the test the patient cannot eat, drink, or smoke, and must stay at rest for 2 hr. During the test, instruct patient to report feelings of weakness, dizziness, nervousness, and confusion.
Hemoglobin A _{1c} (A _{1c}) <i>Normal value: 4%-5.6% (of total hemoglobin)</i>	To determine degree of diabetic control of blood sugar over the preceding 2-3 months. 6-8 wk	A sample of venous blood is required. Fasting is not necessary.	Explain to the patient the need for this test to be done periodically to monitor effectiveness of diabetic therapy and determine degree of control over the disease process.
Fructosamine assay <i>Normal value: 1.5-2.7 mmol/L</i>	To determine degree of diabetic control of blood sugar over preceding 2-3 wk	A sample of venous blood is required. Fasting is not necessary.	Less influenced by age than A _{1c} .
C-peptide <i>Normal value: 0.78-1.89 ng/mL</i>	To evaluate endogenous secretion of insulin when the presence of insulin antibodies interferes with direct assay of insulin	A fasting sample of 1 mL of venous blood is used.	Caution the patient to fast for 8-12 hr before the test. Water is permitted.
Urine Tests			
Ketone bodies	To determine presence of ketones in the urine, which indicates a state of ketoacidosis	A fresh urine sample is tested with a dipstick. Follow instructions on bottle of test material.	Instruct diabetic patient that ketone testing should be done whenever illness has interfered with normal eating and activity for more than 24 hr and whenever signs of hyperglycemia are present.

In a **glucose tolerance test**, the patient is given a set amount of glucose to evaluate insulin secretion and ability to metabolize glucose.

The **hemoglobin A_{1c} (A_{1c})** test (formerly called the *glycosylated hemoglobin test*) measures blood glucose over a period of many weeks (Table 35-4). Glucose in the bloodstream attaches itself to the hemoglobin A (red blood cell) molecule and remains there for the life span of the red blood cell. Providers use A_{1c} test results to prescribe adjustments to a patient's treatment program for managing diabetes. One of the *Healthy People 2020* objectives is to increase the proportion of adults with diabetes who have an A_{1c} test at least twice a year. Fructosamine assay is another test to monitor control of glucose over time. The **fructosamine assay** monitors blood glucose over a shorter time frame than the A_{1c} test, because the assay measures sugar attached to the protein albumin, which has a shorter life span than hemoglobin.

Table 35-4
Average of Blood Glucose Based on Hemoglobin A_{1c} Levels

A _{1c} Level	Average Blood glucose
4%	68 mg/dL
5%	97 mg/dL
5.7%-6.4%	Prediabetes
6%	126 mg/dL
Greater than 6.5%	Type 2 diabetes
7%	154 mg/dL

❖Nursing Management

■ Assessment (Data Collection)

A full physical assessment and history are needed to evaluate a patient who is possibly experiencing an endocrine disorder. The patient's perception of the function of various body systems affected by the endocrine glands is essential.

❑ Think Critically

Why would it be important to assess the patient's past and current emotional status if you suspect an endocrine disorder?

■ Nursing Diagnosis

Table 35-5 presents the most common patient problems, expected outcomes, and nursing interventions for patients with endocrine problems. Additional problem statements/nursing diagnoses are included in [Nursing Care Plans 36-1, 36-2, and 37-1](#).

☒ Focused Assessment

Data Collection for the Endocrine System

Ask the following questions:

- Have you gained or lost weight over the past 6 months?

- Has your appetite increased or decreased?
- Have you noticed any changes in thinking? Any difficulty concentrating? Any difficulty with memory?
- Have you become more anxious or nervous? Do you cry a lot?
- Has your personality changed?
- Has your energy level changed?
- Have you experienced muscle cramping or numbness or tingling in your hands and legs?
- Have you been experiencing diarrhea or constipation?
- Have you had more gas or abdominal bloating?
- Have you noticed any facial or ankle swelling?
- Has your voice become huskier?
- Have you been thirstier than usual? Do you urinate more now?
- Have you had heart palpitations? Has your pulse rate changed?
- Has your sleep pattern changed? Do you need more sleep? Are you finding it difficult to sleep?
- *For women:* Have your menstrual periods altered?
- Is there any history in your family of thyroid, pituitary, or adrenal disease, or diabetes?
- Have you noticed a difference in the way you react to the environmental temperature? Are you cold or hot when others are comfortable?
- Have you noticed any changes in the texture or thickness of your hair or eyebrows? What about your fingernails? Are they brittle?
- Has your skin become dry and rough?
- Have you ever had radiation treatments to the head or neck?

Table 35-5

Common Problem Statements, Goals/Expected Outcomes, and Nursing Interventions for Patients With Endocrine Disorders

Problem Statement	Goals/Expected Outcomes	Nursing Interventions
Altered fluid volume due to increased urine output (DI, HyperT, AD).	Patient will display balance between intake and output.	Monitor for dehydration and signs of decreased cardiac output. Measure and record intake and output q2h; maintain ordered IV fluid rate; encourage oral fluid intake.
Constipation due to loss of fluid from intestine, slowed intestinal peristalsis (DI, HypoT, AD).	Patient will display normal bowel pattern within 2 wk.	Provide high-bulk diet; encourage fluid intake; administer stool softener or laxatives as prescribed. Encourage exercise to promote better bowel function.
Altered body image due to changes in physical appearance (PT, HyperT).	Patient will verbalize acceptance of alteration in body appearance within 2 mo.	Allow time for verbalizing feelings. Assist to identify strengths and positive aspects of self and life. Focus on strengths and positive aspects. Give sincere compliments.
Altered sexual function due to decreased libido, amenorrhea, or impotence (PT, HyperT).	Patient will acknowledge need for patience until therapy improves the symptoms.	Help patient understand how therapy might help the problem. Assist patient to recognize and maintain personal worth as an individual. Assist to maintain roles within family or living unit. Help significant others understand patient's illness.
Insufficient knowledge due to illness and treatment (all endocrine disorders).	Patient will verbalize beginning understanding of concepts taught at end of 2 wk.	Teach patient and significant others about the disease and each aspect of treatment. Provide written instructions regarding medications, their side effects, and what should be reported to the provider. Provide instructions for "sick" days. Alert to signs and symptoms of too much or too little medication. Emphasize the importance of follow-up care. Stress the need for medical-alert tag or bracelet and

		wallet card.
Altered due to anorexia, constipation, increased metabolic rate (PT, HyperT).	Patient will regain and maintain weight within normal limits within 6 mo.	Weigh twice a week. Alter diet as needed to increase fiber and carbohydrate content. Provide small, frequent meals of preferred foods. Provide patient teaching about nutritional requirements.
Fatigue due to weakness, somnolence, lethargy (PT, DI, HypoT, CS).	Patient will verbalize decrease in weakness and fatigue within 1 mo; patient will demonstrate improved energy within 3 mo.	Provide periods of rest. Assist with ADLs as needed. Set slower pace for activities. Give patient time to respond to verbal communications. Encourage physical activity to highest level of tolerance.
Potential for injury due to possible increased intracranial pressure (PT), inability to think clearly (HyperT, HypoT), mental and physical sluggishness (HypoT).	Patient will not experience damage from increased intracranial pressure.	Conduct regular checks of neurologic status. Monitor for signs of increased intracranial pressure. Continue hormone replacement therapy as needed to decrease symptoms from tumor or hypofunction.
Disrupted sleep pattern due to insomnia, hypermetabolic state (HyperT, CS).	Patient will use relaxation methods to induce sleep.	Assist with rest periods during the day if fatigue is severe. Instruct in relaxation methods to help induce sleep. Provide noise-free, sleep-inducing environment.
Limited coping ability due to emotional lability (HyperT, AD, CS).	Patient will devise plan to cope with mood swings until they resolve.	Encourage verbalization of feelings and concerns. Assure patient that as disease is controlled, moods will be more stable. Help patient identify strengths and focus on them. Teach relaxation techniques to handle stressful times. Explain physiologic causes of changes in mood.
Altered cardiac output due to fluid depletion (DI, AD), hypometabolic state (HypoT), hypermetabolic state (HyperT).	Patient will maintain adequate blood pressure.	Explain to patient how disease process is affecting heart function. Monitor for signs of dysrhythmia and hypotension. Assure that treatment of underlying disease should alleviate heart symptoms.
Potential for infection due to surgical incision (PT, HyperT), anti-inflammatory effect of excess cortisol (CS).	Patient will not develop infection as evidenced by normal temperature, WBC count within normal range, and absence of visible signs of wound infection.	Maintain strict asepsis for invasive procedures and dressing changes. Monitor temperature, WBC, and subtle signs of infection; steroids can suppress usual signs. Advise to stay away from individuals who have colds or other infections.
Altered nutrition: due to altered glucose metabolism (CS), hypometabolic state (HypoT).	Patient will regain and maintain weight within normal limits within 3 mo of beginning therapy.	Teach signs and symptoms of hyperglycemia and how to administer prescribed insulin; teach regarding correct diet for condition. Assist in designing diet according to food preferences. Teach to balance diet and exercise.

AD, Addison disease; ADLs, activities of daily living; CS, Cushing syndrome; DI, diabetes insipidus; HyperT, hyperthyroidism; HypoT, hypothyroidism; IV, intravenous; PT, pituitary tumors and hypopituitary syndrome; WBC, white blood cell.

Endocrine disorders to which these problem statements apply are in parentheses.

■ Planning

Planning care for a patient with an endocrine disorder will depend on the type of disorder the patient has. Stress has a direct effect on endocrine function. Therefore measures to help the patient decrease stress should be planned. General nursing goals for patients with an endocrine disorder are:

- Prevention of injury
- Maintenance of fluid and electrolyte balance
- Early identification of hormone imbalance
- Reduction of stress
- Use of effective coping mechanisms
- Knowledge of self-care
- Tolerance for physical activity
- Promotion of normal bowel function
- Improvement of mental-emotional status
- Integration of body image

■ Implementation

Interventions vary depending on the type of endocrine problem and are discussed with specific disorders in [Chapters 36](#) and [37](#) (see [Table 35-5](#)).

■ Evaluation

Evaluation is accomplished by determining whether symptoms are resolving and by laboratory testing to determine whether treatment of the endocrine problem is effective. Many of the symptoms of endocrine disorders are subjective, and you must collect reliable data from the patient about symptoms, such as levels of fatigue, feeling cold or hot, and paresthesias. Each patient is questioned about the symptoms and their improvement during the evaluation of care and treatment. In an effort to better evaluate changes in condition, several rating scales are available for fatigue and paresthesias, much like the pain rating scale.

Community Care

Many patients with endocrine disorders are cared for in outpatient settings. Home care nurses frequently find that patients with heart disease, neurologic problems, diabetes, or respiratory problems also have a thyroid problem. Careful assessment by a clinic nurse may uncover a developing endocrine problem.

Get Ready for the NCLEX® Examination!

Key Points

- The endocrine system is made up of glands and hormones that regulate metabolism, growth and development, and sexual and reproductive processes.
- The primary regulatory activities of the endocrine system include altering chemical reactions, changing the permeability of the cell membrane, and activating a particular cell mechanism. The secretion of a particular hormone normally depends on the physiologic need for it.
- Any type of dysfunction of the pituitary gland will affect one or more of its numerous hormones, as well as the target organ for that hormone.
- Age-related changes of the endocrine system include decreased size of the pituitary gland, decreased metabolic rate, decreases in some hormone levels, increases in others, and only slight changes in still others.
- Endocrine disorders are caused by an imbalance in the production of hormone or by an alteration in the body's ability to use the hormones produced. Primary endocrine dysfunction consists of either hypersecretion or hyposecretion; secondary endocrine dysfunction occurs from factors outside the gland.
- Endocrine system tests include examination of blood or urine, radiographs, ultrasound, and MRI scans.
- A thyroid panel may be ordered to evaluate thyroid function. Patients with primary hypothyroidism will have low levels of T_3 and T_4 and high levels of TSH.
- A full physical assessment and history are needed to evaluate the patient with a possible endocrine disorder.
- General goals for the patient with an endocrine disorder include prevention of injury, maintenance of fluid and electrolyte balance, maintenance of hormone balance, reduction of stress, and use of effective coping mechanisms.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• Online Resources

- Common endocrine disorders, www.endocrineweb.com
- The Hormone Health Network, www.hormone.org

Review Questions for the NCLEX® Examination

1. A patient is scheduled to have a RAIU thyroid scan. What important teaching points should be covered? (*Select all that apply.*)

1. Thyroid medications should not be taken before the test.
2. The radioactive iodine tracer will be given orally several hours before the actual imaging.
3. The scanner may be donut shaped, and some patients experience claustrophobia.
4. Diet intake has no effect on the test results.

NCLEX Client Need: Reduction of Risk Potential

2. A patient complains of muscle cramping and twitching. Based on knowledge of the endocrine system, which hormonal deficiency should be evaluated?

1. Aldosterone
2. Parathyroid hormone
3. Estrogen
4. Melatonin

NCLEX Client Need: Reduction of Risk Potential

3. The nurse is taking care of a patient with hyperparathyroidism. Which laboratory results would confirm the diagnosis?

1. Elevated serum calcium
2. Increased bone density
3. Elevated serum phosphate
4. Increased serum potassium

NCLEX Client Need: Physiological Adaptation

4. A nurse is caring for several patients who have endocrine problems. For which patient is the nurse most likely to perform a urine dipstick for ketone bodies?

1. A patient with abnormal thyroid gland activity
2. A patient with diabetes mellitus
3. A patient with adrenal cortical insufficiency
4. A patient with Cushing syndrome

NCLEX Client Need: Physiological Adaptation

5. A patient is on corticosteroid therapy for an acute exacerbation of a respiratory disease. The initial assessment confirms a patient problem of *fluid volume excess*. The underlying cause for this problem would be:

1. suppression of normal corticosteroid secretion.

2. artificial increase in corticosteroids.
3. increased adrenocorticotropic hormone.
4. mineralocorticoid insufficiency.

NCLEX Client Need: Pharmacological Therapies

6. A nurse formulates a care plan for a postmenopausal woman who is admitted for hip fracture. Nursing assessments support the patient problem of *Potential for injury*. The most likely cause for the diagnosis would be:

1. inadequate estrogen secretion.
2. aldosterone deficiency.
3. progesterone deficiency.
4. inadequate parathormone secretion.

NCLEX Client Need: Reduction of Risk Potential

7. Older adults can have physiologic increases in circulating ADH. Based on knowledge of the function of ADH, which condition should nurses monitor for?

1. Dehydration
2. Fluid overload
3. Increased pulse
4. Increased urine output

NCLEX Client Need: Physiological Adaptation

8. A patient is admitted with hyperthyroidism. The initial assessments suggest the patient problem of *Altered nutrition: less than body requirements*. An appropriate expected outcome would be:

1. patient will identify causes of weight loss.
2. patient will maintain weight.
3. patient will have a balanced intake and output.
4. patient will tolerate activities of daily living.

NCLEX Client Need: Basic Care and Comfort

9. A nurse is caring for a patient who had part of the thyroid gland removed. Based on knowledge of anatomy and physiology, which abnormal laboratory value is of particular concern for this patient?

1. Blood glucose of 150 mg/dL
2. Serum sodium of 149 mEq/L
3. Serum calcium of 7 mg/dL
4. Hemoglobin of 10 g/dL

NCLEX Client Need: Reduction of Risk Potential

10. A nurse is preparing a patient for a glucose tolerance test. Which instructions must be included? (*Select all that apply.*)

1. "Eat a balanced diet for 3 days prior to the test."
2. "Maintain a normal level of activity."
3. "Fast for 24 hours before the test."
4. "No eating, drinking, or smoking during the test."
5. "Report dizziness, nervousness, weakness, and confusion."

NCLEX Client Need: Reduction of Risk Potential

Critical Thinking Questions

Scenario A

Mrs. Kovash, a 64-year-old widow, comes to the endocrine clinic to be evaluated at the request of her nurse practitioner. She complains that in the past year she has "slowed down" considerably. She states, "I guess I'm just getting old." The nurse practitioner suspects that it may not be simply aging, because Mrs. Kovash has always lived a healthy and active lifestyle.

1. What type of examinations would you expect the health care provider to perform?
2. What would you teach Mrs. Kovash regarding what to expect from the laboratory blood tests?
3. What questions would you ask the patient before tests for evaluation of thyroid function?

Scenario B

The provider tells you that a patient has a new-onset deficiency of ADH. You anticipate that the patient is likely to have dehydration, urinary frequency, constipation, fatigue, and knowledge deficit.

1. Use your knowledge of the endocrine system and explain to the patient why he is dehydrated and constipated.
2. What interventions could you use to address the patient's fatigue?
3. The provider orders intravenous fluid therapy, but the patient is reluctant to get "stuck with a needle." What patient teaching can you provide to help the patient understand the need for this therapy?

CHAPTER 36

Care of Patients With Pituitary, Thyroid, Parathyroid, and Adrenal Disorders

Objectives

Theory

1. Give examples of four major problems associated with hyposecretion of pituitary hormones and identify three nursing interventions appropriate for each problem.
2. Outline three nursing interventions appropriate for each problem of hypopituitarism.
3. Plan appropriate nursing assessments and interventions for a patient who might experience complications of a thyroidectomy.
4. Compare and contrast the symptoms of hypoparathyroidism with hyperparathyroidism.
5. Identify six signs and symptoms of adrenocortical insufficiency (Addison disease).
6. Summarize four major causes of Cushing syndrome.

Clinical Practice

7. Individualize care for a patient with a pituitary disorder by choosing patient problem statements appropriate to the patient.
8. Select appropriate nursing interventions for a patient with adrenal insufficiency.
9. Implement patient teaching for a patient with hypothyroidism.
10. Plan postoperative assessment and nursing care for a patient who has had a hypophysectomy.
11. Evaluate the nursing care of a patient who has had a thyroidectomy.
12. Identify nursing problem statements and appropriate interventions for a patient with diabetes insipidus.
13. Assist with the development of a teaching plan for a patient taking a corticosteroid.

KEY TERMS

ablation therapy (ăb-LĀ-shūn THĒR-ă-pē, p. 843)

acromegaly (äk-rō-MĒG-ă-lē, p. 837)

Addisonian crisis (p. 854)

anosmia (än-ÖS-mē-ă, p. 838)

autoimmune thyroiditis (p. 848)

benign pituitary adenoma (bĕ-NĪN pī-TŪ-ī-tĕr-ē ā-dĕ-NŌ-mă, p. 837)

catecholamines (kăt-ĕ-KŌL-ă-mēnz, p. 850)

Chvostek sign (p. 849)

Cushing syndrome (p. 855)
diabetes insipidus (DI) (p. 839)
diuresis (dī-ür-RĒ-sīs, p. 839)
exophthalmos (ěk-sōf-THĀL-mōs, p. 843)
gigantism (jī-GĀN-tīzm, p. 837)
Graves disease (p. 842)
Hashimoto thyroiditis (p. 848)
hyponatremia (hī-pō-nă-TRĒ-mē-ă, p. 840)
hypothyroidism (p. 843)
lability (p. 856)
myxedema coma (p. 848)
pheochromocytoma (p. 850)
Sheehan syndrome (SHĒ-hān SĪN-drōm, p. 838)
syndrome of inappropriate antidiuretic hormone (SIADH) (p. 840)
tetany (TĒT-ă-nē, p. 844)
thyroid crisis (THĪ-royd krī-sīs, p. 843)
thyroid storm (TS) (THĪ-royd, p. 844)
thyrotoxicosis (thī-rō-tōk-sī-KŌ-sīs, p. 844)
Trousseau sign (p. 849)

Disorders of the Pituitary Gland

The pituitary is considered the “master” gland, controlling multiple functions in the body, and many syndromes can result from pituitary disorders. Among the more common disorders of the pituitary are:

- Pituitary tumors
- Hypofunction or hyperfunction of the pituitary gland
- Diabetes insipidus (DI)
- Syndrome of inappropriate antidiuretic hormone (SIADH) secretion

Pituitary Tumors

Tumors of the pituitary gland account for about 10% to 15% of all intracranial tumors. Local symptoms are more likely to occur when the tumor is large and creates pressure within the brain. Even smaller tumors can cause various systemic symptoms and endocrine dysfunctions, depending on whether they stimulate or inhibit the secretion of particular hormones.

Etiology and Pathophysiology

A tumor of the pituitary is usually a **benign pituitary adenoma**. The etiology is not clear, but these tumors tend to affect women more than men. Some tumors do not cause symptoms and may be identified during autopsy after death from other causes. If the tumor is large enough, there is increased pressure within the **optic chiasm** (the part of the brain where the optic nerve fibers cross), which, if not relieved, will damage the optic nerve.

Signs and Symptoms

Local symptoms of pituitary adenoma include headache from the pressure of the tumor and visual disturbance—with possible blindness—from pressure within the optic chiasm. Systemic symptoms may be vague and progress very slowly. Personality changes, weakness, fatigue, and vague abdominal pain can be present for years before the condition is diagnosed correctly.

Diagnosis

Diagnosis of a pituitary tumor begins with a complete history and physical examination. Magnetic resonance imaging (MRI) and high-resolution computed tomography (CT) with contrast media may be used to identify, localize, and determine the extent of the tumor. A thorough ophthalmologic examination will be performed to evaluate pressure on the optic chiasm or optic nerves.

Treatment

In some cases the provider may choose to treat the pituitary tumor conservatively with hormone therapy designed to reduce levels of hormone production. If the tumor continues to grow or presents serious hormonal imbalances, it may be treated surgically or by irradiation. Some specialists prefer to remove the pituitary tumor surgically and then treat the site with radiation to be sure that all tumor cells have been destroyed. **Hypophysectomy**, or surgical removal of the pituitary gland, is most commonly performed microsurgically. The usual approach is transsphenoidal via the nose or at the junction of the gums and upper lip ([Figure 36-1](#)).

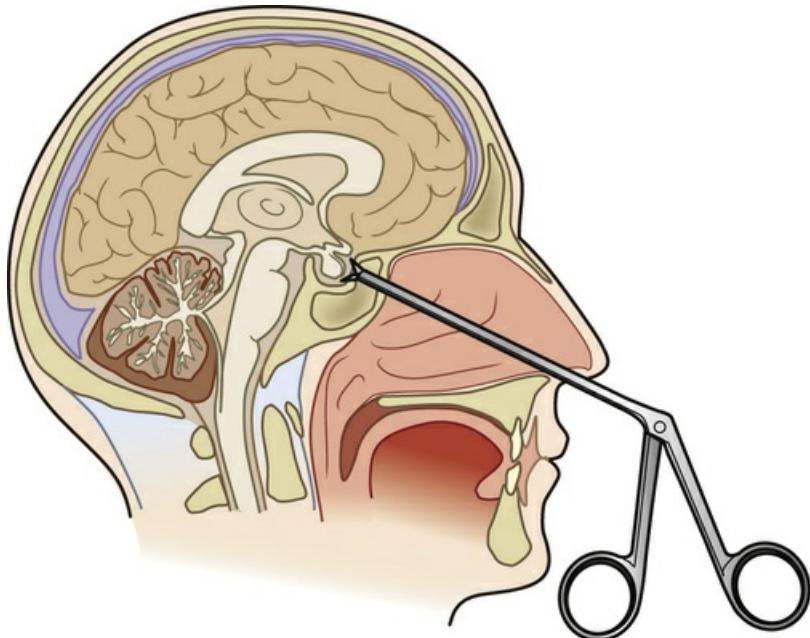


FIGURE 36-1 Transsphenoidal surgical approach for hypophysectomy. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.)

Nursing Management

After the surgery, the patient is kept in a semi-Fowler position. Closely monitor vital signs and the patient's neurologic status. It is important to note and communicate promptly any change in vision, mental status, level of consciousness, or strength. Also monitor for any complications, such as diabetes insipidus (see p. 839). A nasal drip pad is placed and is changed as needed. Expected drainage is bloody or mucuslike; clear watery drainage should be reported. Because nasal packing will be in place for 2 to 3 days, the patient must breathe through the mouth. After surgery it is important that the patient not brush his teeth, cough, sneeze, blow his nose, or bend forward, because these actions may interfere with the healing process. Assist the patient with mouth rinses and encourage hourly deep-breathing exercises to prevent pulmonary problems.

Safety Alert

Coughing

Coughing after a transsphenoidal hypophysectomy may lead to a cerebrospinal fluid leak.

Hyperfunction of the Pituitary Gland

Excessive secretion of growth hormone (GH) results in **gigantism** in children, leading to excessively tall stature, because the bone growth plates have not yet closed. In adults the result is **acromegaly**. When prolactin or gonadotropin are excessive, alteration in fertility and sexual function may occur. Adrenocorticotrophic hormone (ACTH) and thyroid-stimulating hormone (TSH) can also be secreted in excess. These are discussed in the adrenal and thyroid gland sections, respectively.

Etiology and Pathophysiology

Pituitary adenoma may increase release of hormones. Stress and pregnancy are other causes of increased hormone release. Failure of the target organ can also create high levels of hormone, because the normal feedback loop is not functional.

Signs and Symptoms

Gigantism causes the adult's facial features to change: the lips thicken, the nose enlarges, and the forehead develops a bulge (Figure 36-2). The hands and feet become enlarged in adults; the first

sign may be that the patient's shoes no longer fit. Muscle weakness may occur with acromegaly, and osteoporosis and joint pain are common. Signs of prolactin excess include amenorrhea and milk secretion in females and loss of facial hair and impotence in males.



FIGURE 36-2 The progression of acromegaly. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.)

Diagnosis

Alterations in hormone levels can be detected by laboratory testing.

Treatment

Removal of the pituitary adenoma is indicated if a tumor is the cause. Medications that block hormonal effects may be used. Slow-release formulas of somatostatin are used for acromegaly.

Nursing Management

See the previous discussion of hypophysectomy for postoperative management. Monitoring for effectiveness of medical treatment and patient teaching regarding new medications are nursing priorities.

Hypofunction of the Pituitary Gland

Hypofunction of the pituitary gland is a rare disorder characterized by a decrease in the level of one or more of the pituitary hormones.

Etiology and Pathophysiology

The most common cause of pituitary hypofunction is a tumor. Other causes include autoimmune disorders, infections, or destruction of the pituitary. A rare but serious postpartum complication, **Sheehan syndrome**, involves infarction of the gland secondary to postpartum hemorrhage.

The most common pituitary hormone deficiency involves a decrease in the amount of GH and gonadotropins. This decrease results in metabolic problems and sexual dysfunction. Decrease in GH will lead to short stature in children; in adults it leads to an increase in bone breakdown, resulting in increased bone fragility and risk for osteoporosis. The decrease in gonadotropins may lead to testicular failure in males and, ultimately, sterility. Ovarian failure, amenorrhea, and infertility occur with decreased gonadotropins in women.

Signs and Symptoms

Signs and symptoms of pituitary hypofunction depend on the cause of pituitary failure and the hormones involved. If the disorder is related to a tumor, the patient may experience headaches, visual changes, **anosmia** (loss of the sense of smell), or seizures. Other signs and symptoms depend on the hormones that are decreased and are outlined in [Table 36-1](#).

Table 36-1
Decreased Hormones in Pituitary Hypofunction and Associated Clinical Manifestations

Hormone Diminished	Associated Clinical Manifestations
Growth hormone (GH)	Decreased muscle mass, reduced strength, pathologic fractures
Follicle-stimulating hormone (FSH), luteinizing hormone (LH)	<i>Women:</i> Menstrual irregularities, diminished libido, decreased breast size <i>Men:</i> Testicular atrophy, diminished spermatogenesis, loss of libido, impotence, decreased facial hair, decreased muscle mass
Adrenocorticotrophic hormone (ACTH), cortisol	Weakness, fatigue, headache, dry/pale skin, diminished axillary and pubic hair, postural hypotension, fasting hypoglycemia, decreased tolerance for stress, susceptibility to infection
Thyroid hormone	Similar to hypothyroidism, although milder: cold intolerance, constipation, fatigue, lethargy, weight gain

Adapted from Lewis SL, Dirksen SR, Heitkemper MM, Bucher L, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.

Diagnosis

Diagnosis of pituitary gland hypofunction is made by history, physical examination, and diagnostic studies. Laboratory blood tests are performed to measure levels of pituitary hormones. MRI and CT are used to determine the presence or absence of a pituitary tumor.

Treatment and Nursing Management

The mainstay of treatment for hypofunction of the pituitary gland is lifelong replacement of the affected hormones. Somatropin, via subcutaneous injection, is used to replace GH. The patient experiences a feeling of increased energy and well-being, although there are side effects, such as edema, joint pain, and headache. Gonadal hormone therapy is usually offered, including testosterone for men and estrogen or progesterone for women, although associated risks may outweigh the benefits for some patients. If the disorder is caused by a tumor, surgery or radiation for tumor removal is usually performed, followed by hormone therapy.

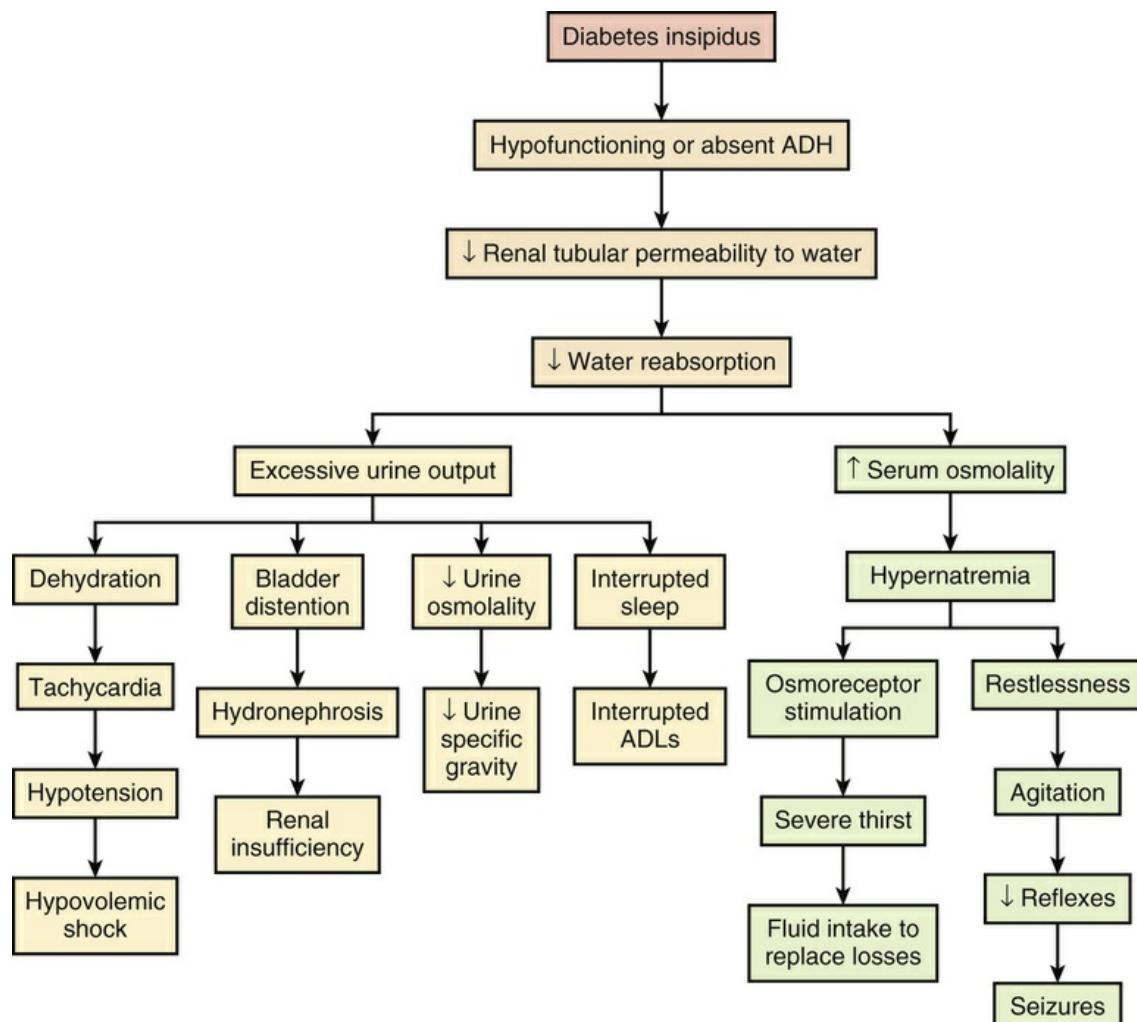
Nursing management involves recognizing the signs and symptoms of hypofunction of the pituitary. Teach the patient about lifelong hormone replacement therapy, including the method and frequency of hormone replacements, side effects, and follow-up.

Diabetes Insipidus

Etiology and Pathophysiology

Diabetes insipidus (DI) is characterized by the production of copious amounts of dilute urine. DI results from decreased production of antidiuretic hormone (ADH), which regulates reabsorption of water in the kidney tubules. When ADH is not present in a sufficient amount, the water is not reabsorbed from the tubule and is excreted as urine ([Concept Map 36-1](#)). The most common forms

of DI are central and nephrogenic. Central DI most commonly occurs after trauma or surgery in the area of the pituitary or hypothalamus and may be temporary or permanent. Nephrogenic DI results from hypercalcemia or lithium toxicity, causing the kidney to be resistant to the effects of ADH. Two less common types of DI are gestational and primary polydipsia (dipsogenic DI).



CONCEPT MAP 36-1 Pathophysiology of diabetes insipidus. ADH, Antidiuretic hormone; ADLs, activities of daily living.

Signs and Symptoms

The patient experiences profound **diuresis** (production of a large amount of urine), often as much as 3 to 20 L in every 24-hour period. Other signs and symptoms include thirst, weakness, and fatigue, often from **nocturia** (urination at night). The patient will exhibit signs of deficient fluid volume, such as tachycardia, hypotension, weight loss, constipation, and poor skin turgor. If untreated, the patient will demonstrate signs of shock and central nervous system manifestations progressing from irritability to eventual coma from hypernatremia and severe dehydration.

Diagnosis

To diagnose DI a complete history is obtained, and a physical examination and laboratory tests are performed, including urine and plasma osmolality and urine specific gravity. A water deprivation test is performed to confirm a suspected case of central DI.

Treatment and Nursing Management

Replacement of fluid and electrolytes, along with hormone therapy, represents the basis of

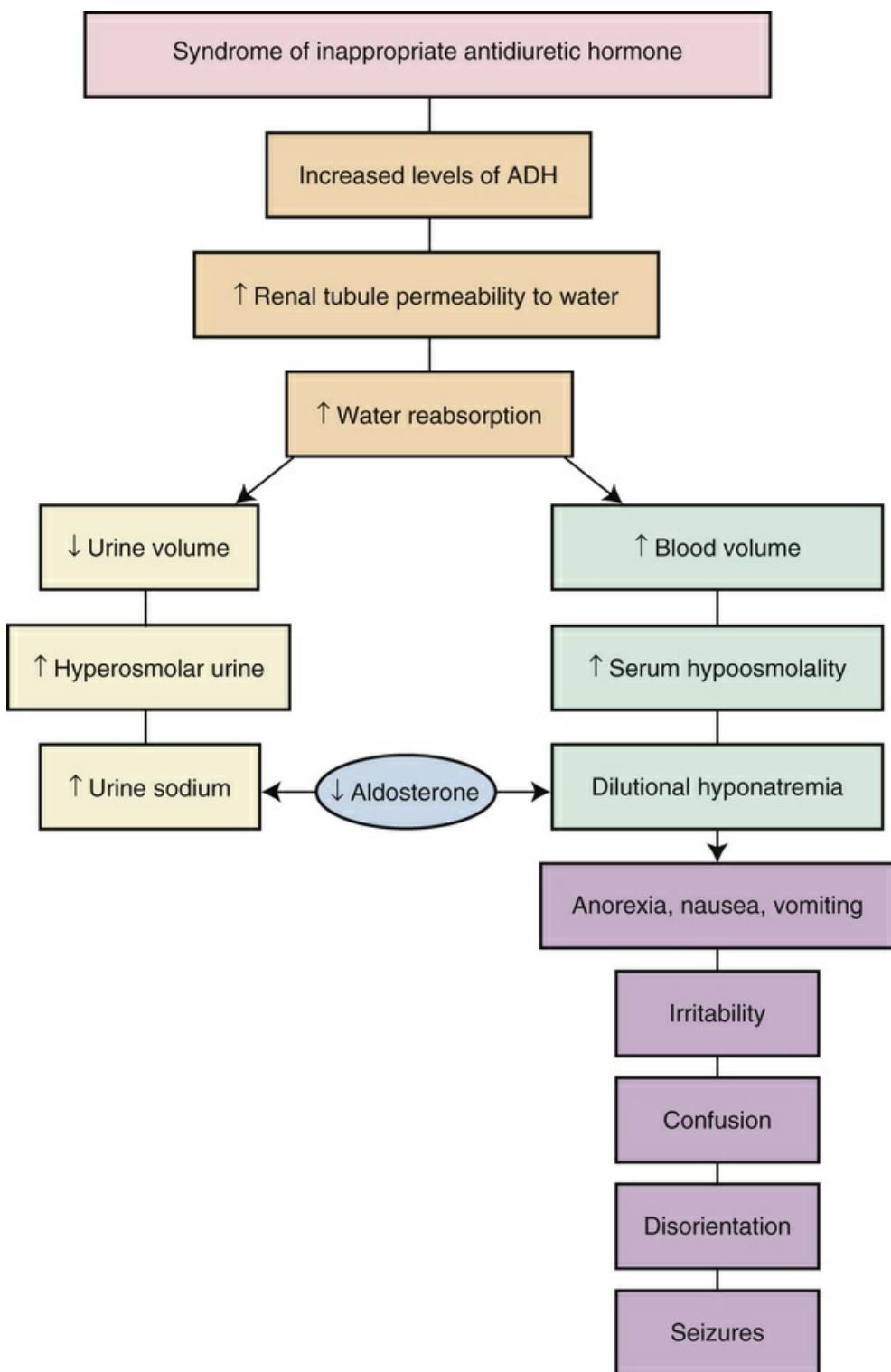
treatment of DI. Oral intake is encouraged to replace fluid losses and is supplemented with intravenous (IV) infusion as needed. In central DI, the hormone of choice to replace insufficient ADH is desmopressin acetate (DDAVP), available orally, IV, or nasally. Other hormone medication choices include vasopressin (Pitressin) via nasal inhalation or by injection. For fluid replacement, hypertonic saline is used, titrated to match the patient's urinary output.

Nursing management focuses on early detection, maintenance of fluid and electrolyte balance, and patient education. Baseline vital signs and weight are important to accurately document and monitor throughout therapy. Strict (hourly) intake and output monitoring are essential to correct fluid losses and to titrate IV fluid replacement.

Syndrome of Inappropriate Antidiuretic Hormone

Etiology and Pathophysiology

Syndrome of inappropriate antidiuretic hormone (SIADH) is the opposite of DI. Excessive amounts of ADH are produced, resulting in fluid retention ([Concept Map 36-2](#)). Numerous factors can cause SIADH, including malignancies and tumors pressing on the pituitary.



CONCEPT MAP 36-2 Pathophysiology of syndrome of inappropriate antidiuretic hormone (SIADH).
ADH, Antidiuretic hormone.

Signs and Symptoms

Signs and symptoms of SIADH include confusion, seizures, and loss of consciousness accompanied by weight gain and edema. **Hyponatremia** from fluid excess, with serum sodium less than 120 mEq/L, occurs frequently. This causes muscle cramps and weakness. Urine output is diminished.

Diagnosis

SIADH is diagnosed by performing urine and serum osmolality tests simultaneously. Results will demonstrate a decreased serum osmolality (less than 280 mOsm/kg) and elevated urine osmolality (more than 100 mmol/kg), which indicates the inappropriate excretion of concentrated urine in the presence of a dilute serum. Other laboratory tests to support the diagnosis include a decrease in blood urea nitrogen (BUN), hemoglobin, hematocrit, and creatinine clearance secondary to hemodilution and elevated urine sodium.

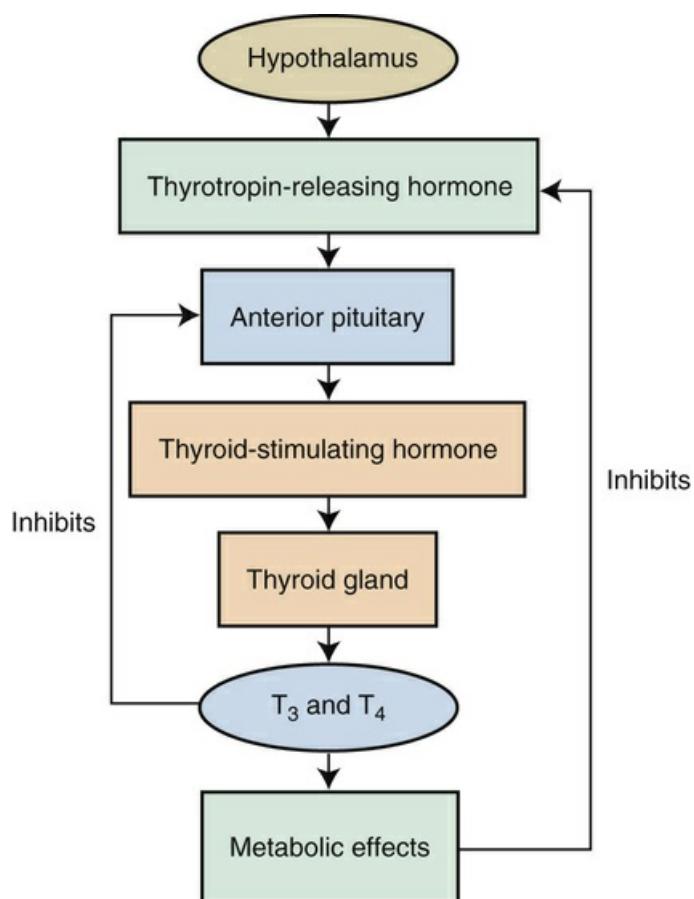
Treatment and Nursing Management

Treatment of SIADH is aimed at correcting the underlying cause; restricting fluids to 500 to 1000 mL/day; and administering sodium chloride, diuretics, and demeclocycline (a tetracycline) to increase excretion of water. Tolvaptan (Samsca) is approved for the treatment of hyponatremia in SIADH. Tolvaptan improves serum sodium levels within 8 hours when given as an IV infusion by blocking the action of ADH; however, there is a danger of overcorrection, and sodium levels need to be closely monitored.

Thorough nursing assessment and data collection are essential to monitor treatment and prevent complications of SIADH. Closely focus on the cardiovascular and neurologic systems and remain alert to the possibility of fluid shifts. Promptly notify the provider of any change in level of consciousness. Electrolytes are monitored closely (as often as several times per day), and daily weights are measured. Hyponatremia produces alteration in neurologic function and requires intervention. Too rapid of correction can result in permanent neurologic deficit. Careful monitoring and implementation of ordered fluids and medications are critical to a good outcome.

Disorders of the Thyroid Gland

Abnormalities in thyroid gland activity and resultant changes in the levels of thyroid hormones are among the most common disorders affecting the endocrine system. The thyroid gland secretes the hormones thyroxine (T_4), triiodothyronine (T_3), and thyrocalcitonin (see [Chapter 35](#)). The secretion of thyroid hormones is regulated by the hypothalamic-pituitary-thyroid control system ([Concept Map 36-3](#)). In other words, all three organs are involved in the closed-loop negative feedback system. Internal conditions, such as low thyroid and norepinephrine (NE) serum levels, can activate the hypothalamus, as can external conditions, such as low temperatures. In response to feedback received by the hypothalamus, thyrotropin-releasing hormone (TRH) is secreted. TRH acts on the pituitary gland, bringing about its release of thyroid-stimulating hormone (TSH). The TSH then acts on the thyroid cells, causing them to release thyroid hormones. When sufficient heat has been produced by increased metabolic activities (if a cold temperature was the stimulus), or when there are sufficient levels of thyroid hormone in the body fluids (if a deficit was the stimulus), feedback to the hypothalamus causes it to stop releasing TRH.



CONCEPT MAP 36-3 Regulation of thyroid hormone secretion by negative feedback control. T_3 , Triiodothyronine; T_4 , thyroxine.

Goiter

Etiology and Pathophysiology

A goiter is a greatly enlarged thyroid gland ([Figure 36-3](#)). One type of goiter is caused by a deficiency of iodine in the diet. Iodine deficiency can be prevented by increasing iodine intake—for example, by using iodized salt. Although the administration of iodine will not cure goiter, it will stop the continued enlargement of the gland. In the United States this is a rare cause of goiter; a

more common cause is an increase of TSH from a lack of thyroid hormone production.



FIGURE 36-3 Goiter. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 9, Philadelphia, 2016, Saunders.)

Signs, Symptoms, and Diagnosis

Because there may be no systemic symptoms or changes in the metabolic rate of a person with simple goiter, the first sign that is usually noticed is an enlargement in the front of the neck. Later, if the gland continues to grow bigger, it presses against the esophagus and causes some difficulty in swallowing. The goiter also can press against the trachea and interfere with normal breathing. The diagnosis of goiter is established by history and physical examination. Goiter can be associated with increased, normal, or decreased hormone production.

Treatment

If goiter resulting from iodine deficiency is treated early, the growth of the gland can be arrested, and in some cases the enlargement will eventually disappear. Medications prescribed include preparations containing elemental iodine (the iodide ion). If lack of thyroid hormone is causing increased tissue growth of the thyroid gland, supplemental thyroid hormone is given in the form of levothyroxine. A very large goiter that continues to grow and produces local symptoms of pressure—or one that presents the possibility of developing into a malignant growth or a toxic goiter—is surgically removed.

Nursing Management

Iodine preparations should be given well diluted and administered through a straw, because they can stain the teeth. Adverse effects of iodine preparations can include gastrointestinal upset, metallic taste, skin rashes, allergic reactions, and epigastric pain. Patients receiving thyroid supplements should be monitored for signs and symptoms such as tachycardia, palpitations, nervousness, headaches, and fatigue indicating overtreatment. Symptoms of inadequate treatment include weight gain, dry skin, hair loss, impaired memory, and cold intolerance.

Hyperthyroidism

Etiology and Pathophysiology

Patients at greatest risk for hyperthyroidism are adult women between 30 and 50 years of age. Primary hyperthyroidism is the result of an abnormality of function involving the thyroid gland itself and causes excessive circulation of thyroid T_4 and T_3 hormones. However, it is possible for only the T_3 level to be elevated if the patient has **Graves disease** (toxic nodular goiter) or toxic adenoma of the thyroid.

High serum levels of T_4 can be caused by either overactivity of the thyroid gland or by excessive

doses of T₄ given in replacement therapy. Primary hyperthyroidism occurs within the thyroid gland. **Secondary** hyperthyroidism usually is the result of an abnormality in another gland, such as the pituitary gland producing too much TSH and therefore overstimulating the thyroid gland.

Primary hyperthyroidism can result from an autoimmune disorder such as Graves disease, also called toxic goiter. Medications containing iodine, such as amiodarone (an antidysrhythmic heart medication) can predispose to hyperthyroidism. Infections are another possible cause. In addition, smoking is a risk factor for developing hyperthyroidism (Ross, 2014).

Signs and Symptoms

The earliest symptoms of hyperthyroidism may be weight loss (despite a good appetite) and nervousness. Symptoms can vary from mild to severe and may include weakness, insomnia, tremulousness, agitation, tachycardia, palpitations, exertional dyspnea, ankle edema, difficulty concentrating, diarrhea, increased thirst and urination, decreased libido, scanty menstruation, and infertility. The condition sometimes is not diagnosed in its early stages because of the vagueness of the symptoms. In some cases hyperthyroidism is misdiagnosed as a cardiovascular disease, because the symptoms are similar.

Older Adult Care Points

Older adults with hyperthyroidism may exhibit milder signs and symptoms or may exhibit an **atypical presentation**, such as shortness of breath, palpitations, or chest pain. Simple fatigue and slowing down may be the only presentation in this patient population.

If hyperthyroidism is not diagnosed correctly and continues untreated for any length of time, the patient can develop cardiomyopathy, heart failure, and cardiac-related death. The symptoms manifested by a patient with hyperthyroid are the result of an accelerated metabolic rate and a speeding up of all physiologic processes. Emotional upheaval occurs as a result of the action of thyroid hormones on the nervous system. The patient often reports episodes of emotional extremes with uncontrollable crying and depression followed by intense physical activity and euphoria. Patients with hyperthyroidism also exhibit an enlarged thyroid gland (toxic goiter) and abnormal protrusion of the eyeballs, or **exophthalmos** (Figure 36-4).



FIGURE 36-4 Exophthalmos of Graves disease. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 7, St. Louis, 2007, Mosby.)

Diagnosis

Medical diagnosis is based on clinical manifestations of hyperthyroidism and the results of laboratory tests for thyroid hormone levels. One indicator of hyperthyroidism is identified by assessment of the heart rate while the patient is sleeping. A rate that is consistently above 80 beats per minute could signify a toxic state resulting from excessive levels of thyroid hormone. The provider may also order an electrocardiogram (ECG) to evaluate cardiac dysrhythmias and a chest x-ray to determine heart size. A nuclear thyroid scan may be indicated.

Treatment and Nursing Management

Hyperthyroidism may be treated medically by administering radioactive iodine and antithyroid drugs, mild sedatives, and beta-adrenergic blocking agents to control tremor, temperature elevation, restlessness, and tachycardia.

Antithyroid drugs are prescribed as the initial treatment of hyperthyroidism. Methimazole (Tapazole) is the main drug used. The patient must take the antithyroid drug at the prescribed time and strictly according to schedule. Propylthiouracil (PTU) is a second-line therapy because of its hepatotoxicity. These medications block the synthesis of thyroid hormone. Iodine preparations may be given to decrease thyroid hormone secretion.

Radioactive iodine (^{131}I), also known as **ablation therapy**, is the definitive treatment for hyperthyroidism; it destroys thyroid tissue. It is contraindicated in pregnant and nursing women, because it can disable the thyroid gland in the fetus or infant. The main disadvantage of ablation therapy is the possibility of **hypothyroidism** (deficient activity of the thyroid gland) caused by overeffective treatment. The hypothyroidism can occur immediately after treatment or long after it is completed; thus the patient must have ongoing follow-up.

Dosage depends on the size of the gland and the thyroid's sensitivity to radiation. Most patients can be dosed and treated as outpatients. The same radioactive iodine is used for treatment of thyroid cancers, with the dosing being higher, requiring precautions that are more stringent for cancer patients. After treatment, all body fluids can be radioactive for a short time. Because the iodine circulates in the blood and is excreted by the kidneys, precautions must be taken when handling needles, syringes, and other equipment likely to be contaminated with blood and bedpans, urinals, and specimen containers that are likely to be contaminated by urine.

All patients receiving radioactive iodine must be observed for signs of **thyroid crisis** resulting from radiation-induced thyroiditis (discussed later).

Safety Alert

Aspirin Contraindicated in Thyrotoxicosis

Use of acetylsalicylic acid (ASA) is contraindicated in patients with thyrotoxicosis. Aspirin interferes with protein binding and increases the free forms of T_3 and T_4 . ASA is used as an antiplatelet medication for cardiovascular disorders and is commonly found in combination analgesic medications.

Iodine preparations also may be given for a period of 10 to 14 days before surgery of the thyroid to reduce the vascularity of the gland and hormone production, minimizing the danger of releasing large amounts of thyroid hormone into the bloodstream during surgery, and to decrease the risk of hemorrhage.

Because many of the signs and symptoms of hyperthyroidism mimic those of cardiac disease, when caring for an older adult be alert to the possibility that such signs may be indicative of an endocrine disorder rather than a cardiac disorder. Physical and mental rest is extremely important, because physical stress and emotional upset can stimulate greater activity in the thyroid gland. Adequate rest is essential to conserve strength, but it is difficult for a person with hyperthyroidism to relax and get sufficient rest.

The diet of patients with hyperthyroidism should be sufficiently high in calories to meet metabolic needs. This will vary from person to person, but continued loss of weight is an indication that more high-calorie foods are needed. It may be necessary to refer the patient to a dietitian, who can work out a satisfactory diet that helps maintain normal body weight.

Patients who are being treated medically for hyperthyroidism must understand that they have an

illness that requires ongoing medication and frequent monitoring to assess the effectiveness of treatment. Sometimes it is difficult for the patient's family to accept and deal with the emotional outbursts and mood changes that occur when the disease is not under control. Once hormone levels return to the normal range, the mental and physical symptoms should subside.

Nursing interventions for selected problems of patients with hyperthyroidism are summarized in [Nursing Care Plan 36-1](#).

Nursing Care Plan 36-1

Care of a Patient With Hyperthyroidism

Scenario

Mrs. Jackson, age 35 years, has been having symptoms of hyperthyroidism. She complains of feeling "hot and soaked with perspiration all the time." She is 25 lb underweight, even though she reports a "ravenous" appetite. Her vital signs are P 110, bounding; RR 30 and somewhat irregular; BP 170/90. She had a physical examination at her provider's office, and her serum calcium level was 11.5 mg/dL. She was admitted for hypercalcemia and for possible thyrotoxicosis. Mrs. Jackson is very apprehensive, agitated, and irritable.

Problem Statement/Nursing Diagnosis

Anxiety/Anxiety related to excess circulating thyroid hormone as evidenced by nervousness and agitation.

Supporting Assessment Data

Subjective: "I don't understand what is happening to me. I feel so nervous all of the time."

Objective: Wringing her hands, eyes darting around the room, fidgeting in bed.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize reduction of anxiety and agitation within 3 days of receiving prescribed medication.	Keep environmental stimuli at a minimum.	Excessive stimuli can worsen anxiety and agitation.	Patient exhibits decrease in agitated behavior.
	No visitors other than family as requested by patient. Approach in a calm and unhurried manner.	A calm approach can decrease patient anxiety.	Patient states that she feels "less anxious."
	Provide 30-min rest periods before lunch, in afternoon, and after supper.	Rest can promote sense of calmness.	Took a nap before lunch.
	Administer antianxiety medications as ordered.	Medications can reduce feelings of anxiety.	Goal met.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/Deficient knowledge related to lack of information about disease and treatment.

Supporting Assessment Data

Subjective: States that she does not know anything about hyperthyroidism or its treatment.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize basic understanding of disease and treatment before discharge.	Explain disease process; reinforce information about diagnostic tests and what to expect for each one.	Basic information about disease increases compliance and contributes to long-term self-management.	Patient verbalized basic understanding of hyperthyroidism.
	Stress importance of compliance and keeping appointments with provider.	Treatment of hyperthyroidism is lifelong.	Patient verbalized the importance of long-term follow-up.
	Encourage questions and help the patient to make a list. Reinforce options, as explained by the provider, for treatment.	Making lists is a self-management strategy that the patient can continue to use when talking to providers or others.	Patient verbalized correct rationale for treatment plan, but decided to ask provider about options. Continue plan.

Problem Statement/Nursing Diagnosis

Altered nutritional status/Imbalanced nutrition: less than body requirements related to increased metabolic rate.

Supporting Assessment Data

Objective: Lost 25 lb over past 6 months, although appetite has increased considerably.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will gain 2 lb/wk when thyroid production is under	Weigh weekly; encourage high-calorie between-meal snacks (e.g., peanut butter, dried fruits).	Weekly weight is more reflective of true weight trends (daily weight tends to reflect water	Patient demonstrated 4-lb weight gain in 10 days but remains less than ideal body weight.

control.	Increase caloric intake to 3000 calories per day. Try to accommodate food preferences. Arrange dietician consult.	gains/losses). High-calorie snacks can be helpful in "sneaking in" extra calories.	Eating peanut butter and wheat toast as a snack. Continue plan.
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Problem Statement/Nursing Diagnosis

Potential for injury due to heart damage/*Risk for injury (cardiac muscle) related to excess circulating thyroid hormone and excess serum calcium.*

Supporting Assessment Data

Objective: Thyroid levels: T₃, 230 mg/dL; T₄, 16 mcg/dL; calcium, 16 mg/dL.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not develop permanent cardiac problems.	Check vital signs q4h.	Increases in pulse and blood pressure may indicate thyroid storm.	Patient's vital signs are BP 130/80, P 85, RR 28, T 100.6° F.
	Assess cardiac function each shift, including ECG monitoring, and watch for symptoms of worsening thyrotoxicosis, such as increased pulse, dyspnea, edema, and rising blood pressure; report as needed.	Hyperdynamic vital signs can be taxing on the heart and must be monitored closely. Alterations in calcium can affect cardiac function.	Patient denies dyspnea.
Patient will have controlled calcium levels within 2 wk.	Medicate with calcium channel blocker as ordered; observe for side effects.	Beta-adrenergic-blocking agents decrease sympathetic tone and decrease stimulation of the heart.	No dysrhythmias present. HR now 70.
Patient will have normal serum calcium by discharge.	Give medication to decrease calcium levels (diuretic) and monitor electrolyte levels.	Loop diuretics increase calcium excretion in the urine.	Patient's calcium level is 9.0 mg/dL; A.M. thyroid levels are pending. Continue plan.

Problem Statement/Nursing Diagnosis

Subjective: States she has been "very moody"; family says that she keeps changing her mind about things.

Supporting Assessment Data

Objective: States she has been "very moody"; family says that she keeps changing her mind about things.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will return to her baseline emotional stability when thyroid production returns to normal.	Assure her that mood swings are manifestations of her thyroid disorder.	Knowledge that emotional lability is disease related can decrease anxiety.	The frequency of emotional episodes has decreased to approximately once per week.
	Help patient to identify signals of mood change and suggest alternative coping strategies.	Early recognition of mood change allows patient to actively control behavior (e.g., feels irritable, so goes to a quiet corner to be alone).	Reports irritation whenever roommate turns on television; has asked the roommate to adjust the sound.
	Establish trusting relationship; be accepting of behavior; spend uninterrupted time with her each shift; display acceptance of her and her behavior.	Acceptance of behavior and spending time with patient increases trust and self-esteem.	Spent 15 min with the patient. She apologized for being "moody." Reassured that this moodiness will pass after the condition is stabilized.

Critical Thinking Questions

- Considering Mrs. Jackson's nervousness and agitation, how would you proceed to implement a teaching session about her hyperthyroidism?
- What specific nutritional suggestions might you offer Mrs. Jackson to help her gain weight?

BP, Blood pressure; *ECG*, electrocardiogram; *P*, pulse; *RR*, respiratory rate; *T*, temperature.

Thyroidectomy

Patients who do not respond well to antithyroid drug therapy, who are unable to take radioactive iodine, or who have greatly enlarged thyroid glands are candidates for a subtotal thyroidectomy. Patients with thyroid malignancy undergo a total thyroidectomy. In the subtotal procedure, two thirds of the glandular mass is removed. The remaining portion of the gland is left intact so production and release of thyroid hormones can continue. For most patients, however, surgery is a treatment of last resort, because the potential complications of hemorrhage, hypoparathyroidism, and vocal cord paralysis can be emotionally devastating. Many patients will be rendered into a state of hypothyroidism because of surgery or radiation therapy that alters thyroid function. It is then necessary to manage their illness with long-term thyroid replacement therapy.

Preoperative Nursing Care

Preoperative care is similar to any major surgery. If the patient appears nervous, tense, and

apprehensive, this should be reported to the surgeon. These symptoms may indicate improper control of the thyroid gland and may predispose the patient to the postoperative complication of “thyroid crisis” (see the following section).

Postoperative Nursing Care

The patient is placed in a Fowler's position (sitting upright to at least 90 degrees) to facilitate breathing and reduce swelling of the operative area. The head is maintained in a neutral position to relieve tension on the sutures. The surgical approach may be a standard incision, minimally invasive video-assisted, or robotic-assisted technique.

The vital signs are checked continuously in the immediate postoperative period, progressing to hourly once the patient is considered to be stable. The patient is watched closely for signs of bleeding and swelling at the operative area, which may cause swallowing difficulty or airway compromise. Any rise in temperature, pulse, or respiration rate should be reported immediately, because it may indicate a high level of thyroxine in the bloodstream. In many hospitals, a tracheostomy set is kept at the bedside of postoperative thyroidectomy patients in case severe respiratory complications develop. Other symptoms to be reported are persistent hoarseness or loss of the voice, which may indicate damage to the vocal cords. **Tetany** (muscular twitching and spasms) and thyroid crisis are other possible complications. These are rare, but be alert for the beginning signs and immediately report observations. Thyroidectomy may be performed as an outpatient procedure for some patients. Patient discharge teaching should include the signs and symptoms of the previously mentioned possible complications.

Tetany actually results from injury to, or accidental removal of, the parathyroid glands. Parathyroid hormone is important in regulating body calcium and phosphorus levels, and a deficiency of parathyroid hormone produces muscle cramps, twitching of the muscles, and, in some cases, severe convulsions from hypocalcemia (see [Chapters 3 and 35](#)). These symptoms represent a medical emergency and must be reported to the provider at once. Treatment consists of intravenous (IV) administration of calcium gluconate during the emergency stage and doses of calcium and vitamin D to maintain calcium balance in the body. The first parathyroid hormone replacement medication is currently in clinical trials ([Cusano et al, 2015](#)).

Thyroid storm (TS), also known as *thyroid crisis* or **thyrotoxicosis**, is another possible complication of thyroidectomy. In the postoperative setting, the condition is caused by a sudden increase in the output of thyroxine caused by manipulation of the thyroid as it is being removed. Newer surgical techniques have made this a rare occurrence. Another cause of TS may be improper reduction of thyroid medication before surgery.

In a patient with hyperthyroidism, TS also can be triggered by other factors unrelated to surgery ([Box 36-1](#)); these patients can also develop TS as a result of consuming an overdose of levothyroxine.

Box 36-1

Causes of Thyroid Storm

- Administration of drugs or dyes containing iodine
- Pregnancy and childbirth
- Myocardial infarction or cardiac emergencies
- Infection
- Severe emotional distress
- Trauma or surgery

The symptoms of TS are produced by a sudden and extreme elevation of all body processes. The temperature may rise to 106° F (41.1° C) or more, the pulse increases to as much as 200 beats per minute, blood pressure elevates, respirations become rapid, and the patient exhibits marked apprehension and restlessness. Unless the condition is relieved, the patient quickly passes from

delirium to coma to death from heart failure.

Assignment Considerations

Changes in Vital Signs

Remind the UAP to report any sudden changes in vital signs (give specific parameters) or behavior (give examples) in patients with thyroid disorders.

Treatment of thyroid crisis must begin immediately after the first symptoms are noticed, rather than waiting for laboratory confirmation. Measures are taken to reduce the temperature; cardiac drugs are given to slow the heart rate; and sedatives, such as a barbiturate, are given to reduce restlessness and anxiety. Adequate fluids must be given to fuel the increased metabolic rate, or profound dehydration may occur.

Safety Alert

Use Caution With Radiology Contrast Studies

Radiocontrast agents have iodine as a base. Imaging studies routinely use these substances. Patients with iodine deficiency are at risk for iodine-induced hyperthyroidism ([Hudzik and Zubelewicz-Szkodzinska, 2014](#)).

Think Critically

What specific assessments would you perform on a patient who returned from having a thyroidectomy 4 hours ago?

Hypothyroidism

Etiology and Pathophysiology

Hypothyroidism can be caused by inflammation of the thyroid gland (thyroiditis) that damages tissue, iodine deficiency, decreased TSH secretion, hypothalamus dysfunction, atrophy of the thyroid gland, or by treatment of hyperthyroidism that results in destroying too many thyroid cells and a resultant deficit of thyroid hormone. Genetic defects can cause congenital hypothyroidism, called *cretinism*. Cretinism is caused by a severe lack of thyroid hormone during fetal life and infancy and is characterized by growth failure. Underactivity of the thyroid gland can also be caused by a pituitary or hypothalamus dysfunction that causes inadequate stimulation of the thyroid, inducing secondary hypothyroidism.

Signs and Symptoms

Children with hypothyroidism have delayed physical and mental growth and become very sluggish within a few weeks after birth. Adults who have **myxedema** (very low thyroid production) have a decrease in appetite but an increase in weight because of a slow metabolic rate. Other signs are bagginess under the eyes and swelling of the face. There is a tendency for patients with hypothyroidism to be lethargic and to sleep for abnormally long periods during the day and night. The speech may be slurred, and the individual will appear sluggish in both mental and physical activities. Other signs and symptoms of hypothyroidism are cold intolerance, constipation and abdominal distention, flatulence, impaired memory, depression, husky voice, thinning eyebrows, hair loss, brittle nails, easy bruising, fatigue, muscle cramps, numbness and tingling, dry skin, and nonpitting edema. Gastrointestinal symptoms are the result of decreased peristaltic activity and can lead to paralytic ileus if untreated.

Older Adult Care Points

Older adults who exhibit lethargy, slow thought processes, and lack of enthusiasm could be

demonstrating signs of hypothyroidism rather than a brain disorder such as dementia. Hypothyroidism is particularly common in older women.

Diagnosis and Treatment

Medical diagnosis is based on clinical signs and symptoms and laboratory testing of serum levels of thyroid hormones and TSH. Hypothyroidism can be treated effectively with replacement of thyroid hormones. The dosage is gradually increased until a proper level has been reached, and then a delicate balance must be maintained so that the patient does not suffer from either hypothyroidism or hyperthyroidism. The results of treatment of hypothyroidism are striking, and most patients show a remarkable abatement of their symptoms. Nurses may not see many cases of hypothyroidism in the hospital setting, because treatment usually does not require hospitalization, however many hospitalized patients are receiving thyroid replacement therapy. Consider how medications and diagnostic testing may alter their usual metabolic control.

Nursing Management

Patients with chronic hypothyroid have very rough and dry skin, and they will need massage with lotions and creams to prevent cracking and peeling of the skin. Provisions for extra warmth must also be made for those who have an increased sensitivity to cold. It is important that the patient receive thyroid medication every day.

Patient Teaching

Self-Care Management of Hypothyroidism

- Take levothyroxine on an empty stomach, because many medications and foods, especially those rich in iron, fiber, calcium, or soy, interfere with absorption.
- Take levothyroxine at the same time each day; morning is usually recommended.
- It may take 6 to 8 weeks to feel benefit or improvement of symptoms.
- Levothyroxine is lifelong therapy; it should never be stopped by anyone except the practitioner who prescribed it.
- Contact your health care provider if you experience unusual bleeding, bruising, chest pain, palpitations, sweating, nervousness, or shortness of breath.
- Report signs and symptoms of myxedema (i.e., dizziness, respiratory distress, low blood sugar, or hypothermia) and hyperthyroidism (i.e., weakness, palpitations, agitation, increased urination, thirst, diarrhea, or insomnia).

Safety Alert

Thyroid Medications

In accordance with The Joint Commission's National Patient Safety Goals, nurses should increase awareness of look-alike, sound-alike products and help patients to recognize the exact name and purpose of their medications. Thyroid medications should not be changed by the patient to the cheapest generic brand, because even slight variations in the level of hormone can be dangerous. Prescriptions should be labeled "NO substitutions."

Do not rush patients with hypothyroid or give them the impression of being annoyed by their sluggishness. Forgetfulness, inability to express oneself verbally, and physical inertia are mannerisms that are a direct result of the thyroid deficiency, and you must recognize them as unavoidable as long as the condition is uncontrolled.

Myxedema Coma

Although rare, **myxedema coma** is life threatening. It can be precipitated in patients with hypothyroid by abrupt withdrawal of thyroid therapy, acute illness, anesthesia, use of sedatives or narcotics, surgery, or hypothermia. Signs and symptoms are loss of consciousness along with hypotension, hypothermia, respiratory failure, hyponatremia, and hypoglycemia. Treatment is IV administration of levothyroxine sodium, fluid replacement, maintenance of an airway and respiration, IV glucose administration, corticosteroids, and warming measures.

Thyroiditis

Etiology and Pathophysiology

Thyroiditis is an inflammation of the thyroid gland. There are three types: acute, such as infection related; subacute, for example, related to upper respiratory viral infection; or chronic, the most common type. **Autoimmune thyroiditis**, also known as **Hashimoto thyroiditis**, is a chronic form that usually affects women between 30 and 50 years of age. The body produces antibodies against the thyroid, which in turn destroy the gland. The reasons behind autoimmune thyroiditis are not fully understood; however, there seems to be a genetic predisposition, and it is more prevalent in people with other autoimmune disorders, such as rheumatoid arthritis.

Signs, Symptoms, and Diagnosis

The patient will experience a painless enlargement of the thyroid gland and may have dysphagia caused by the inflammation. In the initial stages the inflammation will overproduce thyroid hormone, and the patient will display symptoms of hyperthyroidism. Tissue destruction occurs with the autoimmune response, resulting in a hypothyroid condition. Diagnosis is based on laboratory tests, including serum thyroid hormone levels, TSH levels, and radioactive iodine uptake. Needle biopsy of the gland may be performed.

Treatment and Nursing Management

The treatment for chronic thyroiditis is thyroid hormone supplementation to prevent hypothyroidism and suppress TSH secretion. Thyroid function in this disorder is usually normal or low, rather than increased (as in acute thyroiditis). Left untreated, eventually hypothyroidism will develop. The goal of therapy is to decrease the size of the thyroid and prevent hypothyroidism. Surgery to remove part of the gland may be considered. Nursing management focuses on patient teaching and providing for comfort.

Thyroid Cancer

Etiology and Pathophysiology

Thyroid cancer has been diagnosed more frequently in recent years, partially because of increased use of ultrasound for screening. The most common form of thyroid cancer is papillary carcinoma (80%), which occurs most in younger women. This cancer is characterized by a slowly growing tumor that can be present for years before it is diagnosed. The cause of thyroid cancer is unknown but exposure to irradiation for face, head, and neck conditions increases the incidence. Other thyroid cancers include follicular carcinomas, medullary thyroid carcinomas, and anaplastic carcinomas (Sharma, 2015).

Signs and Symptoms

The first sign of thyroid cancer may be a nodule found on a routine physical examination. Only 5% to 10% of nodules are found to be cancerous. Other signs and symptoms of thyroid cancer, such as fatigue, depression, and weight changes, can be easily missed or attributed to other causes.

Diagnosis

The diagnosis of thyroid cancer is made by examination and diagnostic tests. An ultrasound examination is used to assess thyroid size and to locate any nodules. Iodine uptake studies also may be used to check for nodules. **Fine-needle aspiration**, in which a specimen of tissue is taken and

analyzed, is the definitive test.

Treatment and Nursing Management

The treatment for thyroid cancer is thyroidectomy. In some cases, radioactive iodine (ablation) therapy may be used in lieu of surgery to disable the gland (see [p. 844](#)). In 2011 the Food and Drug Administration (FDA) approved vandetanib, which inhibits tumor growth in symptomatic medullary thyroid cancer ([Pazdur, 2013](#)).

Disorders of the Parathyroid Glands

Hypoparathyroidism

Etiology and Pathophysiology

Hypoparathyroidism is most commonly caused by atrophy or traumatic injury to the parathyroid glands. This can occur as a result of accidental removal or destruction of parathyroid tissue during a thyroidectomy, irradiation of the thyroids or parathyroids, neck trauma, or idiopathic (having no known cause) atrophy of the glands. A deficiency of parathormone will result in a drop in serum calcium levels and an increase in phosphorus levels. Patients with chronic renal failure are unable to eliminate dietary phosphorus, and elevated phosphorus levels suppress parathyroid function and result in low calcium levels. There is an inverse relationship between phosphorus and calcium. High phosphorus levels decrease calcium levels.

Signs and Symptoms

Signs and symptoms of hypocalcemia include mild tingling, numbness, muscle cramps, and mental changes, such as irritability. **Chvostek sign** manifests as muscle irritability when the facial nerve is gently tapped. **Trousseau sign** manifests as a carpal spasm, elicited by inflating a blood pressure cuff 20 mm Hg above the systolic blood pressure. Tetany is a serious sign resulting from a lowered serum calcium level. In tetany, muscular twitching and spasms occur because of extreme irritability of neuromuscular tissue. If calcium levels continue to fall, the patient will suffer from convulsions, cardiac dysrhythmias, and spasms of the larynx.

Diagnosis

Medical diagnosis of hypoparathyroidism is established by clinical signs and laboratory data. An electrocardiogram (ECG) may demonstrate abnormalities that can lead to dysrhythmias, heart failure, and hypotension. A CT scan may reveal brain calcifications if the hypocalcemia is chronic. Changes in bone integrity may be seen on radiograph. Other laboratory tests that confirm the diagnosis include serum calcium, total protein, albumin, phosphate, magnesium, vitamin D, parathyroid hormone assay, and urine cyclic adenosine monophosphate (cAMP). Calcium is bound to protein, so alteration in protein levels can affect the serum calcium level.

Treatment and Nursing Management

Acute hypoparathyroidism with tetany is treated with IV calcium gluconate to raise serum calcium levels to normal range. Oral or parenteral administration of calcium salts is used in the acute phase. In chronic hypoparathyroidism, treatment is aimed at restoring and maintaining normal calcium levels in the blood. This can soon be accomplished by parathormone replacement therapy (currently in clinical trials), administration of vitamin D in massive doses to enhance absorption of calcium from the small intestine, and oral administration of calcium salts. Nursing care revolves around electrolyte replacement and patient teaching. Remind the patient that therapy for hypoparathyroidism is lifelong and advise the patient to wear a medical-alert bracelet.

■ Nutrition Considerations

Dairy Products Are High in Phosphorus

Nurses should teach patients with hypoparathyroidism to eat foods high in calcium but low in phosphorus. Milk, yogurt, and processed cheeses are high in phosphorus and therefore are not advised.

Hyperparathyroidism

Etiology and Pathophysiology

Hyperparathyroidism is an endocrine disorder most common in postmenopausal women due to the loss of bone protection from estrogen. Excessive synthesis and secretion of parathormone can occur,

typically as a result of benign enlargement of the parathyroid glands (adenoma) or hyperplasia of two or more glands. Hypercalcemia (calcium level above 10.5 mg/dL) occurs with hyperactivity of the parathyroid glands because the hormone pulls calcium out of the bones. Other causes of hyperparathyroidism are outlined in [Box 36-2](#). Severe hyperparathyroidism is called *Von Recklinghausen disease of the bone*.

Box 36-2

Causes of Hyperparathyroidism

- Parathyroid tumor (benign or malignant)
- Congenital enlargement
- Neck trauma or irradiation
- Vitamin D deficiency
- Chronic renal failure with hypocalcemia
- Lung, kidney, or gastrointestinal tract cancers

Adapted from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.

Signs and Symptoms

Signs and symptoms of hyperparathyroidism may be mild or severe; are usually the result of dysfunction of other organs or tissues related to high calcium levels; and include dehydration, confusion, lethargy, arrhythmias, anorexia, nausea, vomiting, weight loss, constipation, thirst, frequent urination, and hypertension. If hypercalcemia exists, there may be skeletal changes, including thinning of the bone and formation of bone cysts. A bone fracture often causes the patient to seek medical attention. The signs of hypercalcemia are manifested in virtually every major system in the body. Hyperparathyroidism and hypoparathyroidism are compared in [Table 36-2](#).

Table 36-2

Comparison of Hyperparathyroidism and Hypoparathyroidism

	Hyperparathyroidism	Hypoparathyroidism
Serum calcium levels	Increased	Decreased
Serum phosphate levels	Decreased	Increased
Bone resorption*	Increased	Decreased
Calcium and phosphate in urine	Increased	Decreased
Neuromuscular irritability	Decreased	Increased (may progress to tetany)

*Bone resorption, Taking calcium from the bone to increase serum calcium.

Diagnosis

Laboratory testing for persistent elevated serum calcium and low phosphate levels helps confirm the diagnosis. Serum parathyroid hormone is the best test for the initial confirmation. Serum albumin is also measured because serum calcium needs to be corrected for low albumin levels. Dual-energy x-ray absorptiometry (DEXA) to evaluate osteopenia or a bone survey for bone resorption may also be ordered (see [Table 32-2](#)).

Treatment

The treatment of hyperparathyroidism will depend on the severity of the symptoms produced by hypercalcemia and hypophosphatemia. Infusions of isotonic sodium chloride and administration of diuretic agents promotes urine excretion of excess calcium; phosphate therapy and calcitonin is given to inhibit calcium release from the bone.

Safety Alert

Caution With Diuretics

Thiazide diuretics should be used cautiously for patients with hyperparathyroidism, because they potentiate hypercalcemia by decreasing urinary calcium loss ([Sterns, 2013](#)).

Surgical removal of a major portion of the parathyroids (subtotal parathyroidectomy) is recommended for patients who have severe systemic disorders associated with excessively high levels of parathormone. A minimally invasive approach is used when imaging studies are able to isolate the involved gland.

Nursing Management

Nursing management for patients on diuretic therapy includes accurate measuring of intake and output (every 2 to 4 hours), daily weight, monitoring of serum electrolytes, ongoing assessment for electrolyte imbalance, and appropriate nursing intervention. The patient may be placed on continuous cardiac monitoring, depending on the degree of the electrolyte imbalances. Postoperative management is similar to that for thyroidectomy.

Disorders of the Adrenal Glands

Pheochromocytoma

Etiology and Pathophysiology

Pheochromocytoma is a rare tumor of the adrenal medulla that secretes **catecholamines** (epinephrine and norepinephrine). It often causes severe hypertension, and if left untreated it can lead to death. Research is demonstrating a genetic link to inherited gene mutations that predispose individuals to the tumor (Blake, 2014).

Signs, Symptoms, and Diagnosis

Signs and symptoms of pheochromocytoma are related to excess catecholamine release. Signs include tachycardia and severe hypertension (as high as 250/150 mm Hg) that can be intermittent or persistent. Profuse diaphoresis, severe headache, palpitations, nausea, weakness, and pallor may also be present.

Pheochromocytoma is diagnosed by measurement of serum catecholamines and 24-hour urine measurement of catecholamine metabolites. CT and MRI may be used to locate the tumor.

Treatment and Nursing Management

Treatment is surgical removal (often laparoscopically) of the tumor (adrenalectomy). Before surgery, the patient may be in hypertensive crisis and require close monitoring of vital signs and administration of IV antihypertensive medications. The patient should be monitored for signs of orthostatic hypotension related to medication therapy.

Adrenocortical Insufficiency (Addison Disease)

Etiology and Pathophysiology

Addison disease is characterized by decreased function of the adrenal cortex resulting in a deficit of all three hormones secreted by the adrenal cortex. The major problems are related to insufficiencies of the mineralocorticoids and the glucocorticoids. The insufficiency of the androgenic hormones can be compensated for by the ovaries and testes.

Insufficient production of the adrenocortical hormones can result from a disorder affecting the adrenal cortex itself (primary insufficiency) or from a disorder affecting the pituitary gland that stimulates adrenal secretion (secondary insufficiency). Disorders causing a primary insufficiency include idiopathic atrophy, inflammation, infection, and nonsecreting tumors of the adrenal cortex. Secondary insufficiency occurs when the pituitary gland fails to secrete ACTH because the gland is underfunctioning or was surgically removed (hypophysectomy) or after abrupt withdrawal of steroid therapy.

Think Critically

What signs and symptoms might you see in a patient who is developing Addison disease after stopping steroid therapy?

Signs and Symptoms

In the early stages of Addison disease, the clinical manifestations may be so vague as to be annoying to the patient but not serious enough to consult a provider. Hence it is easily missed or misdiagnosed. Later, as the hormone insufficiency worsens, there are severe symptoms associated with fluid and electrolyte imbalance and hypoglycemia. Considering the functions of the mineralocorticoids, a major problem is depletion of sodium (hyponatremia), which in turn causes depletion of extracellular fluid and potassium retention (hyperkalemia). The patient experiences generalized malaise and muscle weakness, muscle pain, orthostatic hypotension, and vulnerability to cardiac dysrhythmias.

Insufficiency of the glucocorticoids affects blood glucose levels and causes symptoms of hypoglycemia. There is also decreased secretion of gastrointestinal enzymes, which results in

anorexia, nausea and vomiting, flatulence, and diarrhea. These symptoms, as well as anxiety, depression, and loss of mental acuity, have been correlated to absence of the peaks of cortisol output that normally occur every 24 hours.

Diagnosis

Diagnosis of Addison disease is made by laboratory testing. Blood cortisol and aldosterone levels are evaluated, and an ACTH stimulation test can determine whether the problem lies in the adrenal gland or in the pituitary. CT and MRI scans may be used to locate a tumor, calcification, or gland enlargement. Abnormal serum electrolyte levels (hyponatremia and hyperkalemia), decreased glucose tolerance, elevated white blood cell count (leukocytosis), and abnormally low levels of free cortisol are among the criteria used to diagnose Addison disease (Griffing, 2014).

Treatment

Replacement therapy to provide the missing hormones usually brings about a rapid recovery, but the patient must continue taking the hormones as lifelong therapy. Prednisone is given to replace glucocorticoids; fludrocortisone is a synthetic adrenocortical steroid to replace the mineralocorticoid aldosterone.

Nursing Management

Nursing management of patients with Addison disease includes:

- Intensive care and support during Addisonian crisis when the patient is in a critical condition and in danger of death from fluid volume depletion, hypotension and shock, and impairment of cardiac function.
- Prevention of problems related to fatigue and orthostatic hypotension.
- Alleviation of gastrointestinal problems.
- Instruction of self-care.

Two important nursing measures are to provide both regular feedings throughout the day and adequate rest. The patient may feel well in the morning but may become progressively weaker and fatigued as the day goes on. If fasting is necessary for diagnostic studies or surgery, the patient with Addison disease probably will need IV glucose to prevent profound hypoglycemia. Maintenance doses of glucocorticoids are especially important whenever fasting is required.

Gastrointestinal problems bring on the possibility of altered nutrition due to anorexia, nausea and vomiting, and diarrhea. Specific fluid and electrolyte imbalances are covered in more depth in Chapter 3. Stress—even relatively mild physical or emotional stress—can quickly bring on an Addisonian crisis for a patient with Addison disease. The patient must avoid undue physical stress whenever possible and must learn effective coping mechanisms to deal with emotional stress (Nursing Care Plan 36-2).

Patient Teaching

Managing Addison Disease

Teach the patient about the signs and symptoms of inadequate or excessive steroid levels, the importance of prompt reporting, and the following points:

- The nature of the illness and what can be done to control it.
- The purpose of each medication and the side effects to be reported.
- The importance of taking the medication every day and of never stopping corticosteroids suddenly; they need to be tapered off slowly.
- Signs and symptoms to report to the provider immediately (worsening weakness, hypotension, confusion, infection).
- The importance of contacting the provider so that medication dosage can be adjusted to combat

the effects of stress.

- Diet adjustments to provide food throughout the day and a bedtime snack.
- The importance of following the prescribed diet to prevent gastrointestinal problems.
- Planned rest periods during the day and sufficient sleep at night, as well as prevention of physical stress.
- The need for a medical-alert tag or bracelet stating the patient has Addison disease and is on steroid therapy.

Think Critically

What specific interventions for a patient with Addison disease would you use to help teach the patient to decrease stress or to cope with stress?

Nursing Care Plan 36-2

Care of a Patient With Adrenocortical Insufficiency (Addison Disease)

Scenario

Mr. Cox, age 49 years, is admitted with a diagnosis of adrenocortical insufficiency (Addison disease). He has recently experienced weight loss, weakness, poor coordination, vomiting, changes in skin coloration, and loss of body hair. During initial assessment, Mr. Cox is found to be very irritable and easily upset by questions. His vital signs are BP 90/50, P 70 and slightly irregular, RR 16 and deep. He reports that he feels pretty good when he awakens in the morning but quickly becomes tired and his muscles begin to ache. He is concerned about his weight loss and change in appearance and also has noticed that he has been unable to "think straight." Admission laboratory data: blood glucose, 50 mg/dL; sodium, 90 mEq/L; potassium, 5.6 mEq/L; white blood cell count (WBC), 12,000/mm³.

Problem Statement/Nursing Diagnosis

Fluid volume deficit/*Deficient fluid volume related to low sodium.*

Supporting Assessment Data

Subjective: Feels very tired, weak, and uncoordinated.

Objective: BP 90/50.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient's BP and pulse will be within 10% of his normal baseline within 4 hr of admission.	Obtain vital signs on admission and as required.	Nursing judgment will dictate the frequency of vital signs; unstable patients may need q15min.	BP continues between 90/50 and 100/60. Provider notified. Will repeat BP in 1 hr.
	Monitor for signs of dehydration (i.e., thirst, dry mucous membranes).	Subjective and objective signs and symptoms of dehydration may occur before BP drops.	Reports thirst and dry sensation in mouth. Oral care given. Willing to take ice chips with subjective relief.
	Administer IV and oral fluids as ordered.	Fluid replacement will correct hypovolemia	IV infusing at 125 mL/hr. Oral fluid offered, but refused because of nausea; provider contacted for antiemetic order.
	Initiate I&O and track pattern over several days.	I&O should be balanced; however, in a hypovolemic state, output is likely to be less than input as the fluid balance recovers.	Intake for end of shift 1000 mL of IV fluid and 2000 mL of oral fluid; output 1000 mL of urine and 500 mL of emesis.

Problem Statement/Nursing Diagnosis

Altered electrolyte balance/*Electrolyte imbalance related to insufficient production of mineralocorticoids and glucocorticoids.*

Supporting Assessment Data

Subjective: Reports fatigue, weakness, mental acuity changes.

Objective: Blood glucose, 50 mg/dL; sodium, 90 mEq/L; potassium, 5.6 mEq/L.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have a stable glucose 70-100 mg/dL. Patient will have normal serum sodium and potassium within 24 hr.	Observe for signs of hypoglycemia (i.e., shakiness, hunger, mental confusion); check fingerstick glucose and report promptly.	Hypoglycemia can be a warning sign of impending Addisonian crisis; brain tissue is very sensitive to low glucose levels.	Patient's blood glucose level is 110 mg/dL.
	Check to see that meals are served on time; provide snacks as needed.	Intake of nutritious foods is important to maintain adequate glucose and sodium levels.	Patient knows signs/symptoms of hypoglycemia. No problems noted at this time.
	Monitor serum sodium and potassium. Watch for signs of hyponatremia (i.e., lethargy, muscle cramps or weakness, headache) or hyperkalemia (i.e., weakness, cardiac dysrhythmias).	Identifying problems with electrolytes in the early phase and acting quickly to restore balance prevents complications.	Provider aware of admission laboratory values and patient condition. Phone order obtained to start an IV with normal saline at 125 mL/hr. Provider will reevaluate patient within the hour.

Problem Statement/Nursing Diagnosis

Altered coping ability/*Ineffective coping related to excess cortisol and mood swings.*

Supporting Assessment Data

Subjective: "Unable to think straight."

Objective: Very irritable and impatient; serum cortisol results pending.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will develop effective coping mechanisms; patient will use relaxation techniques before discharge.	Teach relaxation techniques and supervise practice; work with patient on other ways to decrease stress in daily life.	Effective coping skills are an important determination of how successfully a patient will manage a long-term illness.	Patient practicing relaxation exercise. Verbalized three methods (listening to music, writing in a journal, talking to brother) to decrease stress.
	Help patient to identify sources of stress and set priorities.	Identifying and prioritizing stressors helps patient to make a plan; indicates what type of resources are needed.	Identified job deadlines and financial concerns as major stressors. Decided to call his boss. Financial representative will come to see patient.
	Encourage verbalization of fears and concerns.	Verbalization of fears and concerns can be cathartic; identifies need for mental health referral.	Verbalized that chronic disease would "ruin everything." Agrees to talk to a mental health counselor.
	Discuss alterations in body image and changes that can be expected with therapy.	Anticipatory discussions provide time and opportunity to develop coping strategies.	Sees self as an active person who likes sports and social outings; discussed how the disease affects his self-image and ways that he can continue to participate. Continue plan.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge related to illness, medications, and necessary changes in lifestyle.*

Supporting Assessment Data

Subjective: States that he knows nothing about Addison disease, its diagnosis, or treatment; unfamiliar with corticosteroid therapy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize understanding of medications and dosage schedule before discharge.	Answer questions and discuss medication purpose, side effects, and dose. Emphasize the importance of not suddenly stopping the medications.	Medication compliance is key for treating the disease and preventing complications.	Patient verbalized dosing schedule and the basic action of each medication. Wants a repeat teaching session about side effects.
Patient will verbalize plans for obtaining adequate rest before discharge.	Help him develop a balanced schedule that allows for periods of rest, work, social interaction, and recreation.	Once hormone levels are normalized, the patient with Addison can expect to resume normal activities, as long as rest periods are integrated into the schedule.	Patient described his intention to integrate rest with desired activities.
	Provide written instructions for symptoms of insufficient corticosteroid medication and those of excess medication.	Written instructions increase the retention of vital information. Patient must be able to self-identify and report problems.	Patient verbalized three signs and symptoms of insufficient hormone (weakness, fatigue, diarrhea) or excessive hormone (hunger, thirst, increased urination).
	Instruct him to report either set of symptoms to the provider promptly so medication can be adjusted.	Patient must know when to contact provider so that problems can be prevented.	States that he is happy to know that medication adjustment can be done to address stress and symptoms before things get out of control.
	Instruct to report periods of extra stress (minor illness, such as a cold, an emotional upset, or unusual physiologic or psychological stress) so that medication can be adjusted.	Patient must be aware that stress will have greater effect on his life because of Addison's disease.	Tells family to help him recognize minor physical or emotional stresses that he may overlook because those things are "part of my normal crazy life."
	Instruct him to wear a form of medical-alert identification with data concerning steroid therapy.	Medical-alert identification provides lifesaving information if he is ever unable to give health history.	States that he is a little embarrassed to wear jewelry that "publicly announces my problem," but agrees to seriously consider it.

Critical Thinking Questions

1. In implementing the patient teaching plan for Mr. Cox, when would you perform your patient teaching, and why?
2. Mr. Cox has put together a proposed activity schedule for after he is discharged from the hospital. He lives in a rural community and must go to the post office to get his mail each day. He asks if you would mind looking at the schedule and giving him feedback on it. The schedule

reads: 8 A.M. breakfast, 9 A.M. walk dog, 10 A.M. gardening, 11 A.M. walk to post office/get mail, 12 P.M. lunch, 1 P.M. nap, 2 P.M. watch television, 3 P.M. daughter over for visit. What if any suggestions would you give Mr. Cox, and why?

BP, Blood pressure; I&O, intake and output; IV, intravenous; P, pulse; RR, respiratory rate.

Acute Adrenal Insufficiency or Adrenal Crisis

The presence of cortisol in the body allows the blood vessels to function properly in response to epinephrine and other catecholamines by constricting. Conditions that decrease the amount of circulating cortisol interfere with the ability of the blood vessels to constrict. Patients with Addison disease have a decrease or absence of adrenal cortical secretions, primarily cortisol. Because cortisol is released in response to ACTH from the pituitary gland, abnormalities in ACTH release can also cause a reduction in circulating cortisol. Physical stress from the flu or other infection, or from surgery, can send a patient with Addison disease into **Addisonian crisis**. Another situation that can cause symptoms of acute lack of cortisol results from prescribed treatment. Steroids are given to treat many autoimmune diseases, and the body becomes dependent on this outside source of cortisol. If administration of the medication is stopped abruptly, acute cortisol insufficiency will occur.

Decreased levels of cortisol result in decreased sensitivity of the blood vessels to sympathetic stimulation. It is the sympathetic stimulation that maintains vascular tone. Lack of vascular tone causes vasodilation, producing hypotension. Cortisol helps maintain blood pressure (BP) and cardiovascular function, so the acute lack of it will decrease BP and produce typical signs and symptoms of shock. Other symptoms include severe abdominal, flank, or leg pain; tachycardia; nausea; and change in level of consciousness.

Treatment

Closely monitor vital signs, blood glucose, and sodium and potassium levels. Adrenal crisis requires immediate fluid replacement therapy to prevent irreversible shock. Intravenous hydrocortisone is given along with sodium, fluids, pressors, and dextrose until blood pressure becomes stable. Hyperkalemia must also be addressed with IV insulin and glucose, or calcium chloride (or calcium gluconate) and by monitoring arrhythmias and the patient's intake and output. Hypoglycemia is treated with IV glucose and with glucagon as needed; blood glucose is monitored every hour.

Excess Adrenocortical Hormone (Cushing Syndrome)

Etiology and Pathophysiology

Cushing syndrome is a rare disorder. The symptoms typical of Cushing syndrome are manifestations of excess levels of the hormones from the adrenal cortex. The condition can be caused by:

- Excessive secretion of ACTH by the pituitary, which may result from faulty release of corticotropin-releasing factor (CRF) from the hypothalamus or a pituitary adenoma.
- A secreting tumor of the adrenal cortex.
- Ectopic production of ACTH by tumors outside the pituitary, such as lung cancer.
- Iatrogenic Cushing syndrome from prolonged use of steroid therapy (the most common cause).

Signs and Symptoms

The signs and symptoms of Cushing syndrome are caused by excessive levels of cortisol ([Figure 36-5](#)). They include painful fatty swellings in the intrascapular space (buffalo hump) and facial area (moon face), an enlarged abdomen with thin extremities, bruising after even minor traumas, impotence, amenorrhea, hypertension, and weakness from abnormal protein catabolism with loss of muscle mass.

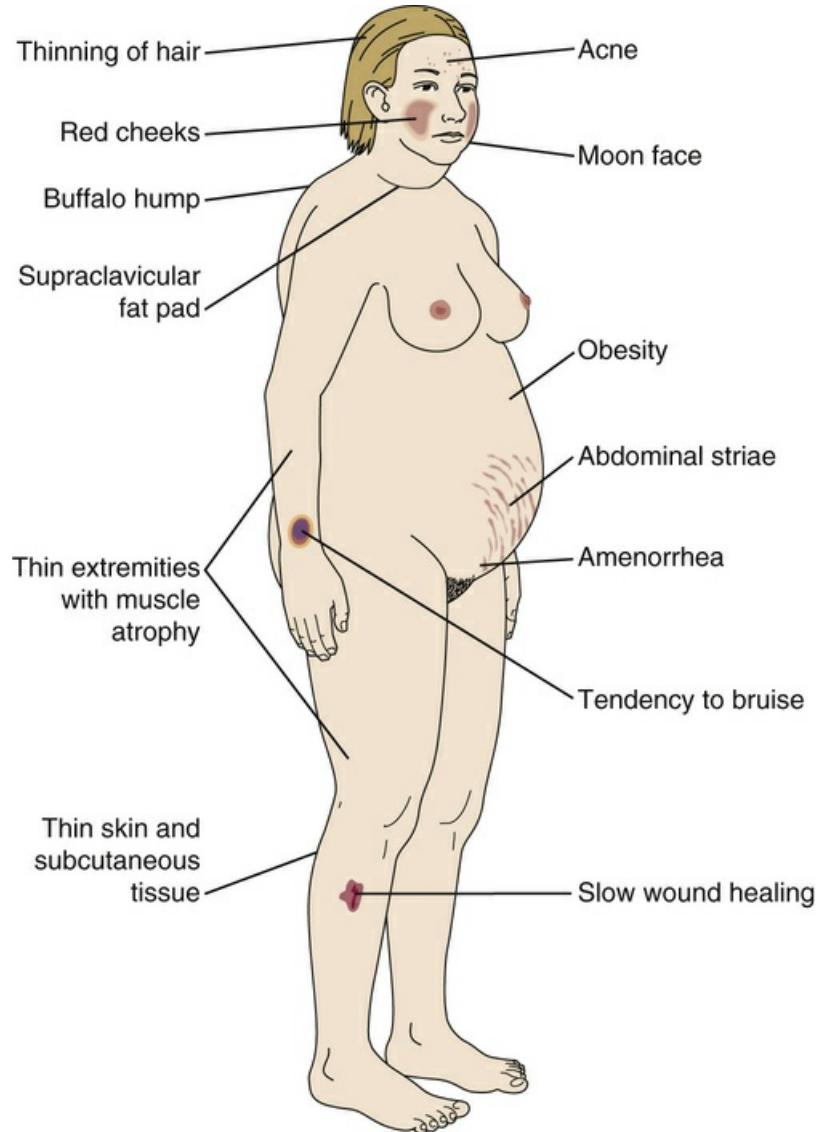


FIGURE 36-5 Common characteristics of Cushing syndrome.

Unusual growth of body hair (hirsutism) can occur in women with Cushing syndrome, and streaked purple markings in the abdominal area can occur because of collections of body fat. Patients with Cushing syndrome who have a familial predisposition to diabetes mellitus commonly develop type 2 diabetes from the anti-insulin, diabetogenic properties of cortisol.

Diagnosis

The diagnosis of Cushing syndrome is established by laboratory findings indicating consistently high levels of free plasma cortisol rather than the usual 24-hour fluctuations. A 24-hour urine test should be performed. If cortisol is elevated, a dexamethasone suppression test should be ordered: for the test, the patient is given a steroid at night, and blood and urine cortisol levels are then measured in the morning. Evening serum and salivary cortisol levels and a dexamethasone-corticotropin-releasing hormone test help with the diagnosis.

Treatment

Pituitary Cushing syndrome can be treated by microsurgery on the pituitary gland. If Cushing syndrome is arising from an adrenal tumor, adrenalectomy is indicated. In this instance replacement of glucocorticoids is necessary. When surgical intervention does not restore normal cortisol levels, medications or radiation may be used.

Clinical Cues

Secondary Cushing syndrome produced by long-term cortisone therapy is often reversible if the medication is tapered off and stopped. However, most people taking cortisone are taking it for other health disorders and cannot discontinue it, so management of Cushing syndrome symptoms is initiated. Steroids should never be taken for a condition other than the specific health disorder for which steroids are prescribed (Box 36-3).

Box 36-3

General Nursing Implications for the Administration of Corticosteroids

When giving a corticosteroid drug:

- Question the patient about history of peptic ulcer, glaucoma, cataracts, diabetes, or psychiatric problems (these conditions may contraindicate the use of steroids).
- Take an extensive drug history and seek specific drug information; many medications interact with steroids.
- Take baseline vital signs and particularly note blood pressure before the start of therapy; steroids may elevate the blood pressure.
- Assess for signs of infection before starting the therapy, because steroids may mask the signs and symptoms of infection.
- Check dosage very carefully and administer only the amount ordered. Spread topical ointment or cream very sparingly.
- Never stop steroid therapy abruptly; such abrupt withdrawal may cause death in a patient who has been on long-term therapy.
- Advise that increased stress, such as infection or surgery, may cause acute adrenal insufficiency.
- Give a daily dose in the morning.
- When not contraindicated, give a diet low in sodium and high in potassium.
- Give oral doses with food to decrease gastrointestinal irritation; medications for gastrointestinal protection are indicated.

Regarding possible side or adverse effects of the drug:

- Assess for side effects when patient has been on glucocorticoid therapy for more than 10 days.
- Monitor older adults for signs of osteoporosis. Give vitamin D and recommend weight-bearing exercise to prevent osteoporosis.
- Assess for changes in muscle strength.
- Watch for signs of depression in patients on high-dose steroid therapy.
- Monitor for signs of hypokalemia, such as nausea, muscle weakness, abdominal distention, and irregular heart rate.
- Monitor blood sugar of diabetic patients closely; glucocorticoids may cause hyperglycemia.
- Check blood pressure regularly during therapy to monitor for hypertension.
- Observe stool for signs of gastrointestinal bleeding.

- Monitor weight, because steroids may cause increased appetite and weight gain.
- Instruct to report slow healing of wounds to the provider.
- Advise patients on long-term steroid therapy that they should have regular checkups for glaucoma and cataracts.

Teach the patient to:

- Take oral doses in the morning with food.
- Not discontinue the drug abruptly but taper down the dosage before stopping it, and only with the approval of the practitioner who prescribed it.
- Be aware that increased hunger and overconsumption could cause weight gain.
- Watch for signs of hypokalemia, such as muscle weakness, fatigue, anorexia, and irregular heartbeat.
- Take the drug only as prescribed.
- Eat foods such as fresh and dried fruits, juices, potatoes, meats, and nuts that are high in potassium.
- Report signs of Cushing syndrome, such as moon-shaped face, puffy eyelids, edema in the feet, increased bruising, dizziness, bleeding, and menstrual irregularity.
- Carry a medical-alert card and wear a bracelet indicating steroid therapy when on long-term steroids.
- Avoid people with infections and stay away from crowds, especially during cold and flu season.
- Advise all other providers and dentists about steroid therapy.
- Be aware that more insulin may be needed if diabetic.
- Be aware that antibody response from immunization may be reduced while taking steroids; live-virus vaccines should not be used.
- Use aspirin and other NSAIDs cautiously; they will increase the risk of gastrointestinal bleeding when taken during steroid therapy.
- Be aware that steroids decrease the effect of barbiturates, phenytoin, and rifampin and that the doses of these drugs may need to be increased.
- Have clotting time monitored closely when taking an anticoagulant at the same time as the steroid.
- Be aware that taking steroids along with potassium-wasting diuretics may cause hypokalemia; increase potassium intake in diet.

NSAIDs, Nonsteroidal anti-inflammatory drugs.

Nursing Management

The nursing care of patients with Cushing syndrome is primarily concerned with helping them cope with the many systemic problems caused by the disorder. Assist the patient with psychosocial concerns presented by emotional **lability** (continually changing) and depression when these occur. The patient needs assurance that with proper treatment the symptoms will improve within 2 to 12 months. In some patients hypertension and glucose intolerance may continue to need management.

Community Care

Nurses in long-term care facilities must be alert for signs of thyroid dysfunction, especially among their older adult female patients. The nurse often is the one to notice subtle changes in the patient that have occurred over many months.

Nurses can be instrumental in preventing secondary Cushing syndrome by cautioning patients to seek means of treatment other than long-term steroid therapy for arthritis or allergies. The nurse must teach patients receiving a new prescription for steroids that this medication must be tapered, never stopped abruptly.

Get Ready for the NCLEX® Examination!

Key Points

- A pituitary tumor secretes GH and antagonizes the effect of insulin. Treatment consists of hormone therapy or surgery.
- Hypofunction of an endocrine gland typically mandates lifelong hormone therapy.
- Hypofunction of the pituitary gland is characterized by a decrease in pituitary hormones and metabolic and sexual dysfunction.
- DI can occur as a result of decreased production of ADH and can lead to hypernatremia, dehydration, and coma. Replacement of fluid, electrolytes, and hormones is required.
- In SIADH, excessive amounts of ADH are produced, resulting in fluid retention. Treatment includes correcting the underlying cause, restricting fluids, and administering medications. Cardiovascular and neurologic systems, electrolytes, and weight should be monitored.
- Signs and symptoms of hyperthyroidism are the result of an accelerated metabolic rate, although older adults may have milder or opposite symptoms. Ablation therapy and thyroidectomy are standard treatments.
- Hypothyroidism causes a decrease in appetite and an increase in weight. Myxedema coma can be precipitated by abrupt withdrawal of thyroid therapy, acute illness, or other stressors.
- The most common type of thyroiditis is autoimmune or Hashimoto. Treatment includes thyroid hormones or surgery.
- Thyroid cancer occurs most often in younger women. Treatment includes ablation therapy, thyroidectomy, or both.
- Hypoparathyroidism can occur from removal or destruction of parathyroid tissue. Treatment includes administration of calcium and vitamin D.
- Hyperparathyroidism is characterized by excessive synthesis and secretion of parathormone. Therapies include infusions of sodium chloride with diuretics, phosphate, and calcitonin; subtotal parathyroidectomy may be performed. Nursing care includes monitoring intake and output, weight, and electrolytes.
- Pheochromocytoma is a potentially fatal adrenal medulla tumor; treatment is surgical removal of the tumor.
- In Addison disease, there is decreased function of the adrenal cortex and a deficit of all hormones. Symptoms include severe fluid and electrolyte imbalances and hypoglycemia.
- Cushing syndrome involves excess levels of adrenal cortex hormones; it may be treated surgically.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- American Thyroid Association, www.thyroid.org
- Cushing's Support and Research Foundation, www.csrf.net
- Cushing's Help Organization, www.cushings-help.com
- National Adrenal Diseases Foundation, www.nadf.us
- MedicAlert Foundation, www.medicalert.org
- Pituitary Disorders Education and Support, www.pituitarydisorder.net

Review Questions for the NCLEX® Examination

1. A 50-year-old man outputs 15 L of urine within a 24-hour period. He has poor skin turgor with low blood pressure and increased heart rate. The nurse would plan to administer which medication?

1. Furosemide (Lasix)
2. Desmopressin acetate (DDAVP)
3. Regular insulin
4. Spironolactone (Aldactone)

NCLEX Client Need: Pharmacological Therapies

2. A 45-year-old man has muscle cramps and weakness. He is weak and confused. Serum sodium is 115 mEq/L. The nurse should report the condition and obtain an order to:

1. give hypertonic (3%) IV saline.
2. encourage fluid intake.
3. infuse hypotonic intravenous fluids.
4. administer vasopressin.

NCLEX Client Need: Physiological Adaptation

3. A 35-year-old woman reports episodes of emotional extremes with uncontrollable crying and depression followed by intense physical activity and euphoria. She complains of drying of the eyes and difficulty swallowing. Her symptoms confirm a nursing problem of altered coping. What is a cause for this diagnosis?

1. Parathyroid hormone deficiency
2. Excessive thyroid hormone secretion
3. Deficient estrogen production
4. Growth hormone deficiency

NCLEX Client Need: Physiological Adaptation

4. A patient received large doses of radioactive iodine (^{131}I) for hyperthyroidism. Which nursing intervention(s) should be included? (Select all that apply.)

1. Monitor vital signs.
2. Restrict fluids.
3. Encourage low-fat, high-fiber diet.

4. Properly handle contaminated materials.
5. Encourage physical activity.

NCLEX Client Need: Reduction of Risk Potential

5. A nurse is caring for a patient after a thyroidectomy. What should the nurse monitor for? (*Select all that apply.*)

1. Bleeding and swelling
2. Hypothermia
3. Increase in pulse
4. Difficulty swallowing
5. Difficulty breathing

NCLEX Client Need: Reduction of Risk Potential

6. A patient complains of severe muscle cramping and muscle twitching after a thyroidectomy. The following orders are obtained. Place in priority order the actions of the nurse.

1. Seizure precautions.
2. Administer calcium gluconate.
3. High calcium diet.
4. Place on ECG monitor.

NCLEX Client Need: Reduction of Risk Potential

7. The nurse is reviewing the medications that each of her patients will receive during the shift. Which patient is likely to receive levothyroxine?

1. Patient who has von Recklinghausen disease
2. Patient who has hypothyroidism
3. Patient who has hyponatremia
4. Patient who has Graves disease

NCLEX Client Need: Pharmacological Therapies

8. A 25-year-old woman complains of amenorrhea with weakness, easy bruising, and painful, fatty swelling on the back. Which assessment question would be most appropriate to ask this patient?

1. Have you been taking steroid therapy for a prolonged period?
2. Have you been taking any medications that contain iodine?
3. Have you been taking lithium for several years?
4. Have you had a recent pregnancy with postpartum bleeding complications?

NCLEX Client Need: Pharmacological Therapies

9. A nurse provides patient instructions regarding taking iodine preparations. It is important for the nurse to include which instruction(s)? (*Select all that apply.*)

1. "Dilute the preparations well."
2. "Use a straw to prevent staining of the teeth."
3. "Watch for easy bruising."
4. "Report severe epigastric pain."
5. "Anticipate a metallic taste."

NCLEX Client Need: Pharmacological Therapies

10. A nurse is caring for a patient with adrenocortical insufficiency (Addison disease). Which set of laboratory values would be the primary interest for this patient?

1. Serum sodium, white blood cell count, and blood glucose
2. Serum calcium, serum phosphate, and vitamin D level
3. Urine osmolality, plasma osmolality, and urine specific gravity
4. Serum T₄, serum T₃, and thyroid-stimulating hormone

NCLEX Client Need: Physiological Adaptation

Critical Thinking Questions

Scenario A

Mrs. Timms has a tentative diagnosis of hyperthyroidism. She is 45 years old, 5 feet 7 inches tall, and weighs 102 lb.

1. What subjective and objective signs and symptoms would you expect Mrs. Timms to present during nursing assessment?
2. How would you prepare Mrs. Timms for diagnostic laboratory tests for thyroid function?
3. If Mrs. Timms' provider decides to treat her condition with large doses of radioactive iodine, what special nursing care will she require?
4. What other forms of therapy are used to treat hyperthyroidism?

Scenario B

Mr. Lau, age 37 years, is receiving adrenocorticoid hormones as replacement therapy for Addison disease.

1. What kinds of problems does insufficiency of the adrenal cortex hormones bring about?
2. What should be included in your instructions to Mr. Lau to help him manage his illness?

Scenario C

Mrs. Josten, age 48 years, is hospitalized for a cholecystectomy. She has Cushing syndrome, as well as gallbladder disease. She is 35 lb overweight and depressed.

1. What kinds of problems is Mrs. Josten likely to have as a result of her Cushing syndrome?
2. What would be your concerns in the immediate postoperative period?
3. What would you want to include in your discharge teaching plan?

Scenario D

A patient complains of fatigue, constipation, cold intolerance, flatulence, hair loss, and dry skin. You suspect that the patient may have a thyroid problem.

1. What other questions could you ask this patient?
2. What laboratory tests is the provider likely to order and what are the normal values for those tests?
3. The patient is prescribed levothyroxine. What teaching points should you share about the medication?

CHAPTER 37

Care of Patients With Diabetes and Hypoglycemia

Objectives

Theory

1. Compare and contrast the two major types of diabetes mellitus.
2. Analyze the four factors that influence the development of diabetes mellitus.
3. Explain the signs and symptoms of an insulin reaction (hypoglycemia) and discuss appropriate nursing interventions.
4. Summarize the acute and long-term complications of poorly controlled diabetes mellitus.
5. Identify sources of support and information for people with diabetes and their families.

Clinical Practice

6. Teach a person newly diagnosed with diabetes about the disease, treatment, and self-care.
7. Perform a focused nursing assessment and gather data for the management of type 1 and type 2 diabetes mellitus.
8. Interpret the results of laboratory tests used in the diagnosis and management of diabetes mellitus.
9. Assess for and gather data related to signs and symptoms that might indicate that a patient with diabetes is in early ketoacidosis.
10. Teach a patient how to recognize and self-treat hypoglycemia.

KEY TERMS

- basal insulin (p. 866)**
- bolus dose (p. 866)**
- correction dose (p. 866)**
- diabetic nephropathy (p. 863)**
- diabetic neuropathy (p. 872)**
- endogenous (ēn-DÖJ-ēn-ūs, p. 860)**
- exogenous (ēks-ÖJ-ēn-ūs, p. 860)**
- gastroparesis (găs-trō-pă-RĒ-sĭs, p. 873)**
- glucometer (p. 873)**
- glycemic control (glī-SĒ-mīk, p. 862)**
- glycosuria (glī-cōs-Ū-rē-ă, p. 861)**
- hyperglycemia (hī-pĕr-glī-SĒ-mē-ă, p. 861)**
- incretin mimetics (in-krē'tin mī-MET-īks, p. 868)**

insulin resistance (p. 860)
insulin-to-carbohydrate ratios (p. 863)
ketoacidosis (kē-tō-ă-sĭ-DŌ-sĭs, p. 860)
medical nutrition therapy (MNT) (p. 863)
metabolic syndrome (p. 861)
neuroglycopenia (nū-rō-GLĪ-kō-PĒ-nē-ă, p. 879)
polydipsia (pōl-ē-DĪP-sē-ă, p. 862)
polyphagia (pōl-ē-FĀ-jā, p. 862)
Polyuria (pōl-ē-Ū-rē-ă, p. 862)

Diabetes Mellitus and Hypoglycemia

Diabetes Mellitus

Diabetes mellitus is a group of diseases in which there is disturbance in metabolism and use of glucose that is secondary to a malfunction of the beta cells of the pancreas. Beta cells are responsible for making insulin. Because insulin is involved in the metabolism of carbohydrates, proteins, and fats, diabetes mellitus is not limited to a disturbance of glucose homeostasis but alters other body functions as well.

Diabetes mellitus results in the body's failure to metabolize sugars and starch. Sugars accumulate in the blood and urine, and the by-products of alternative fat metabolism (ketones) disturb the acid-base balance of the blood, causing a risk of coma or death.

Nutrition Considerations

Whole Grains and Bran

Cho and colleagues (2013) found that consumption of whole grains, cereal fiber, and bran was associated with a lower risk for developing type 2 diabetes, cardiovascular disease, and obesity.

Types of Diabetes Mellitus

Nearly 291 million Americans (approximately 9.3% of the population) have diagnosed diabetes mellitus, and millions more have diabetes and do not know it. The cost of treating diabetes in the United States is approximately \$176 billion a year (National Diabetes Association, 2014).

Table 37-1 summarizes the major characteristics of various forms of diabetes mellitus. Type 1 diabetes—formerly known as *insulin-dependent diabetes mellitus* (IDDM)—accounts for about 5% to 10% of all cases. Type 1 diabetes occurs when the body's immune system destroys insulin-producing beta cells. There is no known way to prevent type 1 diabetes. People who have type 1 diabetes require injections of **exogenous** (from outside the body) insulin to maintain life, because they produce little or no **endogenous** (inside the body) insulin on their own. In general, people with type 1 diabetes are more prone to a serious complication, **ketosis**, associated with an excess production of ketone bodies, leading to **ketoacidosis** (metabolic acidosis). Moreover, type 1 diabetes is more likely to develop early in life. In fact, type 1 diabetes was formerly called *juvenile diabetes* or *ketosis-prone diabetes* because of its typical early onset and potential for ketoacidosis.

Table 37-1
Clinical Categories of Diabetes Mellitus and Characteristics

TYPE	CHARACTERISTICS
Type 1	Little or no endogenous insulin is produced. New patients can be any age but usually are young. Patient must receive exogenous insulin and follow prescribed diet and exercise program. Renal, cardiovascular, retinal, and neurologic complications are likely if disease is not kept under tight control.
Type 2	Patients rarely develop ketosis but may develop hyperglycemic, hyperosmolar syndrome (HHS). Patients vary in need for exogenous insulin. Oral anti-diabetic medications are given to help regulate blood glucose level. New patients are usually older than 30 years, and most are obese. Disorder often responds to diet and exercise.
Latent autoimmune diabetes (LADA) (slow onset type 1 diabetes or type 1.5 diabetes; type 1 diabetes, according to the World Health Organization)	Patients are typically not overweight, have no signs of metabolic syndrome, and may have a history of autoimmune disease. Patients demonstrate rapid failure of oral hypoglycemic drugs. Insulin should be started within 1 year of diagnosis.
Other specific types of diabetes with various causes	Types include drug- or chemically induced diabetes, diseases of the exocrine pancreas (cystic fibrosis), and genetic defects in the action of insulin or beta cell function.
Gestational diabetes	Occurs only during pregnancy. After pregnancy, women with gestational diabetes (2%–10% of pregnancies) have a 35% to 60% chance of developing diabetes within 5–10 years.

Type 2 diabetes—formerly called *non-insulin-dependent diabetes mellitus* (NIDDM)—makes up 90% to 95% of all known cases of diabetes. Type 2 diabetes is believed to begin with **insulin resistance**, in which insulin interaction with glucose becomes less efficient, and therefore glucose metabolism is abnormal. More insulin is produced by the pancreas to maintain cellular metabolism. Type 2 diabetes has a tendency to develop later in life than does type 1, and patients with type 2 rarely develop diabetic ketoacidosis. Box 37-1 lists the signs and symptoms of type 1 and type 2 diabetes. Factors associated with development of type 1 and type 2 diabetes are listed in Box 37-2.

Cultural Considerations

Ethnicity and Type 2 Diabetes

Type 2 diabetes is being diagnosed more frequently in children and adolescents, particularly in American Indians, African Americans, and Hispanic/Latino Americans.

Box 37-1

Symptoms of Type 1 and Type 2 Diabetes

Type 1

- Extreme thirst (polydipsia)
- Frequent urination (polyuria)
- Extreme hunger (polyphagia)
- Rapid loss of weight
- Irritability
- Weakness and fatigue
- Nausea and vomiting

Type 2

- Possibly polydipsia, polyuria, and polyphagia
- More commonly excessive weight gain
- Family history of diabetes mellitus
- Poor healing of scratches, abrasions, and wounds
- Blurred vision
- Itching
- Drowsiness
- Increased fatigue
- Tingling or numbness in the feet

Box 37-2

Factors Associated With Development of Type 1 and Type 2 Diabetes

Type 1

- Family history: genetic predisposition
- Previous infectious disease
- Race: more common in whites, American Indians/Alaska Natives less common in African Americans, Asians, or Hispanics

- Presence of islet cell antibodies in the blood

Type 2

- Older age
- Obesity
- Family history of type 2 diabetes
- History of gestational diabetes
- Impaired glucose metabolism
- Physical inactivity
- Race/ethnicity (African Americans, Hispanic/Latino Americans, American Indians, some Asian Americans, Native Hawaiian/Pacific Islanders)

Data from U.S. Department of Health and Human Services (USDHHS), Centers for Disease Control and Prevention: *National diabetes fact sheet: General information and national estimates on diabetes in the United States*. Atlanta, Ga., 2014, USDHHS.

Latent autoimmune diabetes (LADA) is a form of type 1 diabetes, according to the World Health Organization. Other names for this condition are *slow-onset type 1 diabetes* or *type 1.5 diabetes*. It is believed that the presence of islet cell antibodies in the blood (which are not present in healthy individuals) will eventually destroy the beta cells, and insulin production will cease. Patients with LADA are usually not overweight, have no signs of **metabolic syndrome**, and may have a history of personal or familial autoimmune disease. The diagnosis is based on three criteria: (1) onset after age 30 years, (2) islet cell antibodies circulating in the blood, and (3) insulin is not required sooner than 6 months after diagnosis. Patients can be misdiagnosed as having type 2 diabetes. Rapid failure of oral hypoglycemic drugs suggests LADA. Evidence-based management suggests that metformin can be used in the early phase, and insulin should be started within 1 year of diagnosis; both may offer some protective effects against the destruction of the beta cells, whereas sulfonylureas may hasten destruction of beta cells and therefore are not recommended (Poudel, 2012).

Gestational diabetes may occur as a result of the stress of pregnancy. It may be treated with diet, oral hypoglycemia agents, or insulin. After delivery, the condition must be reevaluated; approximately 35% to 60% of women with gestational diabetes go on to be diagnosed with type 2 diabetes in the years after delivery. The baby also carries an increased risk of type 2 diabetes later in life (Patel, 2014).

Etiology and Pathophysiology

At least four sets of factors influence the development of diabetes mellitus: genetic, metabolic, microbiologic, and immunologic.

Genetic factors are included in the etiology of diabetes, because diabetes tends to run in families. The risk of having some form of diabetes increases in proportion to the number of relatives who are affected, the genetic closeness of the relatives, and the severity of their disease.

Metabolic factors involved in the etiology of diabetes are many and complex. Emotional or physical stress can unmask an inherited predisposition to the disease, probably as a result of glucogenesis induced by increased production of hormones from the adrenal cortex (especially the glucocorticoids). Perhaps even more significant than metabolic factors is the association of type 2 diabetes and obesity. About 80% of patients with type 2 diabetes are obese (more than 20% above their ideal body weight), and there is a higher incidence of type 2 diabetes in people who lead a sedentary life and eat a high-calorie diet. **With weight reduction and increased physical activity, blood glucose can be restored to normal levels and maintained there—hence the importance of diet and exercise in the management of type 2 diabetes.** In type 2 diabetes there also seems to be a relationship to aging and a reduction in the function of the pancreatic beta cells and how they synthesize insulin.

Think Critically

What is one way in which you or your family members might decrease the risk of type 2 diabetes in later life?

Type 1 diabetes is classified as an autoimmune disorder. The immune system causes destruction of the insulin-secreting beta cells of the pancreas. When 80% to 99% of the cells have been destroyed, hyperglycemia develops. Some forms of type 1 diabetes may be related to the viral destruction of beta cells. It is not known if the viral infection initiates or accelerates autoimmunity causing beta cell damage ([Coppieters et al, 2012](#)).

Signs, Symptoms, and Diagnosis

The American Diabetes Association (ADA) recommends screening all adults for type 2 diabetes, especially those who are overweight and have one or more additional risk factors, starting at age 45 years, to be repeated every 3 years. Either hemoglobin A_{1c} (A_{1c} or Hb A_{1c}), fasting plasma glucose (FPG), or 2-hour 75-g oral glucose tolerance test (OGTT) are appropriate screening methods ([ADA, 2014](#)).

In addition to laboratory tests (see [Chapter 35](#)), the health care provider depends on clinical signs and symptoms of diabetes mellitus to establish a diagnosis. The classic symptoms of diabetes mellitus, regardless of type, are related to an elevated blood glucose level, or **hyperglycemia**. Hyperglycemia increases the concentration of the intravascular fluid, raising its osmotic pressure and pulling water from the cells and tissues into the blood. This causes cellular dehydration and the loss of glucose (**glycosuria**), electrolytes, and water in the urine. Cellular dehydration causes thirst and a resultant increased intake of water (**polydipsia**) and diuresis with increased urination (**polyuria**). Hunger (**polyphagia**) is the result of the body's effort to increase its supply of energy, even though the intake of more carbohydrates does not meet the energy needs of the cells.

Clinical Cues

Classic signs and symptoms of diabetes mellitus are polydipsia, polyuria, and polyphagia.

Fatigue and muscular weakness occur because the glucose needed for energy is not metabolized properly. Weight loss in patients with type 1 diabetes occurs for two reasons: (1) the loss of body fluid and (2) in the absence of sufficient insulin, the body begins to metabolize its own proteins and stored fat. The oxidation of fats is incomplete, and fatty acids are converted into ketone bodies and acetone. When the kidney is unable to handle accumulated ketones in the blood, ketosis occurs. The overwhelming presence of the strong organic acids in the blood lowers the pH and leads to a severe and potentially fatal acidosis. The metabolism of body protein when insulin is not available causes an elevated blood urea nitrogen (BUN) level. People with diabetes are prone to infection, delayed healing, and vascular diseases. The increased risk for infection is thought to be partly a result of decreased normal function of leukocytes and abnormal phagocyte function but is primarily from the hyperglycemic environment. Another contributing factor to infection and delayed healing may be decreased blood supply to the tissues because of atherosclerotic changes in the blood vessels. An impaired blood supply means a deficit in the protective cells brought by the blood to a site of injury.

Safety Alert

Immunizations

Because patients with diabetes are susceptible to infectious diseases, it is recommended that they regularly receive pneumonia and flu vaccinations.

Think Critically

If a friend complained of thirst, fatigue, and frequent urination, what questions would you ask? What would you suggest this person do?

Management of Diabetes

There is no cure for diabetes mellitus; the goal is to maintain blood glucose and lipid levels within normal limits and to control these factors to prevent complications. Studies have demonstrated that there are benefits of tight **glycemic control** (control of glucose in the blood) for people with both type 1 and type 2 diabetes. Patients attempting tight control follow an intensive therapy plan of blood glucose testing multiple times a day and insulin injections or an insulin pump. There are some risks associated with perfect control of blood glucose levels, and “tight control” is not indicated for every patient. The most serious control issue is hypoglycemia, or insulin reaction. Real-time continuous glucose monitoring (CGM) can be done through measurement of interstitial glucose, which is fairly close to plasma glucose. Some insulin pumps have CGM capabilities and can provide insulin as programmed to respond to changes in glucose levels.

Research has demonstrated that lowering A1C levels to 6.5% is associated with decreased microvascular complications (eye, kidney, and nerve diseases) of diabetes. If the patient is older and very frail or if the life expectancy is short, the American Geriatrics Association recommends an A_{1c} of 8% (Kirkman et al, 2012).

The protocol for control of diabetes mellitus is highly individualized and depends on the type of diabetes a person has, age, general state of health, ability to follow the prescribed regimen, and acceptance of responsibility for managing illness, along with a host of other factors.

The overall goal of diabetes management is achieved when fasting blood glucose stays within normal limits, A_{1c} tests show that blood glucose has stayed within normal limits from one testing period to the next, the patient's weight is normal, blood lipids remain within normal limits, and the patient has a sense of health and well-being.

Older Adult Care Points

Older adults experience hypoglycemia more quickly than do younger people, and older adults are more prone to hypoglycemic episodes. Older adults may progress to dangerously low levels of blood glucose before signs and symptoms are obvious. Severe hypoglycemia in the older adult can precipitate myocardial infarction, angina, stroke, or seizures. For this reason, “tight” control may not be the best plan for older adults.

Diet.

Diet is the cornerstone of diabetic treatment. Weight gain is common in persons with type 2 diabetes, because of high caloric intake and decreased availability of endogenous insulin to fully use ingested food. Weight gain can make a patient with type 2 diabetes more insulin resistant. In many cases, people with type 2 diabetes can control their blood glucose by reducing caloric intake and increasing physical exercise. There is no such thing as a “typical” person with diabetes, and because diabetes is an unstable and changing process, each patient's needs will change from time to time. A person can eat the “perfect” breakfast 3 days in a row, which results in a “perfect” postprandial (after-meal) blood glucose value, only to eat the very same breakfast the next day and have a high blood glucose measurement. This can be frustrating for the patient. The strategies that are effective in managing diabetes can be altered by many factors (e.g., stress, illness, activity, health beliefs), and the strategies that are effective for one person with diabetes may not be effective for someone else.

Medical nutrition therapy (MNT) is now recommended for all persons with either type 1 or type 2 diabetes. A registered dietitian (RD) or a certified diabetes educator (CDE) performs an in-depth assessment of the type of diabetes, height-to-weight ratio, usual dietary intake, food preferences, exercise level, and daily schedule. A range of interventions are considered when designing a plan that is individualized for the patient. These interventions include reduced fat intake, carbohydrate counting, simplified meal plans, healthy food choices, individualized meal planning strategies, exchange lists, **insulin-to-carbohydrate ratios** (adjusting insulin doses to match carbohydrate intake), physical activity, and behavioral strategies (ADA, 2014). In general, MNT is geared toward providing adequate nutrition with sufficient calories to maintain normal body weight and control of cholesterol, and to adjust the intake of food so that blood glucose is kept within safe limits.

Meal plans include diet guidelines consistent with recommendations for healthy adults. For patients with diabetes, distribution of calories is important for glycemic control. Breakfast calories should be 20% of the daily allotment, with lunch at 35%, dinner 30%, and late evening snack 15%. If

the patient chooses to eat sweets and they are substituted for carbohydrates and do not exceed 10% to 35% of total energy intake, it does not have a negative effect. Proteins should make up 15% to 20%; for patients with **diabetic nephropathy** (kidney disease secondary to high blood glucose level), protein intake of 1 g/kg of body weight is recommended. Meals should include 14 g of fiber per 1000 kilocalories, which is the recommendation for the general public. Reduction of saturated fats, *trans* fats, and dietary cholesterol also improves cardiovascular outcomes ([Academy of Nutrition and Dietetics, 2014](#)).

Clinical Cues

Emphasis should be placed on the positive aspects of the diet—on the foods allowed rather than those that are forbidden. A patient should not be made to feel guilty about having difficulty staying on the diet or the times when she “cheats” and eats foods that are not allowed.

Cultural preferences must be considered when devising meal plans. One of the most effective means of helping a person with diabetes follow the prescribed diet is by teaching about food values and how they affect diabetes. Initially, three or four teaching sessions performed by the RD or CDE lasting 45 to 90 minutes are recommended, with annual follow-up as a minimum. The ADA and the American Dietetic Association have worked together to devise simplified methods of calculating a diabetic diet and planning meals for a person with diabetes. Organizations such as the ADA and the Joslin Diabetes Center, affiliated with Harvard Medical School, have instructive material (see Online Resources at the end of the chapter) available for patient teaching.

Older Adult Care Points

Weight loss is seldom a goal for older adults with type 2 diabetes unless weight is more than $1\frac{1}{2}$ times normal for height and frame. Older adults are more susceptible to nutritional deficiencies from teeth problems, illness, and decreased appetite. Diet is typically managed by reducing concentrated sugars and by adhering to a meal schedule.

Think Critically

How would you obtain accurate data about what your patient with diabetes is eating each day?

Exercise.

Physical exercise is an important part of managing diabetes. Muscular activity improves glucose utilization for energy and improves circulation. In addition to lowering blood glucose levels by “burning up” the glucose, exercise makes the insulin receptors on cells more sensitive to the hormone, and thus improves utilization of the available glucose. Exercise has been shown to improve glycemic control in type 2 diabetes. Because diabetic control also considers blood lipid levels, exercise contributes to that control by reducing triglyceride levels and increasing high-density lipoprotein (HDL) levels. People with type 1 diabetes may decrease their cardiovascular risk with regular exercise even though it does not contribute to control of blood sugar.

The exercise program should be designed for the individual patient. The plan should consider the age and overall physical condition of the patient, ability to carry out the exercises regularly, how well controlled the diabetes is, and baseline blood glucose. Exercise can rapidly lower blood glucose levels and cause serious hypoglycemia.

All exercise programs should begin with milder forms of exercise and gradually increase until the patient's level of tolerance or the desired therapeutic effect is reached. A program should not be started until the blood glucose is under control. The exercise program should be planned so that the exercises are performed at the same time every day, preferably after a meal, when the blood glucose is highest. Blood glucose should be checked before beginning to exercise. The patient is encouraged to wear a medical-alert bracelet ([Figure 37-1](#)) and to exercise with a friend who knows the signs, symptoms, and treatment of hypoglycemia.

Patient Teaching

Home Treatment for Hypoglycemia

Patients should have an emergency plan and supplies for treating low glucose. When signs of hypoglycemia are present and the patient is able to swallow, give one of the following to provide 15 to 20 g of glucose or simple carbohydrates:

- $\frac{1}{2}$ cup (4 oz) of juice or regular soda (not diet)
- 1 cup (8 oz) of nonfat or 1% milk
- 6 or 7 hard candies, such as Life Savers (not sugar-free)
- 1 small box of raisins (2 tablespoons)
- Three glucose tablets
- 1 tablespoon of honey, sugar, or corn syrup
- 1 small tube of cake icing (2 oz) or glucose gel

Follow up with a longer-acting source, such as crackers and cheese or a meat sandwich
If the patient is unable to swallow (groggy or unconscious):

- Turn the patient onto the side.
- Administer 1 mg of glucagon by injection after mixing the solution in the bottle until it is clear.
Call 911 if unable to give injection.
- If the patient does not awaken within 15 minutes, give another dose of glucagon and inform a health care provider of the situation immediately.
- If a health care provider cannot be contacted, call 911 or the local emergency service.

Clinical Cues

Patients should be advised to check with their health care provider before starting an exercise program. Certain activities may not be advised if there are complications. For example, patients with neuropathy, retinopathy, or renal insufficiency may be unable to safely balance, see, or perform rigorous or strenuous activities.

Older Adult Care Points

Physical limitations may discourage older adults with diabetes from exercising. Older patients with diabetes are at risk of developing hypoglycemia up to 24 hours after exercising if the exercise is too strenuous. Walking, swimming, or stationary bicycle riding are considered to be among the safest activities for this group. Exercise should begin slowly and build up to 30 to 45 minutes, three or four times a week. The gradual increase helps prevent hypoglycemia, stress fractures, and cardiovascular complications.



FIGURE 37-1 Medical-alert bracelets.

Glycemic control during exercise.

General guidelines for exercise include practicing good foot care and wearing appropriate shoes and socks. This is very important if there is peripheral neuropathy resulting in decreased sensation. Some types of exercise can increase blood glucose by the release of epinephrine, but most will decrease blood glucose. Managing blood sugar during exercise is individualized to the patient and whether type 1 or type 2 diabetes is present. Gradual increase in activities and consultation with the provider are necessary for safe implementation of an exercise program. Key guidelines for safe exercise include knowing blood glucose before exercise. If blood sugar is low, a carbohydrate snack (20 to 40 g based on body weight) should be consumed before starting. Snacks during activity should be used to prevent hypoglycemia. The amount and frequency will be determined by the type and duration of exercise. A liquid or other readily absorbed source of carbohydrate is recommended.

Performing exercise when insulin or an oral antidiabetic agent is at its peak of action can bring on an acute hypoglycemic reaction. Eating a piece of fruit before even light exercise, if done between meals, also can help prevent hypoglycemia in people with type 1 diabetes. Once a patient begins to follow a regular exercise program, the insulin dosage and diet may need to be revised. In general, the patient may need to take less insulin and to increase caloric intake with regular exercise. Keeping a daily record of exercise, along with weight, insulin dosage, and blood glucose levels, can help motivate the patient to continue exercise.

Health Promotion

Insulin and Exercise

Advise patients to avoid injecting insulin into an area that will soon receive extra exercise (e.g., the leg). The abdomen is a good site for insulin injection, because absorption is steady, rapid, and not affected by exercise.

Oral hypoglycemic agents.

Oral hypoglycemic agents (OHAs) or antidiabetic agents may be prescribed for patients with type 2 diabetes to manage their blood glucose levels. These medications are not a form of oral insulin; pharmacologically, they are from completely different classes of medications. There are several major categories of OHAs that act in different ways to help achieve blood glucose control. Information about these medications can be found in [Table 37-2](#). Many of these individual medications are combined and sold under a variety of brand names.

Safety Alert

Sulfa Drug Allergy

Because the sulfonylureas are from the same family of drugs as the sulfonamide antibiotics, they must be given with caution to persons known to have an allergy to sulfa drugs.

Table 37-2
Oral Hypoglycemic Agents

GENERIC NAME (BRAND NAME)	MAIN SITE OF ACTION	HOW THEY CONTROL BLOOD GLUCOSE	OTHER CONSIDERATIONS
Biguanides			
Metformin (Glucophage) Also available in combination with other OHAs	Liver	Keep liver from releasing excessive insulin; make muscle cells more sensitive to insulin	Do not cause hypoglycemia or hyperinsulinemia Do not lead to weight gain Contraindicated in renal failure, liver disease, and acidosis
Alpha-Glucosidase Inhibitors			
Acarbose (Precose) Miglitol (Glyset)	Intestine	Reduce demand for insulin by slowing absorption of complex carbohydrates, resulting in less of a blood glucose "spike"	Contraindicated in people with inflammatory bowel disease or other intestinal diseases
Thiazolidinediones			
Pioglitazone (Actos) Rosiglitazone (Avandia)	Muscle cells	Make muscle cells more sensitive to insulin; decrease liver production of glucose	Contraindicated in people with congestive heart failure Actos and Avandia have black box warning for cardiac risk
Sulfonylureas (Long-Acting)			
Glimeperide (Amaryl) Glipizide (Glucotrol) Glyburide (DiaBeta, Micronase, Glynnase PresTab) Tolazamide (Tolinase) Tolbutamide (Orinase)	Pancreas	Stimulate pancreas to secrete more insulin	Quick action can cause hypoglycemia Contraindicated in advanced kidney or liver disease, or for those with sulfa allergies
Meglitinides			
Nateglinide (Starlix) Repaglinide (Prandin)	Pancreas	Stimulate insulin secretion, but shorter acting than sulfonylureas	Must be taken immediately before eating Lower risk of hypoglycemia than sulfonylureas
Dipeptidyl Peptidase-4 Inhibitors (DPP-4 Inhibitors)			
Sitagliptin (Januvia) Saxagliptin (Onglyza) Linagliptin (Tradjenta) Alogliptin (Nesina)	Endocrine system	Enhance a natural body system called the incretin system, which helps regulate glucose by affecting alpha and beta cells in the pancreas	May cause delayed gastric emptying (can affect absorption of other medications) Reduced dosage may be required in patients with renal impairment, because medication is excreted via the kidneys
Sodium-Glucose Cotransporter 2 Inhibitors (SGLT2)			
Canagliflozin (Invokana) Dapagliflozin (Farxiga)	Kidney	Blocks reabsorption of glucose in the kidneys	Do not use in renal failure Can cause fluid loss from glycosuria
Bile Acid Sequestrants			
Colesevelam (Welchol)	Digestive system	Used for altering cholesterol levels. Also can decrease blood glucose levels, the mechanism is poorly understood.	Can cause flatulence and constipation.

OHAs, Oral hypoglycemic agents.

Patients receiving OHAs should know that these medications do not eliminate the need for following their diet and exercise program. Some may be under the impression that if they go off their diet and indulge themselves, they can just take more pills to compensate. Others who have been on a diet and exercise program for a time and then have an OHA prescribed for them think it is acceptable to stop planning their meals and exercising regularly. All OHAs are capable of producing gastric irritation, nausea, vomiting, and diarrhea. Liver damage with jaundice, bone marrow depression, and allergic skin reactions may result in some patients. During illness and change in routine, insulin may be added to inpatient treatment. Most patients with type 2 diabetes controlled by OHA medications can return to their usual medication regimen after the acute episode is resolved and will not need long-term injectable insulin.

Clinical Cues

Metformin is the preferred drug for type 2 diabetes, so many patients take this OHA. Metformin should be held before surgery or a procedure requiring contrast media and for 48 hours afterward until renal function is verified.

Insulin therapy.

Insulin therapy can be prescribed for patients with either type 1 or type 2 diabetes. The goal of insulin therapy is to closely mimic **basal insulin**, which is the amount of insulin that would normally be produced by the pancreas throughout the day to maintain a healthy blood sugar level between meals. The pancreas also produces extra insulin after meals (**postprandial**). The health care provider can use a variety of rapid-acting, short-acting, intermediate-acting, and long-acting insulins that best suit the individual patient (Table 37-3). A single daily injection of intermediate- or long-acting insulin, or a combination insulin (such as Humulin 70/30 that combines short- and intermediate-acting insulins), can be used for some patients. The multiple daily injection (MDI) regimen is frequently prescribed and offers the advantage of being more physiologically appropriate. MDI combines short- and intermediate-acting insulins, injected two or more times a day. The patient could also be placed on an intensified regimen. This regimen relies on the patient's ability to accurately perform blood glucose monitoring. The basal dose, again, would be

intermediate- or long-acting insulin. A **bolus dose**, or **correction dose**, of short- or rapid-acting insulin is used to manage elevations in blood glucose and bring the next blood glucose measurement into range.

Clinical Cues

If a patient is on a **sliding scale** of insulin based on fingerstick glucose results and receives **rapid-acting** insulin before meals, make sure the food tray is in front of the patient before giving the insulin to help prevent hypoglycemic events.

Clinical Cues

If regular insulin and longer-acting insulin are to be mixed in one syringe, the regular insulin is drawn up first to prevent any contamination of the regular bottle of insulin with the longer-acting variety. “Clear to cloudy” is an easy way to remember which insulin to draw up first. The clear (regular) insulin is drawn up first, followed by the cloudy (longer-acting) insulin.  **Remember, every insulin dose must be verified by another nurse as it is drawn up, every time.** This habit will also help you meet the National Patient Safety Goal to increase the safety of administering medications.

 **Table 37-3**

Common Types of Insulins: Onset, Peak, and Duration of Action

PREPARATION	BRAND NAME	ONSET (Hr)	PEAK (Hr)	DURATION (Hr)
Rapid Acting				
Insulin aspart injection	NovoLog	0.25	1-3	3-5
Insulin lispro injection	Humalog	0.25	0.5-1.5	5
Insulin glulisine injection	Apidra	0.3	0.5-1.5	3-4
Human insulin inhalation powder	Afrezza	0.25	0.75-1.25	2-3
Short Acting				
Regular human insulin injection	Humulin R	0.5	2-4	5-7
	Novolin R	0.5	2.5-5	8
Buffered regular human insulin injection	Velosulin BR	0.5	1-3	8
Intermediate Acting				
Isophane insulin NPH	Humulin N Novolin N	1.5	4-12	16-24+
	ReliOn N	1.5	4-12	24
Insulin zinc suspension (Lente)	Novolin L	1	6-8	5.7-24
Insulin detemir injection	Levemir	1	6-8	5.7-24
Long Acting				
Insulin glargine injection	Lantus	2-4	None	24
Combination Insulin				
70% insulin aspart protamine suspension/30% insulin aspart injection	NovoLog Mix 70/30	0.25	1-4	24
75% insulin lispro protamine suspension/25% insulin lispro injection	Humalog Mix 75/25	0.25	1-2	16-20
70% human insulin isophane suspension (NPH)/30% human insulin injection (regular)	Humulin 70/30 Novolin 70/30 ReliOn 70/30	0.5	2-4	14-24
50% human insulin isophane suspension (NPH)/50% human insulin injection (regular)	Humulin 50/50 Novolin 50/50	0.5	3-5	24

Adapted from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.

Insulin cannot be taken orally or given via a feeding tube, because it is destroyed by gastric juices. Inhaled insulin was trialed in the late 1990s and was on the market in the early 2000s and then discontinued. An inhaled rapid-acting insulin has recently received FDA approval. The insulin is dispensed in a device much like the inhaled powders for lung disease. Insulin pens, filled with insulin, are another alternative to the traditional syringe-and-needle apparatus. The patient selects the correct dose on a dial, and the insulin is delivered by a small needle at the end of the pen.

Safety Alert

Insulin Pen Injectors

Patients must be careful when dialing the dose of insulin into a pen injector. If performed incorrectly, the numbers of the dosage will be transposed (e.g., 52 units instead of 25 units). This could potentially happen if the pen is held in the left hand, or if the number scale is held upside down.

Injectable insulin continues to be the most common delivery method, so it is critical that nurses be

educated in all aspects of injectable insulin therapy. Insulin injections are rotated within one body area to enhance absorption. Insulin enters the bloodstream at different speeds when given at different sites. The abdomen has the quickest absorption rate, followed by the upper arms. The thighs and buttocks have the slowest absorption, unless the injection is given before exercise when blood flow to those areas will be increased. Patients are given charts showing the places on the arms, legs, buttocks, and abdomen where insulin can be injected (Figure 37-2). They are then encouraged to keep a daily record of injection sites to help remember which sites have been used and to prevent the problem of altered or erratic absorption.

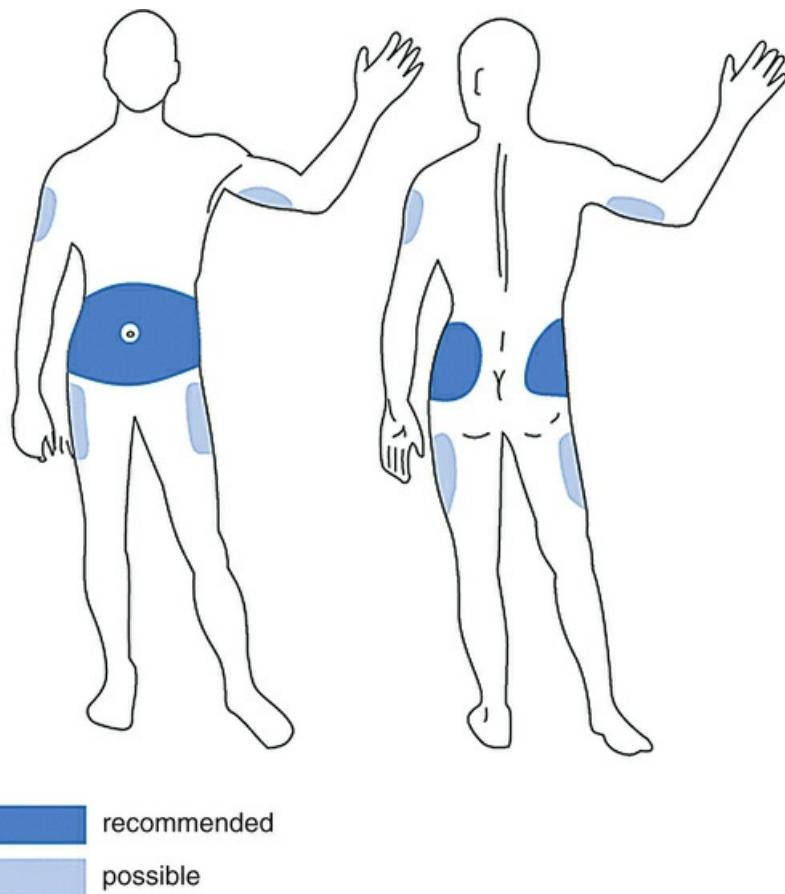


FIGURE 37-2 Rotation sites for injection of insulin. (Courtesy ACCU-CHEK® is a registered trademark of Roche.)

Insulin requirements change as metabolic needs are altered by diet, exercise, age, and even changes in seasons. In the summer, for example, many people are outdoors and exercising more than during the winter months. Also, as a person grows older, the level of physical activity may decrease. Insulin requirements also are altered when the patient has an infection or illness or is under added stress.

Clinical Cues

Some patients are able to use the insulin-to-carbohydrate ratio method. The patient must receive extensive MNT and be taught to interpret blood glucose patterns, to count carbohydrates, and to calculate bolus doses based on carbohydrate intake. One unit of insulin will cover 15 g carbohydrate for most patients (weight and insulin sensitivity must also be considered). See Table 37-4 for an example of lunch calculation. The diabetic educator should be contacted for assistance if a patient could benefit from this type of management system.

Table 37-4

Example of Carbohydrate Counting for Lunch

FOOD SOURCE	GRAMS OF CARBOHYDRATES
2 oz tuna, canned in water	0
1 hamburger bun	30
15 fat-free Pringles	15
1 tablespoon reduced-fat mayonnaise	0
1 tomato and 1 lettuce slice	0
1 medium dill pickle	0
Sugar-free pudding made with fat-free milk	15
Total:	60
Insulin (1 : 15 ratio):	4 units

Modified from Ignatavicius DD, Workman ML: *Medical-surgical nursing: Critical thinking for collaborative care*, ed. 6, Philadelphia, 2010, Saunders.

Think Critically

How would a patient know that her insulin requirement has changed?

Insulin pump.

An alternative to insulin therapy by daily injections is the insulin pump. These pumps can deliver a continuous infusion of insulin through an automated system composed of a battery-driven electronic “brain,” an electric motor and drive mechanisms, and a syringe (Figure 37-3). The syringe is attached to plastic tubing and a subcutaneous needle, which is inserted into the abdomen or thigh. Pumps are helpful in managing diabetes because they allow for improved blood glucose control; people using pumps tend to have fewer episodes of and less severe hypoglycemia compared with MDIs.



FIGURE 37-3 Insulin pump. (Courtesy ACCU-CHEK® is a registered trademark of Roche.)

The pump continuously delivers basal insulin to maintain blood sugar levels between meals and can be programmed to administer a bolus dose for meals or elevated blood sugar levels. CGM is possible via a small sensor inserted under the skin that monitors glucose in the interstitial fluid and not in the blood. Fluid and blood glucose are correlated, but CGM is not used to automatically deliver insulin because there is a lag in the glucose change in interstitial fluid after there has been a change in blood glucose. As the technology is refined, insulin pumps will be able to respond to glucose changes in the same time frame as islet cells. CGM devices can wirelessly send information

to the insulin pump or other monitoring equipment. Insulin pumps are recommended for patients who are willing and able to monitor their blood glucose frequently during the day and who can understand the principles of basal and bolus insulin and carbohydrate counting. As the technology gets more sophisticated and easier to use, the popularity of insulin pumps is increasing.

Clinical Cues

The insulin pump will have to be disconnected for certain diagnostic tests, such as magnetic resonance imaging. Most patients can safely be without the pump for an hour, but blood glucose should be checked before disconnecting and after reconnecting ([American Association of Diabetes Educators, 2014](#)).

Other injectable agents.

Historically, insulin was the only injectable medication for the management of diabetes; however, new injectable agents have been introduced. These medications do not replace standard diabetic medications, but are used to enhance the effect of existing medications. One new category of medications is called **incretin mimetics** because they mimic the action of **incretins**, hormones released from the intestine. In type 2 diabetics they lower postprandial blood glucose levels in a number of ways ([Table 37-5](#)). Other injectable medications to treat diabetes are synthetic hormones, such as pramlintide (Symlin), which can be used in types 1 and 2 diabetes. Although these medications are administered subcutaneously, none of these new medications should ever be mixed in the same syringe with insulin, and the patient must be monitored carefully for hypoglycemia.

Safety Alert

Pramlintide

The medication pramlintide has an FDA **black box warning** (a type of warning sometimes carried on prescription medications indicating the potential for serious adverse effects). This medication has the potential to cause severe hypoglycemia within 3 hours of administration. It is critically important that you observe the patient closely for any signs or symptoms of hypoglycemia.

 **Table 37-5**

Injectable Hypoglycemic Agents

GENERIC NAME (BRAND NAME)	DELIVERY METHOD	HOW THEY CONTROL BLOOD GLUCOSE	OTHER CONSIDERATIONS
Synthetic Hormone			
Pramlintide (Symlin)	Subcutaneous	Synthetic form of the hormone amylin Slows gastric emptying, suppresses glucagon release, suppresses glucose production by the liver, decreases appetite	Black box warning: potential to cause severe hypoglycemia; patients started on this medication should have their rapid-acting insulin dosage cut in half Pramlintide cannot be mixed with insulin and must be administered as a separate injection
Human Glucagon-like Peptide-1 Analogue (Incretin Mimetic)			
Exenatide (Byetta)	Subcutaneous	Mimics the action of incretins Stimulates insulin secretion, suppresses glucagon release, delays gastric emptying	Administer before breakfast or dinner (not lunch) to prevent severe hypoglycemia Give 1 hr after oral hypoglycemic agents
Liraglutide (Victoza)	Subcutaneous	Stimulates the release of insulin when blood glucose levels are elevated	Not a first-line treatment, but may be used in type 2 diabetes as an adjunct to diet, exercise, and oral hypoglycemic agents

Preoperative and postoperative insulin management.

The emotional and physical stress of surgery can increase the blood glucose level and alter the amounts of medication needed for glycemic control. Patients with type 2 diabetes may be taken off OHAs up to 48 hours before surgery and started on insulin by injection to achieve adequate control of their diabetes during this stressful period. The patient should be reassured that the diabetes is not worse, and that the insulin injections are only a temporary measure. A patient with type 2 diabetes will have bolus or correction dose orders (sliding scale) along with the usual insulin order. Blood sugar determinations are performed frequently.

For all patients with diabetes, intravenous (IV) fluids are begun as soon as the patient is ordered “nothing by mouth” (NPO) and are continued until the patient is eating again after surgery. During surgery, an insulin infusion of regular or short-acting insulin may be used, usually mixed in 5% dextrose or 0.9% NaCl solution, depending on hospital policy. Blood glucose is monitored closely

during surgery and every 2 to 4 hours postoperatively; urine is checked for ketones when glucose levels are high.

Clinical Cues

Be especially alert for signs of hypoglycemia in patients who are receiving an insulin infusion. Blood glucose is monitored hourly. The rate of infusion is adjusted according to an algorithm.

Islet cell and pancreas transplantation.

Clinical trials are under way for optimizing a procedure for treatment of type 1 diabetes by transplantation of insulin-producing islet cells. Cells are taken from the donor pancreas and injected into the hepatic circulation of the recipient, where the cells lodge and produce insulin. Lifelong immunosuppressive medications are still needed to prevent rejection of the cells. Whole organ transplantation of the pancreas is also done to replace insulin function. Many times a pancreas and kidney transplant are performed together using organs from the same donor. Altered renal function is a complication of type 1 diabetes, and transplant of both organs results in better outcomes (Lerma, 2013).

Complications

In general, people with diabetes are susceptible to two types of complications: short-term (acute) problems and long-term problems.

Short-term problems.

Acute complications arise when the blood glucose suddenly becomes either too high (hyperglycemia) or too low (hypoglycemia) (Table 37-6).

Safety Alert

Hyperglycemia or Hypoglycemia

When there is doubt as to whether a patient is experiencing hyperglycemia or hypoglycemia, treatment is begun for hypoglycemia until a blood glucose determination is obtained to prevent brain damage from extremely low cerebral glucose levels. Caution should be used to not overtreat with glucose. Hyperglycemia can worsen neurologic conditions. Rapid determination of blood glucose is essential to proper management. Hyperglycemia usually develops slowly and does not cause immediate changes in level of consciousness. Hypoglycemia can occur rapidly.

Table 37-6
Comparison of Hypoglycemia and Ketoacidosis

HYPOGLYCEMIA		KETOACIDOSIS
Etiology		
Overdosage of insulin		Failure to take insulin
Skipped or delayed meal		Illness or infection
Unplanned strenuous exercise		Overeating or too many carbohydrates
		Severe stress (surgery, trauma, emotional upset)
Symptoms		
Headache		Increased thirst (polydipsia)
Weakness		Increased urination (polyuria)
Hunger (polyphagia)		Acetone breath odor ("fruity")
Pallor		Dry mucous membranes and sunken eyeballs (dehydration)
Irritability		Nausea and vomiting
Lack of muscle coordination		Deep respirations (Kussmaul respirations)
Apprehension		Abdominal pain and rigidity
Shakiness		Paresthesias, weakness, paralysis
Diaphoresis with cool, clammy skin		Hypotension
Blurred vision		Minimal urine output (oliguria) or none (anuria) (late sign)
Rapid heartbeat		Stupor or coma (late sign)
Confusion		
Coma (late)		
Treatment		
If patient can swallow, give 3 glucose tablets or equivalent glucose gel, 6 oz of juice, 6 oz regular cola, 8 oz of 2% or skim milk, or 6-8 Life Savers candies.		IV fluid and insulin with correction of electrolyte imbalances.
If patient cannot swallow, administer glucagon IM.		Severe cases are hospitalized for stabilization.
If at the hospital, give D ₅₀ W solution IV.		
Prevention		
Eat meals 4-5 hr apart, plus prescribed snacks.		Take correct dose of insulin.
Take correct dose of insulin.		Consult health care provider when ill (even for minor illnesses).
Test blood glucose level regularly and more frequently during illness.		Follow diet; do not overeat and do not overload with
Eat extra food when exercising more than usual.		

IM, Intramuscularly; IV, intravenously.

When a patient is admitted to the hospital with hyperglycemia, decisions about the proper modes of therapy are based on the presence of objective and subjective symptoms. Type 1 diabetes is more likely to be complicated by ketoacidosis, whereas type 2 diabetes may cause hyperglycemic hyperosmolar state (HHS; previously called hyperglycemic hyperosmolar nonketotic syndrome, also abbreviated HHNC, HNKC, and HHNK).

Diabetic ketoacidosis.

Diabetic ketoacidosis (DKA) is a serious condition caused by incomplete metabolism of fats resulting from an absence or insufficient supply of insulin. When insulin is not present in adequate amounts to meet metabolic needs, the body breaks down protein and fat for energy. This produces an abundance of the by-products of fat metabolism, which are potent organic acids called *ketones*. In an attempt to rid itself of acidosis produced by ketones, the body increases respiratory rate and depth (Kussmaul respirations). Acetone, a ketone body, is excreted in the urine, causing acetonuria or ketonuria, and from the lungs, which can be detected in the characteristic fruity odor to the breath. As the kidney excretes excess glucose and ketones, it also eliminates large quantities of water and electrolytes. These pathologic changes are responsible for metabolic acidosis, dehydration, and electrolyte imbalances.

Signs and symptoms of DKA can be life threatening and are listed in **Table 37-6**. Intravenous fluids are administered first, then electrolyte imbalances are addressed in conjunction with an insulin drip. Electrolytes, especially potassium, and serum glucose are monitored closely. In the absence of insulin, potassium comes out of the cells, and patients present with hyperkalemia. As IV fluids are given and insulin is administered, potassium returns to the cells, causing hypokalemia. These potassium shifts are very important to monitor and manage so lethal cardiac dysrhythmias do not occur. **The goals of treatment are to restore the normal pH of the blood and other body fluids, correct the fluid and electrolyte imbalance, lower the blood glucose level gradually, and provide life-support measures as necessary.** Infection is the most common cause of DKA; however, other causes include poor compliance with the prescribed regimen of diet and insulin therapy and insulin pump failure. After the patient is stabilized, the underlying cause must be determined and treatment or corrective measures implemented.

Clinical Cues

If you suspect a patient is in DKA, immediately ensure that there is at least one patent IV access and anticipate an order for IV therapy.

Hyperglycemic hyperosmolar state.

Hyperglycemic hyperosmolar state (HHS) occurs in people with type 2 diabetes who experience high blood glucose levels because of illness or added stress, such as infection. Glucose levels greater than 600 mg/dL are common; in some cases the blood glucose can reach well over 1000 mg/dL. The extremely high level of glucose in the blood causes severe dehydration and circulating fluid volume depletion secondary to osmotic diuresis. Blood osmolality is considerably elevated (greater than 320 mOsm/kg). HHS is different from DKA because a small amount of circulating insulin remains available, resulting in the absence of ketosis and acidosis. Because ketosis and acidosis are absent, the gastrointestinal symptoms do not occur and the patient does not seek medical care early in the course of illness. The patient's mental state may progress from confusion to complete coma. Also—in contrast to DKA—a patient in HHS may experience generalized or focal seizures.

Older Adult Care Points

Older adults are at greater risk for HHS, because they become dehydrated more quickly than do younger patients. HHS may be the first indicator that the patient has diabetes. HHS most commonly occurs after a febrile illness or gastrointestinal flu, during which the patient has stopped eating properly and possibly has discontinued oral hypoglycemic agents.

Things that may precipitate HHS in a person with type 2 diabetes are (1) medications that

increase serum glucose levels or cause dehydration, such as steroids, thiazides, phenytoin, and beta blockers; (2) acute illnesses, such as infection, myocardial infarction, and stroke; (3) chronic illnesses, such as congestive heart failure and renal dysfunction; and (4) treatments, such as total parenteral nutrition and peritoneal dialysis.

Treatment of HHS focuses on fluid replacement and correction of electrolyte imbalances.

Because fluid replacement will initially be rapid, cardiovascular status and lung sounds must be assessed frequently. Small amounts of insulin may be used until the patient is stabilized. Blood glucose and intake and output must be monitored closely. The underlying illness that triggered the HHS must be identified and treated. HHS can be fatal, and mortality risk is directly correlated with higher elevations of blood glucose and the resultant severity of dehydration.

Rebound hyperglycemia.

Rebound hyperglycemia, also known as the *Somogyi effect*, follows a period of hypoglycemia, often during sleep. When hypoglycemia occurs, the body secretes glucagon, epinephrine, growth hormone, and cortisol to counteract the effects of low blood sugar. The patient may report nightmares and night sweats along with morning elevated serum glucose; if the patient increases the insulin dose, it worsens the problem.

The Somogyi effect is diagnosed by checking blood sugars during the night; once verified, the usual treatment is to lower the insulin dosage or move the time of the intermediate-acting insulin to bedtime. Changing or increasing the bedtime snack also helps.

The **dawn phenomenon** is characterized by elevated blood glucose in the morning. The dawn phenomenon is caused by release of growth hormone, glucagon, and epinephrine during the night, as part of the body's natural circadian rhythm. These hormones act to raise the body's blood sugar. The dawn phenomenon is the reason why most people with diabetes do not tolerate carbohydrates well in the morning. The treatment is an intermediate-acting insulin at night.

Hypoglycemia.

The word *hypoglycemia* means "low blood glucose." Hypoglycemia is a common complication of insulin administration in type 1 diabetes mellitus. Most often it is a response to either too large a dose of insulin or too much exercise in relation to the amount of food eaten. People with diabetes must be taught to monitor for the signs and symptoms of hypoglycemia: tremulousness, hunger, headache, pallor, sweating, palpitations, blurred vision, and weakness. Symptoms may progress to confusion and loss of consciousness. Individual reactions vary considerably. Some patients are alert with a glucose level of 40 mg/dL, whereas others at this level are comatose.

Treatment depends on the degree of hypoglycemia and level of consciousness. If the patient is alert enough to tolerate oral intake safely, glucose levels of 40 to 60 mg/dL respond to ingestion of food such as milk, crackers, or juice. Glucose levels of 20 to 40 mg/dL respond best to concentrated sugars, such as honey, table sugar, or juice. Patients must be taught how to self-treat hypoglycemia (see [Patient Teaching: Home Treatment for Hypoglycemia](#)). In the hospital, if the person is experiencing seizures or is not alert enough to tolerate oral intake safely or has a very low blood sugar, a solution of 50% glucose is given IV. When an IV access cannot be established, 1 mg of glucagon is administered intramuscularly. The injection is repeated in 15 minutes if symptoms are not resolved (see [Table 37-6](#)).

Long-term problems.

The long-term consequences of diabetes mellitus are chiefly the result of damage to the large and small blood vessels, termed *macrovascular* and *microvascular*. Elevated blood glucose levels over a period of years seriously damage blood vessels and the organs they serve. Diabetes is the seventh leading cause of death in the United States for all age groups ([Centers for Disease Control and Prevention, 2015](#)). In addition, cardiovascular disease and other causes of death often can be attributed to diabetes. Damage to the mechanisms that control blood vessel health occurs when blood glucose is elevated over a long period. The alterations in the macrovascular system result in coronary artery disease, peripheral arterial disease, and stroke. Microvascular complications result from damage to the small vessels at the capillary level. This causes diabetic nephropathy, neuropathy, and retinopathy.

Patients who have had diabetes for more than 10 years are likely to develop one or more of the complications of the disease. The less closely the blood glucose has been controlled, the more likely

the development of cardiovascular, eye, and renal complications. **Improperly treated or untreated diabetes is the leading cause of new blindness, renal failure leading to dialysis, and nontraumatic lower limb amputations.** Although not every person with diabetes will suffer from long-term complications, many will periodically be hospitalized for diabetic-related conditions.

Cardiovascular disease.

Two out of three people with diabetes die prematurely from heart attack or stroke. In compliance with The Joint Commission Core Measures, aggressive measures should be taken to prevent stroke in patients at risk. Tight glycemic control is the best strategy to prevent the vascular changes causing myocardial infarction and stroke.

Peripheral vascular disease.

Gangrene, which often leads to amputation, is far more common in people with diabetes. More than 60% of nontraumatic amputations occur among people with diabetes. Vascular changes typically cause very poor circulation in the feet and lower extremities. Healing of wounds in these areas is difficult because of poor blood supply. Because increased levels of glucose in the blood provide a good medium for bacterial growth and decrease the immune response, it is harder to eradicate infection. Learning and practicing excellent foot care are essential to prevent amputation. Multiple studies have identified early identification and intervention as tools to successfully prevent amputation.

Patient Teaching

Foot Care

- Inspect each foot daily for cuts, cracks, blisters, abrasions, or discoloration of the toes; report any abnormality to the health care provider. Use a mirror if unable to bend to see the bottom of the foot. Be certain to check between the toes.
- Wash the feet in warm (not hot) water, using mild soap; do not soak the feet, because this can cause cracking of the skin.
- Thoroughly dry the feet after washing, paying special attention to drying between the toes. Rub in a nonscented, nonmedicated cream if the skin is dry; do not put the cream between the toes.
- Cut the nails along the shape of the toe and file the nails to remove sharp edges. Have corns, calluses, and ingrown nails managed by a podiatrist.
- Wear a clean pair of cotton socks each day.
- Wear properly fitted shoes with a firm sole that do not pinch or bind the foot; never walk barefoot.
- Break in new shoes gradually.
- Never wear open sandals or sandals with straps between the toes.
- Use socks and blankets to warm the feet; do not use a heating pad or hot water bottle near them.
- Test the temperature of bath water with wrist or forearm before stepping into the tub or shower.
- Elevate the feet whenever possible to improve circulation.

Nephropathy.

Diabetic nephropathy occurs directly from changes in the renal blood circulation. Factors that influence whether a person with diabetes will develop kidney disease include genetics, blood glucose level, and blood pressure. After years of having to filter too much blood with elevated blood glucose, the filtering mechanism of the kidney begins to fail, allowing large particles that

normally would have been filtered out (such as protein) to exit through the urine. In the early phase of albuminuria, there are small amounts of protein in the urine. If nothing is done to prevent further damage, increasing amounts of protein are excreted in the urine. Finally, the patient enters end-stage renal disease and requires either a kidney transplant or dialysis to perform the filtering for the kidneys.

Nephropathy can be delayed and possibly prevented by keeping tight control of blood glucose. Research has demonstrated that tight blood glucose control reduces the risk of developing albuminuria and the progression to renal failure. In patients with type 1 diabetes and early albuminuria and hypertension, angiotensin-converting enzyme (ACE) inhibitors have shown to be beneficial in slowing the elevation of albuminuria.

Retinopathy.

Visual impairment and blindness are common sequelae of diabetes mellitus. The three most common visual problems are diabetic retinopathy, cataracts, and glaucoma. Retinal damage, which can cause visual impairment and blindness, occurs in most people with diabetes within 20 years of diagnosis. Changes in the retinal vessels lead to hemorrhages and to retinal detachment. A combination of laser intervention and medication has shown to be effective in reducing vision loss. Photocoagulation of destructive lesions of the retina with laser beams coupled with use of ranibizumab to decrease retinal edema has shown the best outcomes ([Bhavsar, 2014](#)). Tight glucose control, frequent eye examinations, and treatment can help preserve vision.

Diabetic neuropathy.

Approximately 60% to 70% of people with diabetes have mild to severe neuropathy. Pathologic changes in the nervous system cause symptoms such as paresthesia, numbness, and loss of function. **Diabetic neuropathy** primarily affects the peripheral nerves, causing sexual impotence in men, constipation, neurogenic bladder, and pain or anesthesia (lack of feeling) in the lower extremities. It is for this reason that foot care and daily inspection of the feet are so important. Because the patient often cannot feel cuts, blisters, or abrasions on the foot, there is great danger that a neglected sore might become infected. Although it may be mild at the beginning, eventually partial or almost total anesthesia of the affected part creates a potential for serious injury without awareness. In contrast, some patients experience debilitating pain and hyperesthesia; some lose deep-tendon reflexes. No single therapy has been shown to effectively treat pain from diabetic neuropathy. Other problems related to diabetic neuropathies are the result of autonomic nervous system involvement. These include orthostatic hypotension, delayed gastric emptying or **gastroparesis**, diarrhea or constipation, and asymptomatic retention of urine in the bladder.

❖Nursing Management

■ Assessment (Data Collection)

Assess every patient for signs and symptoms of potential diabetes mellitus. Assess the skin for signs of poor wound healing or areas of infection. The feet should be inspected for signs of beginning sores. The patient should be weighed to determine whether weight is within normal limits.

☒ Focused Assessment

Data Collection for Diabetes

The following questions should be asked to establish a database that indicates whether the patient may have diabetes, has poorly controlled diabetes, or has no signs of diabetes:

- Has anyone in your family ever been told he or she has diabetes? What about your parents and grandparents?
- Have you had any recent weight loss or weight gain?
- Have you become increasingly hungry over the past few months?
- Has your thirst increased? Are you drinking more fluids than you used to?

- Do you have to urinate (go to the toilet) more than you used to?
- Have you noticed that you are more tired than you were 6 months ago?
- Do you have any trouble with scratches and wounds healing or becoming infected?
- Have you noticed any numbness or tingling or “funny” sensations in your hands, legs, or feet?
- Is constipation becoming a problem?
- Are you having any sexual difficulties? Any impotence (men)? Any frequent vaginal infections (women)?

If the patient is known to have diabetes, ask these questions also:

- Do you feel that you can easily and correctly perform your blood glucose determinations? (Check the patient's performance using her own machine.)
- Are you having any trouble sticking to your dietary plan?
- How are you planning your meals?
- Are you taking your insulin/oral medication regularly?
- Are you having any problems in relation to the medication?
- Are you keeping records of your blood glucose readings and your insulin injections? (Check records, if available.)
- Are you seeing your primary health care provider at regular intervals?
- Are you having your eyes examined regularly?
- Are you visiting the dentist regularly?

For a patient newly diagnosed with diabetes, you must assess whether the patient is a good candidate for using a **glucometer** (blood glucose-monitoring machine) ([Figure 37-4](#)). The patient must have adequate peripheral circulation to easily obtain a drop of blood for the test. Manual dexterity is needed to perform the fingerstick to obtain a blood sample, place the blood in the right spot, and correctly read the meter. Patients with arthritis or visual impairment may have difficulty with these steps. The patient must be able to remember the correct sequence of the steps, and remember to do it at the designated times. Determining whether the patient can cope with learning the procedure and whether there is willingness to fit it into the daily routine are other assessment factors. Periodic assessment of glucose monitoring techniques, medication administration, and compliance with treatment regimen are essential. CGM can be used for those patients unable to manage a glucometer. The device can display the tissue glucose and signals a result that is too high or too low, alerting the patient to view the blood glucose value and to take corrective action ([Liess, 2014](#)).



FIGURE 37-4 Blood glucose monitor. (Courtesy OneTouch, part of Johnson & Johnson.)

Nursing Diagnosis

The following problem statements are common for patients with diabetes mellitus:

- Altered nutrition due to alterations in insulin availability or utilization.
- Insufficient knowledge due to newly diagnosed disease process, possible complications, and self-care needs.
- Potential for infection due to elevated blood glucose level.
- Limited coping due to denial of need for effective self-care.
- Altered sensory perception due to effect of elevated blood glucose on vascular and nervous systems.
- Potential for injury due to decrease in tissue perfusion and sensation in feet.
- Pain due to nerve damage secondary to peripheral vascular disease.

Specific nursing diagnoses can be chosen from the NANDA-I list (see inside back cover).

There are many other nursing problems related to the various complications that patients with diabetes may develop. Nursing care plans must be carefully individualized to the particular problems and needs of each patient ([Nursing Care Plan 37-1](#)).

* Nursing Care Plan 37-1

Care of a Patient With Diabetes Mellitus

Scenario

Mr. Blackburn, age 49 years, is 5 ft 7 in tall and weighs 350 lb. He was admitted to the hospital for surgical repair of a hernia. During the preoperative evaluation, his blood glucose value was 420 mg/dL. On further examination by the health care provider, Mr. Blackburn reported symptoms of extreme thirst, hunger, and excessive urination. Surgery was rescheduled; further workup confirmed the suspected diagnosis of type 2 diabetes mellitus. Mr. Blackburn was extremely upset at learning the diagnosis and not being able to have his surgery. His response to the diagnosis was to ask the surgeon if he could be prescribed "some pills" and "get on with it."

Problem Statement/Nursing Diagnosis

Altered nutritional status/Imbalanced nutrition: more than body requirements related to alteration in glucose utilization by cells.

Supporting Assessment Data

Objective: Blood glucose 420 mg/dL; weighs 350 lb.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will develop meal plan that will assist in maintaining ideal body weight and blood sugar within normal limits.	Perform dietary assessment (i.e., typical intake, nutritional knowledge, cultural preferences).	Patient's current diet and general knowledge of nutrition and cultural preferences can be considered and modified.	Normally eats a lot of fast foods, but likes fruits and vegetables and would like to improve diet.
Patient will demonstrate knowledge of correct meal planning within 3 mo.	Instruct in diabetic meal planning and carbohydrate counting.	The relationship of meal planning to control of chronic disease is new information.	States that he "doesn't get it" when asked about meal planning and carbohydrate counting.
	Assist with construction of an acceptable meal plan for attaining desired weight and to normalize serum glucose levels.	Any meal plan must be individualized for weight goals, lifestyle, and food preferences.	Able to correctly identify appropriate portion sizes of sample menu.
Hemoglobin A _{1C} and fructosamine assay levels will show compliance with dietary plan within 6 mo.	Reinforce health care provider's instructions to follow up for repeat laboratory tests and for additional dietary education.	Long-term goal is to achieve: Normal value A _{1C} : 3.9%-5.2% (of total hemoglobin) Normal value fructosamine assay: 1.5-2.7 mmol/L	A _{1C} and fructosamine assay level and reassessment of dietary success to be done at follow-up. Continue plan.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/Deficient knowledge related to disease process, possible complications, and self-care.

Supporting Assessment Data

Subjective: Patient asks health care provider if he could be prescribed "some pills" and "get on with it."

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize basic knowledge about disease process within 1 mo.	Instruct patient about the disease process of diabetes using a variety of teaching methodologies based on the content and learning style.	Varied methods that target the patient's learning style increase retention of information (i.e., written material, demonstrations, videos).	Patient verbalized basic knowledge of disease process.
Patient will verbalize ways to prevent the complications of diabetes within 3 mo.	Instruct regarding the potential complications of diabetes and how to decrease the risk of complications. Instruct in oral medication or insulin administration.	Knowledge empowers patient to achieve self-care and to take preventive measures. Long-term self-management of medication is essential.	Patient states, "I need to lose weight." Patient acknowledges complications of diabetes but states he needs more information. Very resistant to the idea of insulin injections, but shows interest in learning about oral medications.
Patient will demonstrate proper foot care within 1 mo.	Instruct in proper foot care techniques (i.e., daily inspection, cleaning, foot attire). Seek feedback regarding material taught by verbalization and demonstration of skills.	Poor circulation and peripheral neuropathy can lead to infection or amputation. Provides opportunity for reinforcement, or praise. Reteaching or redesign of materials might be necessary.	Demonstrates proper foot care. Expresses appreciation of time spent in teaching him about various topics; requests written information about foot care and medication side effects.

Problem Statement/Nursing Diagnosis

Potential for injury/Risk for unstable glucose level related to type 2 diabetes mellitus diagnosis.

Supporting Assessment Data

Objective: Admitting blood glucose 420 mg/dL.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have a premeal blood glucose of 70-140 mg/dL while in the hospital.	Monitor the blood sugar before meals and at bedtime or as ordered. Monitor for signs of hypoglycemia (i.e., hunger, sweating, confusion) and hyperglycemia (i.e., increased urination, thirst, rapid breathing).	Illness and stress will affect blood sugar level and patient is newly diagnosed, so response to therapy must be closely monitored. Hypoglycemia must be treated immediately because brain cells need a continuous source of glucose. Hyperglycemia can cause long-term damage, but can also be life threatening if ketoacidosis occurs.	Blood glucose 230 mg/dL at 6:00 A.M. Health care provider aware, and order for correction dose of insulin obtained. Does not exhibit any signs of hypoglycemia (i.e., weakness, anxiety, palpitations) or hyperglycemia (i.e., nausea, acetone breath, or dry mucous membranes). "Feels pretty good considering."
Patient will demonstrate blood glucose levels within acceptable limits within 1 mo.	Instruct in glucose monitoring technique appropriate to patient. Instruct to record blood glucose findings after testing.	Proper instruction, including return demonstration, is important in ascertaining correct fingerstick values. Keeping a daily record is important in monitoring day-to-day fluctuations in blood glucose.	Able to perform fingerstick and check value. "I'm good with gadgets." Likes to keep records. "It's good to have the data right where I can see it." Continue plan.

Problem Statement/Nursing Diagnosis

Altered self-esteem/Situational low self-esteem due to diagnosis of chronic disease requiring lifestyle changes or insulin injections for survival.

Supporting Assessment Data

Objective: Patient with newly diagnosed diabetes.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize own strengths within 1 mo.	Encourage verbalization of feelings related to diagnosis of diabetes and need for lifestyle changes. Allow expression of frustrations.	Verbalization of feelings is an important first step toward identifying one's own strengths. Frustration is a normal human response to a real or perceived threat.	Initially, very quiet; appears withdrawn and angry after health care provider informs of new diagnosis of diabetes mellitus. "I guess I am taking out my frustrations on you and the doctor." Reassured that frustration is normal.

Patient will express that control over the disease and life is possible.	Encourage exploration of strengths and positive measures of self-worth (i.e., roles, accomplishments).	Remembering past achievements can help patients realize their strengths.	States, "I am a hard worker. I own my own business—I can certainly learn to manage this too."
	Explain how control over disease and life is possible.	After feelings are expressed, patient will be more receptive to information. Knowledge and tools can help him achieve control.	"I think I am beginning to understand. Balancing food intake and insulin is like balancing a spreadsheet of expenditures at my business."
	Praise efforts at learning and practice of self-care techniques.	Positive reinforcement is a powerful tool for helping a patient accomplish acceptance of a situation.	Goal met. Reevaluate as needed.

Critical Thinking Questions

1. The RN has planned the first teaching session for Mr. Blackburn, which you are to help implement. The topics planned for today include meal planning, short-term complications of diabetes, long-term complications of diabetes, foot care, and actions/side effects/interactions of OHAs. If the RN asked for your collaboration on the plan, what would you recommend?
2. Mr. Blackburn has visitors coming to see him. You greet them in the hallway and notice they are carrying bags from Krispy Kreme and Baskin Robbins. How would you respond to this situation?

■ Planning

When caring for a patient with diabetes, you should know the schedule for meal tray delivery and plan glucose testing and insulin injections for appropriate times. Fingersticks for blood glucose testing should be performed 30 minutes before breakfast. If an hour has elapsed without insulin being given after the reading was obtained, the test must be repeated before insulin administration. If rapid-acting insulin is ordered, it should not be given until the food tray is in front of the patient.

When a patient is NPO for tests or procedures, monitor for signs of hypoglycemia and obtain the patient's food tray immediately when the patient returns from testing. The insulin dose should be adjusted according to health care provider order during the NPO period; insulin should not be withheld. Hyperglycemia must be anticipated and assessed for during hospitalization when the patient is undergoing the added stress of diagnostic testing, unknown diagnosis, unrelieved physical distress or surgery.

To prevent delays, make certain that the patient's insulin, appropriate syringes, or oral medication are readily available. Examples of expected outcomes for a patient with diabetes mellitus include:

- Patient will demonstrate understanding of glucose monitoring and glucose-lowering medications.
- Patient will attain a body weight within normal limits within 6 months.
- Patient will demonstrate knowledge of disease process, possible complications, and self-care methods.
- Patient will constantly monitor for signs of infection.
- Patient will develop coping methods to perform self-care.
- Patient will verbalize ways to preserve and protect vision.
- Patient will demonstrate methods to prevent injury to feet.
- Patient will verbalize that pain is within acceptable limits after medication and nonpharmaceutical measures are administered.

■ Implementation

Intervention is geared toward assisting the patient with self-care, performing blood glucose determinations, administering medication when the patient is ill and cannot self-administer, observing for signs and symptoms of complications, assessing learning needs, and carrying out a teaching plan as indicated. Be sure to encourage others involved in the patient's care to be alert for signs and symptoms.

■ Assignment Considerations

Observations

Remind the UAP to report any breaks in the skin observed while giving physical care to a patient with diabetes. Report excessive urination or changes in vital signs, such as increasingly rapid respirations.

Monitor the trend of blood glucose, A_{1c}, and fructosamine assay readings over time, rather than focus only on the current reading. Assess how well the patient is eating and taking fluids. Intake and output recordings are appropriate if the patient is ill or having surgery. Any type of stress can alter the control of the patient's diabetes. Electrolytes also should be monitored, with particular attention to potassium levels, which can shift suddenly when insulin is insufficient.

Every patient taking insulin should be monitored for hypoglycemia after insulin injections. After injection of each type of insulin, you must know when hypoglycemia might occur and should assess the patient at that time. Patients are taught to report signs of hypoglycemia promptly, to prevent a crisis.

Monitoring for signs of ketoacidosis also is essential. Some of the earliest symptoms may be polyuria, fatigue, anorexia, abdominal pain, and a "fruity" smell to the breath. Look for beginning signs of dehydration with decreased tissue turgor, sunken eyeballs, and dry mucous membranes (see [Table 37-6](#)). Report such findings to the health care provider promptly.

Patient Education

The patient must be able to self-manage diet, medication, and progress. In addition, adjustments in lifestyle, recreational choices, and self-image will probably need to be made. The patient must be taught the correct steps for blood glucose monitoring (see [Figure 37-4](#)).

Noncompliance can be devastating to the patient's welfare and can mean the difference between leading a nearly normal life or becoming an invalid; eventually, noncompliance may mean the difference between life and death for a person with diabetes. Many hospitals and clinics have developed standardized teaching programs for diabetes education, because the task of diabetic teaching is very challenging and complex ([Figure 37-5](#)).



FIGURE 37-5 Nurse teaching patient with diabetes.

Major topics covered in a standardized program usually include:

- Pathophysiology of diabetes mellitus, including functions of the pancreas and contributing or precipitating factors in the development of diabetes
- How to manage a diet program
- Blood glucose monitoring at home
- Foot care
- Urine testing when blood glucose level is higher than 240 mg/dL to check for acetone
- Identification tag, identification card, and medical information (see [Figure 37-1](#))
- Information on what to do on "sick" days, especially when nauseated or vomiting and unable to maintain diet
- Community resources and help groups available to patient with diabetes and family
- Travel tips
- Devices that make insulin administration easier (especially for older adults, visually impaired patients, or patients with arthritis)

Patient Teaching

What to Do on Sick Days

A bad cold, flu, or minor gastrointestinal upset can create problems for diabetic patients.

Medication

- Take insulin as prescribed. Adjust the dosage as directed, depending on blood glucose readings.
- If taking an oral hypoglycemic, take usual dose. Do not increase the dose unless ordered to do so by the health care provider. If vomiting and unable to take medication by mouth, the health care provider may temporarily prescribe insulin.

Diet

- Eat a normal diet on schedule.
- If nausea and vomiting occur, replace carbohydrate solid foods in the normal diet with liquids that contain sugar (fruit juice, regular soft drinks, or Jell-O).
- Take at least 1 cup of water or calorie-free, caffeine-free liquid each hour. If nauseated, take small sips to help prevent vomiting.

Monitoring

- Test blood glucose at least every 4 hours and record result. If severely ill, check blood glucose every 2 hours.
- Test urine for ketones if blood sugar level is higher than 300 mg/dL.

Notifying the Health Care Provider

- Call the health care provider right away for vomiting or abdominal pain or a temperature higher than 100.2° F (38.8° C).
- Notify the health care provider if blood glucose is higher than 200 mg/dL or if urine test shows ketones.
- Report to the health care provider if blood glucose level that was higher than 200 mg/dL does not come down with an additional dose of insulin.
- If unable to reach the health care provider, go to the hospital emergency department.

Patient Teaching

Instructions for Traveling

- Carry twice the medication or insulin you expect to need in case of travel delays. Take copies of prescriptions with you. Wear a medical-alert bracelet or tag, and carry a medical information card in a purse or wallet.
- Carry an emergency supply of fast-acting sugar at all times in case of a hypoglycemic episode. Also carry longer-acting foods, such as peanut butter and crackers.
- Pack dried fruit, nuts, and seeds as snacks. Because these are high calorie, measure portions in advance.
- Check your blood sugar frequently. Changes in time zones, eating, and activity level can affect

blood glucose.

- If ill, seek medical attention immediately before a dangerous condition occurs.
- Stick to prescribed meal plans as much as possible, substituting available foods according to food group classification.
- Obtain sufficient rest and avoid stressful situations as much as possible to prevent stress-induced hyperglycemia.
- It is best to travel with someone who is familiar with diabetes and treatment. It is advisable to inform the airline or ship personnel about the diabetes.
- Obtain the usual amount of exercise or adjust food and medication accordingly.
- Drink a glass of water every 2 hours to prevent dehydration.
- Protect insulin from temperature extremes.
- Eat something at least every 4 hours.
- Call airlines and ship companies ahead of departure to request diabetic meals, or take your own.
- Before departure, research food substitutions, so that personal meal plans are consistent.
- Remember time zones: going westward lengthens the day; take more insulin. Going eastward shortens the day; take less insulin.

Patient Teaching

Working With an Older Adult Who Has Diabetes

- Assess hearing and vision. Use aids as appropriate and ensure adequate lighting.
- Set a time for the teaching session that is agreeable to the patient.
- Arrange a quiet, nondistracting environment for the session.
- Be certain that the patient is comfortable before beginning.
- Keep the sessions short—no more than 15 to 20 minutes at a time.
- Limit information to a few major concepts per session.
- Go slowly and seek feedback that the patient has understood each point when finished presenting it.
- Allow time for the patient to jot down important points.
- Repeat key concepts frequently; if the patient does not understand, try rephrasing the concept.
- Use bold-type printed materials with a white or yellow background.
- Leave printed materials that are illustrated with simple drawings and that are not crowded with text.
- Printed materials should be written at a fifth- to tenth-grade reading level depending on the patient.
- If the patient becomes frustrated or distracted, stop the session and reschedule it.

- Summarize what has been taught and what has been learned at the end of the session.

The patient and significant others, staff nurses, health care providers, diabetic specialist, nurse educator, dietitian, podiatrist, and periodontist are all involved in the educational process. Because of frequent updates and changes in diabetes management, all persons responsible for the care of patients with diabetes should read and continue to study and learn about the current protocols.

Evaluation

For a patient with diabetes, the learning that has taken place and compliance with the treatment regimen are the essential components. Monitor A_{1c} and fructosamine assay levels to determine the degree of control of blood glucose. Question the patient about exercise and diet and give feedback. Observe demonstrations of learned skills for insulin injection, proper foot care, dietary planning, and glucose monitoring. If the expected outcomes are not being met, the nursing care plan must be revised. Collaboration with the health care provider and dietitian are necessary to design or redesign a plan that is effective.

Hypoglycemia

Etiology and Pathophysiology

The organs involved in meeting the challenge of carbohydrate ingestion include the intestines, liver, and pancreas (specifically, the beta cells that produce insulin). Thus any condition affecting these organs and their systems can lead to hypoglycemia. Examples other than diabetes mellitus include gastrectomy and surgical bypass procedures. These types of surgery may restrict adequate glucose absorption. Tumors of the pancreas (insulinomas), liver disease, and disorders of the adrenal cortex and pituitary gland can also produce abnormally low blood glucose levels. People who abuse alcohol and other substances are also prone to hypoglycemia. Hypoglycemia related to diabetes is more common, has a different cause, and is treated differently.

Signs and Symptoms

Signs and symptoms of hypoglycemia include rapid heartbeat, tremulousness, weakness, anxiety, nervousness, and hunger. Symptoms can occur rather suddenly, within 4 hours after a meal is eaten. Some physiologic symptoms may be mistaken for indications of a psychiatric illness. These symptoms include irritability, personality change, temper tantrums, and other psychoneurotic manifestations.

Diagnosis and Treatment

Diagnosis of hypoglycemia is made with measurement of blood glucose values. A source of possible infection is investigated. The patient's insulin levels and C-peptide levels can also be measured. The diagnosis may be made using a glucose tolerance test or a medically supervised fast. Computed tomography (CT) scan, ultrasound, and other diagnostics may be used if an insulinoma (insulin-secreting tumor) is suspected.

Hypoglycemia is treated by modifying eating patterns. Smaller and more frequent meals that are relatively free of simple sugars are recommended. The diet should be high in proteins and low in carbohydrates, and carbohydrates should be complex ones, such as those found in whole fruits, vegetables, and whole grains. Refined sugar and white flour are omitted. Cases in which gastric surgery and intestinal bypass are believed to be the cause of hypoglycemia may be treated with drugs that reduce intestinal motility, allowing for greater absorption.

Complications

Untreated fasting hypoglycemia can lead to severe **neuroglycopenia** (shortage of glucose in the brain) and possibly death.

Nursing Management

In addition to information about the patient's physical and mental symptoms, assessment should include a detailed history of eating habits. Does the patient eat regularly? How often during each day? What kinds of foods constitute a typical meal? Does she crave sweets? Have there been

episodes of weakness, sweating, visual disturbances, and confusion or inability to concentrate? If these symptoms have occurred, when are they most noticeable (i.e., in a fed or fasting state)? Nursing interventions for patients with hypoglycemia include explaining the nature of the disorder and the need for diagnostic testing, objective observation and reporting of symptoms, and reinforcement of dietary instruction and restrictions.

Community Care

One major objective of *Healthy People 2020* is to “increase the proportion of persons with diabetes who receive formal diabetes education.” Nurses play a crucial role in home care and in teaching the older adult population who have diabetes. If nurses could follow the progress of these patients over the years with good assessments and implement ongoing patient education programs, the incidence of complications could certainly be decreased.

Long-term care nurses must be alert to the signs of diabetes. When a resident does not properly recover from a viral illness, in-depth assessment for signs of diabetes is proactive. Home care and clinic nurses must be persistent in assessing compliance with diabetic regimens and must also be instrumental in teaching the public about the signs and symptoms of diabetes and self-care to prevent complications (see Online Resources). At present, diabetes is costing the United States more than \$245 billion a year in health care expenditures. This is an area where nurses can be instrumental in cutting health care costs.

Get Ready for the NCLEX® Examination!

Key Points

- Diabetes mellitus involves a disturbance in glucose metabolism. Type 1 diabetes usually appears at a young age, and the patient requires insulin for life. Type 2 diabetes usually develops later in life, but is now being diagnosed more frequently in younger people. Gestational diabetes may occur in pregnancy. Patients with LADA may be initially misdiagnosed with type 2 diabetes. The goal in diabetes is to maintain blood glucose and lipid levels within normal limits to prevent complications.
- The cornerstone of therapy for people with diabetes is diet and exercise. Insulin must be taken for type 1 diabetes; OHAs (and insulin) may be prescribed for type 2.
- The diet plan provides optimal nutrition and calories to maintain normal body weight and allows adjustments to food intake to keep blood glucose within safe limits.
- The emotional and physical stress of surgery and illness can increase the blood glucose level and alter the amounts of medication needed.
- Basal insulin is the amount of insulin that would normally be produced by the pancreas throughout the day.
- A bolus or “correction” dose of short- or rapid-acting insulin is used to manage elevations in blood glucose and bring the next blood glucose into range.
- DKA is a serious condition caused by incomplete metabolism of fats as a result of the absence of insulin marked by metabolic acidosis, dehydration, and electrolyte imbalances.
- HHS occurs in people with type 2 diabetes because of illness or stress. Glucose levels are often between 600 and 1000 mg/dL, leading to severe dehydration.
- Hypoglycemia is often a response to either too much insulin or too much exercise in patients with diabetes. Monitor for hypoglycemia after insulin injections.
- If there is doubt whether the patient is suffering from hyperglycemia or hypoglycemia, treat for hypoglycemia until you obtain a blood glucose level.
- The long-term consequences of diabetes mellitus result from damage to large and small blood vessels. Cardiovascular disease, nephropathy, peripheral vascular disease, retinopathy, and neuropathy can all be reduced by strict blood glucose control.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• Online Resources

- American Diabetes Association, www.diabetes.org
- American Dietetic Association, www.eatright.org
- *Diabetes Forecast* magazine, <http://forecast.diabetes.org>
- Joslin Diabetes Center, www.joslin.org
- National Guideline Clearinghouse, <http://guideline.gov/content.aspx?f=rss&id=34168>

Review Questions for the NCLEX® Examination

1. A 30-year-old woman is admitted for urinary tract infection with sepsis. A urinalysis reveals presence of ketones, glucose, and nitrates. Which question would the nurse ask to further assess possible diabetes mellitus?

1. “Have you noticed an extra roundness to your face?”
2. “Have you had more gas or abdominal bloating?”

3. "Have you been thirstier than usual? Do you find you urinate more now?"
4. "Have you experienced any pain or discomfort with urination?"

NCLEX Client Need: Health Promotion and Maintenance

2. Which teaching technique(s) would be most useful for an older adult patient with diabetes? (*Select all that apply.*)

1. Set a time for the teaching session that is agreeable to the patient.
2. Invite the patient to join a teaching session for patients newly diagnosed with diabetes.
3. Allow time for the patient to jot down important points.
4. Use bold-type printed materials with a white type on a dark blue or black background.
5. Keep the sessions at a limit of 1 to 2 hours and give frequent breaks.
6. Teach all necessary information in one session.
7. Repeat key concepts frequently; if the patient does not understand, try rephrasing the concept.

NCLEX Client Need: Physiological Adaptation

3. A patient newly diagnosed with diabetes is given diet instructions. What should the nurse do to effectively motivate the patient to comply with dietary recommendations? (*Select all that apply.*)

1. Emphasize good food choices.
2. Apply diet prescriptions to patient-preferred foods.
3. Instill guilt to self-regulate when "cheating" occurs.
4. Focus on the benefits of diet compliance.
5. Involve meal preparers in diet teaching.

NCLEX Client Need: Physiological Adaptation

4. A 50-year-old woman was recently diagnosed with type 2 diabetes mellitus and desires to start a healthy lifestyle to control her disease. What is the initial recommendation that the nurse should make?

1. Engage in brisk walking.
2. Lose 10 to 15 pounds.
3. Maintain adequate glucose control.
4. Develop an exercise schedule.

NCLEX Client Need: Reduction of Risk Potential

5. The nurse answers the call light for a patient with diabetes. The patient states she feels shaky and weak. The nurse notes pallor and moist skin. List in priority order the actions of the nurse.

1. Give patient 6 oz of juice.
2. Document interventions.
3. Check fingerstick glucose.
4. Assess level of consciousness.

NCLEX Client Need: Physiological Adaptation

6. A patient who works as a personal trainer is diagnosed with insulin-dependent diabetes. What should the nurse teach regarding self-administration of regular insulin?

1. If you have a strenuous workout, skip your insulin for the day.
2. Inject the insulin before moderate exercise.
3. Exercise during the insulin peak of action.
4. Use the abdomen as an insulin injection site.

NCLEX Client Need: Physiological Adaptation

7. The home health nurse is visiting an older adult patient who has successfully managed her type 2 diabetes for years. During the visit, the nurse notes that the patient has severe arthritis; poor vision; and several dry, red areas on the lower extremities. What is the priority patient problem?

1. Potential for noncompliance due to social circumstances.

2. Potential for ineffective self-health management due to aging.
3. Potential for infection due to poor peripheral perfusion.
4. Potential for disturbed sensory perception due to degenerative changes.

NCLEX Client Need: Physiological Adaptation

8. A nurse determines the fingerstick blood glucose reading for a patient with diabetes is 750 mg/dL. What is the nurse's priority action?
1. Immediately notify the RN and the health care provider.
 2. Assess the vital signs of the patient.
 3. Check the record to verify whether the patient has type 1 or type 2 diabetes.
 4. Administer prescribed sliding scale insulin.

NCLEX Client Need: Reduction of Risk Potential

9. The nursing assistant tells you that a patient with diabetes has a blood glucose level of 60 mg/dL. What symptoms would the nurse be most likely to observe with this glucose level?
1. Confusion, tremulousness, pallor, sweating, and weakness
 2. Dry, flushed skin and mild irritability
 3. Deep, rapid breathing and abdominal pain
 4. Incoherent moaning, combativeness, and seizure activity

NCLEX Client Need: Physiological Adaptation

10. During a routine checkup, the health care provider tells a patient with diabetes that test results reveal albuminuria. Which long-term complication is specific to this test result?
1. Metabolic syndrome
 2. Nephropathy
 3. Retinopathy

4. Peripheral vascular disease

NCLEX Client Need: Reduction of Risk Potential

Critical Thinking Questions

Scenario A

Mrs. Lopez is 42 years old and has had type 2 diabetes mellitus for the past 10 years. She is admitted to the hospital for treatment of an infection of the great toe on her left foot, which is the result of improper care of an ingrown toenail. She is 45 lb overweight and admits to frequent binges of eating foods not on her diet. She does not exercise regularly because she says the housework she does gives her enough exercise. When asked about the OHA and diet that have been prescribed for her, she tells you that she only takes her medicine and follows her diet "most of the time."

1. Describe the essential components of a teaching plan for Mrs. Lopez to help her manage her illness better. Why is foot care an important part of this plan?
2. What could you suggest to Mrs. Lopez to help her lose weight?
3. What do you think might motivate Mrs. Lopez to accept more responsibility for managing her illness?
4. What laboratory testing would be recommended to track Mrs. Lopez's compliance with her treatment regimen?

Scenario B

Mr. Tobin is a 22-year-old construction worker who has recently experienced fatigue, excessive thirst and urination, and weight loss. A routine urinalysis revealed glycosuria and a trace of acetone. His health care provider has arranged for Mr. Tobin to have additional diagnostic testing to determine whether he has diabetes mellitus.

1. If Mr. Tobin is found to have type 1 diabetes mellitus, what kind of information will he need to manage his illness?
2. How would you explain the importance of good or tight control of his blood glucose levels to Mr. Tobin?
3. What criteria could be used to determine whether his diabetes is under control?

Scenario C

Mr. Smith is 76 years old and has recently been diagnosed with type 2 diabetes mellitus. It has been difficult to control his blood sugar, and his health care provider has added insulin to his treatment regimen. Mr. Smith was issued a glucometer by the hospital but says that the test strips are too expensive for him to buy very often. Mr. Smith lives alone, cooks for himself, and likes a glass of wine with dinner. Other than an occasional fishing trip, he does not exercise regularly.

1. How would you approach a teaching program for this patient?
2. What resources could you suggest that might assist him to purchase the test strips for the glucometer?
3. How can a glass of wine be incorporated into an acceptable meal plan for a patient with diabetes?
4. What sort of exercise program could you recommend to this patient?

Scenario D

You are making a home visit to a patient who normally administers her own insulin. On arrival you

notice that she has tremulousness, is pale and sweating, and she seems more irritable and distractible than usual. She reports taking her insulin, but she is unable to tell you when she took it, or exactly how much she injected. She thinks her last food was during supper, last night, but she is unsure.

1. You check her blood glucose level with her home device and get a reading of 55 mg/dL. What does this value indicate?
2. Based on your assessment of the patient's symptoms and the blood glucose level, what is your next nursing action?
3. How will you determine that it is safe to leave the patient?

UNIT XIII

Reproductive System

OUTLINE

Chapter 38 Care of Women With Reproductive Disorders

Chapter 39 Care of Men With Reproductive Disorders

Chapter 40 Care of Patients With Sexually Transmitted Infections

CHAPTER 38

Care of Women With Reproductive Disorders

Objectives

Theory

1. Review the female reproductive organs and their role in overall health.
2. Examine normal physiology considering age-related changes to the female reproductive system.
3. Discuss common menstrual disorders and nursing interventions for each.
4. Compare methods of contraception.
5. Examine causes and treatment of infertility.
6. Present changes associated with menopause, treatment options, and nursing interventions.
7. Explain the screening procedures recommended for maintaining reproductive health.
8. Compare and contrast benign and malignant disorders of the female reproductive system.
9. Understand the role of robotic gynecologic surgery as an alternative to open surgery.
10. Distinguish the nurse's role during screening procedures, data collection, and education of women concerning reproductive health.

Clinical Practice

11. Demonstrate techniques of breast self-examination and vulva self-examination to a patient.
12. Use the nursing process in the care of a woman with a reproductive disorder.
13. Carry out interventions for patients with common disorders of the female reproductive tract.

KEY TERMS

- amenorrhea** (ă-mĕn-ō-RĒ-ă, p. 906)
- anovulation** (ăn-ÖV-ū-LĀ-shūn, p. 906)
- climacteric** (klī-MÄK-tĕr-ik, p. 884)
- cystocele** (SIS-tō-sēl, p. 905)
- dowager's hump** (DÖW-ĕ-jĕrz HÜMP, p. 895)
- dysmenorrhea** (dīs-mĕn-ō-RĒ-ă, p. 886)
- dyspareunia** (dīs-pă-RŪ-nē-ă, p. 894)
- effleurage** (ĕf-lü-RĀZH, p. 886)
- endometriosis** (ĕn-dō-mē-trē-Ō-sīs, p. 907)
- enterocele** (ĕn-TĒR-ō-sēl, p. 905)
- fibroids** (FĪ-broydz, p. 906)
- hirsutism** (HĒR-süt-ĕszm, p. 905)

hysterectomy (hĕs-tĕr-ĚK-tō-mĕ, p. 907)
lymphedema (lĭm-fĕ-DĒ-mă, p. 917)
menarche (mĕ-NĀR-kĕ, p. 884)
menopause (MĒN-ō-păwz, p. 884)
menorrhagia (mĕn-ō-RĀ-jă, p. 906)
menses (mĕn-sēz, p. 884)
menstruation (mĕn-strū-Ā-shŭn, p. 884)
metrorrhagia (mĕ-trō-RĀ-jă, p. 906)
mittelschmerz (MĬT-ěl-shmārts, p. 885)
myomectomy (mī-ō-MĒK-tō-mĕ, p. 907)
oligomenorrhea (öl-i-gō-mĕn-ō-RĒ-ă, p. 906)
polycystic ovarian syndrome (pō-lē-SIŠ-tik, öVĀR-ē-än SĨN-drōm, p. 905)
prolapse (PRŌ-lăps, p. 884)
pruritus (prū-RĪ-tūs, p. 894)
rectocele (RĒK-tō-sēl, p. 905)
sentinel node biopsy (SĒN-tī-nĕl nōd Bī-ōp-sē, p. 912)
stress incontinence (STRĒS īn-KŌN-tī-nēns, p. 905)

The female reproductive system depends on hormones produced by the endocrine system for correct development and reproductive function. A variety of hormones released in a specific order at specific times trigger the formation of internal and external sexual organs in the developing fetus. Puberty and sexual maturation are also dependent on accurate release of hormones at the appropriate time in the cycle. As the childbearing years draw to a close, hormone production slows until the reproductive cycle ceases altogether.

Reproductive health can be disrupted by a variety of disorders, such as infertility; spontaneous abortion; premature labor; infection; and the growth of abnormal tissue, including cancerous and noncancerous tumors. Nursing care of patients with diseases of the female reproductive system is further complicated by the emotional effects of such disorders. The reproductive organs represent the biologic aspect of sexual identity, and women may feel their personal identity is threatened by disorders of this system.

Anatomy and Physiology of the Female Reproductive System

Primary External Structures

The **vulva**, or **pudendum**, is the external female genitalia. It is made up of the following structures:

- The **mons pubis** is a rounded mound of fatty tissue that protects the symphysis pubis. It is covered with pubic hair.
- The **labia majora** are two elongated, raised folds of pigmented skin that enclose the vulvar cleft. The pubic hair extends along these folds.
- The **labia minora** are soft folds of skin within the labia majora. They are soft, shiny, and made up of fat tissue and glands and have no hair follicles.
- The **clitoris** is located at the top of the vulvar cleft, above the urethral opening. It is made up primarily of erectile tissue and is highly sensitive to touch. It is a primary source of pleasurable sensation during sexual activity.
- The **urethral meatus**, or external opening of the urethra of the urinary bladder, is located below the clitoris within the folds of the labia minora.
- The **vaginal vestibule** is situated below the urethral meatus within the labia minora and is the entrance to the vagina.
- The **perineum** is the flat muscular surface between the vagina and the anus.

Primary Internal Structures

- The **vagina** is a muscular tube lined with membranous tissue with transverse ridges called rugae. It connects the external and internal female sexual organs (Figure 38-1).

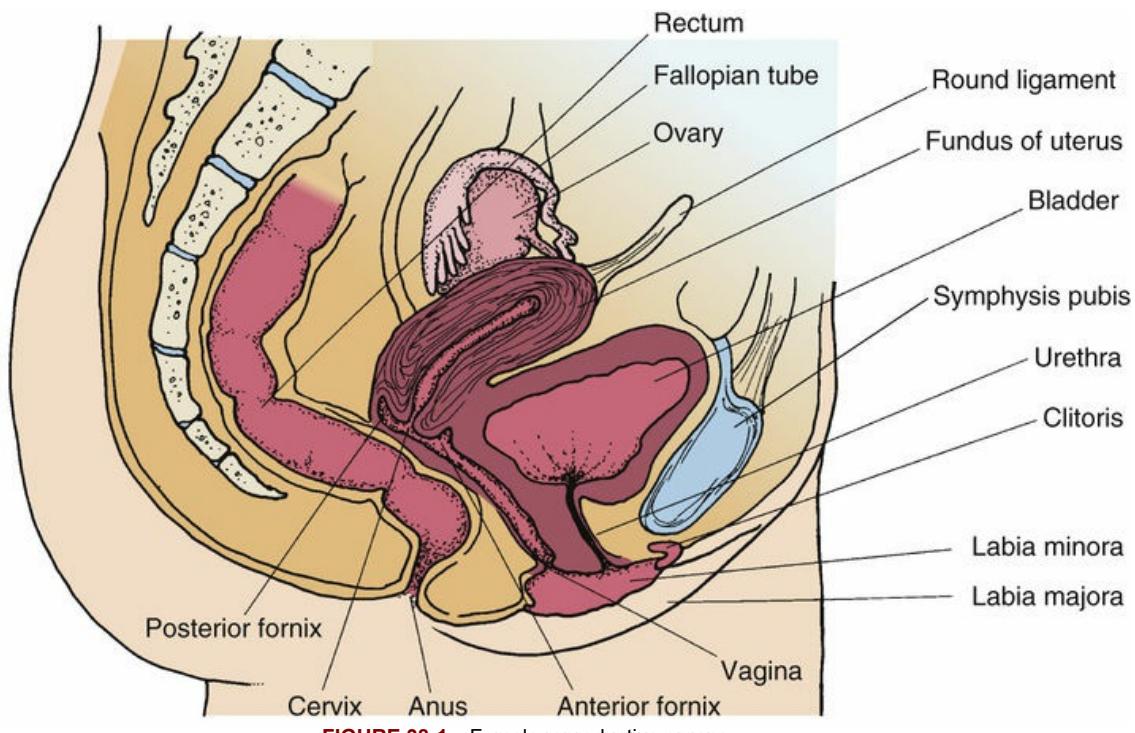


FIGURE 38-1 Female reproductive organs.

- The **uterus** (womb) is a hollow pear-shaped organ with a thick muscular wall. It lies at the upper end of the vagina. It is capable of expanding to many times its normal size to accommodate a

growing fetus. The lower opening of the uterus is the **cervix**, which dilates during labor to allow for delivery of the infant.

- There are two **fallopian tubes** that branch outward from the right and left sides at the top of the uterus. They form the pathway for the **ovum** (egg) from the ovary to the uterus.
- There are two **ovaries**, one located near the end of each fallopian tube. These almond-shaped glands excrete estrogen and progesterone into the bloodstream. At birth, the ovaries contain all the eggs (**oocytes**—primitive ova or eggs) the woman will ever produce, approximately 400,000 in each ovary, most of which will never mature for possible fertilization.
- The **bony pelvis**, located at the base of the body between the hips, supports the pelvic organs, including the growing uterus during pregnancy. It is assisted by the **pelvic floor**, a collection of strong muscles and supportive tissues that brace the pelvis and provide both support and protection for the pelvic organs.

Accessory Organs

- The breasts or **mammary glands**, located on the upper chest, are the accessory organs. They are composed of fibrous, adipose, and glandular tissue and are responsible for **lactation** (milk production), which provides nourishment for the infant.

Phases of the Female Reproductive Cycle During the Childbearing Years

- The **ovarian cycle** has two phases:
 - **Follicular phase:** This is the first 14 days of a 28-day cycle. **Follicle-stimulating hormone (FSH)** and **luteinizing hormone (LH)** stimulate the maturation of ova in preparation for fertilization. Estrogen peaks when the ovum is released (**ovulation**), about 14 days before the next menstrual period. The ovum lives up to 24 hours after fertilization.
 - **Luteal phase:** This is days 15 to 28 of a 28-day cycle. LH and progesterone are the primary hormones released in this phase. The blood supply to the uterus increases in preparation for possible implantation of a fertilized ovum. If fertilization and implantation do not occur, the lining of the uterus will degrade and be shed during menstruation, and the cycle begins again.
- The **menstrual cycle** has four phases (Box 38-1).

Box 38-1

Stages of the Menstrual Cycle

Days 1-5

Stage I: Menstrual Stage (Dismantling Stage)

1. Endometrium sloughs away as menstrual flow begins.
2. Progesterone and estrogen are no longer secreted.

3. New follicle starts to mature.

Days 6-14

Stage II: Growth and Repair (Estrogen or Proliferative Stage)

1. Follicle grows, and egg matures.
2. Endometrium returns to normal state and then begins to thicken in response to estrogen.

Stage III

1. Ovulation occurs 14 days before menses, regardless of length of menstrual cycle. It takes place when the follicle ruptures and releases egg. If pregnancy does not occur, the corpus luteum deteriorates, estrogen and progesterone decline, and the thickened tissue on the endometrium of the uterus is sloughed off and is discharged via the vagina as a menstrual "period."

Days 15-28

Stage IV: Secretory Stage (Postovulatory or Progesterone Stage)

1. Corpus luteum secretes progesterone.
2. Endometrium continues to thicken in response to estrogen and progesterone. Uterus prepares to receive fertilized ovum.

Sexual Development in the Fetus

- During the first weeks of pregnancy, the male and female sexual organs are undifferentiated. After the 7th week, rapid changes occur, and by the 12th week the external genitalia are formed and fully differentiated as male or female. The internal structures also are forming during this period.

Sexual Maturation

- The period of sexual maturation is called *puberty*. It usually occurs between ages 9 and 17 years for girls; the average onset is 12 years of age. It involves a period of accelerated growth, after which the hips begin to widen and the breasts begin to develop. Axillary and pubic hair appears. Puberty is completed by the onset of the menstrual cycle, or **menses**. The beginning of menstruation is called **menarche**. **Menstruation** (shedding of the uterine lining) will continue at intervals of approximately 4 weeks throughout the childbearing years, except when pregnancy occurs.

Menopause

- Toward the end of the childbearing years, women enter the phase known as the **climacteric** period. The menses become irregular in both pattern and flow and eventually cease altogether. **Menopause** has occurred when the menses have completely ceased for at least 12 months.

Aging-Related Changes

- After menopause, some atrophy of the female organs, loss of elasticity, dryness of the vaginal membranes, and reduction of bone mass occur because of the decrease in estrogen levels. Loss of natural tissue elasticity may allow internal organs to sag, or **prolapse**, into the vagina.

Women's Health Care

Women's health care can be defined as the promotion of the physical, psychological, and spiritual well-being in women. The growth of the women's movement in America was the beginning of the recognition that there are health needs unique to women, and legislation gradually emerged that included women as subjects in research studies. Research trials concerning the safe dosages and efficacy of drugs had previously been conducted on male subjects and generalized to apply to women. However, currently it is recognized that there are differences between men and women in many areas, and now even the growth norms for children are published with separate charts for girls and boys.

In the late 19th century, female physicians were rare, and by 1900, only 6% of all physicians were women. The women's health movement of the 1960s expanded women's rights to control their bodies and motivated women to learn more about their bodies and understand wellness. Childbirth education classes flourished, and alternative birthing centers emerged. The 1972 Civil Rights Act prohibited discrimination based on gender in educational institutions, and by 2012 more than 47% of medical doctors were estimated to be women ([Association of American Medical Colleges, 2013](#)).

In 1990, the Women's Health Equity Act (WHEA) was passed, containing laws that increased women's access to health services. The Office of Research on Women's Health (ORWH) was formed as part of the National Institutes of Health.

In the 21st century, women were increasingly economically independent and empowered to make health care decisions. Health care education for adolescents includes information concerning puberty, menstruation, and sexuality. Teenagers need information concerning safe sex, contraceptives, and choices concerning high-risk behaviors. Adult women require information concerning Papanicolaou (Pap) smears, breast self-examination, nutrition, exercise, and lifestyle management. Perinatal education is important. Older women require information regarding menopause, long-term illness, and disabilities that affect health care needs. Today many older women live alone with below-poverty-level income and lack caregivers or easy access to health care facilities. Nurses must have an understanding of these needs and of the normal physiologic changes of each age group to devise a plan of care to maintain health or treat illness.

Clinical Cues

Healthy People 2020 Goals Related to Women's Health

Healthy People 2020 includes the following goals related to women's health care:

- Increase the number of women older than age 40 years who have mammograms to curb the rise in breast cancer.
- Increase the number of women older than age 21 years who have Pap tests according to current guidelines.
- Reduce the occurrence of hip fractures in older women with osteoporosis.
- Reduce the number of sexually transmitted infections (STI) and pelvic inflammatory disease (PID) in women.

Women of all ages need to be knowledgeable about the function of their bodies, health care needs, and signs and symptoms of wellness as well as illness. This chapter focuses on the health of the reproductive system and reviews common gynecologic problems with suggested nursing interventions.

Young women typically first enter the health care system for a Pap smear or for contraceptive advice. Support, reassurance, and understanding of cultural and personal needs are the primary responsibilities of the nurse during this first contact. A complete history; physical examination; age-appropriate screening tests with clear interpretations; referrals; and education concerning nutrition, lifestyle, and health care to meet individual needs are essential responsibilities of the nurse and the

health care team.

Normal Menstruation

During the first year after menarche, the menstrual cycle may be somewhat irregular, but by the second year a regular cycle of approximately 28 days is normally established.

Attitudes and ideas regarding menstruation are formed early. They are based on the thoughts and beliefs expressed by other women and on personal experience. Incorrect perceptions about this normal process may increase physical discomfort or cause a young woman unnecessary embarrassment or fear. Although there has been significant improvement in communication with preadolescent young women about the changes they will experience, many still need further education. It is important for nurses to understand their own attitudes about sexuality and the reproductive process before attempting to provide information for women on these sensitive issues. A healthy view of menarche as a natural physiologic process marking reproductive maturity should be encouraged.

Normal Menstrual Bleeding

Menstrual bleeding occurs about 14 days after ovulation and lasts between 2 and 8 days. Menstrual blood consists of endometrial tissue, blood, mucus, and vaginal and cervical cells. The amount of actual blood loss is only 40 to 80 mL. Blood flow may be heavy at first but gradually reduces to spotting. The color may change from bright red to brown, and the blood may have a musty odor. Once a menstrual pattern is established, a change from this pattern is reason to consult a health care provider. The length of the cycle can be influenced by stress, drugs, nutrition, and illness. Women should be encouraged to keep a calendar of their individual menstrual cycle to determine regularity and recognize deviations. Mild cramping may occur, and some mood swings may be associated with the hormonal changes. **Mittelschmerz** is a sharp pain in the right or left lower quadrant, sometimes felt at midcycle around the time of ovulation, and may last a few hours. Some women are sensitive to this phenomenon and others never experience it.

Normal Vaginal Discharge

The vagina is a warm, moist, dark vault in which microorganisms can flourish. Normal vaginal secretions contain cervical mucus, endometrial fluid, exudate from the Bartholin glands and Skene ducts, and products of normal flora. The main line of defense against infection is lactic acid, which causes an acidic pH. Any change in this pH can result in infection. An increase in secretions normally occurs during pregnancy and at the midpoint of the menstrual cycle when ovulation occurs, and a decrease in secretions normally occurs after menopause.

Normal vaginal discharge has an off-white color and is odorless. If the vaginal discharge develops an odor, changes in color or consistency, or causes irritation or burning of the vaginal mucosa, a health care provider should be consulted.

The Normal Breast

Breasts are made of adipose tissue, milk-producing glands called lobules, ducts, and fibrous tissue that rest on the chest muscle. They may not be completely symmetric (one may be slightly larger than the other) and may feel a bit lumpy and tender, especially during the middle of the menstrual cycle. Age, pregnancy, medication, and diet can affect the way the breasts feel. As women age, the denseness and adipose tissue content decrease, whereas birth control pills, hormone replacement therapy, and pregnancy may cause the breasts to increase in size.

Menstrual Dysfunction

Premenstrual Syndrome and Premenstrual Dysphoric Disorder

Premenstrual syndrome (PMS), also known as *ovarian cycle syndrome*, is the presence of physical, psychological, or behavioral symptoms that regularly recur within the luteal phase of the menstrual cycle and significantly disappear during the remainder of the cycle. These signs and symptoms, which occur between ovulation and menstruation, include abdominal bloating, breast tenderness, irritability, appetite changes, fatigue, mood swings, and a fear of losing control. Management

includes lifestyle diet and exercise changes, stress management, and prevention of fatigue (Hatcher et al, 2011).

Premenstrual dysphoric disorder (PMDD), a more serious problem, is described officially in the *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (DSM-V, 2013), a classification of disorders that is published by the American Psychological Association. It is believed to be the result of abnormal serotonin responses to normal changes in estrogen levels during the menstrual cycle. The symptom criteria used to diagnose PMDD occur between ovulation and the onset of menstruation and begin to improve between the menstruation and ovulation phases; they are not present in the week after the menstrual period. Diagnosis is based on specific symptoms in a pattern throughout more than 3 months. Symptoms include depressed mood; anxiety; irritability; difficulty in concentrating; change in appetite and sleep; and physical symptoms such as breast tenderness, bloating, weight gain, and headaches. Symptoms may interfere with the normal lifestyle or work responsibilities.

Strategies for self-care may include stress management exercises; some lifestyle changes; and maintaining a healthy diet rich in complex carbohydrates and fiber, avoiding simple sugars, salty foods, and caffeine, and prevention of hypoglycemia. Exercise may increase beta-endorphin levels, which results in relief of depression and mood elevation. Although eating chocolate has shown to elevate depressed moods, consumption should be limited. Peer support groups, psychological counseling, and prescribed medications can also be helpful. Medical management commonly includes oral contraceptives (low estrogen, progestin dominant), diuretics during the luteal phase of the menstrual cycle, and nonsteroidal anti-inflammatory drugs (NSAIDs). Serotonin reuptake inhibitors such as fluoxetine (Sarafem) or sertraline (Zoloft) or short-acting anti-anxiety drugs such as paroxetine (Xanax) may be initiated 2 weeks before menses and discontinued when menses begins. This drug regimen has been approved by the Food and Drug Administration (FDA) for the management of menstrual disorders.

Dysmenorrhea

Dysmenorrhea is painful menstruation, a very common gynecologic complaint. There are two classifications of dysmenorrhea.

Primary dysmenorrhea.

Primary dysmenorrhea usually occurs 6 to 12 months after the menarche (when the process of ovulation becomes established and regular menstruation occurs). It is believed to be caused by the release of high levels of prostaglandins in the first 2 days of menstruation, causing uterine contractions and vasoconstriction that result in abdominal cramps with measurable intrauterine pressures similar to the pressure seen in the second stage of labor (Hatcher et al, 2011). Backache; weakness; decrease in appetite; and central nervous system symptoms such as dizziness, headache, and poor concentration may also occur but rarely last longer than 48 hours, coinciding with the decrease in prostaglandin levels. Pelvic examination results are normal.

Primary dysmenorrhea is the leading cause of recurrent short-term school absences in adolescent girls. The most important management of a young adolescent or adult with dysmenorrhea is to promote an attitude of positive sexuality and self-worth. Correction of myths and misinformation is essential, and management is related to the woman's individual responses.

A heating pad promotes vasodilation and often relieves cramps. Back massage and soft rhythmic massage of the abdomen (**effleurage**) can also relieve discomfort. Exercises such as the **pelvic rock** relieve discomfort by releasing endorphins, suppressing prostaglandins, and shunting the blood flow away from the pelvic organs, which results in less pelvic congestion. The pelvic rock is performed in the hands-and-knees position, alternating arching the back and contracting abdominal and gluteal muscles while exhaling and then hollowing the back and relaxing the muscles while inhaling. Several complementary and alternative medicine (CAM) therapies can also be helpful, such as aromatherapy and meditation. A balanced low-fat diet with foods that are natural diuretics, such as cranberry juice, asparagus, and watermelon, may decrease edema-related symptoms. Medications such as NSAIDs are prostaglandin inhibitors and may relieve many discomforts. Health care providers may prescribe an oral contraceptive (OC), which provides relief from menstrual discomforts along with advantages of contraceptive protection. Seasonale is an OC that provides longer periods of pain-free amenorrhea by allowing only four menstrual periods per year, and its use is becoming popular. The FDA has also approved the drug Lybrel, which prevents

menstruation for 1 year (Hicks, 2010). Many herbal preparations and over-the-counter CAM medications are available for self-treatment. Nurses should be aware of side effects and interactions of CAM therapies with prescribed drugs.

Think Critically

Why should nurses ask patients about over-the-counter medications and herbal remedies they are taking and document their use?

Secondary dysmenorrhea.

Secondary dysmenorrhea typically occurs after 25 years of age and is caused by pelvic pathology such as endometriosis, pelvic inflammatory disease, uterine polyps, or fibroids. Pain associated with secondary dysmenorrhea is characterized by a dull lower abdominal pain that radiates to the back or thighs. The pain may occur before the menstrual period and last throughout the days of menstrual flow.

Management involves treating the cause of the pelvic pathology. Temporary relief may be obtained with the same therapies used for primary dysmenorrhea (Table 38-1).

Table 38-1

Drugs Commonly Used to Treat Dysmenorrhea

CLASSIFICATION	SIDE EFFECTS	NURSING IMPLICATIONS
Nonsteroidal anti-inflammatory drugs (NSAIDs) Ibuprofen, Motrin, Naproxen	Nausea, dyspepsia, itching, rash.	Contraindicated in hemophilia, bleeding ulcers, bleeding disorders. Should not be taken with aspirin. (Check labels on cold/allergy medications that may contain NSAIDs.) Should be taken around the clock when menses start to treat discomfort. Patient should take with meals and not consume alcohol.
Mefenamic acid (potent prostaglandin synthesis inhibitor) Cox-2 inhibitors	Diarrhea, nausea, abdominal distention.	Contraindicated in hemophilia, bleeding ulcers, bleeding disorders. Similar precautions to NSAIDs.
Oral contraceptives	Women who smoke should not use hormone therapy. Risks and benefits should be discussed with health care provider.	Use with caution in women with blood clotting disorders, cardiovascular disorders, or cancer.
Levonorgestrel-releasing intrauterine system (LNG-IUS)	Requires invasive application and medical follow-up.	Can be used in combination with contraceptive therapy.

Sexual disorders.

In August 2015, the FDA approved the first drug for female sexual dysfunction, dubbed “female Viagra” (*Medical News Today*, 2015). This drug, flibanserin (Addy) is for women with hypoactive sexual desire disorder (HSDD), which develops in approximately one in ten premenopausal women. An oral dose of 100-mg is taken daily and, if no improvement is seen in 8 weeks, discontinued. Because there is a potentially serious interaction with alcohol, it carries a boxed warning and may only be prescribed by clinicians who have received training and is available only in certified pharmacies.

Contraception

Many women start sexual relationships before they are ready to have children. Others have children and do not wish to have more. For these women, information concerning techniques of contraception is essential to prevent unwanted, unintended pregnancies. Many sexually active women of childbearing age are concerned about regulating, planning, or preventing pregnancy. With the assistance of a health care provider, they can select the birth control method best suited to their physical health, sexual activity, desire to have children at a future date, cultural and religious beliefs about family regulation, and lifestyle.

Contraceptive Options

Women should make an informed decision concerning methods of reliable birth control, and nurses are responsible for providing comprehensive education concerning the advantages, limitations, and side effects of the various contraceptive drugs and devices. Some methods of birth control provide protection against sexually transmitted infections (STIs), but some do not. Newer contraceptive regimens reduce the hormone-free interval, thereby decreasing the occurrence of menstrual periods. The best contraceptive methods for adolescents and young adults are abstinence, the use of planned contraception, the correct use of condoms to prevent STIs, and lifestyle counseling. In the United

States, 47% of high school students report sexual experience, and 40% denied using protection ([Centers for Disease Control, 2014b](#)). *Healthy People 2020* goals include increasing condom use at first intercourse to 73.6% in females and 88% in males. [Figure 38-2](#) illustrates the correct application of a condom and a diaphragm. [Table 38-2](#) reviews the various methods of contraception.

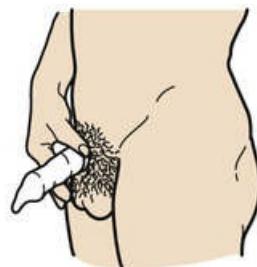
HOW TO USE A MALE CONDOM

1. Apply condom before any contact with vagina because sperm are present in secretions *before* ejaculation.
2. Squeeze air from the tip of condom, and hold it while unrolling condom over erect penis. Leave a half-inch space at tip.
3. Use water-soluble lubricants, if needed.
4. To remove condom, hold it at the base of penis to prevent spillage as you withdraw from the vagina.
5. Dispose and use a new one each time. Be sure to check expiration date on condoms.

A



Squeeze air from tip of condom



Hold condom at base of the penis to prevent spillage

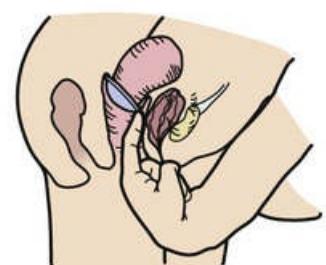
HOW TO USE A DIAPHRAGM

1. The diaphragm can be inserted up to 4 hours before intercourse. Apply spermicide on the rim and inside the center of diaphragm.
2. Compress diaphragm using thumb and finger of one hand, and use other hand to spread the labia.
3. While squatting (or placing one foot on a chair), insert into vagina with spermicide toward cervix. Direct diaphragm inward and downward behind and below cervix.
4. Tuck the front rim of diaphragm into the pubic bone, and feel cervix through the center of diaphragm.
5. Leave in place at least 6 hours after intercourse.
6. To remove, assume squatting position and bear down. Hook a finger over top rim, and pull diaphragm down and out.
7. Wash diaphragm with mild soap and dry after each use. Dust with cornstarch, if needed, and inspect occasionally for small holes.

B



Begin to insert diaphragm into vagina with spermicide toward cervix



Tuck diaphragm behind the pubic bone

FIGURE 38-2 Proper application of (A) a condom, and (B) a diaphragm. (Modified from Leifer G: *Introduction to maternity and pediatric nursing*, ed. 5, Philadelphia, 2007, Saunders.)

Table 38-2
Methods of Contraception

HOW METHOD WORKS	SIDE EFFECTS/PRECAUTIONS	DEGREE OF EFFECTIVENESS/USAGE NOTES
Abstinence Sexual contact is avoided.	Reliable method of preventing pregnancy and STIs.	100% if used consistently
Fertility Awareness Methods Basal Body Temperature (BBT) BBT is measured and charted daily on awakening. Coitus is avoided on the day of temperature rise and for 3 subsequent days.	Temperature must be taken before any activity, or it will rise above its basal level. The special thermometer should be kept at bedside.	80%-90% for all fertility awareness methods if done correctly
Calendar or Rhythm Method Woman charts her monthly menstrual cycle on a calendar and avoids intercourse during fertile period.	Not effective for woman with irregular menstrual cycles. Several months of charting are necessary to establish clear pattern of menstrual cycle.	Fertility awareness methods that monitor multiple parameters (e.g., symptothermal method) may be more effective, but most important aspect of success is faithful adherence to the method; also, the woman must feel comfortable enough with her body to make the necessary observations each month
Ovulation or Billings Method Cervical mucus changes are assessed. During ovulation, mucus is clear with high stretchability ("egg white" consistency). Degree of stretch is tested by pinching a small amount of cervical mucus between the thumb and forefinger and stretching it between them (called <i>spinnbarkeit</i>). During ovulation, mucus smeared on a glass slide will dry into a "fern" pattern.	Woman must feel very comfortable with her body and confident in her ability to detect and assess changes.	
Symptothermal Method Variety of parameters are recorded, including cervical mucus changes, BBT pattern, mittelschmerz (brief sharp abdominal pain that may occur with ovulation), increased libido (sexual drive).	More effective for women with regular menstrual cycles. Requires significant accurate record keeping.	
Chemical Predictor Test A test kit that contains a chemically treated strip that will turn color when estrogen or luteal hormone levels are present in urine.	Increase in hormone levels occurs 12-24 hr before ovulation.	
Mechanical or Barrier Contraception Intrauterine Device (IUD) A small, sterile, flexible plastic device that is inserted by a provider into the uterus. Can be a copper device (ParaGard) or a device containing the hormone levonorgestrel (Mirena). Can provide 5 yr of protection.	May increase menstrual flow or cause cramping or low back pain. Increased incidence of PID in women with multiple sex partners, women whose partners have multiple partners, and women with previous incidence of PID. Patient must check placement by feeling for string once each month.	Up to 99% effective; must be removed by health care provider
Male Condom A sheath commonly made of latex that is placed over the erect penis before intercourse. Oil-based lubricants such as petroleum jelly can cause latex to break down and reduce effectiveness. Some condoms, made of polyurethane, are compatible with oil-based lubricants.	Inexpensive, readily available, easy to use correctly. <i>Precautions:</i> (1) Leave space at tip for semen to collect to prevent it being forced upward out of the condom; (2) store in a cool place, and not for excessively long, to prevent breakage from aging of the latex or heat damage; (3) handle carefully to prevent spilling semen and possibly introducing it into the vagina.	88%-98% if used properly; use of spermicide increases effectiveness to 98%-99%
Lea's Shield A one-size reusable silicone barrier that is held in place by the vaginal walls. Used with a spermicide and inserted before each intercourse act. Lea's Shield is a one-size prescription and is nonhormonal.	Effectiveness enhanced with use of spermicide. Provides STI protection. Should not be left in place for more than 48 hours or used during menstruation. Woman should urinate before and after insertion.	84%-90%
Female Condom Sheath with retaining ring that is placed in the vagina before intercourse. Open end with large entrance ring extends outside the vagina. Can be inserted up to 8 hr before intercourse.	The penis must remain inside the sheath, not between the sheath and the vaginal wall. Acceptance of the method has been slow, because it is more expensive and more difficult and time-consuming to place properly than the male condom. Effectiveness is enhanced with use of spermicide. Provides protection against STIs.	79%-90%; most failures occur when the penis is withdrawn too far and reenters the vagina beside rather than within the condom
Diaphragm A latex or rubber dome-shaped cup that fits snugly over the cervix. Spermicide is applied to the cervical side of the diaphragm, and it is inserted into the vagina so the fitted ring holds it securely in place at the top of the vagina to wall off the cervix. The spermicide enhances effectiveness, should there be a leak around the edge or tear in the diaphragm.	A diaphragm must be fitted professionally and should be refitted annually, with a gain or loss of 7-10 lb, and particularly after pregnancy.	82%-94%
Cervical Cap Filled with spermicidal jelly and fitted over the cervix. Fem Cap is prescription fitted to each woman.	Can be in place up to 48 hr before sexual intercourse. Similar to diaphragm. It is recommended that women void before and after insertion and after intercourse. Should not be used during menstruation.	82%-94%
Vaginal Sponge A nonprescription soft polyurethane sponge traps and absorbs semen and has spermicidal properties.	Sponge is moistened with 2 tablespoons of water and squeezed before insertion. Must remain in place 6 hours after intercourse. Prolonged use can increase risk for toxic shock syndrome.	82%-94%
Spermicidal Methods Gels, Foams, Creams Work by killing sperm within the vagina. Must be applied before intercourse.	Available without prescription. More effective when used as an adjunct to condoms, diaphragms, and caps.	Foam alone, 79%-90%; creams and gels alone, 79%
Hormonal Methods Oral Contraceptives (OCs) "The pill" contains a combination of synthetic estrogen and progestin, hormones that prevent ovulation and thicken cervical mucus, making it difficult for sperm to travel upward (also true for injectable and timed-release hormonal methods). Traditionally based on a 28-day cycle with 7 hormone-free days that result in monthly menstruation. Seasonale is an OC that reduces menstrual periods to four times a year. Lybrel is an OC that is taken 365 days a year and suspends menstruation indefinitely.	Prescription required. Must be taken faithfully to be effective. <i>Precautions:</i> Not recommended for women older than 35 years who smoke or women with a history of heart or liver disease, breast or uterine cancer, blood clots or venous inflammation, or unexplained vaginal bleeding. At least three regular ovulatory cycles should be evidenced before adolescents start OC use. May cause nausea.	97%-99.9%
"Minipill" Contains a small dose of progesterone and no estrogen. Causes endometrium to be hostile to implantation.		97%-99.9%
Low-Dose Regimens Mircette uses low-dose estrogen for 5 of the 7 traditionally "hormone-free" days, resulting in shorter, lighter menses. Loestrin 24 Fe provides 24 days of combined hormones with a 4-day hormone-free interval. Yasmin is similar to Loestrin, but has been shown to relieve symptoms of premenstrual dysphoric syndrome.	There is evidence of increased risk of venous thromboembolism in users of OCs containing drospirenone or levonorgestrel (Parkin et al, 2011).	97%-99.9%
Injectable Contraceptives (Depo-Provera) Synthetic timed-release progestin is injected q12wk, preventing	Injections given in clinic or office. Must be repeated q12wk to	99.7%

ovulation.	remain effective. <i>Precautions:</i> See oral contraceptives.	
Sustained-Release Implants Implanon, a thin, flexible rod containing synthetic hormone, is placed under the skin of the forearm in a minor surgical procedure. Effective for 3 yr.	Small incision required to place and to remove. Less popular now that injection is available. <i>Precautions:</i> See oral contraceptives.	98.4%–99.4%
Emergency Contraception Taken orally the day after unprotected intercourse, it induces menses and prevents implantation in the uterus.	Not to be used as a routine form of contraception. Women receiving the “morning-after” pill should also receive assistance in choosing an effective, ongoing method of contraception.	97%–99.9%
Vaginal Ring The NuvaRing (etonogestrel and ethinyl estradiol) is a flexible silicone ring inserted into the vagina for 3 wk and removed for 1 wk to allow for menstruation.	Leukorrhea and vaginal infection are possible side effects. Other side effects are similar to OCs, but fewer GI problems are experienced because it does not pass through GI tract.	97%–99.9%
Skin Patch A transdermal skin patch containing norelgestromin and ethinyl estradiol applied to dry skin of back, buttocks, upper arm, or torso. Replaced weekly for 3 wk. Not applied in week 4 to allow for menstruation.	The FDA is investigating evidence that a higher level of estrogen is absorbed during sunbathing or while in saunas, increasing risk for complications (symptoms similar to OCs). Risk of thromboembolus may be higher than with OCs.	97%–99.9% (may not be effective in women >200 lb [90 kg])
Delayed Menstruation <i>Seasonale</i> is an OC that delays menstruation so that the woman experiences four menstrual periods a year. <i>Seasonique</i> is an OC that provides 84 days of combined hormones followed by a week of low-dose estrogen rather than a hormone-free interval. The four menstrual periods a year are lighter and with less discomfort.	A popular choice. Requires follow-up research concerning long-term effects.	97%–99.9%
Permanent Contraception Tubal Ligation (Female) (Surgical or Nonsurgical Hysteroscopic Technique)	Fallopian tubes are surgically cut or tied to prevent sperm from reaching ovum. Nonsurgical transcervical insertion of an Essure microchip into each fallopian tube causes local inflammation and closure of fallopian tubes.	100%
Vasectomy (Male)	The vas deferens (sperm ducts) are cut and tied to prevent sperm from entering ejaculatory fluid.	Use another form of birth control until two sperm analyses are negative.

FDA, Food and Drug Administration; GI, gastrointestinal; PID, pelvic inflammatory disease; STIs, sexually transmitted infections.

Data from Fantasia H: Options for intrauterine contraception, *J Obstet Gynecol Neonatal Nurs* 34(3):375–379, 2009; Fischer M: Implanon: a new contraceptive implant, *J Obstet Gynecol Neonatal Nurs* 34(3):361–368, 2009; Fontenot H, Harris A: Latest advances in hormonal contraception, *J Obstet Gynecol Neonatal Nurs* 34(3):369–371, 2009; Hacker N, Gambone J, Habel C: *Essentials of obstetrics and gynecology*, ed. 5, Philadelphia, 2010, Saunders; Hatcher R, Trussell A, Nelson W, et al: *Contraceptive technology*, ed. 19, New York, 2007, Ardent Media; Theroux R: Hysteroscopic approach to sterilization, *J Obstet Gynecol Neonatal Nurs* 34(3):356–360, 2009; and Yranski P, Gamache M: New options for barrier contraceptives, *J Obstet Gynecol Neonatal Nurs* 37(3):384–389, 2009.

Natural Family Planning

Natural family planning, also known as fertility awareness, involves identifying signs of ovulation and abstaining from intercourse during periods of fertility. (The ovum is viable up to 24 hours after ovulation, and the sperm are viable up to 72 hours in the fallopian tube.) The **basal body temperature (BBT)** technique involves monitoring the BBT each morning and noting a rise that occurs at ovulation. A cervical mucous test, called the *Billings method*, can also be used to track the occurrence of ovulation. The **calendar or rhythm method** is based on the knowledge that ovulation occurs 14 days **before** menstruation, and therefore keeping track of the individual's menstrual cycle can help predict the time of ovulation. The **Marquette method** of family planning incorporates the use of an electronic hormonal fertility monitor that tracks the levels of the urinary metabolite of estrogen and LH. Natural family planning requires the commitment of both partners and close, accurate monitoring during the menstrual cycle. Douching, withdrawal, and breast-feeding are unreliable methods of contraception.

Oral Contraceptives

OCs are the most popular method of reversible hormonal contraception in use. They are effective if used properly and offer some noncontraceptive benefits such as relief from breast tenderness, bloating, and PMS symptoms, but do have contraindications and cautions for users ([Figure 38-3](#)). Nurses should counsel women concerning options and collect data that can determine which contraceptive choice is best. The health care provider assists the woman in making the final choice. Traditional OC regimens are based on a 28-day cycle with a 7-day hormone-free interval that allows for menstruation and gonadotropin levels to rise and ovarian follicular growth to occur. When the OC cycle is not resumed on schedule, the risk of unplanned pregnancy occurs. Newer OCs reduce the hormone-free interval, thereby reducing menstrual discomforts as well as decreasing the risk of contraceptive failure. Seasonale, an OC that provides delayed menstruation so a woman has only four menstrual periods a year, is very popular (Hicks, 2010). An alternate regimen (Lybrel) involves low-dose combined hormones for 365 days per year without a hormone-free interval, which allows a woman to postpone menstruation indefinitely. Smoking increases the risk of complications related to OC therapy, especially in women older than 35 years ([Gabbe, 2012](#)).

Clinical Cues

It is important to tell patients that birth control pills and most other birth control methods are not 100% effective in preventing conception. Abstinence is the only 100% effective method to prevent pregnancy.



FIGURE 38-3 Contraceptives. (From McKinney EM, James S, Murray SS, et al: *Maternal-child nursing*, ed. 2, Philadelphia, 2005, Saunders.)

Emergency Contraception

Known as the *morning-after pill*, emergency contraception is indicated after unprotected intercourse. It is not meant to be used on a regular basis, but was developed to decrease the number of unwanted pregnancies and elective abortions. Emergency contraception prevents pregnancy by preventing ovulation or fertilization or by slowing transport of the sperm and egg or altering the uterine lining to prevent implantation. Plan B One-Step is one tablet of levonorgestrel only, to be taken within 72 hours of unprotected sex, that is available to women without prescription and was approved in July 2013. The American Congress of Obstetricians and Gynecologists (ACOG) stated that emergency contraception is safe for women of all ages (ACOG, 2013). (See **Legal and Ethical Considerations** box.) The woman should be referred for counseling and follow-up care after use of any emergency contraception. An emergency contraceptive ulipristal (Ella) has been approved by the FDA and requires a prescription. It prevents pregnancy by prolonging ovulation and can be taken up to 5 days after unprotected sex. The woman is advised to take an antiemetic before each dose to minimize nausea and vomiting. Because emergency contraception is not effective if the woman is already pregnant, failure to menstruate by 21 days after initiation of therapy requires evaluation for pregnancy. There is no evidence that emergency contraception causes abortion, ectopic pregnancy, or fetal anomalies if taken when the woman is already pregnant (Hatcher et al, 2011).

Legal and Ethical Considerations

The “Morning-After” Pill

Although the “morning-after” contraceptive pill can be sold over the counter, there has been some unwillingness by certain pharmacists to provide it. They claim it is against their religious principles. Is it ethical for pharmacists to withhold medication from a woman because of their own personal beliefs? In 2014, the Supreme Court ruled that private enterprises do not have to provide health coverage that the company deems morally objectionable.

A copper intrauterine device (IUD) can be inserted up to 7 days after unprotected sexual

intercourse to prevent implantation of the zygote in women who prefer long-term contraception. A woman who seeks emergency contraception should be educated concerning methods of birth control and prevention of STIs.

Information concerning emergency contraception is provided at www.NOT-2-LATE.com

Infertility

Many women wish to have children but have difficulty conceiving. For these women, preconception guidance and perhaps infertility treatments may be helpful. Preconception guidance involves gathering data concerning the woman and her partner to provide information necessary to make an informed, individualized decision concerning conception or fertility assistance. Screening for genetic disorders may be required.

Cultural Considerations

Fertility

Symbols and rites that celebrate fertility are practiced by many cultures. In the United States throwing rice at the bride and groom is a wish for family growth. Distributing candy or cigars in celebration of a birth is also common in the United States. In some countries, rubbing the swollen abdomen of a statue of a fertility goddess is a popular practice for women seeking to conceive.

Primary infertility is the inability of a couple to conceive a child after at least 1 year of active, unprotected sexual relations without using contraceptives. **Secondary infertility** is the inability to conceive after having once conceived or to maintain a pregnancy long enough to deliver a viable infant. Approximately 10% to 20% of couples in the United States have infertility, and increasing numbers of couples are seeking medical intervention. Infertility services also assist women without a male partner who wish to have a child.

The ability to conceive depends primarily on both partners having normal reproductive physiology, physiologically and psychologically sensitive interaction, and proper timing of intercourse. Factors in men that contribute to infertility include problems with the sperm, abnormal ejaculation, abnormal erections, and abnormal seminal fluid. Chapter 39 presents a discussion of problems in the male reproductive system. Factors contributing to infertility in a woman include:

- Problems with ovulation
- An abnormality in the pathway between the cervix and fallopian tube
- An abnormality in the endometrium of the uterus, or malformation of the uterus
- Tumors in the reproductive tract
- Vaginal or cervical environment that is inhospitable to sperm motility or viability

Repeated pregnancy loss can be caused by an abnormality in fetal chromosomes that results in spontaneous abortion, abnormalities of the cervix or uterus, disorders of the endocrine or immune system, infections, or environmental factors such as toxic agents. Preconception counseling helps the couple evaluate problems or risks related to conception (see the Communication box).

There are many causes of infertility; some involve a problem in the woman, and some in the partner. Diagnostic tests include a detailed health history and laboratory tests such as serum prolactin levels and other endocrine evaluations, semen analysis, sperm antibody agglutination studies, and chromosome studies. Tests for tubal patency and other possible abnormalities in both the male and female reproductive tract may also be needed.

Communication

Emotional Impact of Infertility

The emotional impact of infertility is intense. Some couples become almost desperate to conceive. Be alert to evidence that psychological intervention may be needed to assist the couple to deal with the stress of their situation. Indications that a referral may be needed include, but are not limited

to, inability to focus on anything other than the desire to have a child and tension in the relationship of the couple, including blaming each other.

Nursing Management

Interventions nurses can discuss with patients regarding infertility may include nonmedical actions such as:

- Using water-soluble lubricants during intercourse, because these do not have spermicidal properties.
- Having the male partner avoid environments that cause high scrotal temperatures, such as saunas, which can reduce sperm production as well as the life span of the sperm.
- Using condoms when the woman has an elevated antisperm antibody level. After several months, condoms can be removed during the woman's fertile period.
- Stress management, nutrition counseling, and lifestyle analysis.

Interventions for infertility can also involve medical therapy such as the use of drugs that stimulate ovulation.

Complementary and Alternative Therapies

Herbal Products and Fertility

Because use of CAMs such as herbs and oils is common, women should be instructed that use of herbs and oils such as licorice root, wormwood, fennel, ephedra, goldenseal, flaxseed, pennyroyal, cascara, sage, and periwinkle should be avoided while trying to conceive and carry a pregnancy (Hoffman, 2015).

Herbal products that may be used to promote fertility include nettle leaves, dong quai, and red clover flowers. Vitamin E, calcium, and magnesium supplements have also been used. There is currently no scientific evidence that these herbal products are effective.

Assisted Reproduction

Assisted reproductive therapies (ARTs) are available but are associated with many ethical and legal issues, such as the risk for having a multifetal pregnancy, freezing embryos for later use, and the use of a surrogate mother. Donor eggs or donor sperm can be used, making future legal challenges for custody a possibility. It is now possible for a child to have five parents: sperm donor, egg donor, gestational surrogate, and the parents who will rear the child! Micromanipulation allows the removal of a single cell from an embryo for genetic analysis. Defective genes can be replaced. Success rates of ART vary, and the procedure is usually expensive and rarely covered by health insurance. **Box 38-2** lists some types of ART procedures.

Box 38-2

Examples of Assisted Reproductive Therapy (ART) Procedures

- *In vitro fertilization (IVF-ET)*: Woman's eggs are collected from the ovary, fertilized in a laboratory, and transferred into the uterus at the embryo stage of development.
- *Zygote intrafallopian transfer (ZIFT)*: After in vitro fertilization, the ovum is placed into the fallopian tube at the zygote stage of development.
- *Therapeutic donor insemination (TDI)*: A donor's sperm inseminates the female.
- *Intracytoplasmic sperm injection*: Injection of one live sperm directly into the mature egg.
- *Surrogate mother*: The surrogate mother can be inseminated with one partner's sperm or be implanted with an egg fertilized by one partner's sperm in vitro. The egg is transferred to the

uterus of the surrogate mother; she becomes a gestational carrier.

Menopause

Menopause is defined by the World Health Organization as the cessation of menses for 12 consecutive months because of a decrease in estrogen production. The **perimenopausal** or **climacteric period** is the time around the actual cessation of the menstrual cycle.

Signs and symptoms of the climacteric period and menopause include hot flashes (a sensation of warmth), hot flushes (a visible redness and moistness of the skin), and night sweats caused by vasomotor instability resulting from low estrogen levels. These symptoms usually decrease as the woman's body adjusts to the lower level of estrogen. Changes in the menstrual flow and menstrual irregularity require the woman to "be prepared" for an unexpected menstrual period. The aging process and the decrease in estrogen levels can cause thinning of the vaginal walls (**atrophy**) as well as dryness and itching of the vagina (**pruritus**). These changes may result in painful sexual relations (**dyspareunia**) and can also lead to increased susceptibility to infections, because the vaginal pH increases.

☒ Older Adult Care Points

The significant reduction in estrogen after menopause (about 80% less than during the reproductive years) causes a decrease in natural vaginal lubrication. Women may be prescribed vaginal creams containing estrogen to restore moisture and elasticity to vaginal tissues. Estrogen cream used as a lubricant for sexual intercourse is discouraged, because the cream may damage latex condoms, and other methods of birth control should be used until full menopause occurs. Nonmedicated lubricants should be used for this purpose if necessary. Studies have shown that the estrogen contained in some vaginal creams can be systemically absorbed; therefore they should be used with caution.

The psychological response to menopause has resulted in referring to that period as "the change in life" that can challenge some women's personal coping skills and require family support to maintain a sense of purpose in life. Other women feel a sense of freedom from the need for contraception or medication for cramping.

Western culture values youth and beauty, and the onset of menopause may be seen by some women as a loss of attractiveness and the first step to old age. In other cultural groups, the wisdom gained from life's experiences is valued. Nurses must understand the perceptions of the woman and the family before designing and implementing a teaching plan.

Health Risks of Menopause

The major health problems that occur at or after menopause include the development of osteoporosis and coronary heart disease.

Osteoporosis.

Osteoporosis is a decrease in bone mass that increases the risk for bone fractures. The decrease in estrogen that occurs during menopause slows bone growth, and therefore bone deteriorates and thins before new bone growth occurs. Estrogen also enables vitamin D to assist in calcium absorption in the intestine, and a decrease in estrogen is associated with a decrease in calcium, which is essential to healthy bone tissue. **Box 38-3** provides a list of some lifestyle activities that may increase the risk of developing osteoporosis. The drug denosumab (Prolia) is FDA approved for increasing bone density in the treatment of osteoporosis in menopausal women ([Hanley et al., 2012](#)).

☒ Older Adult Care Points

Older women who are on long-term estrogen replacement therapy are at increased risk for endometrial cancer and breast cancer; it is particularly important that these women have annual pelvic examinations and have regular breast cancer screenings.

Box 38-3

Lifestyle Activities that Increase Risk of Osteoporosis

- Inadequate lifetime intake of calcium and vitamin D prevents reaching peak bone mass by age 30
- **Smoking:** Decreases estrogen production
- **Excessive alcohol intake:** Interferes with calcium absorption and depresses new bone growth
- **Excessive caffeine, cola or soft drink intake:** Results in imbalanced calcium and phosphorus or demineralizes bone

The first signs of osteoporosis are loss of height, back pain, and the development of a **dowager's hump** in which vertebrae fail to support the upper body in an upright position ([Figure 38-4](#)). The ACOG Women's Health Care Physicians recommend bone density screening for menopausal women. [Chapter 32](#) discusses osteoporosis in detail.

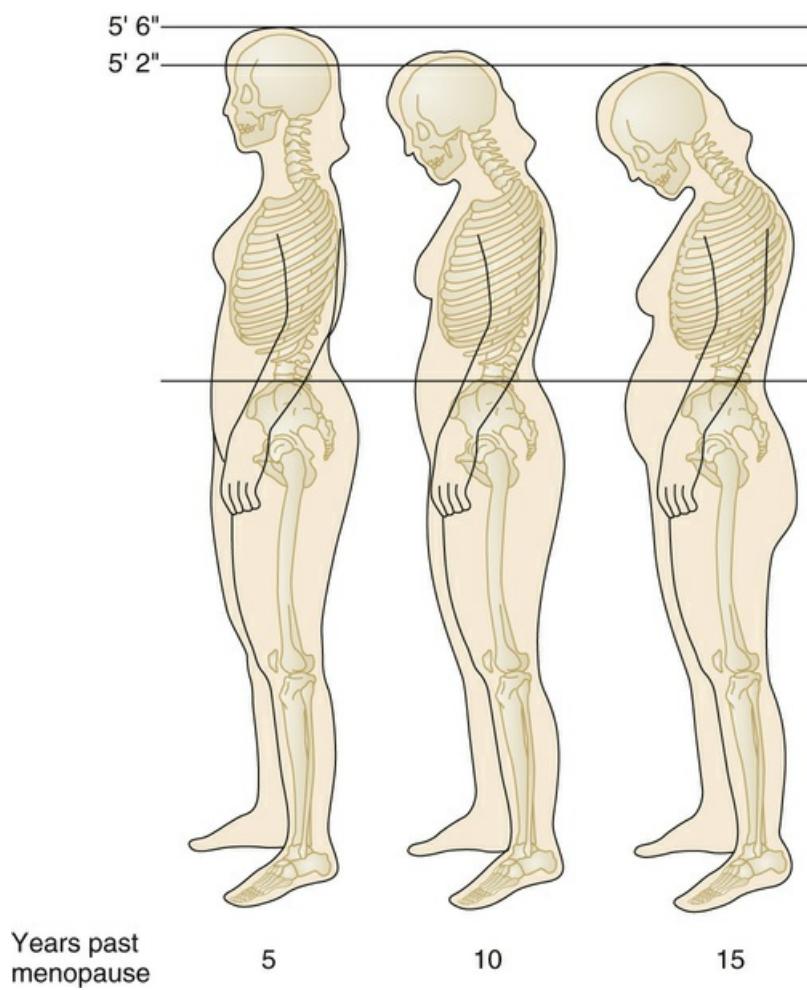


FIGURE 38-4 Osteoporosis. With progression of osteoporosis, the vertebral column collapses, causing loss of height and back pain. *Dowager's hump* is the term used for this curvature of the back.

Coronary heart disease.

Postmenopausal women are at increased risk for coronary heart disease because of changes in lipid metabolism and a rise in total cholesterol. Diet and exercise can help minimize the effects of these risks. See [Chapters 19](#) and [20](#) for details concerning cardiovascular diseases.

Treatment Options During Menopause

Hormone therapy.

Hormone replacement therapy (HRT) (with estrogen and/or progesterone) was once the cornerstone of interventions that reduced the discomforts of menopause (hot flashes and vaginal atrophy) and protected women from developing coronary heart disease and osteoporosis. Research has offered evidence that HRT can increase the risk of developing blood clots, stroke, and heart attack and even breast cancer. The ACOG recommends careful selection of patients for HRT and detailed education concerning risks of therapy. Current guidelines state that hormone therapy should be used by well-informed and well-monitored patients for menopausal symptoms only, at the lowest effective dose and shortest period of time ([Roush, 2012](#)). A combination of estrogen and bazedoxifene (Duavee) was approved in 2013 to treat vasomotor signs and symptoms associated with menopause and may prevent postmenopausal osteoporosis in women who still have their uterus in place ([Hester, 2013](#)).

Bioidentical hormones.

A bioidentical hormone such as oral estradiol, estradiol transdermal patches, or oral micronized progesterone (Prometrium) has a chemical structure identical to hormones produced in the human body but are clinically synthesized from steroid molecules taken from wild yam or soy. It differs from "natural hormones" such as conjugated equine hormone (Premarin), which comes from the urine of pregnant mares and has a chemical structure different from the human hormone.

Progesterone is a bioidentical hormone that has a different chemical structure from progestins. Both synthetic and bioidentical hormones interact with the same estrogen and progesterone receptors on target cells, but their physiologic side effects may differ. Bioidentical hormones are made (compounded) by individual pharmacies are not FDA regulated or approved. Bioidentical hormone drugs do not usually have package inserts. Nurses should be alert to research findings that involve "hormone therapy" and inquire whether the hormones researched are bioidentical or synthetic ([Food and Drug Administration, 2015](#)).

Minivelle, an estrogen-only transdermal patch, may be prescribed to treat vasomotor symptoms of menopause but may increase risk of dementia in women older than 65 years ([Liu and Minikin, 2013](#)).

Alternative therapies.

Some CAM therapies have been helpful in relieving specific discomforts of menopause. Homeopathy, acupuncture, and certain herbs may offer relief, but each may have contraindications as well. Herbal therapy has not been fully researched or regulated, and some side effects or interactions with food or drugs are possible. Phytoestrogens; soy products; and vitamins B, C, and E have also been helpful in relieving menopausal discomforts. Soy isoflavones have been found to be very effective in relieving vasomotor symptoms of menopause but depend on specific bowel flora for activation. Soy should not be used by women with estrogen-dependent cancers or women taking tamoxifen (Nolvadex) or aromatase inhibitors ([Glassy, 2014](#)). Medications such as alendronic acid (Fosamax) can be prescribed for women with osteoporosis, but side effects should be explained carefully. After taking alendronic acid, the woman must be able to sit upright for at least 30 minutes. Diet, physical exercise, yoga, and tai chi have remarkable value, and support groups are very effective in helping to manage menopause ([Glassy, 2014](#)).

Health Promotion

Using CAM Therapies for Menopause

Women should be encouraged to consult with a health care provider before using CAM therapies such as soy isoflavones, black cohosh, or other herbs. For some women with estrogen-dependent cancers, these substances may be contraindicated. Certain herbs may interact with other medications the patient is taking.

Nutritional Therapies

Managing Menopause

When phytoestrogens are recommended by the health care provider, teaching about these substances should be provided. Phytoestrogens are found in foods such as wild yams, cherries, dandelion greens, alfalfa sprouts, and black beans. Food sources of soy include tofu, soy milk, and roasted soy nuts.

Health Screening and Assessment

Health screening is a form of preventive care. **Primary prevention** is designed to decrease the probability of becoming ill, such as maintaining a health or nutrition history and providing immunizations. **Secondary prevention** is designed to focus on detection of specific diseases a patient is at risk for so that early treatment may be given (such as annual mammograms). **Tertiary prevention** minimizes the impact of an already diagnosed condition.

All adult women may be at risk for obesity, high cholesterol, high blood pressure, osteoporosis, and dental disease. Pregnant women or women planning pregnancy may be at risk for a folic acid deficiency that could result in a neural tube defect in the developing fetus; therefore, prenatal vitamins, including folic acid supplements, may be prescribed.

Health screening begins with the woman's visit to her health care provider. It is your responsibility to introduce yourself, ask pertinent questions, and document all information gathered. This phase is called *collection of data*. The data collected identify the patient and summarize her personal health history, the community in which she lives, and her available support system. Some information concerning the woman's culture, lifestyle, and usual coping mechanisms will enable the design of an individualized plan of care. All data collection should include information regarding use of nonprescription as well as prescription medications and CAM therapy.

Breast Self-Examination

Breast self-examination (BSE) is optional and may be done monthly, about 1 week after menstruation begins, or on a specific date each month after menopause. Research indicates that women examine their breasts effectively whether or not they have been taught by a professional, and intensive BSE instruction is unlikely to reduce mortality from breast cancer (Thomas et al, 2002). Mammography and magnetic resonance imaging (MRI) for women at high risk are the other current screening tests. Tomosynthesis (three-dimensional mammography) is the newest form of mammography. Testing for *BRCA1* and *BRCA2* gene mutations is performed on patients who have a high familial risk of breast cancer.

Other tests for breast cancer currently being researched include thermography and tissue sampling (National Cancer Institute, 2015).

Clinical Cues

If a woman is reluctant to have a mammogram recommended by her provider because she has previously experienced a fair amount of discomfort during the procedure, suggest that she take some acetaminophen an hour before the scheduled test (unless contraindicated). Also discuss the benefits of discovering breast cancer early versus the few minutes of breast discomfort from the compression of the machine.

Vulvar Self-Examination

Many women are unaware of the importance of vulvar self-examination (VSE). Although serious lesions in this area are less common than in the breast, early detection allows for rapid and often minimally invasive treatment. Delay in detection can lead to severe surgical disfigurement and even death. VSE should be performed monthly. It usually is done in a sitting position. One hand is used to hold a mirror, the other to separate the labia and expose the area surrounding the vagina. Using both touch (to palpate for lumps or thickening beneath the skin) and visualization, the self-examination begins at the top of the mons pubis and works downward to the clitoris, the labia

majora, the labia minora, the perineum, and finally the area around the anus. The woman should note any changes and report them to her health care provider. These include new moles, warts, or growths; new areas of pigmentation, especially white, red, or dark skin areas; ulcers or sores; and areas of continuing pain, inflammation, or itching. Most of these findings will not be malignancies and will require little, if any, treatment. Treatment of malignancies that have been detected early is typically relatively easy and can prevent deformative surgeries such as **vulvectomy** (excision of the vulva) and prevent **metastasis** (spread of a malignancy to other areas of the body).

Diagnostic Tests

The nurse often is asked to assist with various diagnostic tests. Providing the woman with a clear explanation of what will be done and what she can do to minimize discomfort is essential. A consent may be required with certain procedures, and the nurse is responsible for ensuring that the health care provider has obtained an informed consent. All questions should be answered clearly and accurately before the procedure has started. **Table 38-3** describes common gynecologic diagnostic tests.

Table 38-3
Common Gynecologic Diagnostic Tests and Diagnostic Procedures

PURPOSE	DESCRIPTION	NURSING IMPLICATIONS	
Pelvic Examination	Equipment: Gloves, vaginal speculum, lubricant, light, table with stirrups. Process: Inspection via the vaginal speculum; manual palpation through abdominal wall, vaginally, and rectally of internal organs.	Some discomfort during examination (decreased or eliminated if the patient remains fully relaxed). Nurse to ensure that patient is appropriately draped and correctly positioned in the stirrups. Examination time is usually 5-10 min.	
Pap Smear, Thin Prep	Equipment: Sterile specimen collection equipment. Process: Exudate, mucus, and cells obtained from surface of cervix with sterile swab or scraping tool and placed on laboratory slide or into preservative solution for pathology evaluation.	Cultures and smears of the cervix may cause mild bleeding and cramping.	
Endometrial Biopsy	To determine cause of postmenopausal bleeding, menstrual difficulties, infertility workup. Equipment: Same as pelvic examination plus suction biopsy apparatus. Process: A suction biopsy of the endometrium is performed via the cervical opening.	Severe cramping may occur during procedure. Patient is usually premedicated. Normally some vaginal bleeding follows; flow should not be heavy.	
Colposcopy	Endoscopic examination of the vagina and cervix to evaluate abnormal cells and lesions, particularly after a positive Pap smear. Equipment: Same as pelvic examination plus colposcope. Process: Area is visualized through the scope, with photos and possible biopsies of lesions requiring further study.	Patient is positioned as for pelvic examination. Procedure takes a few minutes. Biopsy may cause a small amount of bleeding and minor cramping. No tampons should be used until healing has occurred.	
Hysteroscopy	Endoscopic examination of the interior of the uterus; may also involve procedures such as biopsy or removal of fibroids, adhesions, and septums. Endometrial laser ablation (destruction of areas within uterine lining) may also be performed.	Equipment: Hysteroscope is inserted vaginally, usually under local anesthesia. May also be done in combination with laparoscopy. Process: Hysteroscopy is done in operating room. The cervix is dilated and the interior of the uterus is cleansed by scraping, suction, or both.	Occasional injury to cervix or uterine wall. If endometrial ablation is done, the woman will have difficulty becoming pregnant, because the lining destruction is permanent.
Dilation and Evacuation (D&E)	To detect cause of excessive bleeding; to remove hypertrophied uterine lining, retained placenta, or tissue remaining from incomplete abortion.	Equipment: Done in operating room. Process: The cervix is dilated and the interior of the uterus is cleansed by scraping, suction, or both.	Mild cramping and bleeding for up to 1 wk. Next period may be either early or late. Complications include uterine perforation, excessive bleeding, infection. Instruct patient to report heavy bleeding, clotting, sharp/severe abdominal pain, abnormal or foul discharge.
Mammography (see Chapter 8)	To screen the breasts for abnormal growths, particularly cancer.	Equipment: Done in the radiology department with special radiographic equipment. Process: A full-field digital mammography machine records images on a computer screen and can computer-enhance questionable images for increased accuracy.	Breast discomfort from compression of the tissue during the test; occasional mild bruising. Instruct patient to wear no deodorant or lotion on the upper body and to wear clothing that allows top to be easily removed.
Hysterosalpingography	To detect uterine tumors, adhesions, or developmental anomalies; detect tubal obstruction preventing ova from reaching uterus.	Patient is placed in the lithotomy position on fluoroscopy table with a speculum in the vagina. Contrast media is injected through the cervix. Fluoroscopy is performed and radiographs are taken.	Have patient void before the procedure. Vaginal discharge may occur for 1-2 days after the test and may be bloody. Instruct patient to report fever, pain, or other signs of infection.
Ultrasound (Sonogram)	Pregnancy: To determine gestation; screen for birth defects or placental abnormalities. Gynecology: To determine presence, location, and size of abdominal mass; determine whether a mass is <i>cystic</i> (fluid filled) or solid; locate intrauterine device; monitor ovulation in infertility.	Equipment: Ultrasound machine. Process: Sound wave transducer emits inaudible sound waves that record interior structures on the ultrasound screen. A video recording is made so results can be restudied and evaluated. A “picture” of the fetus may be provided to the parents.	Some tests require a full bladder, which may be uncomfortable during the test. The nurse should assist the woman to immediately empty her bladder after the examination. Skin should be clean, dry, and free of lotions or powder. During pregnancy, two or more ultrasound examinations may be required. The use of independent three- or four-dimensional ultrasound procedures for purposes of providing mementos to parents is not recommended, because the long-term effects of the extra energy used in these examinations on the fetus has not been researched.
Pelvic/Vaginal Ultrasound	To detect thickness of uterine lining, size of uterus, presence of fibroids; size of ovaries; and presence of cysts or tumor.	Process: Ultrasound transducer is passed over pelvic area or the transducer is inserted into the vagina and guided over areas of the surface.	Advise that there will be minor discomfort if vaginal transducer is used.
Breast Ultrasound	To differentiate benign tumor from malignant tumor. Useful in women with dense breast tissue and fibrocytic disease.	Process: A noninvasive painless procedure.	An ultrasound will not detect microcalcifications that a mammogram can detect.
PET Scan	To stage breast cancer and detect skeletal lesions.	Process: Performed in radiotherapy unit.	—
Breast MRI	Used for women with dense breast tissue.	Process: Images are taken with an MRI machine.	Premedication to lessen anxiety for women with claustrophobia may be advised. Patient must not wear metal during test.
Breast Biopsy			

To diagnose breast cancer. Usually performed when a suspicious breast lump is detected.	<i>Process:</i> A needle aspiration can be done on an outpatient basis under local anesthesia. An incisional biopsy can be done in a same-day surgery setting under local or general anesthesia. All removed tissue or fluid is sent to laboratory for analysis.	Check incision for bleeding. Encourage verbalization of fears. Schedule follow-up appointment for results of laboratory studies.
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MRI, Magnetic resonance imaging; *Pap*, Papanicolaou; *PET*, positron-emission tomography.

The Pelvic Examination

Assemble the equipment and directs the woman to take deep breaths and relax all muscles during exhalation (**Box 38-4**). The woman can be instructed to bear down as the speculum is being inserted. The speculum is gently placed into the vagina by the health care provider. The blades are then opened to view the cervix. Specimens may be collected for laboratory examination. A Pap test may be obtained to determine the presence of abnormal cells (see Skill 38-1, Assisting With a Pelvic Examination and Pap Test, on the Evolve® website). After the examination, assist the woman to a sitting, then a standing position. Disposable tissues may be provided to wipe lubricant from the perineum. The patient usually dresses and returns to speak with the health care provider. Teaching may include the purpose of the tests performed and the need for routine checkups and Pap test every 3 years from ages 21 to 29, with human papillomavirus (HPV) testing every 5 years thereafter until age 65 (Smith et al, 2014).

Clinical Cues

Talking to the patient and holding her hand, if possible, during the examination aids with distraction and enhances relaxation.

Older Adult Care Points

Older women may feel that they no longer need regular mammograms and Pap smears, particularly if they are not sexually active. The American Cancer Society (2015) recommends screening mammography continue every 1 to 2 years for as long as the woman is in good health. Mammogram screening may be traumatic to much older women, and benefits are unclear for patients in this age group who are fragile and in poor health (Centers for Disease Control and Prevention, 2014b).

Box 38-4

Preparing a Woman for a Pelvic Examination

- The unit should provide privacy and good lighting.
- Assemble clean gloves and supplies.
- Orient the patient to the equipment and the purpose of the examination.
- Encourage the woman to void, because a full bladder will make the examination more uncomfortable.
- Position and drape the patient appropriately.
- **Lithotomy**
- **Side-lying**
- **Knee-chest**
- Stay with the woman, encouraging her with information to promote comfort.

Nursing Management

Assessment (Data Collection)

Collect essential data regarding the patient's reproductive history and gynecologic concerns. This can be difficult for both the patient and the nurse, because it involves discussing intimate aspects of the patient's body and personal life. Collecting data concerning sexual health and sexual practices is an important part of routine data collection. Sexual health information should include the "5 Ps": Partners; Practices; Protection from STIs; Past history of STIs; and Prevention of pregnancy (Pessagno, 2013). Also record information on the cultural beliefs and attitudes regarding sexuality and sexual identity, reproduction, and body image, all of which affect the assessment process. Ask questions in a tactful yet matter-of-fact manner and appreciate that the patient has the right to choose not to answer. A symptom diary can be very helpful. Note patterns of coping and available support persons.

Focused Assessment

Data Collection for Gynecologic History

Sample questions when collecting data from a patient with a gynecologic problem include:

- How old were you when you began menstruating?
- Are your periods regular? How often do they occur? How long do they last?
- How heavy is your flow? Do you ever pass clots or pieces of tissue? Do you have pain before or during your period?
- Do you have cramps, headaches, or abdominal or back pain at other times of the month?
- Do you have mood swings, depression, or periods of tearfulness associated with your menstrual cycle?
- Are you having any vaginal discharge or itching?
- Do you have bleeding or spotting between your periods?
- Do you have any problems urinating, including burning, pain, or incontinence?
- How many times have you been pregnant?
- Have you had any miscarriages?
- Have you ever had a pelvic infection?
- Do you perform breast and vulvar self-examination?
- When was your last Pap smear?
- When was your last mammogram?
- Are you taking any medications routinely?
- Are you currently using any method of birth control, and if so, which method?
- Do you feel comfortable with your method or have a desire to change methods?
- Do you have any specific concerns or questions that we have not talked about?

Cultural Considerations

Culture and Women's Health

Cultural considerations can be particularly significant in the area of women's health care. Cultural views regarding sexuality, reproduction, and the role of women in society will have a direct bearing on the type of care sought and the amount and type of information the woman is willing and able to provide. The nurse must not pass judgment based on her own cultural bias, but must be culturally sensitive and supportive to the needs of women from diverse cultural backgrounds.

■ Nursing Diagnosis

Problem statements commonly associated with gynecologic disorders include:

- Altered activity tolerance due to anemia from excessive blood loss, weakness, or disabling discomfort.
- Fluid volume excess due to premenstrual fluid retention.
- Altered skin integrity due to pruritus, genital lesions, and vaginal discharge.
- Pain due to menstrual cycle, decreased vaginal lubrication, or vaginal irritation.
- Altered sexual function dysfunction due to dyspareunia (painful intercourse) or emotional issues.
- Altered coping ability due to negative attitude about human sexuality or menstruation.
- Altered body image due to surgery, fear of mutilating surgery, and loss of femininity.
- Insufficient knowledge about practices of personal feminine hygiene, normal anatomy and physiology of the female reproductive organs, or safe methods of contraception.
- Altered self-esteem related to sterility, menopause, or surgery on a reproductive organ.

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Expected goals or outcomes include:

- Patient uses energy conservation techniques while maintaining activity levels within capabilities.
- Patient maintains adequate fluid volume with appropriate management techniques.
- Skin remains intact with healing of existing wounds.
- Patient verbalizes an acceptable level of pain relief and ability to engage in normal activities.
- Patient expresses satisfaction with physical intimacy patterns and experience.
- Patient develops improved method of communication, problem-solving techniques, and positive attitude to enable effective coping with signs and symptoms.
- Patient evidences enhanced body image and self-esteem with ability to accept altered body part or function.
- Patient demonstrates motivation to learn and verbalizes understanding of female hygiene and safe sex practices.
- Patient recognizes and accepts positive aspects of self.

■ Planning

Planning the care of a patient with a gynecologic problem depends on the specific disorder. However, prevention of infection, effective patient education, and emotional support are appropriate goals for the plan of care for all patients with a gynecologic problem. The needs of a patient who will have gynecologic surgery would include pain management, education regarding the procedure and follow-up care, infection prevention, and supportive care specific to the procedure. A woman who will lose the ability to bear children because of an early hysterectomy may have very different supportive needs from those of a postmenopausal woman undergoing the same procedure. Surgery for breast cancer brings fears of a major change in body image and the possibility of death if the disease is not controlled. These issues need to be addressed in the plan of care. The plan for a patient with an infection would include an appropriate medication schedule, monitoring for effectiveness of treatment (e.g., fever, swelling, pain resolving), and monitoring for signs of an allergic response to the prescribed antimicrobial agent.

In the clinic setting, women may be attending for annual visits, reproductive or contraceptive counseling, treatment of infections or STIs, prenatal and postnatal care, and a variety of other reasons. If the facility uses standardized care plans as a reference, they must be adapted to express the needs of the individual patient. Such plans are commonly used in hospitals, clinics, and other health care facilities.

The plan of care must address education, pain management needs, emotional and physical care,

family impact, cultural influences, and financial constraints. Specific goals of care for any patient are based on nursing observation and assessment, prescriptions for medication and therapies, the patient's personal desires and goals, and input from other members of the health care team. The patient should agree to the goals, and they must be clearly communicated to other care providers through well-written care plans and documentation, as well as team conferences when appropriate. [Nursing Care Plan 38-1](#) presents one example of a nursing care plan for a woman having a hysterectomy.

Nursing Care Plan 38-1

Care of a Patient After Hysterectomy

Scenario

Marilyn Blair, age 52 years, has just returned to the unit after abdominal hysterectomy for multiple fibroids, metrorrhagia, and greatly increased uterine size that caused abdominal pain. She has an IV infusion of 1000 mL normal saline in the left forearm, an indwelling urinary catheter, an abdominal dressing, and patient-controlled analgesia (PCA) pump containing morphine. Her vital signs are BP 138/82; P 86; R 16; T 98.2° F (36.8° C).

Problem Statement/Nursing Diagnosis

Pain/Pain related to abdominal surgery.

Supporting Assessment Data

Subjective: Pain at 7/10 on pain scale: "It hurts to turn."

Objective: Abdominal hysterectomy incision.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Pain will be controlled by prescribed analgesics, with no episodes of acute pain.	Instruct her in use of PCA pump. Give booster medication as prescribed if needed.	When patient feels in control, anxiety is reduced and less pain medication may be required.	Analgesia via PCA pump provides good relief.
	Assess location, type, and quality of pain q3-4h using a pain scale.	Assessing location and quality of pain may alert nurse to developing complications.	Pain at 3-5 on pain scale.
	Assist with repositioning and support with pillows to attain comfort. Provide quiet, darkened atmosphere for rest and sleep.	Changing position prevents stasis of circulation; comfortable, supported position promotes relaxation.	Assisted to reposition q2h. Sleeping long intervals on side with pillow behind back and between knees for comfort.
	Monitor for side effects of analgesics, especially respiratory rate. Administer antiemetic as prescribed at first signs of nausea to prevent vomiting and further pain.	Morphine can depress respiratory rate.	Respirations 18. No nausea or emesis.
	Check Foley catheter and tubing for patency frequently to prevent bladder distention.	Bladder distention can increase pain and cause infection from stasis of urine in bladder.	Bladder not distended, Foley draining clear urine. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for fluid volume loss/Risk for deficient fluid volume related to potential hemorrhage.

Supporting Assessment Data

Objective: Abdominal hysterectomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Vital signs (VS) will remain stable; no signs of shock or hemorrhage.	Monitor VS frequently per postoperative protocol routine.	A rapid pulse and falling blood pressure can indicate development of shock.	VS are at baseline: BP 118/68; P 84; R 16.
	Check abdominal dressing and beneath patient for signs of bleeding with each set of VS; assess for bleeding from vaginal area.	Gravity can cause fluids to drain to a point beneath the patient.	Abdominal dressing clean and dry; no visible vaginal drainage.
	Assess for signs of intra-abdominal bleeding, such as increasing abdominal girth, decreasing bowel sounds, and increasing abdominal pain and rigidity.	Intra-abdominal bleeding is a complication of abdominal hysterectomy.	Abdomen soft; bowel sounds have returned; no evidence of intra-abdominal bleeding. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for altered breathing pattern/Risk for ineffective breathing pattern related to pain.

Supporting Assessment Data

Subjective: "It hurts to take a deep breath."

Objective: Abdominal hysterectomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have no signs of atelectasis or pneumonia as evidenced by clear breath sounds in all lung fields and afebrile status.	Assist patient to use an incentive spirometer, sit up to deep breathe, and cough q2h while awake; give small pillow and instruct her on how to splint incision before coughing.	Cough and deep-breathing exercises can prevent development of atelectasis. Pain can prevent patient from taking deep breaths.	Able to deep-breathe and cough at 8 and 10 A.M. and 12 and 2 P.M. Sitting on side of bed q2h while awake.
	Enlist aid of family or significant others in reminding patient to deep breathe.	Others can provide encouragement and support.	Family helping and reminding patient to do breathing exercises.
	Report adventitious, diminished, or absent breath sounds or crackles.	Abnormal breath sounds can be sign of developing complications.	Lung sounds clear bilaterally; all VS are WNL; T 98.0° F (36.7° C). Continue plan.

Problem Statement/Nursing Diagnosis

Potential for infection/*Risk for infection related to surgery.*

Supporting Assessment Data

Objective: Abdominal surgical incision.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will be without signs and symptoms of infection at discharge.	Administer prophylactic antibiotics as prescribed.	Antibiotics kill pathogens.	Tolerating prescribed medications.
	Monitor incision for signs of redness, swelling, purulent drainage, or hardness.	Redness, swelling, drainage, and pain at incision site may be signs of infection.	No incisional redness, swelling, hardness, or purulent drainage.
	Keep dressing clean and dry. Use careful aseptic technique when changing dressings.	A wound dressing must be kept clean and dry to prevent contamination that can cause infection.	Dressing clean and dry.
	Monitor WBC count and temperature.	—	WBC count WNL; afebrile.
	Assess vaginal drainage for signs of odor or change in character.	Odor or purulent appearance of vaginal drainage may indicate infection.	Vaginal drainage is minimal and without odor.
	Assess abdomen for signs of infection, increasing pain, localized tenderness, swelling, increased erythema (redness) around wound edges, decreased bowel sounds.	Tenderness, swelling, increased erythema, and decreased bowel sounds are signs of intra-abdominal infection.	Abdomen soft, active bowel sounds; no signs or symptoms of infection. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to possibility of thrombophlebitis from bed rest and abdominopelvic surgery.*

Supporting Assessment Data

Objective: Abdominal hysterectomy and decreased activity level.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not exhibit signs of thrombophlebitis at time of discharge.	Encourage ambulation as soon as it is ordered; explain benefits of walking. Assist with leg and ankle exercises q2h.	Range-of-motion exercise and early ambulation can prevent the development of thrombus formation. Leg exercises increase circulation and prevent blood pooling.	Leg and ankle exercises q2h while awake, and is tolerating ambulation.
	Monitor SCDS every shift.	SCDS prevent pooling.	SCDS functioning properly.
	Encourage added fluid intake as soon as diet order allows.	Extra liquids keeps blood more fluid and less likely to clot.	Presently NPO with IV fluids.
	Inspect lower legs every shift; check for positive Homans sign.	A positive Homans sign may indicate development of thrombophlebitis.	Homans sign negative. Continue plan.

Problem STATEMENT/Nursing Diagnosis

Altered body image/*Disturbed body image related to removal of uterus.*

Supporting Assessment Data

Subjective: "I wonder how this will affect my husband's view of me."

Objective: Abdominal hysterectomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will express her concerns over loss of uterus before discharge. Patient will accept new body image within 3 mo as evidenced by lack of depression and reinvestment in usual activities.	Provide openings for conversation regarding patient's concerns over loss of her uterus and its meaning to her. Explore her feelings regarding sexuality after hysterectomy. Encourage expression of positive aspects of having the hysterectomy and how she as a person is unchanged.	Enabling patient to verbalize and express concerns will make it possible to establish a patient-centered plan of care and teaching.	Patient is able to begin discussion about her concerns; will continue tomorrow. Continue plan.

Critical Thinking Questions

- After the abdominal hysterectomy, Mrs. Blair appears depressed and states she is worried her marital relations will "never be the same." What is the best response of the nurse?
- Aside from an abdominal hysterectomy, what other options for the treatment of uterine fibroids are available?

BP, Blood pressure; *IV*, intravenous; *NPO*, nothing by mouth; *P*, pulse; *R*, respirations; *SCD*, sequential compression device; *T*, temperature; *VS*, vital signs; *WBC*, white blood cell; *WNL*, within normal limits.

■ Implementation

The patient's needs must always be addressed when implementing various aspects of the plan of care. Table 38-4 contains detailed information on various types of surgical procedures that are used for different gynecologic problems. Education must be done in a manner appropriate to the patient's knowledge base and her ability to learn new information. Patient teaching should be an important aspect of each nursing contact.

Table 38-4
Gynecologic Surgical Procedures

REASONS FOR PERFORMING	DESCRIPTION	NURSING CARE AND TEACHING POINTS
Dilation and Evacuation (D&E)		
Excessive vaginal bleeding; incomplete abortion; removal of placental fragments; therapeutic abortion.	Scraping away the inner lining of the uterus (endometrium) via the cervix.	Observe for excessive bleeding postoperatively.
Conization or Conical Excision		
To remove abnormal or early cancerous tissue; biopsy.	Removal of cone of tissue with scalpel or electrical cutting wire.	Office procedure. May cause some bleeding.
Fistulectomy		
Presence of rectovaginal fistula (channel between rectum and vagina) or urethrovaginal fistula (channel between bladder and vagina).	Surgical excision of the fistula and repair of the tissue to prevent passage of urine or feces into the vagina.	Observe for excessive bleeding or for vaginal fecal drainage postoperatively.
Hysterectomy		
Prolapse of pelvic organs; pain associated with pelvic congestion; endometriosis; excessive/debilitating uterine bleeding; fibroids; noninvasive uterine or cervical cancer.	Removal of entire uterus, vaginally or abdominally (open, or robotic).	Observe for excessive bleeding; paralytic ileus can occur. Ends childbearing if premenopausal, which may have profound emotional effects.
Pan hysterectomy		
Cancer; pain associated with pelvic inflammatory disease; recurrent ovarian cysts.	Removal of entire uterus, fallopian tubes, and ovaries.	See hysterectomy. Removal of ovaries induces menopause in premenopausal women.
Radical Hysterectomy		
Invasive cancer.	Removal of uterus, tubes, ovaries, upper third of vagina, and lymph nodes.	See hysterectomy and panhysterectomy. Vaginal alteration may affect ability to have sexual intercourse. Possible lymphedema from removal of nodes.
Anterior and Posterior Colporrhaphy		
Presence of prolapse of bladder and rectum into the vagina; may accompany a uterine prolapse.	Repair of the anterior and posterior wall of the vagina.	Observe for excessive bleeding.
Salpingectomy		
Tubal pregnancy; tumor; traumatic injury.	Removal of a fallopian tube.	Will not cause infertility if other tube/ovary is intact.
Oophorectomy		
Tumor; cystic disease; endometriosis; traumatic injury; severe hormonal disorder.	Removal of an ovary.	See salpingectomy. Only a portion of one ovary is necessary to provide normal hormonal balance before menopause.
Vulvectomy/Endoscopic Laparoscopy		
Malignancy.	Radical vulvectomy: surgical excision of the labia, clitoris, perineal structures, femoral and inguinal lymphatic tissues.	Major disfigurement; extreme supportive measures, including professional counseling, often required.

■ Evaluation

Any nursing intervention requires evaluation of its effectiveness. This can be accomplished by asking the following questions: How effective were pain control measures? How is the patient tolerating the change in diet or new therapy? Have there been any adverse reactions to medications or treatments? A decision to continue the plan of care or revise the plan of care is the outcome of evaluation.

Disorders of the Female Reproductive Tract

Pelvic Relaxation Syndrome (Cystocele, Rectocele, Enterocoele, and Uterine Prolapse)

When the muscles, ligaments, and fascia that support the pelvic floor weaken, the pelvic organs may descend toward the vaginal orifice. It can affect the bladder (**cystocele**), rectum (**rectocele**), bowel (**enterocele**), or uterus (uterine prolapse).

Etiology and Pathophysiology

Because the lack of estrogen results in weakening of tissue structures, pelvic relaxation syndrome is more likely to occur as women age. The bladder protrudes through the vaginal wall, forming a cystocele, or into the rectum, forming a rectocele. As expected life span increases, these problems have increased in frequency. Heavy lifting, constipation, and obesity contribute to the weakening of the pelvic floor muscles and tissues. Pelvic surgery and the strain of vaginal childbirth may also contribute to the development of pelvic relaxation syndrome.

Signs and Symptoms

Symptoms relate to the specific organs involved. In a cystocele, urinary frequency or incontinence is most common. A rectocele may result in constipation, soiling, or painful defecation. A uterine prolapse may result in dyspareunia. The uterus may protrude from the vaginal orifice. The woman often complains of general symptoms that include a sense of fullness in the pelvis and backache. **Stress incontinence** (loss of small amount of urine during coughing, sneezing, or lifting objects) may occur.

Diagnosis

Diagnosis is confirmed by history and physical examination. Obtain an obstetric history concerning the number of vaginal deliveries and the size of the infants, which may have contributed to the problem. A history of stress incontinence or constipation may indicate how the problem may interfere with activities of daily living. A computed tomography scan may be required if other pelvic pathology is suspected. The patient and the health care provider determine whether a nonsurgical or surgical approach to management is most appropriate.

Treatment and Nursing Management

Nonsurgical management.

Nonsurgical management includes teaching the woman how to perform Kegel exercises to strengthen the pubococcygeal muscles that support the pelvic floor (refer to [Chapter 33 Patient Teaching on p. 780](#)).

Lifestyle changes include increasing fluid intake and a high-fiber diet to prevent constipation and heavy lifting and maintaining an optimal weight. Hormone therapy may be prescribed. A **pessary** (a hard rubber or plastic ring) can be fitted into the vagina by the health care provider to provide support to the pelvic structures.

Complementary and Alternative Therapies

Biofeedback and Transcutaneous Electrical Nerve Stimulation

Biofeedback and transcutaneous electrical nerve stimulation (TENS) may be performed by a licensed provider to help strengthen the pelvic floor muscles.

Surgical management.

The procedure to repair a cystocele or rectocele is called an *anteroposterior repair (colporrhaphy)*. A **hysterectomy** (removal of the uterus) may be indicated.

The management of pelvic prolapse includes minimally invasive surgery. Surgical repair may be accomplished laparoscopically, abdominally, or transvaginally. The use of some mesh materials such as vicryl or allogenic materials have not shown to improve the surgical outcome.

Research is continuing concerning the use of synthetic polypropylene mesh with large pore size that decreases the chance of complications such as mesh infection and erosion (Delroy, 2013). Decreased operation time and rapid recovery time have been noted with the use of collagen-coated transvaginal mesh (Rudnicki, 2014). Postoperatively monitor bowel and bladder patency. Residual urine may be measured via catheterization after voiding. Routine postoperative pain management is provided. Refer to Chapter 34 for treatments for urinary incontinence.

Polycystic Ovarian Syndrome

Polycystic ovarian syndrome is a congenital condition in which many cysts develop on one or both ovaries and produce excess estrogen. High levels of testosterone and LH and low levels of FSH occur. Signs and symptoms include irregular menstruation, infertility, hyperinsulinemia, and glucose tolerance problems. Excessive hair on the body (**hirsutism**) is common.

Treatment involves use of OCs to inhibit LH and testosterone production. Surgical removal of the cysts may be indicated. If pregnancy is desired, ovulation-stimulating medications are prescribed. Advise the patient concerning the importance of follow-up care to monitor the progress of this condition.

Dysfunctional Uterine Bleeding

Dysfunctional uterine bleeding is uterine bleeding that occurs at times other than the normal menstrual cycle or abnormal bleeding during menstruation. Uterine bleeding may be considered abnormal if the interval between menstruations is less than 21 days or more than 45 days, the duration of menstrual flow is more than 7 days, or the amount of blood loss exceeds 80 mL.

Oligomenorrhea (decreased menstruation) usually refers to menstrual periods that occur at an interval of 45 days or longer. The cause often involves a problem with the hypothalamus, the pituitary gland, or ovarian function. Hormone therapy is the treatment of choice, and the woman should be educated concerning advantages and disadvantages of hormone therapy. The use of OCs can decrease menstrual flow. Structural abnormalities can cause obstructions or destruction of the endometrium, resulting in oligomenorrhea. The woman should be taught to keep close records of her menstrual cycle and associated symptoms.

Amenorrhea means absent menstruation. *Primary amenorrhea* refers to women who have not had a normal onset of menstrual periods (they never started to menstruate). *Secondary amenorrhea* applies to women who began normal menses that later ceased. Some causes can include anatomic defects such as **imperforate** (closed) hymen, an endocrine dysfunction affecting female hormones, chronic disease, extreme weight loss or obesity, emotional disturbances, drug side effect, excessive exercise, or poor nutrition. Amenorrhea is a normal occurrence during pregnancy. Goals of treatment include progression of normal pubertal development; prevention of complications such as osteoporosis, endometrial hyperplasia, or heart disease; and promotion of fertility.

Metrorrhagia is bleeding between menstrual periods. Occasionally, a brief episode of "spotting" occurs 14 days before the expected menstrual period (corresponding to the time of ovulation). This is known as "mittle staining" and is considered normal. Women who take OCs or have an IUD may have bleeding between menstrual periods, which is termed *breakthrough bleeding*. The problem is usually resolved by adjustment of the medication or dosage. Causes of abnormal metrorrhagia include leiomyomas, uterine polyps, trauma, foreign body, malignancy, infection, or an interrupted pregnancy. The treatment depends on the cause. Nursing responsibilities include providing reassurance, support, and education.

Menorrhagia is excessive menstrual bleeding or duration of the menstrual period. There are many causes, including hormone imbalances, malignancies, fibroids, infections, and the use of some drugs. One cause of heavy menstrual bleeding is von Willebrand disease, which is caused by a chromosome factor VIII dysfunction. Symptoms often include frequent nosebleeds and delayed postpartum hemorrhage. Blood tests should be taken during menstruation for accurate diagnosis. Treatment of menorrhagia depends on the cause. The hemoglobin and hematocrit should always be assessed to determine the seriousness of the blood loss. In 2010 the FDA approved a nonhormonal treatment of menorrhagia with the drug tranexamic acid (Lysteda). This oral medication works by

reducing clot breakdown in the uterus. Tranexamic acid should not be used with oral contraceptives, because the risk for thrombus formation or stroke increases with the combination ([Drugs.com 2014](#)). Nursing interventions include education concerning follow-up care, an iron-rich diet, and information concerning treatment options available.

Abnormal Uterine Bleeding

Abnormal uterine bleeding is defined as uterine bleeding not related to the menstrual period. It is often caused by anovulation and a failure of hormonal changes during the menstrual cycle. It most often occurs at the beginning (menarche) or end (menopause) of the reproductive years. Bleeding from continuous estrogen production can also occur as a result of thyroid dysfunction, polycystic ovarian disease, infection, trauma, or neoplasm. Use of some herbal products that promote estrogen activity can also cause dysfunctional or abnormal uterine bleeding.

Older Adult Care Points

Vaginal bleeding in postmenopausal women is a possible warning sign of cervical or uterine cancer. An immediate pelvic examination to determine and treat the cause of such bleeding is advised. The incidence of these cancers increases with age.

Monitoring the hemoglobin and hematocrit is essential, and hospitalization may be required if the hemoglobin falls below 8 g/100 mL. Severe bleeding may be treated with intravenous conjugated estrogens (Premarin) until bleeding stops or slows significantly. A dilation and evacuation (formerly known as a *dilation and curettage*) and endometrial biopsy may be required. The woman may be given OCs for 3 to 6 months, after which the bleeding pattern will be reassessed.

Persistent **anovulation** (failure to ovulate) with continuous estrogen stimulation of the endometrium can cause abnormal tissue changes in the uterus. Nursing interventions include educating the patient concerning the use of unsupervised CAM therapies and proper use of OCs, providing support during treatments, and ensuring that the patient is aware of treatment options.

Leiomyoma

Commonly known as uterine **fibroids**, leiomyomas are benign tumors of the uterine muscle. Their growth is influenced by ovarian hormones, and they are common in women taking birth control pills. They spontaneously shrink during and after menopause. Common symptoms include backache, a sense of lower abdominal pressure, constipation, urinary frequency or incontinence, and abnormal uterine bleeding. A pelvic examination and ultrasound may help confirm the diagnosis.

Medical management depends on the size and location of the fibroids, the symptoms experienced, the desire for future pregnancies, and how near the woman is to natural menopause. In mild cases, monitoring and supportive care to relieve symptoms are indicated. Nonsteroidal anti-inflammatory drugs or OCs may be prescribed. In severe cases, leuprolide (Lupron) or nafarelin (Synarel), which are gonadotropin-releasing hormone (GnRH) agonists that shrink the fibroids, and other hormones may be prescribed to suppress estrogen. These drugs may cause menopausal symptoms and bone demineralization, and their use is limited to a 6-month period to reduce the fibroids and prepare for surgery.

Uterine artery embolization involves the injection of special pellets into selected blood vessels that supply the fibroid, resulting in shrinkage of the fibroid. It is performed under conscious sedation by an interventional radiologist (a radiologist who specializes in invasive procedures not requiring general anesthesia). Cramping, nausea, fever, and malaise (postembolic syndrome) may occur postoperatively as the fibroid degenerates. Postoperative pain may require an overnight hospitalization and treatment with fentanyl or hydromorphone (Dilaudid) by patient-controlled analgesia. Maintenance of hydration and ambulation to prevent complications are encouraged postoperatively. After 6 weeks, MRI confirms the effectiveness of the procedure. Postoperative teaching includes not using anticoagulant drugs, including aspirin; avoiding douches, sexual intercourse, and the use of tampons for 4 weeks postoperatively; monitoring urine output; preventing constipation; and returning for follow-up care.

Myomectomy is the removal of the tumor from the uterine wall and can be accomplished by use of an endoscope via an abdominal incision (**laparoscopy**) or vaginally (**hysteroscopy**). It is performed in the proliferative phase of the menstrual cycle and does minimal damage to the uterine lining, allowing for positive pregnancy outcomes in the future. Fibroids can eventually return.

Hysteroscopic endometrial ablation is a nonsurgical technique that involves resection of submucosal fibroids followed by scraping and burning of tissue. This procedure significantly reduces future fertility. **Myolysis**, laser or electrosurgical destruction of the fibroids, can also be done laparoscopically or vaginally and may preserve fertility. **Magnetic resonance-guided focused ultrasound surgery (MRgFUS)** is a safe way to significantly reduce symptoms of premenopausal uterine fibroids with a rapid return to quality of life (Abdullah et al, 2010).

A **hysterectomy** (removal of the uterus) may be performed if the woman does not wish future pregnancies. A laparoscopic supracervical hysterectomy preserves the cervix and is less invasive, with fewer complications. However, for benign disease, the robotic or vaginal route for hysterectomy is preferred. Of the 590,000 hysterectomies performed within the United States each year, approximately 40% are for fibroids, 17% for endometriosis, and 14% to treat vaginal prolapse. Many hysterectomies are performed unnecessarily, because there are commonly other alternatives. The medical necessity for a hysterectomy includes cancer, an unmanageable infection or bleeding, or a serious birth complication such as a ruptured uterus. Nursing responsibilities include providing education to understand options, clarify misconceptions, and reduce anxieties. The postoperative teaching plan should include current information concerning advantages and disadvantages of hormone therapy, comfort measures for pain relief, and when to resume normal activities. The use of lubricants for vaginal intercourse and a plan for follow-up care should also be provided. Danger signs to report to the health care provider include bleeding or abnormal vaginal discharge.

Endometriosis

Endometriosis is a common disorder in which endometrial tissue (the inner lining of the uterus) is found outside the uterus, particularly on the ovaries, in the rectovaginal septum (wall separating the rectum and the vagina), and in the pelvis and abdomen. It usually undergoes the same changes as the normal endometrium during the menstrual cycle and may bleed at the time of menses, which can cause irritation, pain, and the formation of adhesions. Other symptoms may include excessive menstrual flow, bleeding between periods, painful bowel movements, and painful coitus.

Continuous hormonal contraceptive therapy and drugs such as medroxyprogesterone acetate (Depo-Provera) or norethindrone (Ortho Micronor) suppress growth of the endometrial tissue. Danazol (Cyclomen, Danocrine) and GnRH agonists such as leuprolide or nafarelin create a "pseudomenopause" by interfering with hormones that stimulate ovulation and menstruation. Menopausal symptoms such as hot flashes, decreased **libido** (sexual drive), and reduced bone density may occur. Continuous hormonal contraceptive treatment may be continued for 3 to 6 months. Surgical treatment may include a laparoscopy to remove adhesions or laser ablation of the lesions, which may preserve fertility.

If the woman does not desire children in the future, a complete hysterectomy and removal of all endometrial lesions is the treatment of choice. Treatment for menopausal symptoms may be needed postoperatively.

Surgical Management

Robotic surgery is surgery performed by a surgeon's medical manipulation of robotic "hands" and electronic monitors. Robotic surgery has benefits such as shorter operative time, shorter hospitalization, more rapid recovery, and more sophisticated surgery. Robotic surgery is not indicated for very short procedures such as endoscopic sterilization. Urogynecologic reconstructive surgery, fistula repair, and hysterectomy are best accomplished by robotic approach. The application of robotic surgery to gynecologic cancer is growing. Robotic surgery may be preferred over minilaparotomy for tubal anastomosis or reproductive endocrinology.

Inflammations of the Lower Genital Tract

Etiology and Pathophysiology

Inflammations or infections of the vulva, vagina, or cervix most often occur when the acid environment of the vaginal secretions changes, enabling the survival of pathogenic organisms. The acid environment of the vaginal vault is maintained by estrogen levels and the presence of *Lactobacillus*. Risk factors that alter the bacterial flora and pH environment within the vagina include aging; poor nutrition; the use of medications such as steroids, OCs, or antibiotics; and douching.

Organisms can also gain entrance to the vagina through contaminated hands, clothing, loss of skin integrity from trauma or surgery, or sexual intercourse. Vulvar infections typically occur as a result of skin trauma caused by itching and scratching. Although *Candida albicans* is normally present in low levels in the vaginal area, a change in vaginal pH can lead to an overgrowth, resulting in vulvovaginitis (Table 38-5).

Table 38-5
Comparison of Two Types of Common Vaginal Infections

	BACTERIAL VAGINOSIS	YEAST INFECTION
Primary causative organism(s)	<i>Gardnerella</i> (most common).	<i>Candida</i> (formerly called <i>Monilia</i>).
Onset	May be asymptomatic.	Abrupt; preceding menstruation.
Odor	Fishy, most noticeable after intercourse.	None or mild "musty" odor.
Itching	Usually none (does not invade vaginal wall).	Severe; most prominent symptom.
Discharge	Thin, gray, may be frothy.	Thick, white, "cottage cheese" texture when colonization is heavy.
Sexually transmitted	Possibly; 70% of women have this organism present in vaginal flora.	Possibly. Associated with high estrogen levels; diabetes mellitus; tight underclothing that increases warmth and moisture.
Vulvar signs	Absent.	Redness; excoriation from scratching; may have edema of labia.
Vaginal signs	Vaginal pH above 4.6. Little redness; discharge adherent to vaginal wall, normal cervix.	Normal cervix, no discharge. Lesions and edema from scratching.
Treatment	Metronidazole orally, sometimes vaginally; clindamycin in second trimester if pregnant (metronidazole associated with adverse pregnancy outcomes).	Miconazole, clotrimazole, or nystatin vaginally as directed. Oral treatment: fluconazole (Diflucan) 150-mg single dose. Nonprescription treatment is available.

Signs, Symptoms, and Diagnosis

A history and physical examination usually reveal the nature of the problem. Lesions may be present, and **dysuria** (painful urination) commonly occurs because the acidic urine comes into contact with open lesions. An abnormal vaginal discharge may occur that causes **pruritus** (itching discomfort). Women with cervicitis may experience bloody spotting after intercourse.

The diagnosis of the specific condition may be accomplished by culturing vaginal discharge or lesions, blood tests for specific infections, or a colposcopy or biopsy of the lesion. Drug therapy is based on the diagnosis.

Treatment and Nursing Management

You can teach the woman about the risks and prevention of genital infections as well as the treatment protocol for the specific infection. Infections of the lower genital tract are typically treated with local creams, vaginal suppositories, or systemic antimicrobials. Hand hygiene; wearing loose cotton underwear; and the use of intermittent warm, local, moist heat provide comfort and decrease irritation. Genital infections can cause the woman embarrassment, impair her self-image, and negatively affect relationships. Providing psychological support is very important. Because many organisms that cause lower genital tract infections are spread by sexual intercourse, prompt treatment is essential to prevent the spread of infection to the upper genital tract. The importance of recognizing symptoms and seeking medical care should be stressed. A nonjudgmental attitude will empower the woman to ask questions and seek advice. Ensure that the woman fully understands directions for taking medication or applying creams, and visual aids should be used whenever possible to ensure clarity of directions. Infections of the lower genital tract that are also STIs, such as pelvic inflammatory disease, are discussed in Chapter 40.

Toxic Shock Syndrome

Toxic shock syndrome (TSS) is a rare and potentially fatal disorder caused by strains of *Staphylococcus aureus* that produce toxins that cause shock, coagulation defects, and tissue damage if they enter the bloodstream. It is associated with the trapping of bacteria within the reproductive tract for a prolonged time. Risk factors include the prolonged use of high-absorbency tampons, cervical caps, or diaphragms.

Symptoms of TSS include:

- Sudden spiking fever
- Flulike symptoms
- Hypotension
- Generalized rash resembling a sunburn
- Peeling skin on the palms or soles

Treatment includes hospitalization and intensive care with supportive treatments and intravenous antimicrobials. The nurse plays an important role in preventing TSS by teaching the woman hand hygiene when inserting tampons, and the importance of changing tampons every 4 hours. Tampons should not be used when sleeping, because they will likely remain in place longer than 4 hours. Diaphragms and cervical caps should not be left in place for a prolonged time or used during menstruation.

Cancer of the Reproductive Tract

Vulvar Cancer

Vulvar intraepithelial neoplasia (VIN) refers to the growth of abnormal tissue on the vulva that may be precancerous. Cancer of the vulva is rare and occurs most commonly in aging women. Symptoms include red, brown, or white patches on the skin of the vulva. Treatment includes surgical removal of the pathologic tissue. Some strains of VIN are associated with the HPV. The incorporation of the HPV vaccine (Gardasil) into the standard immunization regimen for all girls will further reduce the incidence of this condition. Melanoma may begin on the vulva as well, even though the vulva is not typically exposed to sunlight. Women should be encouraged to observe and report any changes in any moles or visible lesions in the vulvar area.

Cancer of the Cervix

The risk factors for cancer of the cervix include multiple sex partners, sexual intercourse with uncircumcised males, starting intercourse at a young age (younger than 20 years of age), multiple pregnancies, obesity, and history of HPV infection or an STI. An approved HPV vaccine given to girls at or before puberty may prevent the type of HPV infection that causes cervical cancer. Regular pelvic examinations and Pap smears may enable early diagnosis and provide an opportunity for early and more successful intervention. The HPV screening can be done during or instead of a Pap test in women older than 30 years ([Centers for Disease Control and Prevention, 2014](#)). The ACOG recommends Pap testing (without HPV testing) should begin at age 21 and be repeated every 3 years between ages 21 and 29 in asymptomatic women. Women with three consecutive negative screenings at age 30 years should have repeated testing, including HPV testing, every 5 years until age 65 years, when testing of asymptomatic women is no longer necessary. Women with cervical pathology or cancer should be screened annually for 20 years after treatment. Treatment of cervical neoplasia may include cryosurgery, electrosurgical excision, or surgical conization of the cervix. Cervical cancer requires a hysterectomy with possible bilateral salpingo-oophorectomy (removal of the uterus, including the fallopian tubes and ovaries) followed by radiation and chemotherapy. See [Chapter 8](#) for discussion of care of a patient receiving radiation or chemotherapy.

Cancer of the Uterus

The most common malignant tumor of the female reproductive tract is endometrial cancer. It is a slow-growing cancer that most commonly occurs after menopause. The treatment of choice is a hysterectomy with bilateral salpingo-oophorectomy. Treatment is often complicated by the fact that many women with cancer of the uterus may be elderly or have chronic conditions such as diabetes. Surgery is commonly followed by radiation and chemotherapy. Chemotherapy agents used are doxorubicin (Adriamycin), cisplatin (Platinol), 5-fluorouracil (5-FU), carboplatin (Paraplatin), and paclitaxel (Taxol). See [Chapter 8](#) for discussion concerning care of a patient receiving chemotherapy and radiation therapy.

Cancer of the Ovary

Approximately 70% of ovarian tumors are benign. Ovarian cancer is known as a "silent cancer" because signs and symptoms are often nonspecific or vague, such as fatigue or abdominal distention with no detectable precancerous changes in the ovary. An important risk factor for the development of ovarian cancer is having a sister or mother with the disease or inheriting the *BRCA1* or *BRCA2* gene, which is also associated with breast cancer. Exposure to asbestos, talc powder, pelvic irradiation, or mumps has also been linked to the development of ovarian cancer. Women on hormone therapy should be informed concerning the risks for ovarian cancer. Factors that may prevent ovarian cancer include one or more term pregnancies, breast-feeding, tubal sterilization, and possibly the use of OCs. Ovarian cancer is classified according to the type of tissue within the ovary that is involved. Diagnosis is commonly made during a routine pelvic examination. An ovarian cancer tumor marker (CA-125), assessed by a blood test, combined with pelvic ultrasound can detect ovarian cancer, but not at an early stage. In 85% of cases, diagnosis of ovarian cancer is

first established when the cancer is well beyond the ovary. Current research is focusing on the fallopian tube as the source of ovarian cancer. Researchers at Yale Medical School have a new test under development and trials that could detect ovarian cancer in the early stages. However, at this date, the CA-125 test is not covered by most insurance companies for routine screening. Once diagnosis is established, a **panhysterectomy** (removal of the uterus, the fallopian tubes, and the ovaries) is followed by chemotherapy and radiation. Newer drugs have improved the survival rate to 50%. Cisplatin and carboplatin are used for stage III and stage IV disease. Altretamine (Hexalen) is used for recurrent ovarian cancer. Paclitaxel and topotecan (Hycamtin) are used to treat metastatic ovarian cancer. CAM is helpful in managing the side effects of the cancer and the medications used to treat the cancer.

Health Promotion

Symptoms of Ovarian Cancer

The American Cancer Society identified possible warning signs of ovarian cancer as:

- Abdominal, pelvic pain
- Feeling full quickly when eating
- Feeling a frequent or urgent need to urinate
- Increased abdominal girth

Disorders of the Breast

Although the breast is not a reproductive organ, it is affected by hormonal changes related to the menstrual cycle and after pregnancy; therefore, it is discussed in this chapter.

Benign Disorders of the Breast

Fibroadenoma

Fibroadenomas are commonly found in teenagers and young adults. Fibroadenomas are firm, rubbery, mobile nodules of fibrous and glandular tissue that may or may not be tender on palpation. They typically occur in the upper outer quadrant of the breast and do not change during the menstrual cycle. A fine needle aspiration or biopsy may be performed to determine the presence of cancerous cells.

Fibrocystic Breast Changes

Fibrocystic breast changes (FBCs) are common during the reproductive years. An FBC is a palpable thickening of portions of the breast tissue associated with pain and tenderness. Multiple smooth, well-delineated cysts may form that are most painful during the premenstrual phase of the menstrual cycle. The “lumps” make BSE more difficult and are commonly a source of anxiety. Women with FBC can learn to recognize the size and shape of their normal lumps and should report any change in these findings as well as other changes to their health care provider. Treatment of fibrocystic changes is conservative and based on supportive care. Vitamin E supplements, the elimination of caffeine and alcohol, reduction of fat in the diet, and the use of NSAIDs such as ibuprofen help control discomforts associated with FBC. Wearing a supportive bra and the use of heat are also helpful.

Complementary and Alternative Therapies

Alternative Therapy for Fibrocystic Breast Changes

Relaxation techniques and herbal therapy with angelica, lady's mantle, or evening primrose oil may be helpful in FBC.

Intraductal Papilloma

Intraductal papilloma is the development of small elevations in the epithelium of the ducts of the breasts under the areola. The ducts erode, causing a serosanguineous discharge from the nipple. Treatment includes excision of the mass and analysis of the discharge to determine whether cancer cells are present.

Clarify and reinforce the explanations of diagnostic procedures to be performed and recognize the anxiety and apprehension that the woman feels until the final diagnosis is confirmed. The woman should be encouraged to express her concerns, and supportive care should be provided.

Breast Cancer

In the United States approximately one in eight women (12%) will develop breast cancer in her lifetime. In 2013 more than 230,000 cases were diagnosed, 10% of which were caused by gene mutations and 85% of which were women with no family history of breast cancer ([American Cancer Society, 2014](#)). Gender and aging are the highest risk factors. The incidence of breast cancer dropped by 7% in 2003, possibly because of the decreased use of routine hormonal therapy. Early awareness via education, early detection available with new technology, and treatment advances have reduced the death rate of breast cancer. Although the risk of developing breast cancer increases with the woman's age, many other factors contribute to the risk ([Box 38-5](#)). Breast cancer is identified according to the structure affected and staged according to the size and degree of invasiveness ([Table 38-6](#)).

Box 38-5**Risk Factors for Breast Cancer**

1. Family history of relative with breast cancer
2. Early menarche, late menopause
3. Late first pregnancy or no children
4. Previous breast biopsy
5. Obesity
6. Environmental exposure to hormone-modulating chemicals such as pesticides and polycyclic aromatic hydrocarbons found in meat barbequed or grilled at high temperatures.
7. Consumption of alcohol

Note that the specific cause of breast cancer has not been established. It is most likely due to genetic factors combined with environmental factors resulting in a cumulative risk level. Risk factors 1 to 4 are included on the National Cancer Institute (NCI) risk assessment tool. This can be accessed on www.cancer.org.

Table 38-6
Stages of Breast Cancer

CANCER STAGE	LOCATION	DESCRIPTION	5-YEAR SURVIVAL RATE
Stage 0	Carcinoma in situ	Lobular carcinoma in situ (LCIS)—cancer cells in lining of a lobule. Ductal carcinoma in situ (DCIS)—cancer cells in lining of a duct.	100%
Stage I	Early stage of invasive cancer	Tumor is <2 cm in diameter. Cancer cells have not spread beyond the breast.	100%
Stage II	Invasive	Any one of the following: Tumor is <2 cm across. Cancer has spread to lymph nodes under the arm. Tumor is between 2 and 5 cm. Cancer may have spread to lymph nodes under the arm. Tumor is >5 cm. Cancer has not spread to lymph nodes under arm.	92%-81%
Stage III	Locally advanced	Large tumor, but cancer has not spread beyond the breast and nearby lymph nodes.	
Stage IIIA		Any one of the following: Tumor is <5 cm. Cancer has spread to underarm lymph nodes attached to each other or to other structures. Tumor is >5 cm. Cancer has spread to underarm lymph nodes.	67%
Stage IIIB		Any one of the following: Tumor has grown into chest wall or skin of the breast. Cancer has spread to lymph nodes behind the breastbone.	54%
		Inflammatory breast cancer is a rare type of Stage IIIB in which the breast looks red and swollen because cancer cells block the lymph vessels in the skin of the breast.	
Stage IIIC		Any size tumor that has: Spread to lymph nodes behind the breastbone and under the arm. Spread to lymph nodes under or above the collarbone.	This was defined only recently, so survival rate not yet available
Stage IV	Distant metastatic	Distant metastatic cancer. Cancer has spread to other parts of the body.	20%

From National Cancer Institute: *Cancer Information Service*. Retrieved from www.cancer.gov; and *Breast Cancer Facts & Figures: 2009-2010*. Retrieved from www.cancer.org.

Etiology and Diagnosis

The development of breast cancer is believed to be related to the hormones estrogen and progesterone. For example, women who start to menstruate at an early age (early menarche) and have late menopause are exposed to more estrogen spikes during monthly ovulation and are at higher risk of developing breast cancer. Conversely, women who have had multiple pregnancies have fewer monthly ovulating cycles and hormonal spikes and thus are at lower risk.

Genetic testing for *BRCA1* and *BRCA2* gene mutations continue, because identifying high-risk women can result in specific interventions to prevent development of cancer such as preventive mastectomy and reconstructive surgery. The current breast cancer risk assessment tool developed by the National Cancer Institute (NCI) is available on the website www.cancer.gov.

Legal and Ethical Considerations***BRCA1* and *BRCA2* Genes**

If all women are tested for the presence of the *BRCA1* or *BRCA2* gene, an ethical problem is raised regarding the action to take if the gene is present. Should the young woman have a prophylactic mastectomy? Should the woman be given prophylactic treatment with tamoxifen? Does the knowledge of the potential risk for cancer produce anxiety that may result in life changes that can have a negative outcome? Would there be health insurance implications?

In 2013 the U.S. Preventive Services Task Force (USPSTF) did not recommend that routine genetic testing be done. *BRCA* testing can be expensive and may not be covered by insurance. Instead, the USPSTF recommends that women who have at least one family member with *BRCA1*- or *BRCA2*-related cancers be screened for genetic testing using one of the following models:

- Ontario Family History Assessment Tool
- Manchester Scoring System
- Referral Screening Tool
- Pedigree Assessment Tool
- FHS-7

The Referral Screening Tool (which can be found at www.breastcancergenescreen.org) and FHS-7 are the simplest and easiest to use. The USPSTF reports that no one tool is better than another and makes no recommendation as to which tool to use.

Signs, Symptoms, and Diagnosis

Although 90% of breast lumps are detected by the woman during a BSE, most early breast cancer can be detected by mammography (x-ray examination of the breast) before it can be clinically palpated. A nipple discharge or change in the skin pattern such as “dimpled skin” on the breast may also be a sign of breast cancer. Any unilateral breast change should be immediately reported to a health care provider. Even a short delay in diagnosis can result in invasion of surrounding tissue and metastasis to other parts of the body. Fenretinide, a retinoid, is being studied as a way to reduce the risk of breast cancer, along with other drugs such as aromatase inhibitors ([American Cancer Society, 2014](#)). Scintimammography (molecular breast imaging) involves injecting a radioactive tracer into a vein that attaches to a breast cancer cell and is detected by a camera for more accurate diagnosis than an MRI scan. This new technology does not replace routine screening tests such as mammography. Refer to [Table 38-3](#) for details on the role of routine ultrasound or MRI diagnostic tests in confirming diagnosis.

Prevention

A healthy lifestyle that includes exercise and a diet rich in antioxidants and phytoestrogens, such as vegetables, fruits, whole grains, and soy products, may protect against the development of many cancers. Monthly BSE ([Figure 38-5](#)) and regularly scheduled mammograms between the ages of 50 and 85 years have been recommended by the ACOG, but research concerning a needs-based or individual risk screening plan is ongoing. At present, the drug tamoxifen is used to prevent recurrent breast cancer and is also recommended for women at high risk of developing breast cancer, because it may reduce breast cancer risk by half ([M.D. Anderson, 2015](#)). However, this drug is not recommended for the general population because of potential side effects such as increased bone pain, photosensitivity, headache, and increased risk for pulmonary embolism or uterine malignancies. Fenretinide, a retinoid, is being studied as a way to reduce the risk of breast cancer. Aromatase inhibitors such as anastrozole (Arimidex) or exemestane (Aromasin) may be more effective than tamoxifen and are under continued study.

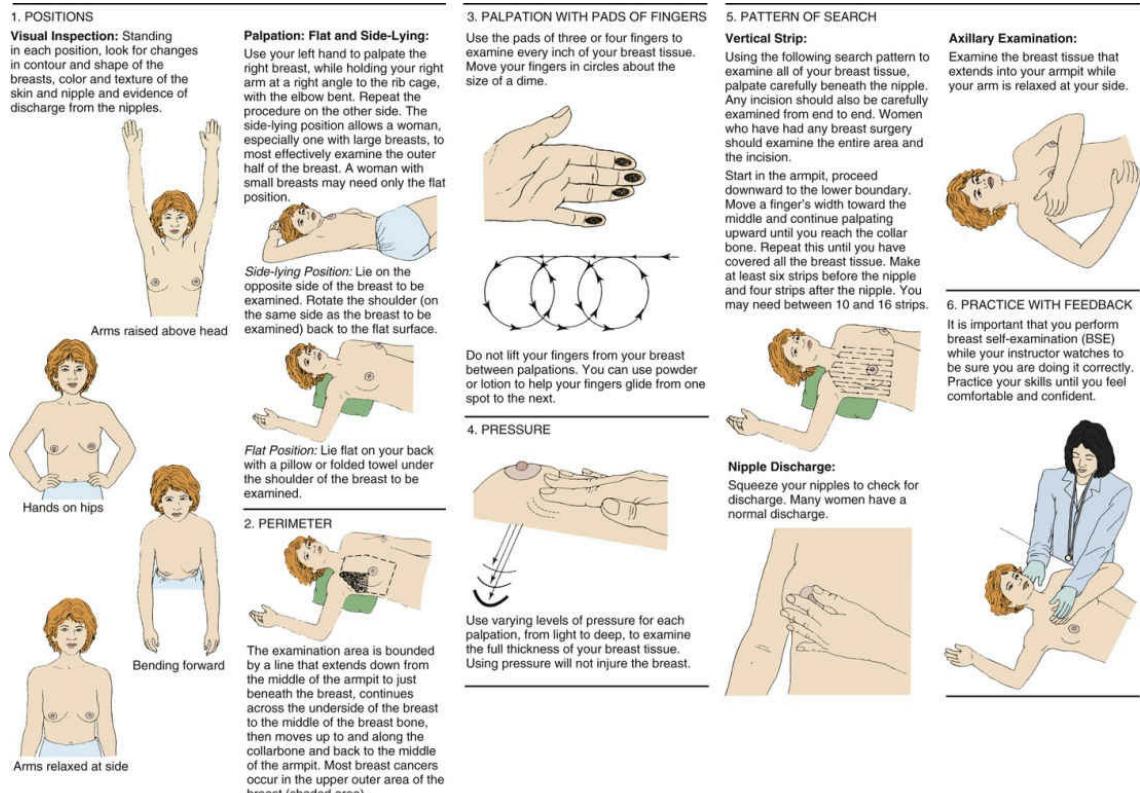


FIGURE 38-5 Recommended breast self-examination procedure. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 7, St. Louis, 2007, Mosby.)

Some women who have known genetic *BRCA1* or *BRCA2* predispositions have elected to have prophylactic bilateral mastectomies. The psychological implications and effect on self-image should be carefully measured against the preventive benefits. The decision is between the woman and her health care provider.

Treatment

Treatment options are based on the type of breast cancer, stage of the disease, patient's age, physical and menopausal status, and other health factors that may affect the woman's ability to undergo the specific treatment. In general, the primary treatment depends on the size of the cancer and can be initial chemotherapy to shrink the tumor followed by surgical removal, or simply surgical removal of a smaller tumor and varying amounts of surrounding tissue. The types of surgery include:

- **Lumpectomy** (removal of tumor only).
- Partial or **segmental mastectomy** (removal of tumor and a portion of the surrounding breast tissue and axillary lymph nodes).
- Simple or **total mastectomy** (removal of entire breast and axillary lymph nodes).
- **Modified radical mastectomy** (removal of breast, axillary lymph nodes, and lining over the chest wall muscles).
- **Radical mastectomy** (removal of breast, axillary lymph nodes, and chest wall muscles under the breast). Radical mastectomy was once very common, but high success rates with a reduction in disfigurement are now made possible by using appropriate staging of the disease when making treatment decisions.

A suggested nursing care plan for a woman undergoing a lumpectomy in a same-day surgery unit is presented in [Nursing Care Plan 38-2](#).

Nursing Care Plan 38-2

Care of a Patient After Breast Lumpectomy

Scenario

A 24-year-old woman is ready for discharge from the same-day surgery unit after undergoing a breast lumpectomy for a suspicious breast lesion. She expresses concern about the amount of scar tissue that will form and that her breasts may no longer be the same size after the lumpectomy.

Problem Statement/Nursing Diagnosis

Altered body image/*Disturbed body image related to asymmetric breasts and scar tissue as a result of undergoing a breast lumpectomy.*

Supporting Assessment Data

Subjective: Concern about scar tissue and that breasts will no longer be the same size.

Objective: Lumpectomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will use positive coping strategies to adjust to changes in body image as evidenced by use of support system and available resources.	Assess for previous problem with self-esteem.	Previous coping strategies can be revealed by discussing previous experiences.	Patient discussed previous experiences and recognizes the stages of loss she experienced.
	Assess for signs of anxiety or inability to focus.	Anxiety can be an expected result of a diagnosis that may involve a possible cancer.	Patient expressed understanding of prognosis as explained by physician.
	Encourage verbalization of feelings.	Verbalization can reduce anxiety and focus on the problem of altered body image.	Patient expressed her concerns about scar tissue and alteration in breast symmetry.
	Involve family and multidisciplinary health care team in offering support.	Providing patient with broad support base and resources assists in adjustment.	Patient expressed understanding of healing process and resources available for assistance after discharge.
	Provide accurate information concerning prognosis.	Provides an opportunity to correct misinformation.	Patient expressed understanding of need for follow-up care.
	Encourage her to help care for wound.	Looking at and touching wound indicates readiness to participate in self-care to achieve optimal wound healing.	Patient states will actively participate in wound dressing changes.

Critical Thinking Questions

1. What factors influence a woman's perception of the importance of body image?
2. What other problems or issues might there be for a woman sent home the same day after a breast lumpectomy?

If there is concern that cancer cells have invaded the lymph nodes, **sentinel node biopsy** may be performed, wherein the primary node is removed and, if laboratory results show no evidence of cancer, the remaining nodes are left intact. Alternatively, an axillary node dissection may be performed during breast surgery, in which the lymph nodes under the affected arm are removed and sent to the laboratory. This procedure may result in swelling of the affected arm.

Tamoxifen blocks estrogen by binding with the estrogen receptors. This drug is usually prescribed for 5 years. Nausea and anorexia may occur, and cholesterol and triglyceride levels should be monitored. Certain drugs interfere with the metabolism of tamoxifen and should be avoided, including some selective serotonin reuptake inhibitor (SSRI) and selective serotonin-norepinephrine reuptake inhibitor (SNRI) antidepressants such as paroxetine; fluoxetine; and duloxetine; some antipsychotics such as pimozide, perphenazine, and thioridazine; some cardiac drugs such as quinidine or ticlopidine; some medications for infectious diseases such as terfenadine; and histamine (H_2)-blockers such as cimetidine.

Approximately 25% of women have a type of breast cancer tumor that manifests the human epidermal growth factor receptor-2 protein (*HER2*-positive breast cancer). Studies have shown that the monoclonal antibody trastuzumab (Herceptin) added to chemotherapy is very effective at reducing the risk of tumor recurrence. A new class of drugs called *Poly ADP ribose polymerase (PARP) inhibitors* show promise in treating breast, ovarian, and prostate cancer in patients resistant to other drugs (American Cancer Society, 2014).

Research is ongoing concerning the customization of treatment options for women with breast cancer. The National Institutes of Health and the NCI are researching a treatment trial called TAILORx (Trial Assigning Individual Options for Treatment). Women are assigned to treatment regimens based on genetic findings. The results of these trials may enable a change from standardized treatment to customized treatment protocols.

Radiation therapy commonly is performed after lumpectomy or segmented mastectomy to destroy micrometastases and decrease cancer recurrence rates. Radiation therapy options include

whole-breast radiotherapy using external beam radiation weekly for 7 weeks; intensity-modulated radiation therapy (IMRT), which minimizes damage to surrounding tissue; accelerated partial breast irradiation (APBI), using a balloon catheter in the local tumor site; interstitial brachytherapy, with pellets inserted around the tumor site; or external beam radiation (EBRT) after healing occurs (Figure 38-6). Chemotherapy also may be considered as part of treatment, in combination with surgery and radiation. Aromatase inhibitors such as anastrozole, letrozole (Femara), or exemestane reduce the risk of recurrence by inhibiting the enzyme aromatase, which results in decreased estrogen production. Aromatase inhibitors are not used in premenopausal women with functioning ovaries (see Safety Note). An estrogen receptor agonist such as fulvestrant (Faslodex) binds with estrogen receptors and can be used when tamoxifen fails. Ovarian ablation is the surgical removal or irradiation of the ovary to stop estrogen production. The use of goserelin (Zoladex) may be an alternative to chemotherapy. See Chapter 8 concerning care of a patient receiving chemotherapy or radiation therapy.

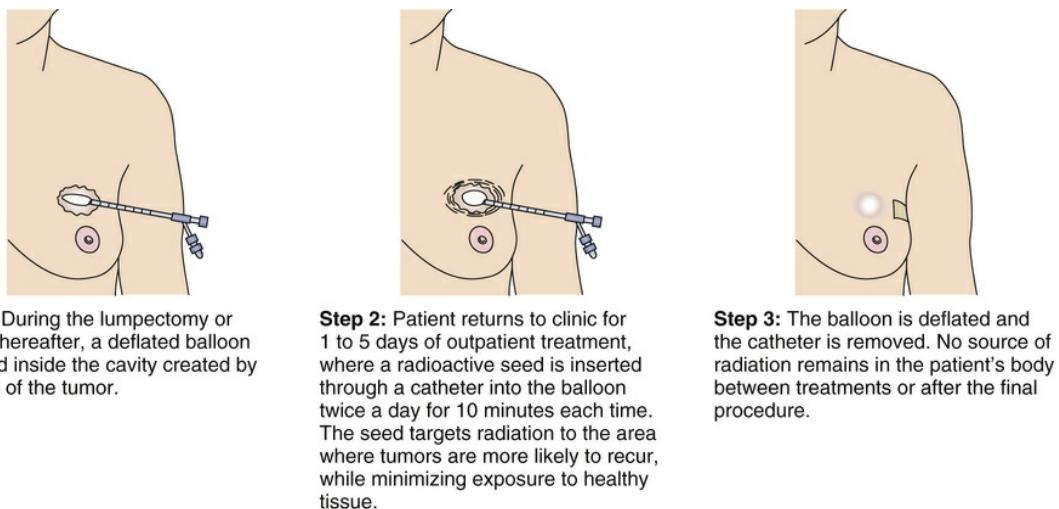


FIGURE 38-6 Brachytherapy. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 7, St. Louis, 2007, Mosby.)

Safety Note: Skin moisturizers and some vaginal creams that contain estrogens used on a regular basis can be dangerous to estrogen-receptor-positive cancer in women, especially if they are taking aromatase inhibitors (Olson et al, 2009).

Breast Reconstructive Surgery

Plastic surgery of the breast may be performed to reduce breast size (reduction mammoplasty), enlarge breast size (augmentation mammoplasty), or reconstruct (reconstruction mammoplasty) the breast after breast cancer surgery.

Reduction mammoplasty.

Problems related to an excessively large breast include back and shoulder pain, pressure on nerves from brassiere straps, inability to buy clothing that fits, and psychological problems related to fear of ridicule or unwelcome sexual advances.

A mammogram may be necessary before surgery in women older than 40 years of age. The amount and degree of scarring should be discussed with the woman, because the scar is determined by the technique of surgery. Although data suggest that breast reduction surgery does not interfere with successful breast-feeding, it is possible milk production may be affected. Decreased nipple sensation or loss of part of the areola may also be a side effect of surgery that the woman should be aware of preoperatively. Information concerning successful breast-feeding after breast reduction surgery may be obtained from the La Leche League International.

Augmentation mammoplasty.

Breast augmentation is usually initiated by patients who wishes to improve self-image and attain a

sense of increased femininity. Breast augmentation can be accomplished by insertion of a saline implant under the pectoralis muscle.

Reconstructive mammoplasty.

Reconstructive mammoplasty creates a new breast when the natural tissue has been removed during mastectomy. A nipple/areola reconstruction provides a more natural appearance. Saline implants can be used, or skin and tissue may be taken from other parts of the body (autologous reconstruction), and tattooing of the nipple area provides natural-looking coloring. A pedicle flap tunnels body tissue to the breast area, keeping the blood vessels intact so that a microvascular surgeon is not needed. A free flap or muscle-sparing flap is another technique of reconstructive breast surgery in which blood vessels are harvested along with tissue and a microvascular surgeon reimplants the vessels. Perforator flap surgery is a technique that spares muscle tissue but requires detailed surgical skill ([Dellacroce, 2015](#)). Nursing responsibilities include frequent checking of the flaps for adequate perfusion, maintaining hydration to support flap perfusion, and proper patient positioning as prescribed. Pain management is essential to encourage deep breathing post-operatively. Range-of-motion exercises typically begin 1 week after surgery, and 5-lb weight lifting is prescribed for 6 to 8 weeks. The nipple is reconstructed 3 to 4 months after breast reconstruction surgery to be sure swelling is minimal. Tattoo of the nipple is a popular option rather than reconstruction of a new nipple.

Nursing Management for Breast Cancer Surgery

Preoperative care.

Most women need extensive education before breast surgery. Many surgeons now provide educational programs for their patients, but it is important for you to determine whether, in fact, the patient did receive adequate information and whether she has a good understanding of what was taught. Women commonly are particularly concerned about the change in their appearance after breast surgery. Talking with a Reach to Recovery volunteer or a nurse with extensive professional or personal knowledge before surgery can be very helpful. Teaching points will vary depending on the amount of tissue to be surgically removed and whether or not a prosthesis will be implanted either during the initial surgery or at a later date ([Figure 38-7](#)).

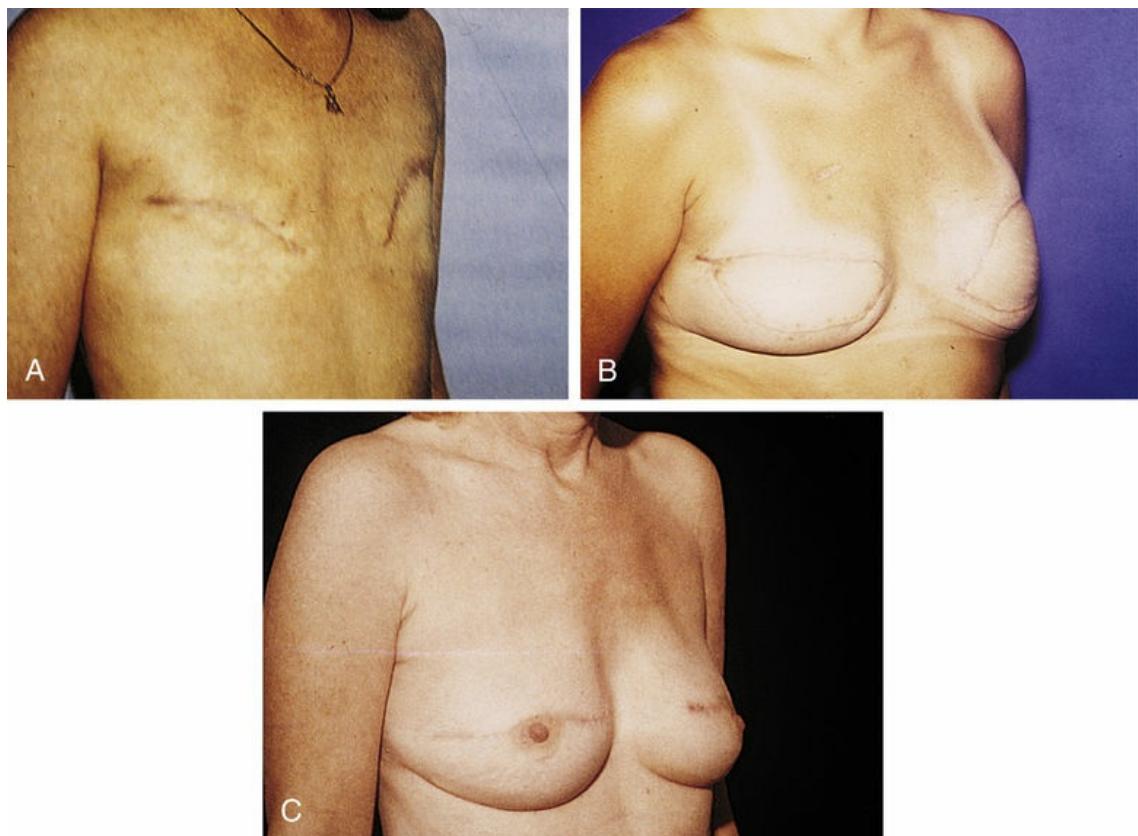


FIGURE 38-7 Reconstructive breast surgery. **A**, Appearance of the chest after bilateral mastectomy. **B**, Postoperative breast reconstruction before nipple reconstruction. **C**, Postoperative breast reconstruction after nipple and areolar reconstruction.

Postoperative care.

Postoperative care includes pain management, observation for signs of infection, and continued supportive and educational measures. Because breast tissue is very vascular, bleeding may be a problem. Surgical dressings should be observed frequently during the first 48 hours after the procedure.

Body image and disfigurement issues, as well as the focus in our society on the breast as a marker of femininity or sexual attractiveness, make treatment for breast cancer a highly emotionally charged experience. Women require ongoing supportive care, and most will benefit greatly from participating in a support group and from visits by American Cancer Society Reach to Recovery volunteers. These women have all undergone treatment for breast cancer and have been trained to do peer counseling. The local chapter of the American Cancer Society can be contacted regarding Reach to Recovery visits.

Collaborative care.

Collaborative care is essential to reduce anxiety and stress in the patient. Emotional support and accurate information are essential. The woman and her partner may differ in how much information they want to discuss. Issues concerning self-image and loss of control should be addressed.

Complications

Lymphedema.

Lymphedema is swelling of the arm that sometimes occurs after breast cancer surgery because of the damage to and resulting congestion of the lymphatic tract. (It can also be idiopathic, or of unknown origin, or a congenital problem.) Upper body symptoms usually occur within 6 months to 3 years of treatment in 10% to 64% of women who undergo breast node biopsy or cancer surgery,

and about 20% develop lymphedema (Hayes et al, 2012). Lymphedema can become a chronic condition. The use of sentinel node biopsy, with removal of additional lymph nodes only if the sentinel lymph node is positive for cancer, has reduced the occurrence of lymphedema because of less damage to the lymph tissue and thus less chance of developing lymphedema. Nursing interventions during the postoperative nursing care of a patient with a breast node biopsy or breast cancer surgery that can reduce the risk of development of lymphedema include:

- Do not assess blood pressure in the affected arm.
- Do not give injections or do venipuncture in the affected arm.
- Provide meticulous skin care.
- Teach the patient to wear gloves in the kitchen and when gardening to prevent skin irritation or injury.
- Teach the patient to avoid heavy lifting.
- Advise the patient to wear a compression garment during strenuous activities.
- Advise the patient to elevate and exercise the arm daily.

Patient Teaching

Measures to Prevent or Decrease Lymphedema

Teach the patient to:

- Elevate the extremity to the level of the heart. This reduces hydrostatic pressure within the veins.
- Apply elasticized stockings or gloves that do not have tight bands when up and active. This increases pressure on vessels and encourages venous return. (Garments may be removed when the extremity can be elevated.)
- Do not wear constrictive clothing.
- Do not cross your legs when sitting; do not carry a heavy bag if an arm is affected.
- Perform active exercise of the skeletal muscles. This promotes massage of the lymph vessels and the movement of lymph.
- Cleanse and dry the skin thoroughly and regularly, applying mild skin moisturizers to prevent cracking.
- Try to prevent any minor trauma to the area (e.g., no blood pressure cuffs or blood draws on the affected extremity) and do not use a heating pad.
- Wear gloves and sunscreen when gardening.

Review exercises that may be helpful (Figure 38-8). Discharge teaching should focus on the need for follow-up care, exercises to improve range of motion, prevention of infection, side effects of medical therapy, and community resources available.



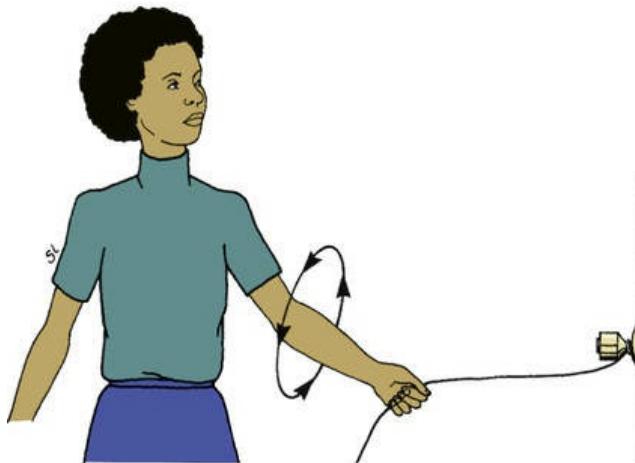
FRONT WALL CLIMBING

Patient stands facing the wall, elbows slightly bent. Palms are placed at shoulder level and fingers are flexed and unflexed as hands "walk" up the wall as high as possible. Hands are then walked back down to shoulder level. Patient moves toward wall as fingers climb higher and then away from wall as fingers move downward.



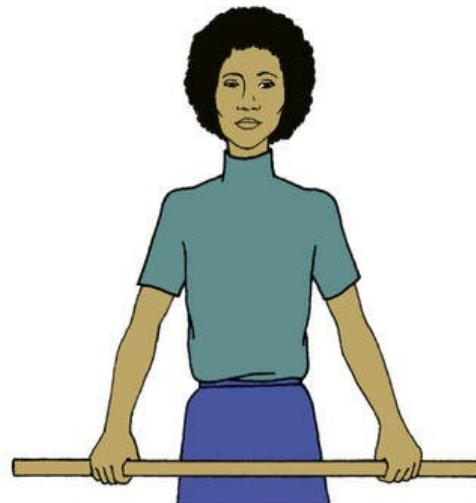
SIDE WALL CLIMBING

With operative side to wall, arm is extended until fingers touch wall. Patient moves toward the wall as fingers climb higher until body touches it. Maneuver is reversed as fingers climb back down wall.



ROPE TURNING

One end of rope is tied to door knob. Patient holds other end of rope and swings it in a circular motion, being sure entire arm and not the wrist is in motion.



YARDSTICK OR BROOM LIFT

Holding a yardstick or broom handle with both hands, the back is placed against a wall. Arms are extended straight downward and, with elbows straight, the stick is raised by the straightened arms until knuckles touch the wall over the head.

FIGURE 38-8 Postmastectomy exercises.

Clinics that specialize in the care of patients with lymphedema are available in some states. The standard of care is complex physical therapy, which involves techniques that provide lymphatic drainage, specialized pressure bandaging, application of a compression garment, exercising, and

skin care. More information can be obtained from the National Lymphedema Network website at www.lymphnet.org.

The diagnosis and treatment of breast cancer in women can be a direct threat to the sense of femininity and body image. Anxiety, denial, anger, and depression are common reactions. Many women fear they will no longer be attractive to their peers. A combination of peer support and psychotherapeutic, spiritual, and educational guidance can help the woman cope with the diagnosis and treatment. Nurses play a key role in education and referral.

Home Care

Home health nursing is a standard of care in the United States. Hospital stays are becoming progressively shorter, and women typically go home very quickly after illness, surgery, or childbirth. Intravenous antibiotic therapy is increasingly occurring in the home setting; many health problems are treated outside the hospital setting.

Many women recover at home after a surgical procedure. Home health nursing responsibilities include pain management, observation of the surgical site for signs of infection (redness, swelling, pain, presence of exudate, foul odor, fever), or reopening of the surgical wound because of trauma or a poor healing response. If the procedure involves the pelvic reproductive organs, the nurse must also assess the amount and duration of bleeding, any increase in the volume of flow, and any change (e.g., purulence or foul odor) that indicates the presence of infection.

Patient teaching typically becomes the responsibility of the home health nurse. Even conscientious teaching by the hospital nurse commonly needs extensive follow-up, because the patient's learning ability was impaired by immediate concerns such as acute pain, recovery from anesthesia, or emotional stresses associated with the diagnosis and the potential effects on daily living. The home health nurse must be prepared to give accurate, detailed information as part of home care. The nurse also should assess the patient's need for more general education regarding reproductive health, such as regular clinical breast examinations (CBEs), Pap smears, and need for information regarding contraception or STIs.

The home health nurse must be able to function independently and needs to communicate with the other members of the care team by phone, written documentation, and group conferences. The nurse also is commonly the primary source of information about appropriate support groups and informational programs that would be of assistance to the patient and her family.

Patient Teaching

Teaching Older Adults

Advanced age can inhibit ability to learn at a time when information concerning comfort and health is vital. In any teaching plan, the nurse should:

- Promote readiness and motivation to learn. The woman must sense that the information applies to her and is important.
- Provide brochures; reliable sources confer credibility of information.
- Include the woman's experiences and interests; personalizing teaching makes it more meaningful.
- Ask questions to confirm understanding.
- Provide socialization and opportunity to share. Use group sessions when possible.
- Provide short teaching sessions.
- Face the patient, and talk loudly and clearly.
- Use a quiet, adequately lit environment.

Community Care

Community care can take many forms. In the area of general reproductive health, low-cost women's health care clinics and organizations such as Planned Parenthood offer pregnancy testing, counseling and instruction on contraception and prevention of STIs, programs concerning BSE and VSE, and screening procedures such as pelvic examinations and mammograms. Instruction and low-cost screening may also be made available by local chapters of organizations such as the American Cancer Society. These outreach programs seek to make information and services available to all women at a reasonable cost. Such programs assist in the prevention and early detection of disease, reducing the long-term effects of potentially serious illness and the cost of intrusive health care.

Community care also takes the form of educational public service announcements on radio and television and in newspapers and magazines. These give the public valuable information on sexual health and disease prevention and treatment.

School nurses can and should play a major role in reproductive education and health maintenance. Drugs, alcohol, and early sexual activity are major health care concerns for adolescents. The school nurse is in a position to become a trusted source of accurate, nonjudgmental information for young people who are confused and lack education in the realities of reproductive health.

In recent years, a variety of programs have been developed for women at risk for serious diseases of the breast or reproductive organs. They may be sponsored by national organizations such as the American Cancer Society or by local groups or health care facilities and organizations. These programs provide both education and support groups for women undergoing treatment of serious health problems such as breast or uterine cancer, infertility, fetal loss, and other health concerns of women. The nurse can be very helpful in referring women to these community programs or by volunteering as a group facilitator or resource person.

Get Ready for the NCLEX® Examination

Key Points

- Reproductive health can be disrupted by many physical disorders. Alterations in reproductive health can affect other body systems.
- Women should keep a calendar of their individual menstrual cycles to determine regularity and recognize deviations from their normal cycle.
- PMS, also known as *ovarian cycle syndrome*, is the presence of physical, psychological, or behavioral symptoms that regularly occur in the luteal phase of the menstrual cycle.
- PMDD is a more severe type of PMS described officially in the DSM-5, a classification of disorders published by the American Psychological Association.
- Personal contraceptive techniques include fertility awareness methods, BBT, calendar and rhythm methods, ovulation or Billings method, and symptothermal method.
- Mechanical contraception methods include the use of a male condom, female condom, diaphragm, spermicide, cervical cap, or IUD.
- Hormonal contraception methods include the use of OCs, injectable contraceptives, transcutaneous patches, intrauterine and vaginal inserts, and sustained-release implants.
- Permanent contraception includes tubal ligation (female) and vasectomy (male).
- Emergency contraception may be indicated after unprotected intercourse but is not meant for regular use.
- Menopause is described as cessation of menses for a 12-month period because of decreased estrogen production. The perimenopausal or climacteric period is the period around the actual cessation of the menstrual period. Common symptoms include irregular menstruation, hot flashes or hot flushes, fatigue, insomnia, emotional swings, depression, back pain, headache, irritability, and decreased libido.
- A decrease in estrogen can increase the risk for the development of osteoporosis and increased blood cholesterol levels.
- Osteoporosis is a decrease in bone mass that increases the risk for bone fractures.
- BSE should be performed monthly 1 week after menstruation begins or on a specific date each month after menopause.
- Risk factors for cancer of the cervix include multiple sex partners, early sexual activity, multiple pregnancies, infection with HPV, and smoking.
- Leiomyomas (fibroids) of the uterus are common among women between 25 and 40 years of age and may cause vaginal bleeding between menstrual periods.
- Endometriosis is a condition in which endometrial tissue is found outside the uterus.
- Pelvic relaxation syndrome can affect the bladder (cystocele), the rectum (rectocele), or the uterus (uterine prolapse).
- Robotic gynecologic surgery is an effective alternative to open surgery.
- Exercise to restore arm function is very important after mastectomy.
- School nurses can and should be a valuable resource to young women regarding issues of sexuality, reproduction, and disease.
- Disorders of the female reproductive system can affect the woman's self-image.
- Specific genes have been identified that can predict the risk of specific types of breast cancer.
- Screening measures such as mammography, BSE, VSE, and Pap smears allow early detection and treatment of cancer of the reproductive tract and accessory organs.
- Modern technology can assist women who have fertility problems.
- Nurses must understand the perceptions of the woman and family before designing a teaching plan.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• **Online Resources**

- Breast Cancer Information: www.breastcancer.org
- Emergency contraception: www.Planbonestep.com/ or www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm168870.htm
- National Cancer Institute: www.cancer.gov
- National Lymphedema Network: www.lymphnet.org
- North American Menopause Society: www.menopause.org
- Uterine fibroids: www.emedicinehealth.com/uterine_fibroids/article_em.htm

Review Questions for the NCLEX® Examination

1. A female patient complains of irritability, fatigue, mood swings, and fear of losing control days before menstruation. The initial assessment suggests a nursing problem of altered coping due to cyclic hormonal changes. Which of the following instructions given by the nurse would likely promote patient coping?

1. "Avoid calcium-containing foods."
2. "Exercise regularly."
3. "Have occasional alcohol."
4. "Consider a sodium-rich diet."

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

2. Which of the following nursing interventions would help relieve symptoms of dysmenorrhea? (*Select all that apply.*)

1. Pelvic rocking exercises
2. Cold compresses
3. Effleurage
4. Low-fat diet
5. NSAIDs

NCLEX Client Need: Health Promotion and Maintenance

3. A 44-year-old patient complains of irregular menses with hot flashes. She is informed that she is approaching the climacteric period. Her nurse finds her withdrawn and crying. An appropriate statement by the nurse would be:

1. "It is not the end of the world."

2. "You seem upset. I am here to listen."
3. "Everything will be all right."
4. "Aging is not for the faint of heart."

NCLEX Client Need: Psychosocial Integrity

4. Metrorrhagia is associated with which of the following?

1. Uterine polyps and leiomyomas
2. Trauma and foreign body in the vagina
3. Cervical cancer
4. All of these

NCLEX Client Need: Health Promotion and Maintenance

5. A 65-year-old patient complains of vaginal bleeding. She has been menopausal for 11 years. Which of the following are possible causes? (*Select all that apply.*)

1. Postcoital bleeding from atrophic vaginitis
2. Endometrial cancer
3. Endometriosis
4. Cervical polyp

NCLEX Client Need: Safe and Effective Care Environment

6. A nurse is discussing healthy lifestyle activities with a woman. Which of the following statements by the woman indicates a need for follow-up teaching? (*Select all that apply.*)

1. "I can use herbals such as Angelica or evening primrose oil during menstruation to decrease breast tenderness."
2. "I will focus on drinking caffeine-free colas to keep my fluid intake adequate."
3. "I will douche regularly with an alkaline solution to maintain vaginal health."

4. "I will wear form-fitting, nylon clothing and underwear for warmth and to prevent infections."
5. "As I approach menopause, I can eat wild yams, cherries, and alfalfa sprouts as a source of phytoestrogens."

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

7. A nurse is discussing various methods of contraception with a woman. When discussing mechanical methods of contraception that do not provide any protection from STIs, the nurse would specifically include:

1. The symptothermal method
2. The Billings method
3. The use of water-soluble spermicidal lubricants during sexual activity
4. The use of IUDs
5. OCs

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

8. A nurse empowers a patient who had a right radical mastectomy by providing specific instructions regarding postoperative care of the surgical site and surgical complications. Which of the following statements by the patient would indicate a need for more teaching?

1. "Blood pressure cannot be taken on the right arm."
2. "I can resume intense weight training immediately after discharge."
3. "No injections must be given in the right arm."
4. "When gardening, I need to wear gloves."

NCLEX Client Need: Safe and Effective Care Environment

9. A 44-year-old patient who had a right radical mastectomy expresses concerns regarding her physical appearance. Further assessment indicates a nursing problem of altered body image. An important goal for this patient would be to:

1. participate in activities of daily living.

2. demonstrate acceptance of change in appearance.
3. perform aseptic wound care.
4. state signs and symptoms of infection.

NCLEX Client Need: Safe and Effective Care Environment

10. A nurse is taking the gynecologic history of a postmenopausal Mexican American patient. Which strategies would help develop rapport with the patient? (*Select all that apply.*)

1. Establish direct eye contact.
2. Involve family members.
3. Touch the patient.
4. Use a polite tone of voice.
5. Respect privacy.

NCLEX Client Need: Psychosocial Integrity

Critical Thinking Questions

Scenario

Mrs. Long is a 45-year-old college instructor, married with two teenage children. She found a lump during BSE that was diagnosed as malignant. Mrs. Long does not want to have the radical mastectomy recommended by her surgeon.

1. What are some possible reasons for Mrs. Long's hesitation about having a radical mastectomy?
2. What alternative surgical procedures are available to Mrs. Long?
3. What types of resources are available to help Mrs. Long make this decision?

CHAPTER 39

Care of Men With Reproductive Disorders

Objectives

Theory

1. Review the effects of aging on the male reproductive system.
2. Summarize the medical and nursing management of erectile dysfunction.
3. Recognize factors involved in fertility, infertility, and contraception in men.
4. Present the most common diagnostic tests and examinations of the male reproductive system.
5. Explain the assessment of the male reproductive system.
6. Outline the pathophysiology and manifestations of common disorders of the male reproductive tract.
7. Evaluate the plan of care for a male patient with a disorder of the reproductive tract.
8. Explain the psychological and emotional effects of disorders of the male reproductive tract.
9. Analyze the role of drug therapy in disorders of the male reproductive tract.
10. Compare and contrast four types of surgical treatments for benign prostatic hyperplasia (BPH).
11. Diagram the preoperative and postoperative nursing care of a patient with BPH.
12. Discuss inflammations of the male reproductive system and their treatments.
13. Illustrate the patient teaching involved for early detection of testicular and prostate tumors.

Clinical Practice

14. Teach a patient about the procedure for a prostate biopsy.
15. Create a nursing care plan for a patient with prostate cancer.
16. Devise a teaching plan for testicular examination for young adult men.
17. Prepare materials describing treatment to a patient experiencing erectile dysfunction.

KEY TERMS

- androgens** (ăN-drō-jĕnz, p. 924)
azotemia (ă-zō-TĒ-mē-ă, p. 931)
cremasteric reflex (krē-mă-STĒR-ik, RĒ-flĕks, p. 930)
ejaculation (ē-jäk-ü-LĀ-shūn, p. 923)
erectile dysfunction (ED) (ĕ-RĒK-tĕl dīs-FŪNK-shūn, p. 927)
erection (ĕ-RĒK-shūn, p. 923)

gonads (GŌ-năds, p. 923)
gynecomastia (jīn-ě-kō-MĀS-ti-ă, p. 931)
impotence (İM-pō-tēnz, p. 927)
infertility (ĭn-fĕr-TĬL-i-tē, p. 928)
libido (lī-BĒ-dō, p. 924)
orchieectomy (ör-kē-ĚK-tō-mē, p. 937)
premature ejaculation (prē-mă-TYŪR ī-jăk-yū-LĀ-shūn, p. 928)
priapism (PRī-ă-přz-ěm, p. 928)
prostate-specific antigen (PSA) (PRŌS-tāt spě-SI-fik ĀN-ti-jēn, p. 926)
PSA velocity (vě-LÖ-sě-tē, p. 938)
retrograde ejaculation (rēt-rō-GRĀD ī-jăk-yū-LĀ-shūn, p. 928)
rugae (RŪ-jē, p. 923)
semen (SĒ-měn, p. 923)
spermatogenesis (spēr-mă-tō-JĚ-ně-siš, p. 923)
tamponade (tăm-pōn-ĀD, p. 934)
urodynamics (ū-rō-dī-NĀM-īks, p. 931)
vasectomy (vă-SĒK-tō-mē, p. 924)

Many diseases and disorders, and many medications, can affect the male reproductive system. The urinary system and reproductive system are so closely linked in the male that a disorder in one system typically affects the other. Assessment of the reproductive system is an essential part of any comprehensive health history. Nurses need to be comfortable with their own sexuality and knowledgeable about the male reproductive system to be helpful to patients.

Anatomy and Physiology of the Male Reproductive System

Structures

- The male **gonads** (sex glands) are the testes; they are oval shaped and are encased in the scrotum along with the epididymis, seminal vesicles, and vas deferens (Figure 39-1).

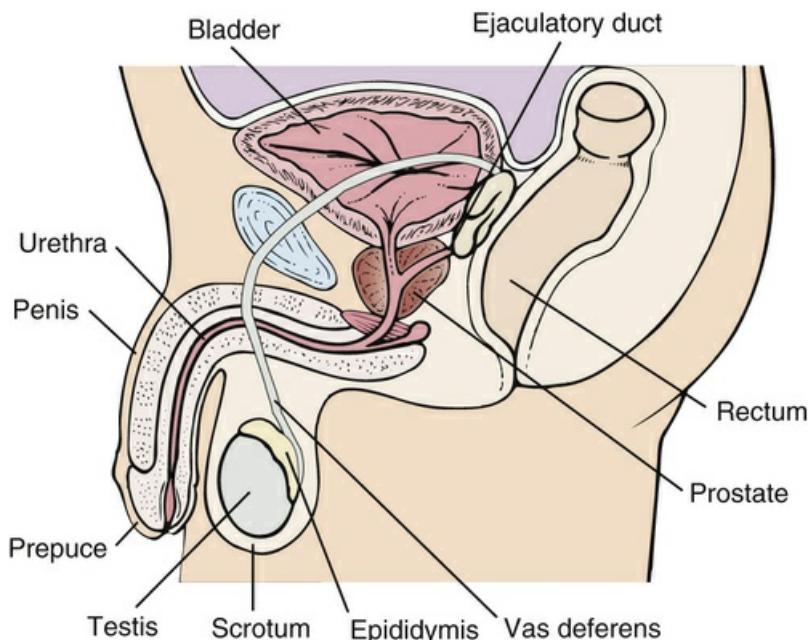


FIGURE 39-1 Structures of the male reproductive system. (From Lewis SL, Heitkemper MM, Dirksen SR, Bucher L: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

- The scrotum is covered with wrinkled skin (**rugae**) and is very sensitive to temperature, pressure, touch, and pain.
- The penis is a cylindrical, erectile organ that hangs in front of the scrotum. It contains three columns of erectile tissue that can cause it to extend and enlarge in circumference, becoming stiff. The penis is covered with skin and includes a foreskin (unless circumcision has been performed). The scrotum and penis make up the external genitalia of the male.
- The prostate gland is shaped like a walnut, encircles the urethra, and is located below and to the rear of the bladder.
- The bulbourethral (Cowper) glands are small pea-sized glands located in the urethral sphincter, posterior to the urethra.

Functions of the Organs of the Male Reproductive System

- The scrotum—a thin-walled, muscular sac—holds the testes, the epididymis, and the vas deferens. The scrotum hangs from the pubic bone and suspends the testes outside the body, where they remain several degrees cooler than the body; the cooler temperature is needed for the production of viable sperm.
- The spermatic cord attaches the testes to the body. It contains the blood vessels and nerves that supply the testes.
- The seminiferous tubules within the testes produce sperm (**spermatogenesis**). These tubules collect and transport the sperm to the epididymis. Testosterone also is produced in the testes.
- The epididymis is a long tube (almost 6 m if uncoiled) that conducts sperm from the testes to the

vas deferens. Immature sperm mature as they travel through this tube. Mature sperm are stored in the lower portion of the epididymis.

- The vas deferens is a muscular tube that connects to the epididymis. It stores sperm and then carries it to the ejaculatory duct by peristaltic movements.
- The prostatic section of the urethra receives the sperm and carries it to the penile portion of the urethra for ejaculation. Secretions from the seminal vesicles and ducts of the prostate gland are mixed with the sperm in an alkaline solution that assists in neutralizing the acidity of the vaginal tract.
- The seminal vesicles produce a fluid that is thick and contains fructose to nourish the sperm and provide energy. The fluid also contains prostaglandins, which contribute to the motility of the sperm. This fluid mixes with the sperm to form seminal fluid, or **semen**. The average volume of semen ejaculated is 2.5 to 4 mL but may vary from 1 to 10 mL.
- The prostate gland produces thin, milky, alkaline secretions that contribute to the seminal fluid and enhance the motility of the sperm.
- The bulbourethral glands secrete an alkaline mucuslike fluid in response to sexual stimulation.
- The secretions of the bulbourethral glands neutralize the acid of residual urine in the urethra and provide some lubrication at the tip of the penis for intercourse.
- The penis is flaccid until sexual arousal causes the arterioles to the erectile tissue to dilate and the veins to constrict, engorging the penis with blood until it is enlarged and rigid. This is an **erection**. Erections are stimulated by anticipation, memory, visual sensations, or touch on the glans penis and skin of the genital area. If stimulation continues, **ejaculation** will occur. This is the forceful expulsion of semen from the urethra. Thoughts, emotions, some medications, or medical disorders can sometimes inhibit erection. The penis transfers semen to the vagina. It also carries urine through the urethra to be excreted.

Control of Sperm Production

- The hypothalamus, the anterior pituitary, and the testes secrete hormones that control male reproduction.
- The hypothalamus secretes gonadotropin-releasing hormone (GnRH) in response to an unknown stimulus.
- GnRH stimulates the anterior pituitary to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH). LH stimulates the testes to produce testosterone. FSH binds with cells in the seminiferous tubules, making them respond to testosterone. Testosterone and FSH stimulate the formation of sperm (spermatogenesis).
- The male sex hormones are called **androgens**.
- At puberty, testosterone levels rise and cause maturation of the male reproductive organs. Sperm take 70 days to mature and are constantly being produced once puberty has occurred.
- Normal sperm count is 100 million/mL. Sterility occurs when the sperm count drops to less than 20 million/mL.

Age-Related Changes

- The scrotum becomes more pendulous, and there are fewer rugae.
- Prostate enlargement may occur, with risk of urethral obstruction.
- Plasma testosterone and progesterone levels decrease.
- There is decreased sperm production, but fertility remains intact. Ejaculate volume decreases.
- After age 60 years, the cycle of sexual response lengthens. Arousal takes longer and more direct penile stimulation may be needed; the firmness of the erection may be decreased.
- Sexual activity in older men is closely related to their sexual activity in earlier years.
- Vascular problems are the major causes of impotence.
- Certain medical disorders, or the use of various medications, may have side effects that can affect sexual function.

The Male Reproductive System

The male reproductive organs are shared with the urinary tract, and disorders in functioning of one system typically affect the other. For this reason, men who have a disorder or dysfunction of the reproductive tract are commonly treated by a urologist.

Fertility

If the anatomy and physiology of the male reproductive tract are intact, sexual function is influenced by the functioning of the hypothalamus, pituitary, and testes; the metabolism and transport of sex hormones (such as GnRH and others); and the cognitive and sensory centers in the brain. A sexual desire (**libido**), the ability to respond to sexual stimulation with a penile erection, and the ejaculation of semen containing live sperm are necessary for fertility. Both the parasympathetic and sympathetic nervous systems influence the normal sexual response cycle.

Older Adult Care Points

The decrease in testosterone with age decreases muscle strength, bone mass, libido, and erectile function, and affects the psychological sense of well-being. Testosterone replacement therapy is thought to decrease visceral fat and improve bone density, muscle strength, libido, and energy, but it may not improve erectile function of the penis. There is no evidence that dehydroepiandrosterone (DHEA) supplements, available over the counter, benefit older men. Studies are ongoing concerning the benefits of testosterone therapy in older adults.

As a man ages, there is no abrupt cessation of gonadal hormone activity as there is in a woman. In the man, there is a gradual decrease in testosterone and other anabolic hormones, such as growth hormone and DHEA.

Contraception

Contraception is a method of preventing unwanted pregnancy. The only 100% effective method of contraception is abstinence. Abstinence is encouraged for adolescents and young adults and is taught in many school programs. However, nurses must be able to provide contraceptive options for the many couples who prefer not to have additional children. Contraception is the responsibility of **both** the man and the woman. Female contraception is discussed in [Table 38-2](#).

Reversible Contraception

Reversible contraception involves the use of spermicidal creams, gels, or foams applied before intercourse to kill sperm in the vagina. These are more effective if used in conjunction with a condom. A male condom is an effective reversible contraceptive technique if it is applied and used properly. The condom sheath is typically made of latex. Proper application includes timing of application and removal and providing a space at the tip for semen to collect. Oil-based lubricants such as petroleum jelly can cause latex to deteriorate, so these lubricants reduce the reliability of latex condoms. It is important to suggest the use of water-soluble lubricants such as jellies made for this purpose. Condoms made of polyurethane are compatible with oil-based lubricants. Latex condoms provide some protection against sexually transmitted infections (STIs).

Permanent Contraception: Vasectomy

Male sterilization by vasectomy is a popular method of permanent contraception. The term **vasectomy** refers to a surgical procedure performed on the vas deferens for the purpose of interrupting the continuity of this duct, which conveys the sperm at the time of ejaculation. This is considered a permanent procedure, but occasionally a vasectomy can be successfully reversed by vasovasotomy (microsurgery) at a later time if a man's life circumstances change.

A vasectomy is done on an outpatient basis in a clinic or provider's office, with a local anesthetic. An incision is made into the scrotal sac on each side, and the vas is lifted out. A segment of the vas is cut out, the ends are bound, and the incision is closed.

The patient should be instructed to use ice applications and acetaminophen or ibuprofen for

scrotal pain and swelling the first 12 to 24 hours postoperatively. The patient should wear jockey shorts or a scrotal support for comfort. Sexual intercourse may be resumed in about 1 week or whenever the patient finds it comfortable. Two negative sperm counts are needed after vasectomy before the patient can be considered infertile, and some form of contraception should be used until then.

Because seminal fluid is manufactured in seminal vesicles and the prostate gland, there is no decrease in semen ejaculation after a vasectomy. However, the semen does not contain sperm. After vasectomy, the sperm cells produced by the vas deferens are reabsorbed by the body. Vasectomy has no effect on libido or sexual performance and provides no protection from STIs. Some patients consider storing fertile sperm in a sperm bank before a vasectomy. Because reversal of a vasectomy may or may not be successful, using frozen sperm at a later date to father a child thus remains an option.

Clinical Cues

After the vasectomy, instruct the patient to use another method of birth control until sperm counts are negative, because active sperm are still present in the vas. Another sperm count should be done 1 year later to verify that the vas deferens is not intact.

❖Nursing Management

■ Assessment (Data Collection)

Because particular kinds of male reproductive disorders predominate in certain age groups, the age of the patient is relevant to nursing assessment. In men older than 50 years, the assessment is directed more toward detecting prostate problems, whereas younger men are carefully assessed for STIs and testicular cancer.

It may be awkward for new nurses to obtain a sexual and reproductive history, but with experience in interviewing male patients of all ages, they will soon become more comfortable and adept at obtaining necessary data. Because questions about urinary problems are usually less sensitive than those dealing with sexual dysfunction, it is best to begin with questions of this kind and then lead into more sensitive ones.

Open-ended questions that start out with "Tell me about..." or "When did you first notice..." give the patient room to discuss only those things he is comfortable talking about. It also is helpful to relate his problem to the inconvenience it has caused in his daily life. For example, tenderness and discomfort in the scrotal area could make sitting at a desk or walking very difficult and interfere with getting assigned work done. Frequent urination can cause distracting and sometimes embarrassing interruptions in his work schedule or recreational activities.

Good communication depends on the sender and receiver of messages using mutually understood language. Many people do not know the medical names of their sex organs. If you suspect that the patient does not understand what particular part of the body is being discussed, or if you are not familiar with the term the patient is using, it is important to phrase questions differently or ask for clarification from the patient.

Focused Assessment

Data Collection for the Male Reproductive System

Ask the following questions:

- Have you noticed any changes in patterns of urination? Any differences in the stream of urine?
- Do you ever have any discharge coming from the penis?
- Have you felt any masses or bumps in the scrotum or groin?
- Do you have any tenderness or pain in the scrotum or penis?
- Do you have any rectal or perineal pain?

- Do you perform regular testicular examinations?
- Have you had past infections of the reproductive system?
- What drugs do you take regularly?
- Do you have difficulty obtaining or maintaining an erection?

Health Promotion

Health Screening and Assessments

Regular self-evaluation of the testes is encouraged, such as testicular self-examination for early detection of cancer. You can encourage the patient to perform self-examination and teach proper techniques and follow-up care ([Figure 39-2](#)). (Privacy should be provided during examination and obtaining specimens.)

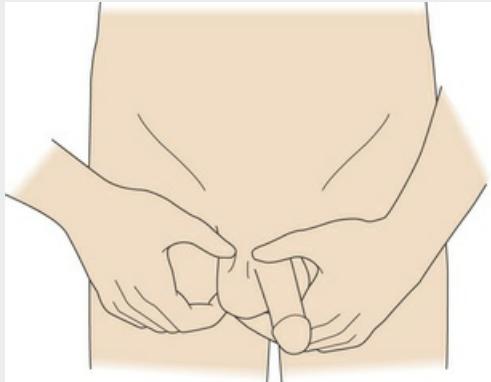


FIGURE 39-2 Testicular self-examination. (Courtesy Coloplast Surgical Marketing, Minneapolis, Minnesota.)

Think Critically

Can you think of five relatives or friends for whom you could provide information on testicular self-examination? How would you approach them on this subject?

Diagnostic Tests

Tests for general state of health, such as complete blood cell count, urinalysis, chemistry profile, and thyroid tests, are done initially for problems concerning the male reproductive tract. Serum acid phosphatase is usually elevated in patients with prostate cancer. Serum alkaline phosphatase is elevated if malignancy of the prostate has metastasized to the bone. A kidney-ureters-bladder (KUB) x-ray, an intravenous pyelogram, and cystoscopy with uroflowmetry studies also may be performed (see [Chapter 34](#) for more information on these tests). Blood tests are performed to detect specific UTIs.

Tumor protein marker studies are performed for patients with testicular cancer for follow-up to determine the success of treatment or recurrence of the disease. The primary tumor markers are alpha-fetoprotein (AFP) and the beta subunit of human chorionic gonadotropin (beta-HCG). A **prostate-specific antigen (PSA)** test detects levels of a glycoprotein produced by the prostate that is elevated in prostate cancer. Diagnostic tests that relate to the male reproductive organs are summarized in [Table 39-1](#).

Think Critically

How would you begin your assessment interview with a 52-year-old man? Would you have any difficulty asking the questions necessary to obtain a good reproductive system history and

information about present problems?

Table 39-1
Diagnostic Tests for the Male Reproductive System

TEST	COMMENTS
Digital rectal examination	A lubricated, gloved finger is inserted into the rectum to evaluate the consistency and size of the prostate and detect any nodules.
Semen analysis	Through masturbation, the patient provides a specimen of semen, which is analyzed for volume and for sperm content and motility.
Testicular self-examination (TSE)	Monthly self-examination is encouraged (see Figure 39-2).
Prostate-specific antigen (PSA) level	A sample of blood is examined for the level of glycoprotein produced only by the prostate. An elevated level is found in benign prostatic hyperplasia, and levels above 10 mg/mL may be indicative of prostate cancer. However, abnormal levels do not indicate a positive diagnosis. The United States Preventative Services Task Force recommends against routine screening for prostate cancer. The National Comprehensive Cancer Network recommends risk-stratified screening. The American Cancer Society recommends that men should make an informed choice.
Transrectal ultrasound	Recommended when PSA and/or digital rectal examination results are abnormal. May also be used to guide needle biopsies of the prostate.
Urography	Radiologically detects changes caused by ureter abnormalities and follows urine excretion pathway.
Uroflowmetry	Measures the volume of urine expelled from the bladder per second. Detects outflow tract obstruction. Patient voids into a urine flowmeter. Privacy is provided.
Prostate tissue analysis (biopsy)	Specimens of prostate tissue or fluids can be obtained by perineal or transrectal needle aspiration. If procedure is outpatient based, the patient is taught to report hematuria or change in urine flow after the procedure.
Cystoscopy	A lighted instrument is inserted through the urethra into the bladder. Used to detect prostate hypertrophy and bladder tumors. This is done as a sterile procedure.
Urethral smears	Used for laboratory microscopy study to identify pathogens. Prostate massage increases secretions in the urethra. A sterile swab is inserted into the urethra to obtain the specimen. Often used to diagnose some sexually transmitted infections.
Endocrine Studies	
Luteinizing hormone (LH) level	LH secreted by the pituitary stimulates Leydig cells in the testes to produce testosterone. High levels may indicate testicular failure.
Prolactin level	Prolactin, a hormone secreted by the pituitary, potentiates testosterone production.
Follicle-stimulating hormone (FSH) level	FSH is secreted by the anterior pituitary gland and stimulates the Sertoli cells in the seminiferous tubules to complete formation of mature sperm. Increased FSH levels indicate decreased spermatogenesis.
Testosterone level	Testosterone is secreted by the Leydig cells of the testes. High levels may indicate a testicular tumor. Low levels may occur in older men. Because testosterone levels are highest in the morning and lowest in the evening, it is important to obtain a morning sample.

■ Nursing Diagnosis

Examples of problem statements frequently associated with the male reproductive system may include:

- Altered elimination due to urinary blockage.
- Anxiety due to failure to empty bladder totally or due to leakage of urine.
- Pain due to pressure within the pelvis, bladder distension, surgical incisions, or bladder spasms.
- Altered sexual function due to failed erection or decreased libido.
- Decreased self-image due to changes in sexual function.
- Potential for infection due to urine stasis.

Additional problem statements may be appropriate for patients undergoing surgery or who have cancer (see Chapters 4, 5, and 8).

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning

Expected outcomes are written for individual patients based on the problem statements chosen. Interventions are planned to help the patient meet the expected outcomes. Plan interaction with the patient based on his age, educational level, degree of comfort in discussing reproductive problems, and culture.

Expected outcomes for a patient with problems of the male reproductive system are:

- Patient will have normal urinary flow without obstruction.
- Patient will have normal urinary elimination after surgery.
- Patient will have bladder spasms controlled with medication.
- Pain will be resolved after surgical recovery.
- Patient will have increased self-esteem 3 months after surgery.
- Patient will explore avenues for achieving sexual satisfaction.
- Patient will focus on positive traits and capabilities to increase a positive body image.
- Patient will not experience any infection from stasis of urine or from surgery.

■ Implementation

Nursing actions for selected problems of the male reproductive system are found within the sections on specific diseases that follow. Privacy should always be provided when assessing the genitals, performing catheter care, or doing dressing changes. There are wide variances in the degree of modesty in men. Female nurses must be especially cautious and display a matter-of-fact, respectful manner when providing care. Sensitivity to embarrassment is necessary. Rather than stating "Don't worry; I'm used to this," it might be better to state, "I understand that this may be embarrassing for you; I will try to be as quick about it as I can."

Some patients make inappropriate comments when they feel that their sexuality is threatened. A male patient with sexual dysfunction, or one about to undergo surgery that may affect his sexuality, might make sexual comments or advances to a female nurse; she should be tactful and matter-of-fact in setting limits on such behavior, without taking the patient's inappropriateness personally.

■ Evaluation

Evaluation assesses how effective the nursing actions are in helping the patient achieve the expected outcomes. If the actions and treatments are not achieving the desired effect, a revision in the plan of care is necessary.

Disorders of the Male Reproductive System

Erectile Dysfunction

Erectile dysfunction (ED), also known as **impotence**, is the inability to achieve or maintain an erection that is firm enough for sexual intercourse more than 25% of the time. Impotence can also involve ejaculation problems. ED has both psychological and organic causes.

Clinical Cues

Sexual Activity Among Older Adult Men

Cultural factors can affect erectile function in older men. Some cultures may disapprove of sexual activity among older adults, and some older men may not seek guidance for ED.

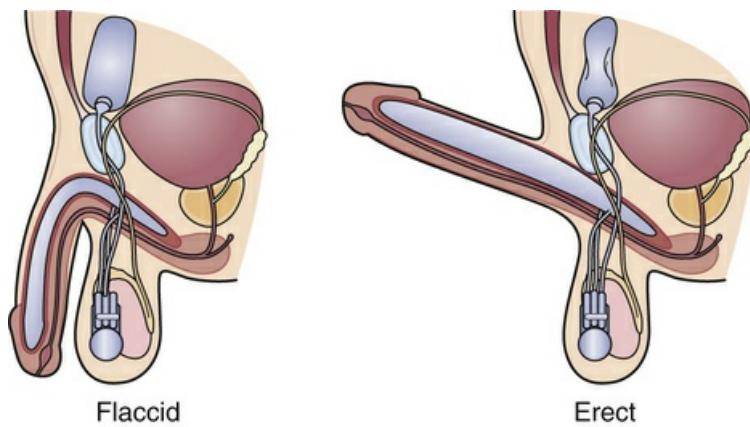
Factors that interfere with the mechanisms of penile erection will cause ED. Any condition that impairs the blood supply to the penis, impairs pathology of the nervous system or hormonal supply, or impairs psychosocial responses can interrupt the process of penile erection. Anxiety and depression can affect achieving or maintaining an erection. Organic causes can include diabetes mellitus and other endocrine disorders, disorders of the urinary tract, neurologic disorders, and chronic illness (such as sickle cell anemia, hypertension, cardiovascular disease, liver disease, and cancer). Medications and drug and alcohol abuse can interfere with sexual performance. Some antihypertensive drugs, diuretics, tranquilizers, and medications used to prevent gastroesophageal reflux disease (GERD) can cause sexual problems. Antiparkinson medications can enhance sexual desire but not the ability to perform (Wold, 2008).

A complete history and physical examination are needed to rule out any physical illness that may affect sexual performance. Sleep laboratories can monitor nighttime penile erections to detect organic causes of impotence. A Doppler probe can measure arterial flow in the penis essential for erections, and nerve conduction tests can rule out neurologic pathology related to impotence. Review the patient's medications for side effects affecting erectile function and conduct a complete evaluation for psychological causes of impotence before devising an individualized treatment plan. Studies have shown that among patients who seek help for ED, nearly 30% have undiagnosed hypertension, 15% have diabetes mellitus, and 5% have significant coronary artery disease (Jackson et al, 2006).

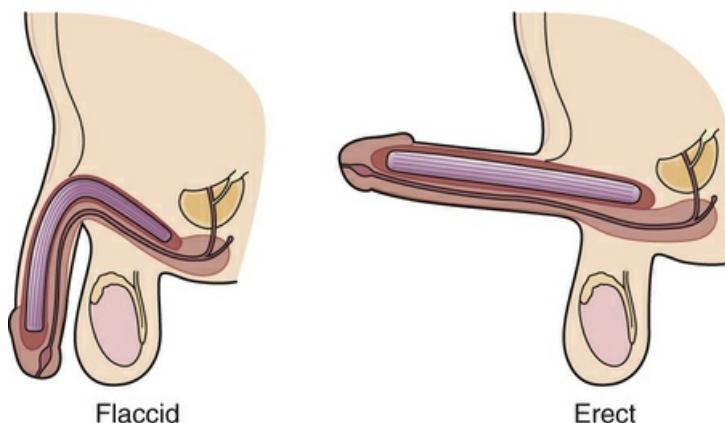
Treatment

Medical treatment depends on the cause of ED. Medical conditions are treated, the medications prescribed are reviewed and adjusted, hormone therapy may be prescribed for hypothalamic-pituitary disorders, and vascular surgery may be indicated for penile blood flow obstruction.

The primary intervention for ED is modifying reversible causes of the problem. Drug therapy includes phosphodiesterase (PDE-5) inhibitors, taken an hour before sexual activity. These drugs should not be taken with nitrate-based drugs used for heart problems, because a serious drop in blood pressure can occur from the combination. If these methods fail to resolve ED, surgical interventions include inserting a penile implant that can be rigid or flexible. One type of implant includes a pump, inflatable cylinders, and a reservoir for emptying after erection. The erection produced is usually firm enough to enable intercourse (Figure 39-3). Complications of oral medication therapy include **priapism**, a persistent abnormal erection that can develop into a urologic emergency. Treatment options are presented in Table 39-2.



INFLATABLE PENILE IMPLANT



FLEXIBLE ROD PENILE IMPLANT

FIGURE 39-3 Penile implants.

Table 39-2

Treatment Options for Erectile Dysfunction

OPTION	COMMENT
Medications Taken About 1 Hour Before Intercourse	
PDE-5 Inhibitors	Side effects can include headache, dyspepsia, and nasal congestion.
Sildenafil (Viagra)	Contraindicated in patients taking nitrates and patients with hypertension or retinopathy. Usually taken $\frac{1}{2}$ to 4 hr before sexual stimulation. Viagra
Vardenafil (Levitra): rapid onset	
Tadalafil (Cialis): longer lasting	can cause color vision disturbances and should not be taken more than once per day.
Yohimbine	Useful if organic disease is cause of ED.
Trazodone	Has sedation as side effect.
Intraurethral prostaglandin E ₁ suppository (alprostadil)	Works locally on corpora cavernosa as a vasodilator.
Intracavernosal injections of vasodilating drugs	Currently replaced by oral sildenafil therapy. May cause priapism.
Vasoactive drugs	Can be administered by topical gel, local self-injection, or insertion of medication pellet (alprostadil) into the urethra. Side effects can include pain, fibrotic nodules, and hypotension.
Papaverine gel	
Alprostadil (Caverject)	
Phentolamine (Vasomax)	
Complementary and Alternative Therapies	
Siberian ginseng	Believed to increase penile blood flow, but research-based evidence is lacking.
Ginkgo biloba	These therapies may be used in conjunction with other options. Research-based evidence of effectiveness is lacking, but research is ongoing.
Acupuncture	
Aromatherapy	
Sandalwood	
Rose	
Jasmine	
Ylang ylang oil	
Imagery	
Biofeedback	
Relaxation	
Other	
Sexual therapy	The psychosocial factors that may be causing ED are discussed with a qualified sexual therapist. Counseling should include the partner.
Penile implants	Can be a semirigid rod or an inflatable prosthesis.
Negative pressure (vacuum constrictive devices)	Used to induce erection by suction. A band is placed at base of penis to maintain erection. May be cumbersome to use. Injury can occur if constriction band is left in place longer than 1 hr.

ED, Erectile dysfunction; *PDE-5*, phosphodiesterase.

Be aware of relationship problems within the family unit. Asking open-ended questions concerning sexual function or problems can provide information that will be helpful to the plan of care. Referral to a sex therapist may be indicated to help the patient integrate his sexual belief, practices, and abilities into a healthy lifestyle. Community support groups for patients with ED and their partners may be available, such as Impotence Anonymous (I-Anon).

Older Adult Care Points

Older men who have been consistently participating in intercourse throughout adult life have the best chance of maintaining this capability. When abstinence has occurred over a considerable time, ED may become a problem. With patience and treatment, this problem may be overcome. Men can reproduce as long as they can participate in intercourse.

Ejaculation Disorders

Spinal cord injuries, neurologic disorders such as multiple sclerosis, diabetes mellitus, urologic surgery, or the side effects of various medications can cause problems with ejaculation. **Premature ejaculation** is the most common ejaculation problem in men; it occurs when the ejaculation reflex is not controlled, and the release of semen occurs before release is desired. Chemical, vibratory, and electrical stimulation can be used to treat premature ejaculation.

Retrograde ejaculation occurs when the semen travels toward the bladder rather than exiting the penis. Determining the physical and psychological factors causing the retrograde problem is the priority for selecting appropriate treatment and planning care. Retrograde ejaculation may occur after prostatectomy.

If fertilization is desired, men with retrograde ejaculation may have sperm harvested from their urine for artificial insemination. When spinal injury is the problem, an electro-ejaculation device inserted into the rectum stimulates the prostate and enables sperm collection for artificial insemination.

Infertility

Infertility is defined as failure of a couple to achieve a pregnancy after at least 1 year of frequent, unprotected intercourse. Approximately 25% to 30% of infertility may result from factors in the male partner.

Hypothalamic-pituitary disorders and ED contribute to infertility, but testicular disorders are the most common organic cause of male infertility. Drugs, infections, systemic disease, and congenital disorders can cause testicular failure.

A semen analysis with sperm count and activity is performed. Laboratory tests performed include FSH, LH, and testosterone levels to determine whether hormone therapy is indicated. A postejaculation urine specimen may be examined to diagnose retrograde ejaculation of semen into the bladder. An ultrasound of the seminal vesicles may reveal dilated vesicles and obstruction of the vas deferens near the ejaculatory duct. Surgical resection of the ejaculatory duct may be indicated. A fine-needle aspiration or biopsy of the testicles may reveal pathology that can be treated. Discussion with both partners concerning technique and timing of intercourse is indicated.

Pathology may be corrected with medications, hormone therapy, or surgery. In vitro fertilization or intracytoplasmic sperm injection (ICSI) after sperm extraction is often successful in treating male infertility.

The environment should be evaluated for toxins such as pesticides, lead, mercury, or radiation exposure—all of which can affect fertility. Occupational influences on fertility include exposure to heavy metals, solvents, fumes, or polycyclic aromatic hydrocarbons (DeFleurian, 2009). Patients seeking fertility should be instructed to prevent excessive heat around the scrotal area, which could decrease sperm development. Hot tubs, using a laptop on the lap, and tight underwear should be avoided. Stress reduction techniques, information concerning timing and technique of intercourse, optimum nutrition, and health practices should be reviewed with both partners. When infertility is attributable to the man, his self-image may be affected; therefore diplomatic, caring, and considerate family interactions are essential.

Hydrocele

There is normally a small quantity of fluid in the space between the testis and tunica vaginalis within the scrotum (Figure 39-4). A larger-than-normal amount of fluid accumulating in this space is known as *hydrocele*. The fluid accumulation may be caused by infection, such as epididymitis or orchitis, or accumulation may occur after trauma; hydrocele involves interference with lymphatic drainage of the scrotum. In many cases the cause is unknown. Hydrocele causes enlargement of the scrotum and usually is painless, but the weight and added bulk of the fluid can cause discomfort.

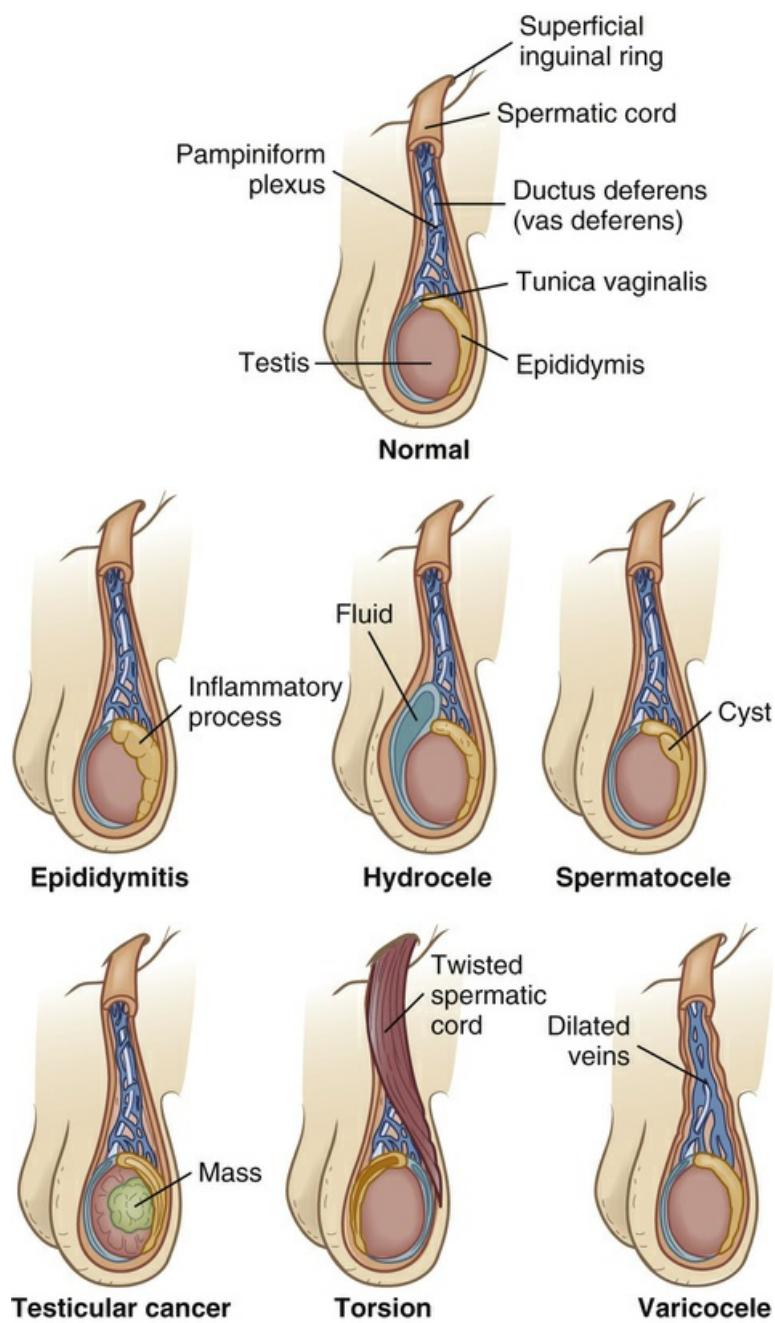


FIGURE 39-4 Scrotal masses. (From Lewis SL, Heitkemper MM, Dirksen SR, Bucher L: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Treatment, when indicated, is aspiration or surgical incision and drainage of the sac. A pressure dressing and a drain are left in place postoperatively. The patient will need to wear an athletic supporter for several weeks.

Varicocele

Dilation and clumping of the tributary vessels of the spermatic vein cause a painful swelling called *varicocele* (see [Figure 39-4](#)). Varicocele typically occurs on the left side of the scrotum from retrograde blood flow from the left renal vein. The discomfort is rarely enough to warrant surgery. If infertility has been a problem, surgical correction via injection of a sclerosing agent or ligation of the spermatic vein may improve fertility.

Nursing measures to help the patient cope with fatigue, weakness, and fever are appropriate, because these problems are commonly associated with urogenital infections and surgical procedures. Fluid intake should be increased to help prevent fluid deficit, reduce fever, increase urinary flow, and remove debris and bacteria. The patient is advised to wear scrotal support after any intervention.

Testicular Torsion

Testicular torsion is a twisting of the testes and spermatic cord (see [Figure 39-4](#)). It is commonly caused by elevated hormone levels in young adult men but can also be the result of scrotal trauma. Signs include sudden acute scrotal pain and an absence of the **cremasteric reflex** (retraction of the testicles when the inner thigh is stroked). Nausea and vomiting may also occur. A Doppler ultrasound scan may reveal diminished blood flow and confirm the diagnosis. To prevent testicular ischemia and necrosis, emergency surgery secures the testicle within the scrotum or possibly removes the testicle. Provide routine postoperative wound care, with emphasis on providing support and relieving anxieties concerning the patient's sexual self-image and future sexual performance.

Priapism

Priapism is a prolonged penile erection resulting in a large, hard, and painful penis, unrelated to sexual desire or activity. The cause can be neurologic, vascular, or the result of medications such as those designed to increase sexual performance. The most common disease that causes priapism is sickle cell disease, which causes a local accumulation of erythrocytes that result in engorgement of the corporal bodies. Circulation to the penis may be compromised, and voiding may be impaired while the penis remains erect, so prompt treatment is essential.

Treatment can be conservative, to promote dilation of vessels and relieve pressure. Sedation, bed rest, warm baths or enemas, and urinary catheterization may be prescribed. Aspiration of the corpora cavernosa with a large-bore needle or a shunting procedure to divert blood may be necessary to prevent ischemia of the penis. Provide supportive care to the patient, who not only may be in pain, but may be embarrassed by the loss of erectile control and fearful of the effect of this condition on future sexuality.

Peyronie Disease

Peyronie disease is a condition in which a plaque of nonelastic fibrous tissue develops in the tunica portion of the dorsal corpus cavernosa of the penis. The loss of elasticity in that section of the penis results in the inability to have a uniform erection of the penis. The penis will curve upward when erection occurs. Inability to penetrate the vagina may result, and the erection may become painful as well as embarrassing.

Treatment may include conservative measures such as local injections to dissolve the plaque. The size of the lesion and the level of ED may indicate a need for surgical intervention.

Benign Prostatic Hyperplasia

Etiology and Pathophysiology

Enlargement of the prostate, also known as benign prostatic hyperplasia (BPH), occurs when the prostate gland enlarges and extends into the bladder neck, causing obstruction of urine flow. An enlargement of the prostate often begins to develop before age 30 years. Fifty percent of men show evidence of enlargement by age 60 years, and 80% of men in their eighth decade develop BPH ([American Urological Association, 2010](#)).

Signs and Symptoms

BPH produces no symptoms until the growth becomes large enough to press against the urethra ([Figure 39-5](#)). Then the patient begins to experience difficulty in urinating, evidenced by a decrease in the caliber of the stream of urine, hesitancy, and dribbling after voiding. There may be frequency, nocturia, and urgency resulting from irritation of the distended bladder wall. In the later stages there may be complete obstruction of the urinary flow. Retention of urine (urinary stasis) is defined as more than 60 mL of residual urine after a void. Urinary tract infections can result from urinary stasis, because the retained urine acts as a medium for organism growth. Gradual dilation of the ureter (**hydroureter**) and kidneys (**hydronephrosis**) can occur. Nitrogen products can accumulate in the blood (**azotemia**) and cause renal failure if the urinary obstruction is not relieved. The American Urological Association has developed a tool to assess symptoms related to urinary obstruction, which aids in clarifying the severity of the problem ([American Urological Association, 2010](#)). The tool gives a numerical score to the severity of each symptom of urinary retention. The total numerical score is used to determine appropriate treatment options.

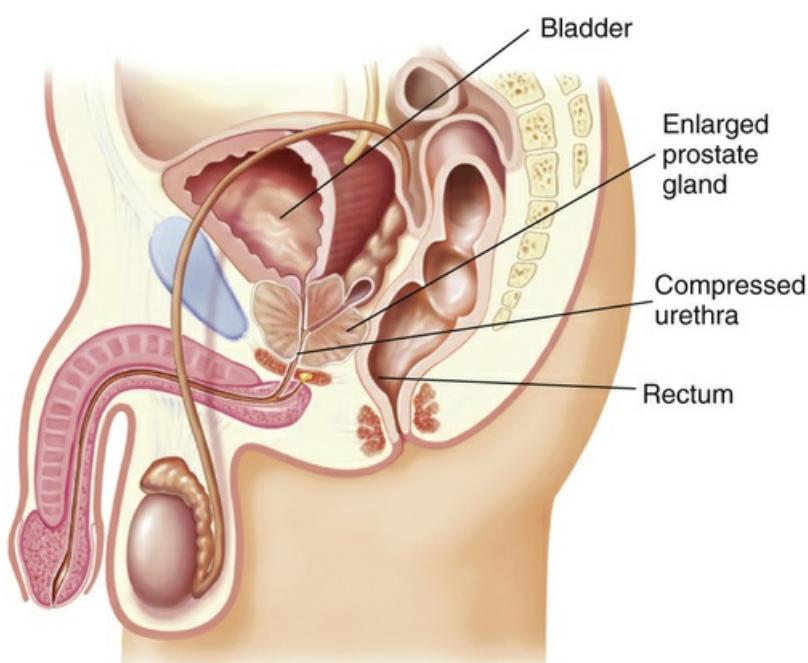


FIGURE 39-5 Benign prostatic hyperplasia. (From Lewis SL, Heitkemper MM, Dirksen SR et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Diagnosis

A digital rectal examination will reveal an enlarged prostate. The gold standard test for bladder outlet obstruction is increased bladder pressure relative to urinary flow. Pressure flow studies can be performed ([urodynamics](#)). An ultrasound after urination or catheterization to determine residual urine volume is also a helpful diagnostic aid. A transrectal ultrasound differentiates BPH from prostate cancer, and a serum creatinine level can rule out renal insufficiency.

Treatment

If the patient cannot void, an immediate catheterization will relieve the emergency problem, and follow-up care concerning the cause and severity of the prostate enlargement will then be completed.

Drug therapy.

Drug therapy includes:

- **Alpha-adrenergic blockers**, which promote relaxation of smooth muscle and reduce blood

pressure. Side effects of doxazosin (Cardura), terazosin (Hytrin), tamsulosin (Flomax), and alfuzosin (Uroxatral) include dizziness and orthostatic hypotension. These drugs offer prompt relief but may not reduce the prostate size. Silodosin (Rapaflo) also induces smooth muscle relaxation by selective action in the prostate, bladder base, prostatic capsule, and prostatic urethra. Because of reduced side effects, sometimes prazosin (Minipress) is prescribed off-label. However, it is not always efficacious (Deters, 2014).

- **5-Alpha-reductase inhibitors (ARIs)** are steroids and may take several months to work. Antiandrogen agents such as finasteride (Proscar) and dutasteride (Avodart) can decrease prostate size by reduced dihydrotestosterone (DHT) production. Side effects include decreased libido and increased breast size (**gynecomastia**). Finasteride has been approved for use to prevent prostate cancer in select patients when combined with doxazosin. Dutasteride is used alone or in combination with tamsulosin to reduce the conversion of testosterone to DHT, thus reducing symptoms (Deters, 2014).
- **PDE-5 enzyme inhibitors** are agents that inhibit the enzyme PDE-5, thus producing an increased vasodilation and inducing smooth muscle relaxation. Tadalafil (Cialis) requires sexual stimulation to activate the effect.
- Combination products recently have been emerging and have been shown to provide an improvement in symptoms and compliance. The most well-known of these is a combination of dutasteride and tamsulosin (Jalyn). This combination is indicated for BPH with an enlarged prostate.

Safety Alert

5-Alpha Reductase Inhibitors and Cancer

A warning has been issued by the Food and Drug Administration (FDA) that individuals taking 5-ARIs may be at an increased risk for developing high-grade prostate cancer (Drugs.com, 2014).

Herbal therapy.

Plant extracts such as saw palmetto (*Serenoa repens*) have been thought to relieve symptoms, although research has not proven their effectiveness and side effects may include an increase in blood pressure and gastrointestinal disturbances. Plant extracts should not be taken if the patient is receiving hormone replacement therapy. Research in the treatment of BPH is ongoing (Erlich, 2013).

Complementary and Alternative Therapy

Simple Lifestyle Changes for Benign Prostatic Hyperplasia

Urinating immediately when the urge occurs and going to the bathroom at every opportunity can relieve minor symptoms of BPH (Erlich, 2013).

Surgery.

Indications for surgical intervention include incontinence, hematuria, urinary retention, bladder stones, and urinary tract infections. Minimally invasive techniques such as balloon dilation, transurethral needle ablation, laser resection, and transurethral microwave thermotherapy are newer techniques that may help relieve symptoms. They are more effective than medications but less effective than surgery.

The most effective way to reduce symptoms is through surgery. This includes transurethral resection of the prostate (TURP), transurethral incision of the prostate (TUIP), laser photoselective vaporization of the prostate (PVP), and open prostatectomy. Review the surgical options that were presented by the health care provider to ensure that the patient has a clear understanding of treatment options (Table 39-3).

Table 39-3

Surgical Interventions for Male Urogenital Problems

TREATMENT	COMMENTS
Minimally Invasive Treatment (Outpatient Surgery)	
Transurethral microwave thermotherapy (TUMT)	Heats and coagulates prostate tissue via a transurethral probe. A urinary catheter may be left in place for 1 wk after treatment to facilitate passing of necrotic tissue and prevent urinary retention. Antibiotics, analgesics, and bladder antispasmodics are prescribed after the procedure.
Transurethral needle ablation (TUNA)	Places radiofrequency needles directly into the prostate to coagulate specific tissue areas. Hematuria may occur for 1 wk after this procedure.
High-intensity focused ultrasound (HIFU)	High-intensity, low-frequency ultrasound waves destroy prostate tissue. Has been found effective in treatment of BPH, but continued research concerning after effects are ongoing.
Surgery	
Open prostatectomy	Involves an external abdominal incision that allows complete visualization of prostate tissue. There is risk for infection and erectile dysfunction, postoperative pain, and a longer recovery period.
Suprapubic prostatectomy	Enters via the bladder.
Retropubic prostatectomy	Does not enter the bladder.
Perineal prostatectomy	The removal of the prostate via an incision in the perineum; has high risk for postoperative wound contamination, incontinence, and impotence.
Transurethral resection of the prostate (TURP)	TURP is the gold standard of treatment for BPH and is performed under spinal anesthesia. A resectoscope is inserted into the urethra to excise and cauterize obstructive prostate tissue. A large three-way catheter is inserted to provide hemostasis and allow urinary drainage. May be performed as outpatient surgery at many facilities.
Transurethral incision of the prostate (TUIP)	The TUIP incises the prostate. May be performed as outpatient surgery at many facilities.
Laser prostatectomy	A modified TURP; uses a laser beam to destroy prostate tissue. Minimal postoperative bleeding occurs, but a catheter may be required for 1 wk postoperatively to prevent urinary retention from edema.
Transurethral electrovaporization of the prostate (TUVP)	Electrosurgical vaporization and desiccation destroy prostate tissue. Complications include hematuria and retrograde ejaculation.
Transurethral photoselective vaporization of prostate (PVP)	Uses a green light laser beam to coagulate prostate tissue.
Urethral stent	A metallic stent is placed in the urethra to hold the urethra open. This is usually a temporary measure, because displacement is common.
Laparoscopic radical prostatectomy	Provides better visualization and less postoperative complications and has a shorter hospital stay.

Serum PSA is a protein-specific antigen that is produced by the prostate tissue and is elevated in BPH, cancer of the prostate, and prostatitis and after prostate biopsy. Interpretation of PSA levels should take into consideration any diagnostic procedures involving the prostate gland. An elevated PSA is therefore not **always** indicative of cancer. The value of routine PSA screening is currently under evaluation.

Think Critically

A patient has been experiencing increasing difficulty in emptying his bladder; he is diagnosed with BPH. His provider has recommended prostate surgery, but he is reluctant to have surgery. What other options are available to this patient that might prevent further organ damage?

Nursing Management

Preoperative care.

Urinary drainage is accomplished by insertion of a catheter using sterile technique. If the obstruction is severe, a urologist may insert a special rigid catheter. A high fluid intake is encouraged, and antibiotics are routinely prescribed. You should interview the patient to assess the understanding of the procedure to be performed and the impact on his lifestyle, self-image, and sexual function.

Preoperative teaching includes deep-breathing exercises; range-of-motion leg exercises; the general preoperative and postoperative routine; and explanation of care for the incision, catheters, irrigation system, and drains (see [Chapters 4 and 5](#)).

Postoperative care.

The postoperative nursing care of the patient varies according to the type of prostate surgery performed ([Figure 39-6](#)). The general principles of postoperative nursing care that apply to all patients having major surgery are necessary for the patient undergoing a prostatectomy. Potential postoperative complications are bleeding, urinary incontinence, and bladder spasms. Because hemorrhage always is a danger, vital signs are taken per agency protocol, then every 4 hours. The patient is monitored for pallor and rising pulse, which, along with blood pressure changes, may indicate excessive bleeding and shock. A high-fiber diet and a stool softener may be prescribed to prevent straining, which increases intra-abdominal pressure and can cause further bleeding.

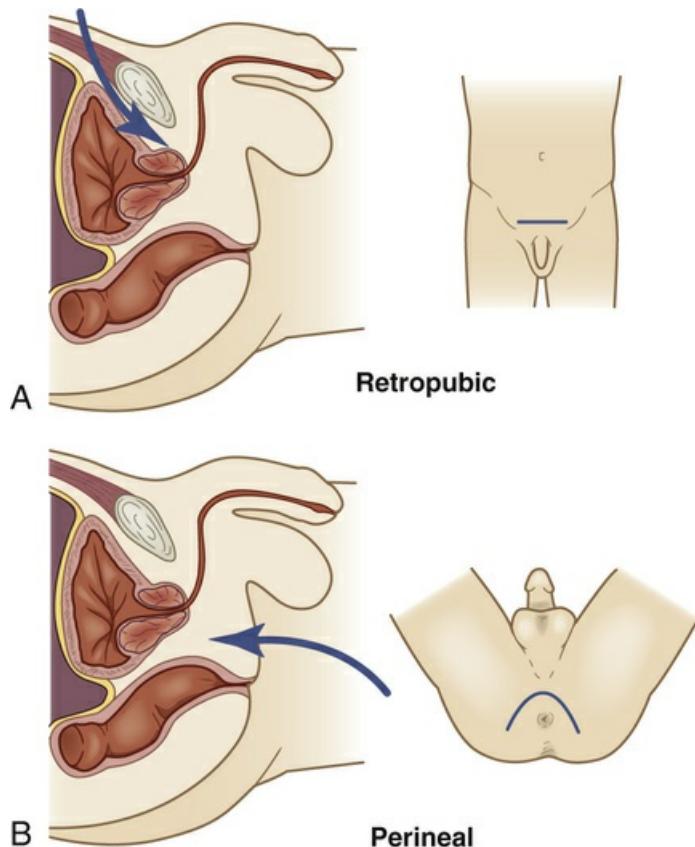


FIGURE 39-6 Two approaches to perform a prostatectomy. **A**, The retropubic approach involves a midline abdominal incision. **B**, The perineal approach involves an incision between the scrotum and anus. (From Lewis SL, Heitkemper MM, Dirksen SR, Bucher L: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

Patients with suprapubic prostatectomy and transurethral resection of the prostate (TURP) will return from surgery with a three-way urethral catheter connected to continuous bladder irrigation with sterile normal saline (Figure 39-7). Blood-tinged urine is normal for the first few days after the surgery. To decrease clot formation, the bladder irrigation flow rate is adjusted to keep the urine diluted to a reddish pink, clearing to a pink tinge within 48 hours. Some pieces of tissue and small clots may be seen in the drainage. Additional intermittent irrigation with 20 to 30 mL of normal saline may be needed to clear the catheter of obstruction ([Nursing Care Plan 39-1](#)). Hemorrhage is a possible complication and occurs mostly in the first 24 hours. Strict sterile technique must be used when irrigating the bladder, and the catheter should be connected to a closed drainage system to prevent infection.

Clinical Cues

When caring for a bladder irrigation system:

- Use sterile normal saline unless otherwise ordered.
- Monitor rate of irrigation.
- Monitor and record intake and output.
- Record the amount of irrigation fluid instilled and the amount returned. The difference equals the urine output.
- Check drainage tubes for kinks and clots.
- Observe for signs of bladder spasms and medicate promptly as needed.

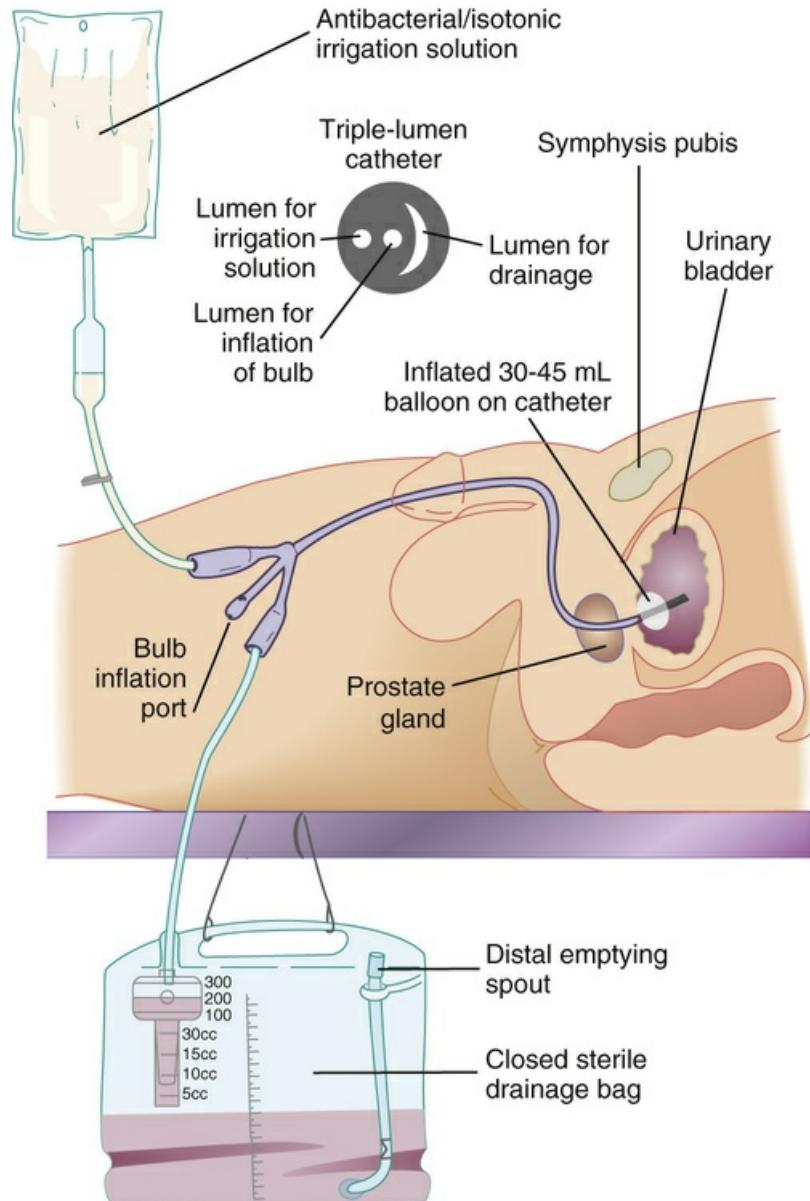


FIGURE 39-7 Continuous bladder irrigation system. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

* Nursing Care Plan 39-1

Care of a Patient After Prostatectomy

Scenario

A 65-year-old man is admitted to the postoperative unit after a prostatectomy. His vital signs are stable, and a bladder irrigation system is set up at the bedside. The patient is awake and oriented, and the provider's orders include diet as tolerated.

Problem Statement/Nursing Diagnosis

Potential fluid volume deficit/Risk for deficient fluid volume secondary to postoperative hemorrhage and limited fluid intake.

Supporting Assessment Data

Objective: Transurethral prostatectomy.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient evidences normal fluid volume and stable vital signs.	Monitor vital signs.	A change in vital signs can indicate fluid deficit.	Vital signs stable.
	Monitor intake and output.	Encouraging oral fluids as tolerated and recording amount and type of output enable identification of fluid volume status.	Intake >3500 mL; output >3200 mL. Taking sufficient oral fluids.
Patient evidences clear to pink urinary drainage with no clots.	Perform closed bladder irrigation as prescribed.	Irrigation removes accumulating clots that can obstruct urine outflow and precipitate further hemorrhage.	Irrigation outflow pink with few clots.
	Administer IV fluids as prescribed.	IV therapy can help maintain fluid balance.	IV infusion at 150 mL/hr.

IV, Intravenous.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/Deficient knowledge related to lack of knowledge regarding self-care after discharge.

Supporting Assessment Data

Subjective: "No, I've never had to do any wound care before. What do I have to do?"

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will list signs of infection; explain need for increased fluid intake; demonstrate care of wounds, dressings, and catheter; and follow medication regimen.	Instruct to report signs of infection: fever, chills, malaise, increased pain, purulent drainage, excessive swelling.	Finding infection early means early treatment.	Able to provide accurate feedback of all instructions.
	Instruct to avoid heavy lifting, driving, and sexual activity until permitted by urologist.	Heavy lifting or sexual activity may cause disruption of tissue and bleeding.	States he understands and will comply with restrictions.
	Instruct to report new onset of burning on urination or cloudy urine.	Burning on urination or cloudy urine may indicate bladder infection.	No burning on urination; no cloudy urine.
	Explain what each medication is for and when and how to take it.	Helps with compliance with medication regimen.	States understands when and how to take the medications.
	Provide written information about signs and symptoms of urethral stricture or infection and instruct to report these.	Written instructions can be reviewed at home and help to get quick attention for problems.	Given written instructions regarding complications and what to report to surgeon.

Problem Statement/Nursing Diagnosis

Anxiety/Sexual dysfunction, fear of related to inability to achieve erection.

Supporting Assessment Data

Subjective data: "Do you think my wife will leave me if I can no longer have an erection to meet her sexual needs?"

Objective data: Prostatectomy 6/25.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will discuss concerns before discharge.	Encourage verbalization of problems and concerns.	Verbalization of concerns helps with identifying solutions.	Verbalizes concern about the possibility of not being able to obtain an erection.
	Provide information on alternative ways to achieve erection.	Gives the patient useful information in case of need.	Provided with information about the alternate ways to achieve erection.
Patient will discuss concerns with his spouse before discharge.	Counsel in other ways to achieve intimacy. Include spouse or significant other in discussions.	Addressing individual needs of patient encourages learning and retention.	Agrees to include spouse in discussions regarding his sexual concerns.
	Assist to make plan to meet sexual needs.	Provides tools to cope with sexual problems.	—

Critical Thinking Questions

- What are the priority nursing interventions if the nurse notices that the urinary outflow is less than the irrigation input after bladder irrigation?
- Why is it important to attend to complaints of pain from bladder spasms as soon as possible? What medication is generally used for this type of pain?

Persistent bleeding turning the urine darker than cherry red or bright red, or viscous drainage with many clots, should be reported immediately to the surgeon. Traction may be applied to the catheter to supply pressure (**tamponade**) to prevent excessive bleeding. The surgeon does this by pulling against the balloon and then taping the catheter to the thigh or abdomen. This pressure may cause the patient to have a sensation of a continuous need to void. Check frequently to see that the catheter and tubing are not kinked and that outflow is appropriate. Irrigation is continued for 2 to 3 days. The patient may have some urinary frequency and burning after catheter use is discontinued. Some blood in the urine may occur for several more days.

The patient who has had a suprapubic prostatectomy will have a suprapubic catheter in addition

to a urethral catheter. Each catheter is attached to a separate sterile drainage system. After the urethral catheter is removed (sometime after the third day), the suprapubic catheter is clamped, and the patient attempts to void. Residual urine is measured afterward by unclamping the suprapubic catheter. When there is no more than 60 mL of residual urine after voiding, the suprapubic catheter is removed. Dribbling of urine often occurs after prostatectomy because of decreased sphincter tone but usually stops within about 6 months. Patients who experience incontinence are taught perineal muscle strengthening (Kegel) exercises for this problem and are given instruction in bladder training (see [Chapters 33](#) and [34](#)). Teaching begins 24 to 48 hours after surgery. Kegel exercises and coping strategies should be taught to enable early return to a normal lifestyle.

When the urethral or suprapubic catheter is removed, the patient must be carefully monitored for ability to void. Intake and output are tracked closely. Any difficulty in voiding within 6 hours after removal must be reported to the surgeon promptly, because a distended bladder may cause bleeding.

Monitor the incisional dressings and changes them as often as necessary to keep the patient dry and comfortable. Urine is very irritating to the skin, and any area that is exposed to urine drainage is thoroughly cleansed before a new dressing is applied.

Prophylactic antimicrobials and analgesics are administered in the early postoperative period. Bladder spasms often are a problem after TURP or suprapubic prostatectomy. Before giving medication, check to see that the tubing is not kinked and the catheter is draining well, because obstruction can cause bladder spasm. Abdominal distention may be a sign of catheter obstruction as well. A patient who has had a radical procedure may have a patient-controlled analgesia pump to control pain.

Clinical Cues

Belladonna and opium (B&O) rectal suppositories are effective for bladder spasms if they are given when the spasms first begin. Relaxation techniques and an anticholinergic drug, such as oxybutynin (Ditropan), may be used to help relieve bladder spasms.

Discharge teaching includes care of the catheter, management of incontinence, maintaining hydration, preventing constipation, observing for signs of infection, and management of anxiety related to impaired sexual function and self-image (see [Patient Teaching](#) on p. 939). Retrograde ejaculation (semen discharged into the bladder) may cause the urine to appear cloudy. Frequent planned urination and avoidance of irritating foods such as citrus, caffeine-containing products, and alcohol should be initiated. The patient should be taught to monitor output and contact the health care provider if unable to void. BPH can recur, so annual digital rectal examinations should be continued (see [Nursing Care Plan 39-1](#)).

Inflammations and Infections of the Male Reproductive Tract

Many of the inflammations and infections affecting the male reproductive system are similar to those of the female reproductive system in cause and effect. For example, urethritis in the men and women can be caused by common pyogenic and colonic bacteria and by *Neisseria gonorrhoeae*. Men also can be infected with *Trichomonas vaginalis* or *Chlamydia*, which are transmitted by sexual contact. The sexual partners may continue to reinfect each other until both are treated simultaneously.

Nonspecific genitourinary infections in men—including nongonococcal urethritis (NGU)—may be caused by various organisms, but these infections present substantially the same clinical picture. Among the symptoms of nonspecific urethritis are mucopurulent discharge from the urethra, painful urination of varying degrees of severity, and the occasional appearance of blood in the urine. A microscopic examination of a smear from urethral secretions may not show any specific organisms, but there may be an excessive number of white cells.

Epididymitis

Epididymitis is an inflammation of the epididymis and may result from an infection of the prostate or urinary tract infection. A patient with epididymitis experiences groin pain and swelling and pain in the scrotum. In men younger than 35 years, the major cause of epididymitis is *Chlamydia*.

trachomatis, a sexually transmitted organism. Symptoms include scrotal pain, swelling, induration of the epididymis, and eventual edema of the scrotal wall. The adjacent testicle may become involved. The urine may contain pus (pyuria), and chills and fever may follow. Antibiotics, ice packs, analgesics, sitz baths, and elevation of the scrotum are the prescribed treatment protocol. A local anesthetic may be injected into the spermatic cord to manage pain.

Orchitis

Orchitis is inflammation of the testicle and may affect one or both testes. It may be caused by local or systemic infection (viral or bacterial) or by trauma. Bilateral orchitis is serious and often causes sterility. **Mumps orchitis** occurs in about 20% of adult men who contract mumps. Gamma globulin usually is given to decrease the possibility or severity of mumps orchitis. The symptoms and treatment parallel those of epididymitis.

Prostatitis

Prostatitis is an inflammation of the prostate that occurs from an infectious agent or other causes. The National Institutes of Health (NIH) uses the following classification system:

- **Type I: Acute bacterial prostatitis** with recovery of bacteria from fluid and signs of illness such as fever
- **Type II: Chronic bacterial prostatitis** with recovery of bacteria from fluid and no signs of systemic illness
- **Type III: Nonbacterial prostatitis/chronic pelvic pain syndrome** with recovery of leukocytes; microscopic purulence of prostate fluid is present but few or no bacteria are recovered
- **Type IV: Asymptomatic inflammatory prostatitis (prostatedynia)** with no bacteria or leukocytes in prostate fluid but persistent symptoms of prostate discomfort, including poor urinary flow, frequency, and dysuria ([Merck Manual, 2014](#))

Symptoms include recurrent urinary infection, pelvic pain, and sexual dysfunction and are often mistaken for BPH. Because blood PSA levels are often elevated in prostatitis, misdiagnosis of prostate cancer can occur. Prostate massage, useful for diagnosis, presents a risk for bacteremia. The various types of prostatitis can be diagnosed with a segmented culture of the initial stream urine, midstream urine, prostate fluid before and after massage, and postmassage urine specimen. Treatment includes bed rest, analgesia, bladder sedatives, sitz baths, and stool softeners to prevent straining. Antibiotics may be prescribed according to culture and sensitivity laboratory findings.

Antibiotics diffuse poorly into the prostatic fluid, so chronic prostatitis is commonly treated with alpha-adrenergic blockers (tamsulosin); fluoroquinolones may be prescribed. The patient is taught to recognize symptoms of urinary tract infection and to reduce retention of prostatic fluid by ejaculation. The patient should be taught to avoid foods that increase prostatic secretions, such as alcohol, chocolate, tea, and spices. Follow-up care to detect reinfection is essential.

Cancer of the Male Reproductive Tract

Penile Cancer

Cancer of the penis is rare, occurring mostly in men with human papillomavirus infections or who were not circumcised.

Cultural Considerations

Incidence and Mortality Rate of Penile Cancer

Penile cancer is very rare in the United States. Testicular cancer is more common in whites; prostate cancer occurs most frequently, and has a high mortality rate, among African American men.

A nontender nodule may appear on the penis, and biopsy will show a squamous cell-type carcinoma. Laser resection of the lesion is the treatment of choice unless the cancer has spread. Radical resection of the penis followed by radiation and chemotherapy may be required. The shaft of the resected penis can respond to sexual stimulation and enable orgasm and ejaculation. After a

total removal of the penis (penectomy) the patient may experience orgasm via stimulation of the scrotum and perineal area.

Testicular Cancer

Testicular cancer occurs most commonly in men ages 15 to 40 years and is the leading cause of cancer death in men 25 to 35 years of age. Studies have identified a gene mutation that may predispose a man to develop a type  of familial testicular cancer ([American Cancer Society, 2015](#)). The 5-year survival rate for testicular cancer is greater than 95% ([American Cancer Society, 2015](#)).

Men most at risk for testicular cancer are those who have had an undescended or partially descended testicle. Men who were exposed to diethylstilbestrol (DES) in utero also may be at high risk for testicular cancer, but evidence-based research is lacking. All males between ages 15 and 40 years should practice testicular self-examination on a monthly basis. Cancer symptoms appear slowly and involve painless enlargement of the testes, backache, and weight loss.

Health Promotion

Testicular Self-Examination

- Testicular self-examination should be performed monthly.
- Perform after bathing when scrotal skin is relaxed.
- Roll each testicle between thumb and fingers.
- Report lumps to health care provider.

If a mass is found and thought to be malignant, diagnostic tests for tumor marker proteins such as elevated levels of AFP, beta-HCG, alkaline phosphatase, and lactate dehydrogenase are obtained to confirm diagnosis. Computed tomography (CT) scans and/or ultrasound should be performed to detect sites of testicular mass. Testicular cancer spreads rapidly via lymph and blood vessels. A microscopic tissue analysis is performed after surgical removal of the mass for definitive diagnosis.

There are three stages for classifying the malignancy of testicular cancer. In **stage I**, the tumor is confined to the affected testis. In **stage II**, malignant cells have spread to the regional lymph nodes, usually on the same side as the affected testis. In **stage III**, there is metastasis to other organs, such as the lungs and liver.

If the testicular tumor is limited to the scrotal sac and there is no metastasis, a laparoscopic surgical removal of the testis ([orchietomy](#)) may be all that is necessary to cure the patient of his disease. A gel prosthesis can be implanted. Care is taken to preserve the nerves associated with ejaculation. The nursing care focuses on teaching and providing psychological support. Ice bags and scrotal support provide comfort, and the importance of follow-up care is stressed. Removal of only one testis will not affect the patient's ability to produce the male hormone testosterone or render him impotent, because the other testis can carry on adequate testicular function.

Further treatment for stage II testicular cancer may include radiation. Chemotherapy is reserved for advanced stages of cancer and results in a high percentage of complete remission. See [Chapter 8](#) for a detailed discussion of radiation and chemotherapy in the care of cancer patients.

Some men view an orchietomy as a loss of manhood. You can be instrumental in assisting the patient to accept the procedure. Time for questions and discussion of concerns should be provided for the patient and his sexual partner. Sperm banking before surgery is an option for patients who may face chemotherapy. Continued follow-up care is essential.

Prostate Cancer

Carcinoma of the prostate is the second most common cause of cancer deaths in men (after lung cancer). The American Cancer Society predicted approximately 220,800 new cases for 2015 in the United States, with 27,540 men dying of prostate cancer ([American Cancer Society, 2015](#)).

Carcinoma of the prostate is usually a slow-growing cancer that is dependent on the hormone androgen. Some studies have identified an association of the prostate cancer antigen gene (*PCA3*),

which can be measured via urinary assay as a significant risk factor. Studies are in progress to determine the effect of chemotherapy on prevention of prostate cancer (ACS, 2014). Both finasteride and dutasteride have been found to decrease the risk of prostate cancer by 25%. However, further studies have found that finasteride has no effect on long-term survival, and neither of these drugs are approved for cancer prevention use (ACS, 2014).

Clinical symptoms and screening.

If prostate cancer is detected early, the possibility of cure is high. Early detection by digital rectal examination can reveal a hardened lobe of prostate early in the course of the disease. Routine PSA screening of young healthy men is not recommended by the American Cancer Society; the United States Preventative Task Force has recommended against prostate screening (USPSTF, 2012), and the National Comprehensive Cancer Network recommends only risk-stratified screening (NCCN, 2014). Men with prostate cancer often exhibit some sexual dysfunction.

Think Critically

What sort of psychological care would the patient undergoing a prostatic biopsy need from the nurse? What might be some of the patient's concerns?

An elevated PSA (about 4 ng/mL) may indicate prostate pathology but is not diagnostic for prostate cancer. The **PSA velocity** is a trend in PSA levels over time that may indicate a need for further tests to diagnose prostate cancer. A transrectal ultrasound may be performed, and bones may be scanned to detect metastasis. A ProstaScint scan combined with CT or magnetic resonance imaging (MRI) scans can detect prostate cancer cells when the PSA levels are low. A urine test to detect prostate cancer, Progensa (PCA-3) assay, is closely related to biopsy outcomes. Transrectal, transurethral, and transperineal prostate biopsy and tissue analyses determine the severity or extent of prostate cancer.

Treatment and nursing care.

Because prostate cancer is relatively slow growing, conservative treatment may involve monitoring and follow-up care. Annual digital rectal examinations are performed, and PSA levels are monitored in high-risk patients. When surgical therapy is indicated, a laparoscopic radical prostatectomy is considered the most effective treatment for long-term survival before metastasis occurs. Other treatment options are listed in Table 39-4. In 2011 a monoclonal antibody, denosumab, received FDA approval for treatment of bone loss (osteoporosis) in men who have had androgen deprivation therapy for prostate cancer (NCI, 2013).

Table 39-4
Treatment Options for Prostate Cancer

TREATMENT	COMMENTS
Radical prostatectomy	The prostate gland, seminal vesicles, and portions of the neck of the bladder are removed. ED and incontinence are long-term complications. A laparoscopic approach provides fewer complications and shorter hospital stay. Robotic prostatectomy reduces risk of incontinence and impotence.
Cryosurgery	A freezing technique destroys prostate tissue. Complications include urethral damage, ED, and incontinence.
Radiation therapy	May be prescribed when the patient is not a candidate for surgery or may be offered in combination with surgery and hormone therapy.
External beam radiation	Most popular form of radiation therapy, given weekly on an outpatient basis for 2 mo. Side effects can include skin irritation, GI cramping and bleeding, ED, and bone marrow suppression. Cure rates for patients with localized cancer are comparable to radical prostatectomy.
Brachytherapy	The implantation of radioactive seeds into the prostate gland. It may be offered in combination with external beam irradiation.
Hormone therapy	Designed to reduce androgens. Leuproreotide (Lupron, Viadur), goserelin (Zoladex), and triptorelin (Trelstar) are common drugs used; produces a chemical castration.
Chemotherapy	Used for hormone-resistant cancer or late-stage cancer. The prostate has limited response to chemotherapy.
Bisphosphonates	Reduce bone complications in advanced stages of prostate cancer. Drugs may include zoledronic acid (Zometa), risedronate (Actonel), etidronate (Didronel), or alendronate (Fosamax).

ED, Erectile dysfunction; GI, gastrointestinal.

A multidisciplinary approach integrates surgery, radiation, and androgen restriction. After surgery, PSA levels are monitored; a decrease may indicate treatment success. In the early stages, radiation therapy may be the treatment of choice. Gamma teletherapy (external) and brachytherapy (internal) are used for cancer of the prostate and provide greater preservation of sexual ability.

Chapter 8 presents a detailed discussion concerning care of patients receiving radiation and chemotherapy. Hormonal therapy is designed to suppress androgen stimulation of the prostate by decreasing plasma testosterone. Removal of the testes may be performed to cause prostate atrophy.

An LH-releasing hormone (LHRH) agonist such as leuprolide or goserelin or androgen agents such as flutamide (Eulexin) suppress androgen and may be used in combination with radiation therapy. Provide a sensitive, caring approach to the patient and family to help them cope with the diagnosis and make informed choices. Preoperative care involves restoration of urinary drainage, prevention of urinary tract infection, and understanding the options for treatment and their effect on sexual function. Complications of surgery may include bleeding, catheter obstruction, and sexual dysfunction. Impotence or retrograde ejaculation may occur. Options to enable erections and improve sexual function via prosthetic devices or medication should be discussed with the patient. The nursing care of a patient with a prostatectomy includes reducing anxiety, relieving discomfort, maintaining fluid balance, monitoring for bleeding or infection, catheter care, and teaching the patient self-care and the need for continued follow-up care.

Older Adult Care Points

For older adults undergoing chemotherapy or radiation therapy:

- Monitor for infections.
- Promote assisted ambulation.
- Institute fall precautions.
- Encourage use of an incentive spirometer.
- Minimize pain.
- Reorient to environment as needed.

Community Care

Nurses in the community can be instrumental in teaching and promoting testicular self-examination in men between ages 15 and 40 years. Educating all men older than 40 years about prostate cancer screening benefits and drawbacks will allow them to make a personal decision regarding PSA testing.

Patient Teaching

Discharge Instructions for a Patient After a Prostatectomy

The patient is instructed regarding the following points:

- Drink 12 to 14 glasses of water during the day to keep the urine flowing freely.
- Do not lift any object weighing more than 8 lb.
- For 2 to 3 weeks after surgery (depending on provider's instructions), avoid strenuous activities.
- If blood is noticed in the urine, lie down and rest; drink more fluids and call the surgeon if the bleeding continues.
- Depending on the type of employment, it may be possible to return to work within 2 to 4 weeks. Consult the surgeon.
- Keep the catheter clean; cleanse the catheter and around the meatus daily with soap and water and rinse thoroughly.
- Report any cloudiness or foul smell in the urine.
- Report signs of infection such as fever, chills, or purulent wound drainage.
- After catheter removal, dribbling of urine may occur for up to 6 months. The problem usually will resolve. Perineal strengthening exercises help.
- After healing is complete, report any changes in the force or size of the urine stream to the surgeon.
- Report for annual checkups to detect recurrence of tissue growth or the development of prostate cancer.

Nurses should be sufficiently knowledgeable about BPH and prostate cancer to direct patients toward treatment options and reliable information.

Nurses in long-term care facilities must be watchful for urinary obstruction in older adult male residents. Alert men should be questioned regularly about problems with urination; men with cognitive impairment who do not have a normal urinary stream should be placed on intake and output recording to detect any problems with urinary obstruction. Palpation just above the symphysis pubis may reveal a distended bladder.

All nurses can be instrumental in teaching perineal muscle (Kegel) exercises to decrease the incidence of incontinence. Incontinence is one of the prime causes of loss of self-esteem in older adults and can be corrected in many cases. Correcting incontinence also greatly decreases the nursing care time that needs to be spent with the patient, thereby cutting health care costs.

Home care nurses supervise or assist with dressing changes for patients after radical surgery, monitor side effects and complications in patients undergoing radiation, teach self-care, and provide psychosocial support for patients with prostate cancer and sexual dysfunction. Collaboration with the provider, social worker, and community agencies can provide avenues of help for these patients.

Nurses in the community can assist patients who are experiencing ED by including assessment for this problem when working with male patients. Knowledge about treatment options, a matter-of-fact optimistic attitude, and a comfortable manner when speaking about this topic can provide hope and guidance. Sometimes ED is brought to light when speaking with the spouse of an older patient. Many times a satisfying sexual life can be reinstated for these couples, providing added fulfillment and joy in the later years.

Get Ready for the NCLEX® Examination!

Key Points

- Anxiety, depression, various medications, and certain diseases can contribute to ED.
- Complications of treatment for ED can include priapism, which requires prompt intervention.
- Testicular cancer occurs most commonly in men ages 15 to 40 years, and the 5-year survival rate is 95%.
- Nurses can be instrumental in teaching and promoting use of monthly testicular self-examination and monitoring for prostate cancer by digital rectal examination and PSA testing.
- Serum PSA levels become elevated when prostate disease is present (such as BPH or prostatitis) and therefore may not be a reliable marker indicating cancer.
- The medical treatment of BPH involves medications that relax the bladder and urethra (alpha blockers) and reduce prostate tissue through reduced DHT production (5-ARIs).
- Indications for surgical intervention for BPH include urinary retention, gross hematuria, bladder stones, and urinary tract infections.
- Nursing care is planned based on the patient's age, educational level, degree of comfort in discussing reproductive problems, and culture.
- Patient education concerning disorders of the reproductive tract should include information about the effects on sexual activity.
- Older adults who have consistently participated in intercourse throughout adult life have the best chance of maintaining this capability into old age.
- Nurses in long-term care facilities must watch for signs of urinary obstruction in older men.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• Online Resources

- Agency for Healthcare Research and Quality, www.ahrq.gov
- Men's Health, CDC, www.cdc.gov/men
- National Comprehensive Cancer Network, www.nccn.org
- WebMD Men's Health Center, www.webmd.com/men/

Review Questions for the NCLEX® Examination

1. A patient is discharged after having a vasectomy. Which statement by the patient would indicate a need for further teaching?

1. "I don't want any more children."
2. "Now I can go home and have sex without fear of impregnating my wife."
3. "There is a possibility that this procedure can be reversed in the future."
4. "I should use ice packs to the scrotum after surgery to reduce swelling."

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

2. A 22-year-old man complains of sudden acute scrotal pain. Initial examination reveals absence of the cremasteric reflex. Doppler ultrasound reveals a diminished blood flow. This condition would most likely be:

1. varicocele.
2. testicular torsion.
3. hydrocele.
4. priapism.

NCLEX Client Need: Health Promotion and Maintenance

3. A 25-year-old African American man was hospitalized for a prolonged penile erection unrelated to sexual desire or activity. A likely cause would be:

1. diabetes mellitus.
2. sickle cell disease.
3. hemophilia.
4. urinary infection.

NCLEX Client Need: Health Promotion and Maintenance

4. A post-prostatectomy patient expresses concerns regarding his ability to have intimate relations with his wife. The nurse identifies a possible sexual dysfunction. Priority nursing interventions would be geared toward which of the following nursing goals?

1. Identify signs and symptoms of infection.
2. Facilitate verbalization of personal concerns with his partner.
3. Demonstrate good aseptic wound care.
4. Facilitate development of alternative coping strategies.

NCLEX Client Need: Physiological Integrity: Physiological Adaptation

5. A 65-year-old man complains of difficulty urinating, described as decreased caliber of the urine stream. He also has accompanying hesitancy, dribbling, and urgency. A digital rectal examination reveals an enlarged prostate. Which nursing intervention(s) would be appropriate? (*Select all that*

apply.)

1. Teach to decrease caffeine and artificial sweeteners.
2. Teach to limit spicy foods and alcohol intake.
3. Apply a condom catheter.
4. Restrict fluid intake.
5. Plan a timed voiding schedule.

NCLEX Client Need: Physiological Integrity: Basic Care and Comfort

6. A 30-year-old white male presents to the clinic for an annual examination. While there he states, "I have a hard lump on my testicle. I just noticed it recently and I think it's because I took up bike riding. I will have the doctor check it the next time I come in if it's still there." What should the nurse tell him?

1. "That's probably a good plan. Most testicular lumps are not cancer and you can always come back sooner if it does not go away."
2. "The doctor should look at it now. Most testicular lumps are cancerous and we can begin treatment right away."
3. "The doctor should check that lump today. Most testicular lumps are benign, but we do not want to take a risk."
4. "Yes. I think the doctor is running late anyway, and you should make an appointment with the doctor because that is an add-on problem, and this is a prevention visit."

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

7. A nurse is taking care of a 40-year-old Hispanic man who had a bilateral orchiectomy. Clinical interviews with the patient confirm mounting concerns regarding his "manhood." The nurse would effectively approach the patient's disturbance in body image by:

1. establishing eye contact.
2. demonstrating sensitivity to nonverbal cues.
3. asking specific questions.

4. involving nonessential members of the family.

NCLEX Client Need: Psychosocial Integrity

8. A 40-year-old man comes into the clinic and asks for a prostate examination and a PSA test. He states, "I know that prostate cancer is the most common cancer in men. I want to start getting screened now and then annually. Screening is the best prevention." What should the nurse tell him?

1. "Screening for prostate cancer can begin at age 45 years; depending on the results, a screening prevention plan is devised based on risk."
2. "Oh you do not need to worry now. Prostate screening begins at age 50 years and then continues annually."
3. "Prostate screening is done at the same time as your colon cancer screening and begins by age 50 years."
4. "We only check PSA levels now. Examinations have been found to be unreliable."

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

9. A patient who had TURP complains of increasing bladder spasms. Which is an appropriate initial nursing action?

1. Medicate with a B&O suppository.
2. Check the urinary catheter tubing for kinks and obstruction.
3. Teach relaxation exercises.
4. Encourage use of patient-controlled analgesia.

NCLEX Client Need: Health Promotion and Maintenance

10. A patient states, "The doctor says I have a hydrocele." How should the nurse explain a hydrocele? (*Select all that apply.*)

1. "A fluid collection within the scrotum that can be drained."
2. "Sometimes caused by an infection of the testis that causes inflammation."
3. "An inflammation of the testes and scrotum from an illness such

as mumps."

4. "Possibly from an injury with inflammation."

NCLEX Client Need: Health Promotion and Maintenance

Critical Thinking Questions

Scenario A

Your brother, who is 20 years old, tells you of a friend who has just learned that he has testicular cancer and is scheduled for surgery tomorrow. Your brother is concerned about the effect the surgery will have on his friend's "manhood." He also says that, if ever he has that kind of cancer, he "doesn't want to know about it, and certainly wouldn't allow surgery."

1. What information could you give your brother about testicular cancer and self-examination of the testes?
2. How could you explain that removal of a testis does not render a man less masculine?

Scenario B

Mr. Watts, age 67 years, has been admitted to the hospital to undergo TURP. He is assigned to your care on his second postoperative day. Mr. Watts seems disoriented and restless, and when you begin to give him his bath, he tells you that his bladder is full and he needs to urinate. You check the catheter and find that it apparently is not draining as it should.

1. What would you tell Mr. Watts about his need to void?
2. What would you do about the catheter, which seems to be obstructed?
3. What observations should you make while caring for this patient?
4. What special precautions should be taken for his safety?

CHAPTER 40

Care of Patients With Sexually Transmitted Infections

Objectives

Theory

1. Differentiate the signs and symptoms of common sexually transmitted infections (STIs).
2. Present the danger of contracting human papillomavirus (HPV) and preventive measures.
3. Explain the procedure for the various tests for STIs.
4. Describe the treatment of common STIs, their prevention, and the resources available to those who need information about STIs.
5. Compare the symptoms of gonorrhea in male and female patients.
6. Distinguish the ways in which human immunodeficiency virus (HIV) is transmitted.
7. Contrast the three stages of syphilis and discuss prevention, treatment, and complications.
8. Illustrate the nurse's role in preventing, identifying, reporting, and treating common STIs.

Clinical Practice

9. Devise a teaching plan for a patient who has experienced a first incidence of genital herpes.
10. Instruct a female patient on ways to prevent contracting or transmitting HIV.
11. Teach a female patient and a male patient ways to prevent STIs.

KEY TERMS

agglutination (ă-GLŪ-tĕ-NĀ-shūn, p. 951)

bacterial vaginosis (băk-TĒ-rē-ăl vă-jī-NŌ-sīs, p. 944)

chancre (SHÄNG-kĕr, p. 950)

gram negative (grām 'NE-gē-tiv p. 951)

gram positive (grām 'PÄ-zə-tiv, p. 951)

oophoritis (oof-ō-RĪ-tīs, p. 944)

pelvic inflammatory disease (PID) (PĚL-vīk īn-FLĂ-mă-tō-rē dī-ZĒZ, p. 944)

peritonitis (pér-i-tō-NĪ-tīs, p. 944)

salpingitis (săl-pīn-GĪ-tīs, p. 944)

sexually transmitted infection (STI) (SEK-sh(ə-)wēl-lē TRAN(t)s-'mit-tēd, in-'FEK-shēn, p. 943)

The term **sexually transmitted infection (STI)** refers to those particular infections spread by intimate physical contact. Modes of transmission include sexual intercourse and contact with the genitals (sexual organs), rectum, or mouth. STIs can also be transmitted via blood contact and can

be transmitted to a fetus via the placenta or to a newborn during the birth process.

The incidence of STIs continues to rise throughout the world. Although all sexually active people must be considered potentially at risk, people with multiple sexual partners are at very high risk for contracting an STI. The largest population groups affected by STIs are adolescents and young adults ([Centers for Disease Control and Prevention, 2013](#)). Teens are engaging in sexual practices at an earlier age and have an opportunity for multiple partners. They are often unaware of signs and symptoms of STIs and are reluctant or unable to access confidential health care. Inflamed tissue and open lesions associated with STIs increase the risk of developing human immunodeficiency virus (HIV) infection, which can result in acquired immunodeficiency syndrome (AIDS). AIDS is an STI for which there is currently no cure (see [Chapter 11](#)). The risks of STIs do not disappear with age. More than 10% of HIV cases occur in patients older than 50 years ([Wold, 2011](#)). Safe sex practices are essential at all ages.

Think Critically

What safe sex practices can help prevent the spread of STIs?

STIs have a major impact on reproduction and general health. Because STIs are communicable, these infections are of concern both to the patient and to the general public health. One of the goals of [@Healthy People 2020](#) is to increase efforts to “promote responsible sexual behaviors, strengthen community capacity and increase access to quality services to prevent STIs and their complications.” Another *Healthy People 2020* objective is to “prevent HIV infection and its related illness and death.” The progress in reaching these national objectives is monitored by the U.S. Department of Health and Human Services. An interesting point regarding progress toward these objectives is that the “CDCs Division of STD Prevention launched a Facebook page for clinicians, health departments, and partners to promote STD awareness and prevention. [Interested parties can] visit and ‘like’ the DSTDP Facebook page and join the conversation!” ([CDC, 2013](#))

Common Infections of the Female Reproductive Tract

Pelvic Inflammatory Disease

Pelvic inflammatory disease (PID) refers to any inflammation in the pelvic cavity. If the infection is located in the fallopian tubes, it is called **salpingitis**. Infection of the ovary is called **oophoritis**; involvement of the pelvic peritoneum is called pelvic **peritonitis**. The organisms causing the infection are usually introduced from the outside, traveling through the uterus to infect pelvic organs. Therefore PID is much more common in sexually active women, particularly women with multiple sexual partners. Most of these infections are caused by two sexually transmitted organisms, *Neisseria gonorrhoeae* and *Chlamydia trachomatis*, and the most common complication is infertility from fallopian tube damage. However, PID can also be the result of an infection after pelvic surgery or childbirth and is not **always** an STI.

Symptoms of acute PID include severe abdominal and pelvic pain and fever, commonly accompanied by a foul-smelling purulent vaginal discharge, and the woman appears acutely ill. Chronic PID usually causes backache, a feeling of pelvic heaviness, and disturbances in menstruation. However, mild cases may produce no symptoms but still cause significant reproductive damage. Acute PID usually is treated with intravenous (IV) antimicrobials, symptom relief, and patient support and teaching. See [Chapter 38](#) for other common inflammations and infections of the female reproductive tract.

Candidiasis

Candidiasis (moniliasis) is a yeast infection, and although it is not considered a sexually transmitted infection, recurrent infections increase the risk for STIs in sexually active women. Candidiasis is caused by a change in the vaginal pH, which allows the yeastlike fungus *Candida albicans* to grow. The pH of the vagina can be altered by diabetes mellitus, oral contraceptives, some systemic antibiotic use, or the frequent douches sometimes practiced by sexually active women. Symptoms of candidiasis include itching; burning on urination; and a white, cheeselike discharge. Treatment includes vaginal miconazole or clotrimazole for 3 to 7 days or oral fluconazole in a single dose.

Bacterial Vaginosis

Bacterial vaginosis occurs when normal lactobacillus in the vagina is replaced by *Mycoplasma hominis* or anaerobic bacteria. Bacterial vaginosis is associated with minor vaginal tissue trauma, often caused by frequent sexual activity or douching. Symptoms include a grayish-white discharge that has a fishy odor. Although not considered an STI, this condition can increase the risk for STIs and does have serious consequences if it occurs during pregnancy. Treatment includes metronidazole or clindamycin (see [Chapter 38](#) for other common inflammations or infections of the female reproductive tract).

Risk Factors for Transmission of Sexually Transmitted Infections

Although men and women are equally susceptible to STIs, **women are diagnosed with STIs at a much higher rate than men.** Biologically, young, sexually active women have a large proportion of columnar epithelium lining the cervix and a vaginal pH that can be altered by frequent douching. An alteration of vaginal pH can place the woman at higher risk for an STI. During and after the sexual act, male secretions and semen are in contact with female mucous membranes for a period of time longer than female secretions are in contact with male mucous membranes. Therefore women have an increased risk for STI.

Cultural Considerations

Media Effects on Sexually Transmitted Infections

Custom and culture can also affect the development of STIs. STI rates increase in societies in which the media (television, magazines, movies, and Internet chat rooms) focus on sexuality and premarital sexual experiences of people with varying behaviors and values, including greater sexual freedom.

The mucus plug in the cervix of women (that protects the upper genital tract) becomes more permeable around the menstrual period, which can result in an increased risk during this time for infections in the upper genital tract, such as PID.

Contraceptive choice may influence a woman's increased risk of STIs, because the use of oral contraceptives alters the cervical secretions, resulting in a more alkaline environment in the vagina and thus a more favorable setting for growth of organisms that cause STIs. The use of long-acting oral contraceptives may reduce the use of condoms, thus increasing the risk of exposure to STIs in both partners.

Cultural Considerations

Contraception Choices

In societies or cultures in which women are passive, they may not insist on condom protection before intercourse. The condom offers protection from STIs, but the man often decides whether or not it is to be used.

Women may not seek medical care as quickly as men for symptoms of an STI. Commonly a vaginal discharge is considered a normal variance, and health care may not be sought until the infection spreads and symptoms of PID occur. In men, urinary tract infections associated with sexual activity may be the first sign of an STI. Men may seek earlier health care intervention because the signs and symptoms are obvious and distressing. STIs can have long-term effects in the form of sterility, complicated pregnancy, or neonatal infection. Health care screening services and easy access to health care are important in preventing the spread of STIs.

Prevention of Human Papillomavirus

The Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention (CDC) has recommended routine HPV vaccinations for all girls and boys 11 to 26 years old. Gardasil® provides protection against types 6 and 11, which cause genital warts, and against 16 and 18, the cancer-causing HPV strains. Cervarix, another HPV vaccine, provides protection against types 16 and 18 only. Both types of vaccine are highly efficacious against cervical, vaginal, vulvar, and anal cancers; are well-tolerated; and are considered safe. HPV vaccine can be given to girls and boys as young as 9 years of age and to women up to 45 years of age. Three doses are required (the

second dose is given 2 months after the first, and the third dose is given 6 months later).

Lesions of Sexually Transmitted Infections

In men, the lesions related to STIs may appear under the prepuce; on the head or body of the penis; or on the scrotum, perianal area, rectum, anus, or inner thighs. In women, lesions of STIs can appear on the vulva, vagina, cervix, perianal area, or inner thighs. Lesions around the mouth can occur in cases of oral sexual practices. Lesions can also be found far from the genital area. For example, lesions of syphilis include a classic rash on the palms of the hands and soles of the feet. Lesions of *Neisseria gonorrhoeae* may spread and cause pustules on the extremities as part of an "arthritis-dermatitis" syndrome. Examples of common organisms involved in STIs are listed in Box 40-1.

Box 40-1

Causes of Sexually Transmitted Infections

Bacteria

- *Neisseria gonorrhoeae*
- *Chlamydia trachomatis*
- *Treponema pallidum* (syphilis)
- *Haemophilus ducreyi* (chancroid)
- *Mycoplasma hominis*

Viruses

- Human herpesvirus 2 (herpes simplex virus type 2)
- Hepatitis B virus
- Human immunodeficiency virus (HIV)
- Human papillomavirus (HPV)

Yeasts and Fungi

- *Candida albicans*
- *Candida glabrata*
- *Candida tropicalis*

Parasite

- *Trichomonas vaginalis* (trichomoniasis)

Data from www.cdc.gov/std/trichomoniasis/default.htm.

Reporting Sexually Transmitted Infections

STIs must be reported to the local public health agency in accordance with state and local statutory requirements. The CDC and local health authorities establish these regulations and provide regular updates and reporting forms to health care providers for monitored infections. Syphilis, gonorrhea, chlamydia, chancroid, lymphogranuloma venereum, hepatitis B, PID, HIV infection, and AIDS are reportable diseases in all parts of the United States, according to the public health guidelines from

the CDC. The requirements for reporting other STIs differ by state, and clinicians must be familiar with state and local reporting requirements. This tracking information is used to determine community resource needs and is evaluated in terms of the national goals of *Healthy People 2020*[®].

Transmission of Sexually Transmitted Infections

STIs are primarily passed through some type of intimate contact, either genital to genital, mouth to genital, or genital to rectum. They occur in both heterosexual and homosexual relationships. Some infections, such as HIV or hepatitis B or C, also may be passed through blood contact, by the sharing of contaminated needles, or—though rarely—through transfusion with contaminated blood. Accidental transmission to medical personnel may occur via needle or sharps injuries or by direct exposure to open wounds or body fluids.

Blood-borne infections may be transmitted to a fetus before birth. Newborns are at risk for contracting any STI that may reside in the vagina at the time of birth. Depending on the organism, such exposure can lead to a variety of serious problems for the infant, including pneumonia and blindness.

Think Critically

What are the four major modes of transmission for STIs?

In many states screening for some STIs—particularly for syphilis—is required for a marriage license. However, it is expensive to screen for all STIs. The greatest hope for controlling STIs is public awareness and willingness to take responsibility for prevention and for treatment, should infection occur.

Common Diagnostic Tests

Table 40-1 lists common STIs and contains information about modes of transmission, diagnosis, symptoms, treatments, and nursing responsibilities.

Table 40-1
Common Sexually Transmitted Infections

INFECTION	MODES OF TRANSMISSION	SYMPTOMS	MEDICAL DIAGNOSIS	MEDICAL TREATMENT	NURSING INTERVENTIONS
<i>Chlamydia trachomatis</i>	Direct sexual contact. May be transmitted to the newborn during vaginal delivery. Second-most common STI in the United States.	<i>Male:</i> Often asymptomatic. Dysuria; frequency of urination; watery, mucuslike discharge. Causes about half the cases of epididymitis and nongonococcal urethritis. <i>Female:</i> Approximately 75% have no symptoms. Yellow vaginal discharge, urinary frequency, dysuria. May have unusual odor after intercourse. Can result in PID, ectopic pregnancy, and sterility. <i>Neonate:</i> Exposure can cause eye infections and pneumonia.	By cervical culture, DNA probe, enzyme immunoassay, ELISA, or nucleic acid amplification. <i>Screening protocol:</i> Test women ages 15–25 yr via low vaginal swab (SOLVS) or first void urine (SVU). Test men seen in genitourinary clinic via urine sample. TMA, SDA, or PCR test; test for gonorrhea as well.	Azithromycin 1 g orally in a single dose OR Doxycycline 100 mg orally twice a day for 7 days Alternative: Erythromycin base 500 g orally four times a day for 7 days. OR Erythromycin ethylsuccinate 800 mg orally four times a day for 7 days. OR Levofloxacin 500 mg orally once daily for 7 days OR Ofloxacin 300 mg orally twice a day for 7 days	<i>Education:</i> Encourage patients to seek attention for any unusual vaginal or penile discharge. Partner(s) must be treated concurrently. Encourage condom use for prevention of future infection, with abstinence until course of treatment completed. Remind that patient must complete antibiotics to ensure effective treatment and prevent development of PID. CDC recommends screening all pregnant women and sexually active young women.
Human papillomavirus (HPV) Condylomata acuminata (venereal warts) caused by HPV	Spread during sexual contact. Highly contagious. Can be transmitted to newborn during vaginal delivery. Most common STI in the United States.	Warts are flat or raised, rough, cauliflower-like growths on the vulva, penis, perianal area, vaginal or rectal walls, or cervix. The flat variety is more likely to lead to tissue changes that contribute to cervical or penile cancer. <i>Neonate:</i> Laryngeal papillomas.	Biopsy, colposcopy, anoscopy, Pap smear.	Laser therapy, surgical removal, cryotherapy. Topical podophyllin, TCA, imiquimod, and podofilox are alternative treatments for external warts. Topical TCA or interferon is used for difficult cases. Some lesions can cause cancer.	<i>Education:</i> Teach about mode of infection and use of condoms to prevent spread. Recommend regular Pap smears because of risk of cervical cancer. Two vaccines are available and are recommended for all girls and boys ages 9–26 yr. May be given to women until age 45 yr. Should remain supine for 15 min after vaccination; fainting may occur.



Genital herpes	<p>Caused by herpes simplex virus (HSV) types 1 and 2. Highly contagious, spread by direct contact; not limited to sexual contact. Self-inoculation also possible, for example, from lip ulcer (fever blister) to genitals. Invades nerve cells located near the site of infection. Lies dormant; flare-ups erratic and unpredictable. Some patients have frequent recurrence, others rarely or none. Neonate may be infected during delivery if mother has active disease (more common if initial episode occurs during pregnancy).</p>	<p>Primary: Fever, headache, malaise, myalgia, burning genital pain, dysuria (female), painful intercourse. Vesicles in genital area that ulcerate, crust over, and resolve spontaneously in about 2 wk.</p> <p>Secondary: Burning genital pain, possible numbness and tingling 24 hr before lesions appear, vesicles.</p> <p>Male: Lesions may appear on glans penis, shaft of penis, prepuce, scrotal sac, inner thighs.</p> <p>Female: Vulva, vaginal surface, buttocks, cervix. Cervical lesions may be superficial with diffuse inflammation or a single, large, necrotic ulcer.</p> <p>Primary infection during pregnancy associated with high risk of premature labor and spontaneous abortion.</p> <p>Neonate: Local infections of eyes, skin, or mucous membranes to severe disseminated infection that can be lethal may occur.</p>	<p>Lesions usually easily identified by experienced clinician. Can be confirmed by viral cultures of fluid from vesicles.</p>	<p>No known cure. Treatment with acyclovir, valacyclovir, or famciclovir may reduce symptoms and accelerate healing. For individuals with frequent recurrence, continuous treatment may reduce frequency. Viral shedding may continue after lesions are healed.</p> <p>Contact Precautions are necessary.</p> <p>Education: Encourage use of condoms with spermicide to help prevent spread, avoidance of sex if lesions present; scrupulous hand hygiene. If patient becomes pregnant while disease is active, infant will be delivered by cesarean section to protect it from exposure.</p>
Gonorrhea (GC)	<p>Easily transmitted by direct sexual contact. Transmitted to the newborn during vaginal delivery if mother has active disease. Autoinoculation via fingers to eye possible. Occasionally becomes blood-borne.</p>	<p>Incubation: 2-6 days after exposure. May be asymptomatic.</p> <p>Male: Dysuria with frequency; scant to copious purulent discharge from penis, unilateral testicular pain. If untreated may develop urethral stricture and epididymitis; can cause sterility.</p> <p>Female: Vaginal discharge, burning on urination. Untreated, results in PID. May involve rectum, eyes, oropharynx.</p> <p>Neonate: If exposed at birth to mother's vaginal secretions, is at risk for ophthalmia neonatorum, which can cause blindness,</p>	<p>Confirmed by presence of the causative organism, <i>Neisseria gonorrhoeae</i>, in vaginal or urethral smear, rectal or pharyngeal culture. Nucleic acid amplification test using urine sample is accurate.</p>	<p>Single intramuscular dose of ceftriaxone 250 mg plus a single dose of azithromycin 1 g orally.* Alternative (if ceftriaxone is not available): Cefixime 400 mg orally plus azithromycin 1 g orally.* If ceftriaxone cannot be given because of severe allergy. Dual treatment with single doses of oral gemifloxacin 320 mg plus oral azithromycin 2 g OR Single doses of intramuscular</p> <p>Standard Contact Precautions and frequent hand hygiene.</p> <p>Education: Teach about prevention, treatment, and importance of completing treatment; naming all contacts for treatment; and having follow-up cultures to ensure that treatment has been effective. Encourage safer sex practices to prevent reinfection. Be sure patient understands how to take prescribed medication. Teach CDC recommendations for sexually active patients to be screened for GC infection.</p>

		and other infections within 2-5 days after birth. <i>Children:</i> Infection in children over 1 yr of age is likely the result of sexual abuse.	gentamicin 240 mg plus oral azithromycin 2 g Hospitalize if PID or severe illness occurs.* Empirical treatment for chlamydia is recommended by CDC.		
Hepatitis B	Caused by hepatitis B virus (HBV). Transmission via sexual contact, blood contact, and to the fetus via the placenta in an infected mother.	May have anorexia, malaise, vomiting, abdominal pain, dark urine, jaundice, skin rashes, arthralgias, arthritis. Acute infection may be asymptomatic. Infection may be persistent and result in a chronic carrier state and may develop chronic active hepatitis, cirrhosis, hepatocellular carcinoma, hepatic failure, and death. Infants born infected are at high risk for chronic hepatitis B infection.	Serologic testing for HBV infection gives definitive diagnosis.	No specific therapy is available. HBIG is given prophylactically after known exposure. Hepatitis B vaccine (Hep B) is recommended for people at risk for exposure, including health care workers. Hep B vaccine is currently given as part of normal childhood immunizations with a three-dose regimen beginning at birth. Postexposure interval before vaccination administration should not exceed 7 days for needle-stick exposure and 14 days for sexual exposure.	
HIV, AIDS, ARC	HIV is transmitted by intimate contact with body secretions of an infected person or exposure to infected blood or by perinatal transmission from mother to newborn.	Initially, flu-like symptoms several weeks after HIV exposure. Antibodies appear in blood a few months to 1 yr later. A latent period follows with gradual reduction in CD4 cells. CD4 cell decline results in reduced immune function, resulting in opportunistic infections, such as Kaposi sarcoma, <i>Pneumocystis jiroveci</i> (formerly <i>Pneumocystis carinii</i>) pneumonia, and oral candidiasis. CD4 count below 200/mm ³ is diagnostic of AIDS.	Diagnosis of HIV infection based on reactive enzyme immunoassay (EIA) confirmed by a more specific assay (e.g., Western blot or immunofluorescent assay). The ELISA and HIV-RNA tests are recommended by the CDC (Swan, 2009). AIDS and ARC may be diagnosed based on laboratory results and/or specific diagnostic criteria. The FDA has approved a rapid test for HIV screening that provides results in less than 1 hr. A positive rapid HIV test requires further testing for confirmation.*	Currently there is no cure. Drug regimens interrupt reproduction of viruses. There are five major classes of antiretroviral drugs that are tailored to individual patient needs. Raltegravir is the first HIV integrase inhibitor and is used for initial antiretroviral therapy (Lennox, 2009). Postexposure prophylaxis (PEP) treatment should start within 72 hr of exposure (Kurtyka, 2010).	
Syphilis		Direct body contact; organism (<i>Treponema pallidum</i> , a spirochete) requires warm, wet environment to survive; can be destroyed with plain soap and water. Can penetrate intact mucous membrane. Placental transmission to fetus in about 50% of women with active disease during pregnancy.	Syphilis has three stages. Primary (after 3-4 wk incubation period): Chancres (hard, painless sore) on the mucous membrane of the mouth or genitals, often unnoticed in women. Chancres teeming with spirochetes, very contagious at this stage. Spirochetes enter bloodstream 3-7 days after infection and begin to multiply rapidly (bacteremia). Symptoms disappear within 3-8 wk. Secondary (6 wk later): Symptoms vary. May have generalized skin rash. Serology test is positive.	Screening: VDRL and RPR tests, performed on blood or spinal fluid if neurosyphilis is suspected. May be negative in primary, but always positive in secondary and tertiary phases. Confirmation: Dark-field microscopy of scrapings from chancre. FTA-Abs blood test. Tests for other STIs should also be done. Single-dose Benzathine penicillin G 2.4 million units* Alternatively: In the case of penicillin allergy: Doxycycline 100 mg orally twice daily for 14 days OR Tetracycline 500 mg four times daily for 14 days OR Ceftriaxone 1-2 g daily either IM or IV for 10-14 days* Other regimens have documented treatment failures*	<i>Education:</i> Caution patients not to ingest alcohol for 24 hr before VDRL or RPR (may cause false-positive result). Remember that chancre is highly infectious (gloved contact only). Encourage naming of contacts so everyone can be treated. Encourage condom use to prevent reinfection. Explain importance of follow-up (usually 3- and 6-mo VDRL) to ensure treatment has been effective. Follow-up usually at 1, 2, 3, 6, 9, and 12 mo for HIV-positive individuals.

		Symptoms may disappear as the disease enters latent period. <i>Tertiary</i> (late: 1-20 yr after infection): Spirochetes have had access to all body tissues. "Gumma," a soft encapsulated tumor, appears on any organ, causing symptoms (including neurologic). Congenital. Stillbirth, CNS damage.		
Trichomoniasis	Sexually transmitted.	Pruritus; frothy gray-green vaginal discharge; dysuria.	Laboratory observation of protozoa; ulceration on cervix or vaginal wall.	Metronidazole (Flagyl), single 2-g dose for patient and partner. OR Tinidazole 2g orally in a single dose Alternative regimen: Metronidazole 500 mg orally twice a day for 7 days*

*2015 Centers for Disease Control and Prevention Treatment Guidelines.

AIDS, Acquired immunodeficiency syndrome; ARC, AIDS-related complex; CD4, T helper cell; CDC, Centers for Disease Control and Prevention; CNS, central nervous system; DNA, deoxyribonucleic acid; ELISA, enzyme-linked immunosorbent assay; FDA, Food and Drug Administration; FTA-Abs, fluorescent treponemal antibody absorption; HBIG, hepatitis B immune globulin; HBsAg, hepatitis B surface antigen; HIV, human immunodeficiency virus; IM, intramuscular; Pap, Papanicolaou; PID, pelvic inflammatory disease; RNA, ribonucleic acid; RPR, rapid plasma reagins; STI, sexually transmitted infection; TCA, trichloroacetic acid; VDRL, Venereal Disease Research Laboratory.

Chlamydia trachomatis and gonorrhea figures from Morse S, Moreland A, Holmes K, eds: *Atlas of sexually transmitted diseases and AIDS*. London, 1996, Mosby-Wolfe. HPV figure from Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 7, Philadelphia, 2005, Saunders. Genital Herpes figure from Morse SA, Holmes KK, and Ballard RC: *Atlas of sexually transmitted diseases and AIDS*, 2011, Saunders. Courtesy of Barbara Romanowski, MD. Syphilis figure courtesy U.S. Public Health Service, Washington, DC.

A variety of tests are used to detect STIs. Noninvasive diagnostic techniques have been developed that use urine samples. **Smears** and **cultures** may be taken directly from the site (e.g., vaginal, cervical, or urethral swabs). In some instances, organisms also can be cultured from the blood. **Biopsies** are microscopic tissue examinations performed on a sample taken from the affected area and are usually done to differentiate between benign and malignant tissues, but can also provide a differential diagnosis in diseases that have specific cellular changes or organisms present.

Numerous types of blood tests can help detect STIs. They look for specific antibodies formed by the presence of certain microorganisms, or for the effects of antigens (substances in the bloodstream that stimulate the production of antibodies). Such effects include the tendency for **agglutination**—the clumping together of cells in a variety of characteristic patterns.

Staining procedures differentiate organisms by using dyes that have been found to stain some bacteria in specific ways. An example of this would be a Gram stain, in which bacteria are first stained with crystal violet, then treated with a strong iodine solution, decolorized with ethanol or ethanol acetone, and then counterstained with contrasting dye. Those retaining the initial stain are considered **gram positive**; those losing the stain but accepting the counterstain are considered **gram negative**. Current development of noninvasive testing and screening procedures using urine samples will increase public acceptance of mass screening. See [Chapter 6](#) for further discussion on testing for infectious agents.

❖Nursing Management

Identifying microorganisms is a complex procedure. When collecting or assisting in the collection of specimens, there are several specific responsibilities to ensure that the samples will allow accurate studies to be performed. These include:

- Ensure that appropriate laboratory request slips have been prepared according to the health care provider's specific orders. If antimicrobials have been started, note this on the laboratory slip.
- Check the laboratory manual for any specific restrictions or preparations for the tests ordered.
- Urethral swabs should not be done within 1 hour of the last void, because organisms will have been flushed away.
- Female patients should not douche before vaginal cultures or smears.

- Some tests will give a false-positive reading if the patient is on specific medications or has other types of infection present. Check the patient's history.
- Antimicrobials may cause cultures to be negative even though the drug or the dose may not be sufficient to cure the infection. Document the medication history.
- Stool present in the rectum can prevent good rectal swabs from being obtained.
- Cultures and smears usually are obtained with a **sterile** swab and sent to the laboratory.
- Prepare the patient. (See information on preparing the patient for a pelvic examination in [Chapter 38](#).)
- Explain what tests have been ordered and any specific home preparation. Answer all questions.
- Provide appropriate draping and privacy, and remain with the patient during the procedure.
- Provide emotional support as needed.
- Make sure that specimens are appropriately labeled and delivered to the laboratory with the corresponding laboratory slips.

Assessment (Data Collection)

Screening for potential STIs or risk for acquiring such an infection should be part of any patient history data collection. However, it often is difficult to get accurate information. Patients may not disclose symptoms such as inflammation, rash, or discharge if they fear it is related to sexual activity. Adolescents may fear parental disapproval, rejection, or disciplinary action if they admit to being sexually active, and so may hide symptoms. Fear of finding a serious disorder such as HIV also may make the patient reluctant to cooperate with data collection.

Communication

Gathering Information

When someone is diagnosed with an STI, the public health department is responsible for collecting the names of sexual partners so that they can be contacted and treated. Many people do not wish to give out this information. Professionals who deal with these issues regularly, such as public health nurses, often have special training in obtaining an appropriate history.

Obtaining a history on a patient seeking treatment for an STI requires tact and sensitivity. Such a history involves very intimate questions and may involve a variety of cultural and personal issues. You must maintain an open and nonjudgmental attitude.

Focused Assessment

Data Collection for Sexually Transmitted Infections

The following questions are asked when assessing a patient with or at risk for an STI:

- Are you currently sexually active?
- At what age did you become sexually active?
- Do you currently have more than one sexual partner?
- Have you had other partners in the past?
- If yes to either of the last two questions: Do you understand the risks associated with having multiple sexual partners?
- If a sexually active female: Are you having regular gynecologic examinations with Papanicolaou (Pap) smears? If yes, when was your last examination?
- If a sexually active female: Are you currently pregnant or trying to become pregnant?

- Are you checked at least annually for STIs even if you do not have symptoms?
- If currently in non-monogamous relationships: Are you using condoms to help prevent STIs?
- Have you ever had an STI? If yes, ask for specific information (what, when, how treated; was follow-up done?).
- Do you have symptoms or reasons to believe you might have an STI now? If yes, ask for specific information (symptoms, duration; partner[s] symptomatic?).

Think Critically

What factors make it difficult to take an accurate history or provide education for a patient with an STI?

Physical examination for STIs involves exposure of the most private parts of the anatomy. Such an examination is usually performed by both a health care provider and a nurse, particularly when there are gender differences between the medical personnel and the patient. Provide appropriate draping and to give the patient privacy when he or she is undressing for the examination.

Patients may request that a family member be allowed to remain with them, and they have this right. You should escort such individuals into the room and have them sit or stand by the patient in a manner that allows them to provide support. Make sure that any required equipment, supplies, specimen containers, and laboratory slips are ready in the examination room.

Nursing Diagnosis

Problem statements for patients with an STI may include:

- Insufficient knowledge regarding modes of transmission, signs and symptoms, and treatment of STI
 - Pain due to inflammation
 - Anxiety due to intimate examination and personal information required
 - Fear of being HIV positive
 - Absence of compliance due to repeated infection with STIs and refusal to use condoms
- Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Planning

Expected outcomes for the patient with an STI may include:

- Patient will verbalize knowledge of self-care to prevent recurrence or other STI.
- Patient will be free of pain after treatment.
- Patient will cope adequately with history taking and physical examination.
- Patient will have decreased fear of HIV diagnosis after examination and treatment.
- Patient will comply with safer sex practices.
- Patient will comply with treatment requirements.

In addition to managing the treatment protocol and any pain related to an STI, patient education and emotional support are primary aspects of planning for patients with or at risk for STIs. Education in this area commonly is hampered by the patient's reluctance to discuss sexual issues. This may result from cultural views or more personal feelings. Patients of all ages may wish to protect themselves or their partners from possible condemnation or embarrassment through disclosure of sensitive information. Maintain a nonjudgmental attitude and give assurance that information will be kept confidential within the health care system.

When planning education, consider the patient's existing knowledge and ability to understand information provided. Select appropriate teaching aids, such as pictures, pamphlets, and three-dimensional models, to assist in the education of the patient.

Emotional support is another important aspect of care for patients with an STI. Allow time in the teaching plan for listening to the patient's concerns and for answering questions. Be prepared with information on support groups, counseling services, and informational programs that may be of

assistance. In the case of serious infections, such as HIV, support programs and professional counseling are of particular importance to the patient.

■ Implementation

Symptom Relief

STIs cause a variety of symptoms, some of which may cause mild discomfort or significant pain. Review Chapter 7 on pain management techniques and Table 40-1 for specific nursing interventions. Nursing Care Plan 40-1 gives specific nursing interventions for a patient with chlamydia.

✳ Nursing Care Plan 40-1

Care of a Patient With Chlamydia

Scenario

A 21-year-old woman is admitted to the clinic and diagnosed with a chlamydia infection.

Problem Statement/Nursing Diagnosis

Insufficient knowledge/*Deficient knowledge related to new diagnosis of chlamydia infection.*

Supporting Assessment Data

Subjective: "What is chlamydia?"

Objective: Positive test for chlamydia.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize understanding of disease prevention, transmission, and treatment protocols.	Assess readiness to learn about chlamydia.	Readiness to learn is essential for successful learning to occur.	Patient asking questions about her diagnosis.
	Determine knowledge base concerning chlamydia.	Learning plan should build on existing knowledge.	Patient discussing her understanding.
	Identify barriers to learning.	Language barriers, cultural beliefs, and embarrassment can alter learning effectiveness.	Patient speaks fluent English and is willing to discuss illness.
	Teach the medication regimen.	Compliance with medication regimen is essential for successful treatment.	Patient verbalizes understanding of when and how to take medication.
	Review safer sex practices.	Safer sex practices can prevent exchange of body fluids and minimize risk of STI transmission.	Patient demonstrates understanding of safer sex practices.
	Schedule follow-up appointments.	Follow-up testing is an essential part of confirming successful treatment of chlamydia.	Patient promises to return for follow-up care.

Problem Statement/Nursing Diagnosis

Altered tissue integrity/*Impaired tissue integrity related to testing positive for chlamydia.*

Supporting Assessment Data

Subjective: "I've had a small amount of vaginal discharge."

Objective: Chlamydia test positive.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will show signs of successful treatment of chlamydia as evidenced by absence of symptoms and completion of medication regimen.	Assess for signs and symptoms of chlamydia such as vaginal discharge and dysuria.	Absence of symptoms may indicate successful treatment.	Patient does not evidence continued signs of the disease.
	Assess for risk factors for reactivation of disease.	Minimizing risk factors can prevent reinfection.	Patient states she is now in a monogamous relationship.
	Encourage woman to identify partners to enable treatment.	Treating sexual partners can minimize risk for reinfection and spread of infection.	Patient has contacted other partners, who have come in for examination.
	Teach safer sex practices and risk for recurrence.	Use of safer sex practices can minimize reinfection.	Patient evidences understanding of safer sex practices.

Critical Thinking Question

1. What are the long-term problems associated with untreated chlamydia?

Prevention of Spread

The spread of STIs is a major health concern in the United States. People often become sexually

active at a young age, and it is not uncommon for individuals to have a variety of sexual partners over the years. Strategies for prevention and control of STIs are given in **Box 40-2**.

Health Promotion

Preventing Sexually Transmitted Infections

Although the only absolute prevention is abstinence, certain behaviors significantly reduce the risk of contracting an STI. These behaviors include using condoms with a spermicide containing nonoxynol-9, which acts as a barrier and has viricidal and bactericidal action; limiting sexual contacts, preferably to one partner; and avoiding sexual contact if a partner is known to be infected or if lesions are observed in the genital, perianal, or oral regions. If the patient or the sexual partner is an IV drug user, education regarding not sharing needles is important.

Box 40-2

Prevention of Sexually Transmitted Infections

The prevention and control of STIs are based on the following major strategies:

- Early education of adolescents concerning abstinence and safer sex practices.
- Education and counseling of people at risk on ways to prevent STI through changes in sexual and lifestyle behaviors.
- Identification of asymptotically infected people and of symptomatic people unlikely to seek diagnostic and treatment services.
- Effective diagnosis and treatment of infected people.
- Evaluation, treatment, and counseling of sex partners of people who are infected with an STI.
- Pre-exposure vaccination of patients at risk for vaccine-preventable STIs such as hepatitis B and HPV.
- Follow-up of patients at risk or under treatment to ensure compliance.

HPV, Human papillomavirus; *STIs*, sexually transmitted infections.

Adapted from www.cdc.gov/std/hpv/default.htm.

Evaluation

Initially, each patient teaching contact should be evaluated for effectiveness by reviewing information discussed to determine whether learning has occurred. Over time, evaluate whether the patient is following the recommendations. Follow-up cultures that are negative are a good indicator that treatments were followed as prescribed. During the follow-up interview, inquire about use of safer sex practices and evaluate retention of information previously taught.

Community Care

Most communities have clinics, often through the public health system, that provide screening and treatment for STIs. These may be low cost or no cost, and they provide a valuable service by assisting the community to control the spread of STIs.

Patient education is an important service provided by community clinics. The health department and organizations such as Planned Parenthood are just two of the community agencies that routinely provide pamphlets, posters, and classes on preventing and treating STIs. Confidential screening and education on safer sexual practices are important services provided by these clinics. Public service announcements, such as the television spots on HIV/AIDS awareness, are another source of public education. In many areas, information and education are made available through schools and colleges and are directed both at students and their families and at the general community.

Get Ready for the NCLEX® Examination!

Key Points

- STIs are primarily passed through intimate contact with body fluids. Needle sticks or blood transfusions with contaminated blood can also spread STIs. An STI can also be transmitted to a newborn during the birth process.
- One objective of *Healthy People 2020* is to “prevent HIV infection and its related illness and death.”
- STIs can be caused by bacteria, viruses, or protozoa.
- Contraceptive choice influences a woman’s risk for STIs.
- A properly used condom offers protection from the transmission of STIs.
- STIs can cause sterility, complicate pregnancy, or cause neonatal infection.
- Many STIs are reportable to the public health department.
- Awareness of symptoms of STIs can aid in early diagnosis, treatment, and education of patients.
- Nursing responsibilities include helping to identify, screen, and educate patients at risk for STIs.
- PID is an inflammation of the pelvic cavity commonly caused by STIs that can cause sterility.
- Candidiasis is a yeast infection caused by a change in vaginal pH that can be the result of frequent douching, use of oral contraceptives, or systemic antibiotic therapy.
- Bacterial vaginosis occurs when normal lactobacillus in the vagina is replaced by pathogenic organisms, and it increases the risk for STIs.
- Education concerning safer sex practices can prevent STIs.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• **Online Resources**

- Kids' Health, www.kidshealth.org
- STI information, www.cdc.gov/std; www.womenshealth.gov

Review Questions for the NCLEX® Examination

1. Changes in the vaginal pH predispose women to develop various forms of infections. Which product decreases vaginal resistance to infections?

1. Vaginal douche
2. Tampons
3. Latex condoms
4. Spermicidal agents

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

2. A mother brings her 12-year-old daughter in for an annual checkup. The nurse recommends administration of one of the HPV vaccines. The mother replies, “My daughter does not need the vaccine because she is not sexually active.” What is the best response?

1. “Perhaps you can bring her back when she becomes sexually

active."

2. "Regardless of your daughter's sexual activity now, studies have shown that the earlier the vaccine is given, the more effective it is. When she does become sexually active, the vaccine will be protecting her."
3. "If you wait until your daughter is sexually active it will be too late. How will you know?"
4. "It's your choice."

NCLEX Client Need: Health Promotion and Maintenance

3. The nurse talks with the parents of a 9-year-old girl regarding the HPV vaccinations. The information session must include which statement(s)? (*Select all that apply.*)

1. "The vaccine is a one-dose immunization."
2. "The vaccine prevents genital warts."
3. "The vaccine prevents some precancerous lesions of the cervix."
4. "The vaccine protects against some other full-blown HPV infections."
5. "The vaccine eliminates the need for routine cervical cancer screening."

NCLEX Client Need: Health Promotion and Maintenance

4. An important nursing responsibility is the reporting of certain sexually transmitted infections to the CDC and local health authorities. Which infection(s) should the nurse prepare to report? (*Select all that apply.*)

1. Gonorrhea
2. Syphilis
3. Bacterial vaginosis
4. Candidiasis
5. Chlamydia

NCLEX Client Need: Safe and Effective Care Environment

5. Which statement is true regarding the Venereal Disease Research Laboratory (VDRL) test?

1. VDRL tests are used for screening and diagnosis.
2. False-negative reactions are associated with malaria, leprosy, and viral pneumonia.
3. The VDRL values increase quantitatively after completion of therapy.
4. False-negative reactions are associated with alcohol consumption.

NCLEX Client Need: Physiological Integrity: Risk Reduction Potential

6. A nurse is assessing a patient for clinical signs and symptoms of syphilis. What are the classic manifestations of syphilis? (*Select all that apply.*)

1. An open ulcer on the genitals
2. A red rash on the palms of the hands
3. A cough and fever
4. A red rash on the soles of the feet

NCLEX Client Need: Physiological Integrity: Basic Care

7. Which sexually transmitted infections can put a neonate at risk? (*Select all that apply.*)

1. Syphilis
2. Herpes simplex virus
3. HPV
4. Chlamydia

NCLEX Client Need: Physiological Integrity: Reduction of Risk Potential

8. A nurse is taking the clinical history of an adolescent with a tentative diagnosis of gonococcal urethritis. Initial assessment confirms a patient problem of fear. A likely etiology for the diagnosis would be:

1. potential death.
2. parental disapproval.
3. disfigurement.
4. loss of reproductive function.

NCLEX Client Need: Health Promotion and Maintenance

9. A nurse is teaching a patient about her diagnosis of genital herpes. Which statement made by the patient indicates that further teaching is necessary?

1. "Once my lesions are healed I am no longer communicable."
2. "Primary lesions will resolve in about 2 weeks."
3. "This infection can spread to other parts of my body."
4. "A cesarean section may be necessary if the infection is active during pregnancy."

NCLEX Client Need: Physiological Integrity: Basic Comfort

10. While inserting an indwelling urinary catheter, the nurse finds raised, rough, cauliflower-like growths on the vulva and vaginal walls. A likely causative agent would be:

1. herpes simplex virus.
2. human papillomavirus.
3. *Treponema pallidum*.
4. *Neisseria gonorrhoeae*.

NCLEX Client Need: Physiological Integrity: Basic Care

Critical Thinking Questions

Scenario A

A friend confides that she has a rash in her genital area that occurred after she began having sex with her latest boyfriend. She is afraid she may have syphilis or genital herpes and does not know what to do.

1. What would you say to convince her that she needs to see an experienced clinician for diagnosis and treatment?

2. Where can she go if she does not want to see her regular health care provider?

Scenario B

A patient confides in you that he has three girlfriends, all of whom are taking oral contraceptives, so he sees no reason to use condoms.

1. What could you tell him about the importance of using condoms and his risky behavior?

UNIT XIV

Integumentary System

OUTLINE

Chapter 41 The Integumentary System

Chapter 42 Care of Patients With Integumentary Disorders and Burns

CHAPTER 41

The Integumentary System

Objectives

Theory

1. Describe the structure and functions of the skin.
2. Compare and contrast the various causes of integumentary disorders.
3. Analyze important factors in the prevention of skin disease.
4. Plan specific measures to prevent skin tears.
5. Interpret laboratory and diagnostic test results for skin disorders.
6. State nursing responsibilities in the diagnosis of skin disorders.
7. Write outcome objectives for a patient with a problem of altered skin integrity.

Clinical Practice

8. Teach three patients to perform a self-assessment of the skin.
9. Analyze the changes that have occurred with aging that affect the skin barrier for one of your older adult patients.
10. Perform a focused integumentary assessment on a patient.
11. Provide skin care for an older adult with dry skin.
12. Implement a teaching plan appropriate for adolescents and young adults for the prevention of skin cancer.

KEY TERMS

- biopsy** (BĪ-öp-sē, p. 961)
erythrasma (ě-rīth-RĀZ-mă, p. 961)
exudate (ĚKS-ū-dāt, p. 961)
keloid (KĒ-loid, p. 962)
keratoses (kĕr-ă-TŌ-sēs, p. 962)
macule (MÄK-ūl, p. 962)
papule (PĀP-ūl, p. 962)
plaque (pläk, p. 963)
pustule (PÜS-tüł, p. 966)
senile lentigines (SĒ-nīł lĕn-TĪJ-ě-nēz, p. 958)
senile purpura (SĒ-nīł PŪR-pū-ră, p. 964)
vesicle (VĒS-ě-küł, p. 966)
wheal (WĒL, p. 961)

Anatomy and Physiology of the Integumentary System

Structure of the Skin, Hair, and Nails

- The skin consists of two layers of tissue, the epidermis and the dermis (Figure 41-1).

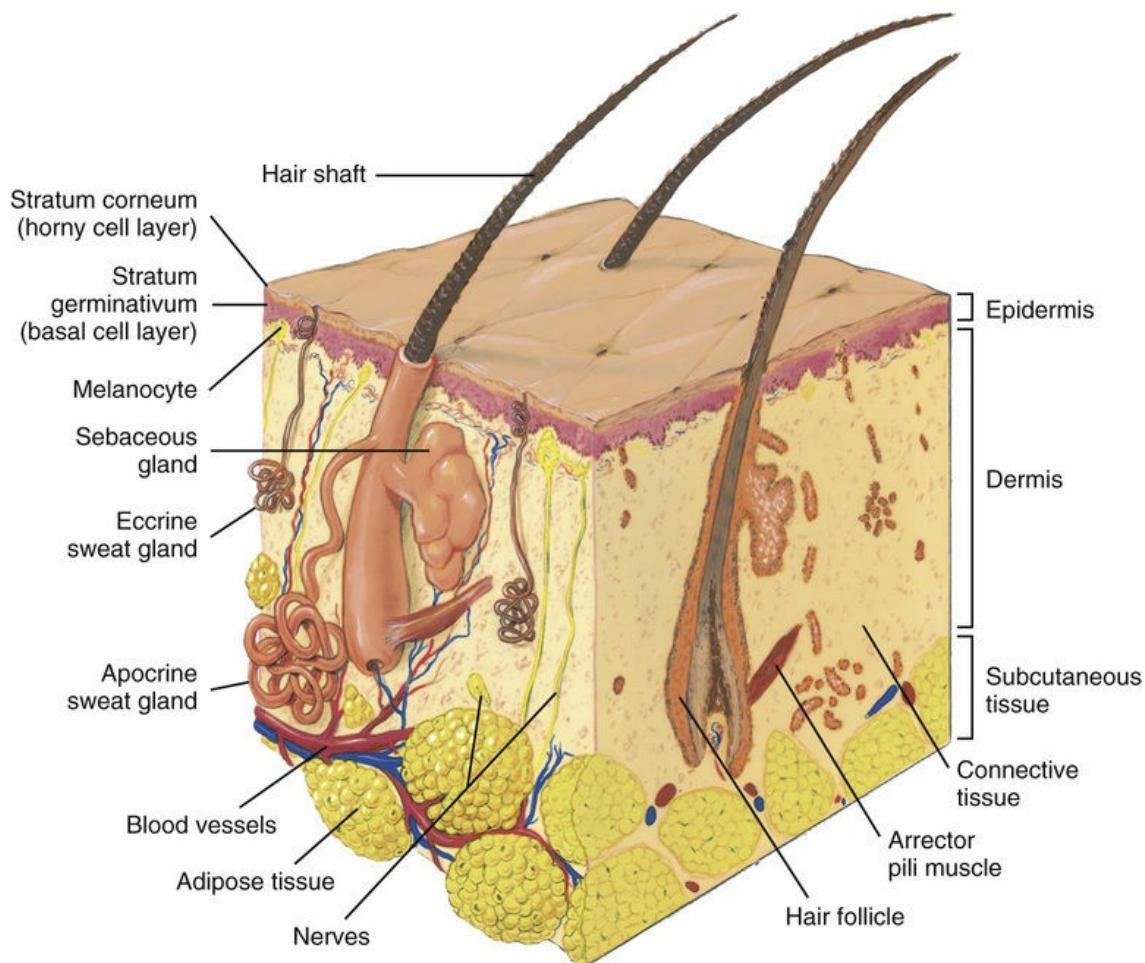


FIGURE 41-1 Structure of the skin. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.)

- The skin is attached to underlying structures by subcutaneous tissue.
- The epidermis consists of squamous epithelium and contains no blood vessels; cells receive nutrients by diffusion from vessels in the underlying tissue.
- Cell growth occurs from the bottom of the epidermis and pushes cells above to the surface, where they eventually die and slough off or are washed off. This layer is called the *stratum corneum*.
- The bottom layer of the epidermis contains melanocytes that contribute color to the skin.
- The dermis, also called the *corium*, is thicker than the epidermis and consists of dense connective tissue.
- The dermis contains both elastic and collagenous fibers that give it strength and elasticity.
- The dermis contains blood vessels and nerves as well as the base of hair follicles, glands, and nails that are derived from the epidermis.
- A hair consists of a shaft and a root made up of dead keratinized epithelial cells.
- The hair root is below the surface of the epidermis and is enclosed in a hair follicle that is embedded in the dermis.

- Fibroblasts that produce new cells to heal the skin are contained in the dermis.
- Glands contained in the skin are *sebaceous* (sweat producing) or *ceruminous* (wax producing).
- Nails are dead stratum corneum with a very hard type of keratin (Seeley et al, 2011).

Functions of the Skin and Its Structures

- The skin acts as a protective covering over the entire surface of the body.
- The keratin in the skin makes it waterproof, preventing water loss from the underlying tissues and too much water absorption during swimming and bathing.
- Skin provides a barrier to bacteria and other invading organisms.
- Skin protects underlying tissues from thermal, chemical, and mechanical injury.
- The skin helps regulate body temperature by dilating and constricting blood vessels and by activating or inactivating sweat glands.
- When the skin is exposed to ultraviolet (UV) light, molecules in the cells convert the rays to vitamin D.
- Melanin pigment absorbs light and acts to protect tissue from UV light.
- The nerve receptors in the dermis transmit feelings of heat, cold, pain, touch, and pressure.
- Hair follicles contained in the skin produce hair.
- Sebaceous glands secrete sebum that functions to keep hair and skin soft and pliable. Sebum also inhibits bacterial growth on the surface of the skin and, because of its oily nature, helps prevent water loss from the skin.
- Sweat glands act to excrete water and salt when the body temperature increases; sweat evaporates, producing a cooling effect.
- Sweat glands in the axillae and external genitalia secrete fatty acids and proteins as well as water and salts. They become active at puberty and are stimulated by the nervous system in response to sexual arousal, emotional stress, and pain.
- Hair color is produced by melanocytes in the skin and depends on the type of melanin produced.
- The shape of the hair shaft determines whether hair is straight or curly.
- Hair assists the body to retain heat.
- Nails cover the distal ends of the fingers and toes.
- Each nail has a free edge, a nail body, and a nail root that is covered by skin.
- The cuticle of each nail is a fold of stratum corneum.

Aging-Related Changes in the Skin and Its Structures

- The number of elastic fibers decreases, and adipose tissue diminishes in the dermis and subcutaneous layers, causing skin to wrinkle and sag.
- Loss of collagen fibers in the dermis makes the skin increasingly fragile and slower to heal.
- The skin becomes thinner and more transparent.
- Reduced sebaceous gland activity causes dry skin that may itch.
- Thinned skin and decreased sebaceous gland activity reduce temperature control and lead to an intolerance of cold and a susceptibility to heat exhaustion.
- A reduction in melanocyte activity increases the risk of sunburn and skin cancer.
- The number of hair follicles decreases and the growth rate of hair declines; the hair thins.
- A decrease in the numbers of melanocytes at the hair follicle causes gradual loss of hair color.
- Nail growth decreases, longitudinal ridges appear, and the nails thicken; nails become more susceptible to fungal infections.
- Some areas of melanocytes increase in production, producing brown “age spots” or “liver spots,” properly named **senile lentigines** (Figure 41-2).



FIGURE 41-2 Senile lentigines (age spots or liver spots).

The Integumentary System

The skin is the first line of defense against invasion by pathogenic bacteria living in the environment. When an area of the skin is destroyed by disease or trauma, its protective functions are immediately impaired. This impairment makes the body susceptible to infection. If very large areas of skin are destroyed, as in an extensive burn, fluid and electrolyte balance is disturbed. Protein and body heat are lost from burned areas. Skin diseases are common; they are often difficult to diagnose and cure and tend to recur. The physical effects of skin diseases are not often serious. However, when the disorder renders the patient unattractive, there is a psychological impact that threatens self-image and damages self-esteem. The skin also reflects systemic diseases.

Disorders of the Integumentary System

Causes

More than 3000 disorders of the skin have been officially named, and many more are not included in any official nomenclature. Most of the recognized and named skin disorders arise from some pathology in the skin itself. The remainder are manifestations of systemic disease. Skin disorders may occur from immunologic and inflammatory disorders, proliferative and neoplastic disorders, metabolic and endocrine disorders, and nutritional problems. Physical, chemical, and microbiologic factors also can damage the skin.

Many patients with dermatologic disease are not hospitalized and are seen only in providers' offices and outpatient clinics. Others do not seek medical attention but treat their skin disorder themselves with home remedies and over-the-counter drugs. In some cases self-care measures are successful, but they also have the potential for aggravating the condition or only temporarily relieving more severe symptoms. This can lead to delay in treatment and allows the disease to progress to a chronic and sometimes untreatable state.

Prevention

Hygiene.

The ritual of the daily bath is almost an obsession with the average American. Traditionally, plenty of soap, hot water, and friction were considered a necessity for cleanliness; however, many facilities have adopted disposable cleansing cloths to replace the individual bathing basin. In a recent study, [Marshall and colleagues \(2012\)](#) cultured bath and kitchen basins and cleaning sponges and found *Staphylococcus aureus*, *Klebsiella* spp., *Escherichia coli*, and *Pseudomonas aeruginosa* flourishing. Soap and water continues to have a place in hygiene, but beyond infection control, astute nurses assess for and consider skin type. Blondes and redheads with a fair complexion usually have very delicate skin that requires special care to prevent drying and irritation. If the skin appears dry and scaly, frequent bathing with soap and hot water only aggravates the condition. Oils and creams are available that cleanse the skin quite effectively and help replace the natural oils at the same time. On the other hand, people with dark hair usually have skin that is oilier and less susceptible to excessive drying and irritation. People with oily skin will need to clean the skin frequently with a liberal amount of soap and water and will need to apply fewer or no additional oils to the skin.

Think Critically

You assist an older adult with a bath and notice that she has very dry skin. What interventions would you use?

Clinical Cues

Remember to dry areas where two skin surfaces touch, such as the axilla and under the breasts.

Diet.

Even borderline deficiencies of vitamins and minerals will cause the skin to take on a sallow and

dull appearance. Severe nutritional deficiencies lead to skin breakdown and the development of sores and ulcers. Dehydration causes loss of skin turgor and predisposes to pressure ulcers. People can be so concerned about their physical appearance that they refuse to eat properly for fear of gaining weight; however a well-balanced diet will enhance appearance.

Age.

Young people are not the only ones who should be concerned with the care of their skin. As we grow older, our skin undergoes certain changes that easily lead to irritation and breakdown if proper care is not given. The oil and sweat glands become less active, and the skin has a tendency to become dry and scaly. It also loses some of its tone, becoming less elastic and more fragile. Frequent cleansing of the skin becomes unnecessary as the skin ages, and alcohol and other drying agents must be used sparingly, if at all. Assist older patients to establish a regular routine of massaging oil, cream, or oily lotion into the skin.

Older Adult Care Points

Older adults who have dry skin do not need a full bath every day; cleansing of the axillae and genital-rectal area between bathing days should be sufficient. Older adults should use a mild lotion-based soap or body wash for bathing. After showering or bathing, a lotion or cream that helps seal in moisture should be applied while the skin is still damp. Moisturizing lotion or cream should be reapplied at bedtime.

Environment.

Several environmental factors can have a direct effect on the health of the skin. These include prolonged exposure to chemicals, excessive drying from repeated immersions in water, very cold temperatures, and prolonged exposure to sunlight. Some of these are occupational hazards. A change of jobs may be necessary to eliminate contact with a factor that is causing a skin disorder. One of the *Healthy People 2020* objectives[®] is to reduce occupational skin diseases or disorders among full-time workers.

Overexposure to the UV rays of the sun can seriously and permanently damage the superficial and deeper layers of the skin. The damage results in severe wrinkling and furrowing, as well as loss of elasticity, and the skin assumes a tissue-paper transparency. In addition to the potential for premature aging and degenerative changes, solar damage also can result in malignant changes. Ultraviolet rays from the sun have long been known to be carcinogenic. This is especially true for fair-skinned people who have subjected their skin to prolonged exposure to sunshine. Although sunburns are particularly harmful, it is the normal daily exposure of unprotected fair skin to sun that causes long-term damage.

Health Promotion

Sun Exposure Precautions

Health teaching to inform the public about the dangers of solar UV radiation should include the following information:

- Although fair-skinned people who freckle easily are more likely to suffer sun-damaged skin, people of all complexions and races can and do burn if exposed to sufficient sunlight.
- Although a good tan might be considered by many to be desirable, dermatologists say that there is no such thing as a "healthy tan." Tanning causes damage to the skin. For those who insist on lying out in the sun, the initial exposure should be slow and gradual, and an adequate sunscreen with a sun protection factor (SPF) of at least 30, as well as ultraviolet A (UVA) and ultraviolet B (UVB) protection, should always be used. Too much sun too quickly only leads to blistering and peeling.
- Select a sunscreen preparation on the basis of skin type and ability to tan, as well as its active ingredients and the amount of time to be spent in the sun. Remember that the sunscreen can be

washed off by water or perspiration or rubbed off on sand and towels and must be periodically reapplied. Apply sunscreen liberally 15 to 30 minutes before sun exposure ([FDA, 2014](#)). Reapply every 2 hours. The ingredients in the sunscreen are actually used by the body and depleted within these 2 hours, so a higher SPF sunscreen will not last longer.

- Avoid exposure to the sun during the time its rays are most hazardous—that is, between 10 A.M. and 2 P.M. standard time or 11 A.M. and 3 P.M. during daylight saving time. Local radio and television stations often give information about current weather conditions and the chances for being burned by the sun at particular times during each day.
- You can be sunburned on a cloudy or overcast day.
- Light, loosely woven clothing will not give adequate protection from the sun's rays.
- Remember that snow, water, and sand can reflect the sun's rays and increase the intensity of exposure.
- Do not try to gauge how much you are being burned while in the sun. It may be 6 to 8 hours before a painful burn becomes obvious.
- Wear sunglasses and a hat when you go out in the sun, and, when possible, wear protective clothing.
- **Never use a tanning booth;** there is an eightfold increased risk to develop melanoma for persons under age 36 years ([CDC, 2014](#)).

Complementary and Alternative Therapies

Ultraviolet Radiation Protection

An oral form of fern plant extract may help protect the skin from UV radiation. The fern extract is from *Polypodium leucotomos* and is a natural antioxidant with tumor inhibition properties. Initial studies showed that volunteer subjects could tolerate threefold to sevenfold longer sun exposure time.

Clinical Cues

It is estimated that 90% of people between 50 and 71 years of age are not getting adequate vitamin D. Adults with limited sun exposure are at especially increased risk of vitamin D deficiency, if their skin is dark. During spring, summer, and autumn, 5 to 15 minutes of sun exposure without sunscreen twice per week to the face, arms, hands, and back is sufficient for adequate vitamin D production ([Drezner, 2014](#)).

Think Critically

You are talking to a young woman who works as a ski instructor. She is fair-skinned and says that “on really sunny days, my hat is in my pocket and I never use sunscreen.” Discuss some issues related to this woman’s integumentary health.

Integrity of Skin

Good nursing care includes protection of the skin and prevention of skin tears. A skin tear is a potentially preventable, traumatic wound that occurs primarily on the extremities of older adults because of age and debility. The wound occurs as a result of careless handling, friction alone, or shearing and friction forces that separate the epidermis from the dermis or separate both structures from the underlying tissue. More than 1.5 million skin tear injuries occur each year among institutionalized adults in health care facilities ([Stephen-Haynes and Carville, 2011](#)). The epidermis thins and becomes less elastic with age, making it susceptible to tearing with little trauma. Those

individuals who require total care are at the highest risk. Risk factors for skin tears, other than age older than 65 years, are presented in [Box 41-1](#).

Box 41-1

Risk Factors for Skin Tears in Older Adults

Assess the patient for the following factors:

- Dry skin with dehydration
- Areas of ecchymosis
- Presence of friction, shearing, or pressure from bed or chair
- Impaired sensory perception
- Impaired mobility
- Taking multiple medications
- Prolonged use of corticosteroids
- Presence of renal disease, congestive heart failure, or stroke impairment
- Incorrect removal of adhesive dressings
- Rough handling when being bathed, dressed, transferred, or repositioned

The Payne-Martin classification system ([Stephen-Haynes and Carville, 2011](#)) classifies skin tears as :

- *Category I:* A skin tear without tissue loss
- *Category II:* A skin tear with partial tissue loss
- *Category III:* A skin tear with complete tissue loss in which the epidermal flap is missing

Nursing Management

Rigorous nursing care ([Box 41-2](#)) to prevent skin tears is obviously preferable to treating skin tears that could have been prevented. However, when a skin tear is discovered, steps for its management are:

- Gently cleanse the skin tear with saline.
- Allow the area to air-dry, or pat dry gently and carefully.
- If the skin tear flap has dried, remove it using scissors and sterile technique.
- If the skin tear flap is viable, gently roll the flap back into place using a moistened cotton-tipped applicator.
- If bleeding has stopped, silicone-coated net dressings are preferred; Steri-Strips or petroleum-based protective ointments are also used. Cyanoacrylate skin protectants are in a liquid form that creates a barrier to protect damaged skin. The substance does not need to be removed because it will shed in approximately 1 week ([Knaff-Baker, 2013](#)).
- If bleeding continues, dress with alginate and a secondary dressing.
- Manage the same as a skin graft. The flap should not be disturbed for about 5 days to allow the skin flap to adhere.
- Assess and measure the size of the skin tear.
- Document assessment and treatment.

Box 41-2

Measures to Prevent Skin Tears and Protect Fragile Skin

- Have patients wear long sleeves and long pants to protect the extremities, or protect the fragile skin on extremities with stockinettes.
- Provide adequate lighting to reduce the risk of bumping into furniture or equipment.
- Maintain the patient's nutrition and hydration; offer fluids between meals.
- Lubricate the skin with cream or lotion twice a day, paying special attention to the arms and legs.
- Use an emollient soap for bathing, and do not use soap every day on extremities if no soiling has occurred.
- Use a lift sheet to move and turn patients.
- Avoid wearing rings or bracelets that could snag the skin.
- Use transfer techniques that prevent friction or shear.
- Pad bed rails, wheelchair arms, leg supports, or other equipment where the patient might bump an extremity.
- Support dangling arms and legs with pillows or blankets.
- Use nonadherent dressings on fragile skin. Use gauze wraps or stockinettes to secure dressing. If tape must be used, use a paper or nonallergenic tape and apply it without tension.
- Mark the dressing with an arrow showing the direction it should be removed.
- Remove tape and dressing with extreme caution:
 - Use a solvent or saline to loosen the adhesive bond.
 - Slowly peel tape away from anchored skin (stabilize skin).
- If a thin hydrocolloid or solid wafer skin barrier is used as a protective barrier between the skin and the dressing, allow it to fall off naturally.

Stephen-Haynes and Carville (2011) recommend that a skin tear comprehensive assessment is essential to ensure that adequate attention is given to the wound. The dressing should (1) continuously cleanse the wound, (2) conform to the wound, (3) absorb exudates, and (4) keep the wound bed moist and reduce pain and discomfort. The wound must be watched for signs of infection. Extra padding for the involved extremity will help to prevent additional injuries.

Clinical Cues

According to the Wound, Ostomy, and Continence Nurses Society, transparent adhesive dressings are no longer recommended for covering skin tears (Miner et al, 2009).

Diagnostic Tests and Procedures

Skin biopsy.

Removing a sample of tissue (**biopsy**) from a skin lesion usually is performed with a local anesthetic. It can be done by shaving a top layer off a lesion that rises above the skin line (**shave biopsy**), by removing a core from the center of the lesion (**punch biopsy**), or by excising the entire lesion (**excisional biopsy**).

Skin biopsy is used to differentiate benign from malignant lesions and to help identify the causative organism in bacterial and fungal infections. No special patient preparation is necessary beyond a simple explanation of the procedure and its purpose. If a local anesthetic is to be used, the patient is asked about any personal or family history of allergies. After the procedure, the patient is given instructions for the care of the biopsy site. Usually the bandage is changed daily. The site may or may not be treated with a topical antibiotic solution or ointment. Sutures from an excisional biopsy will need to be removed in 10 to 14 days.

Culture and sensitivity tests.

When a bacterial, viral, or fungal infection of the skin is suspected, culture and sensitivity tests can be used to identify the causative organism and the drug most appropriate for treating the specific infection. A sampling of **exudate** (drainage) is taken from the lesion and sent to the laboratory for culturing. Once the organism has been cultured, colonies can be tested for sensitivity to certain anti-infective agents. Care must be taken when handling the specimen and its container to avoid contaminating people who will later be handling the specimen.

Safety Alert

Skin Drainage or Weeping

Whenever there is a question of a pathogenic process, weeping or drainage from skin lesions, or the suspicion of scabies, Standard Precautions should be employed when touching the patient's skin to prevent self-contamination or transmission of an organism.

Microscopic tests.

Various stains and solutions are used to prepare skin, hair, scales, or nail material for study. These tests can identify fungal, bacterial, and viral organisms. To check for organism infestations, scrapings are suspended in mineral oil and examined under the microscope.

Special light inspection.

Inspection of the skin is one of the principal means by which skin lesions are diagnosed. To facilitate the diagnosis of certain kinds of skin disorders, special lights may be used by the examiner. A **cold light** is one in which the light is transmitted through a quartz or plastic structure to dissipate the heat. Because there is no danger of burning the skin, the cold light can be applied directly to the skin to illuminate its layers for visualization of malignant changes.

A **Wood's light** is a specially designed UV light. The nickel oxide filter holds back all but a few violet rays of the visible spectrum. This special light is especially useful to diagnose fungal infections of the scalp and chronic bacterial infection of the major folds of the skin (**erythrasma**). Under a Wood's light, fungal lesions and erythrasma are fluorescent. Erythrasma usually is seen on the inner thighs, scrotum, and axilla; under the breasts; and in the area between the toes.

Diascopy.

Diascopy uses a glass slide or lens pressed down over the area to be examined, blanching the skin and thereby reducing the erythema caused by increasing blood flow to the area. The shape of the underlying lesion is then revealed.

Skin patch testing.

When a rash is suspected to be of an allergic nature, patch testing is used to identify the responsible allergen. Test chemicals or substances are introduced to unaffected skin, usually on the forearm or back, by superficial scratches or pricks. If a localized reaction producing a **wheel** (smooth, slightly elevated area that is pale or reddened) occurs, the test is positive. Patch tests are sometimes evaluated at a later time.

Nursing care for diagnostic tests.

Check to see that the patient has signed an informed consent, if one is needed, for biopsies.

Reinforce what the provider has told the patient about the procedure and assess whether the patient understands or has additional questions. Check for allergies to the anesthetic or skin preparation solution. Properly label any specimens and send them to the laboratory. Apply a dressing and give both verbal and written postoperative instructions to the patient. Tell the patient approximately when the results will be back and that the patient will be notified. Advise whether a follow-up visit is necessary.

❖Nursing Management

■ Assessment (Data Collection)

History Taking

Diagnosing skin disorders requires a thorough history to identify factors that predispose a patient to skin disease or factors that cause some types of skin disease.

☒ Focused Assessment

Data Collection for Skin Disorders

The following questions should be asked when seeking data on a skin disorder:

- When did the rash or lesion first appear?
- Can you think of any event or different food you ate or substance you were using just before it appeared?
- What is your usual dietary pattern? What do you eat and drink?
- Have you noticed if anything makes it worse?
- What seems to make it better?
- Have you been using any chemicals lately for household cleaning or in pursuit of your hobbies?
- Have you been out in rural areas or the woods lately?
- Have you been traveling? Did you visit a tropical area?
- Have you had any recent exposure to animals?
- What drugs are you taking? Do you take any over-the-counter medications?
- Have you ever had a drug reaction?
- Have you ever had radiation therapy?
- Do you have a history of any skin disorders in your family?
- Does anyone in the family currently have similar symptoms, such as a rash?
- Do you have any allergies?
- Are you experiencing itching? Pain? Fever?
- Have you had any gastrointestinal problems that began about the same time that the rash or lesion appeared? What about a runny or stuffed-up nose? Cough?
- Has the skin condition affected your social life or work?

Scabies, lice, and other parasites can be transmitted through close personal contact with infected

persons at work, recreation, home, or school. It is important to know whether exposure has occurred, so that others can be notified and treated.

Many drugs can produce skin eruptions in certain individuals. Drug allergy or reaction can produce lesions and rashes that imitate those found in a long list of diseases, including measles, chickenpox, fungal infections, skin cancers, and psoriasis.

Itching and pain are the most common complaints. If the patient has recently been exposed to severe cold, her skin may be drier than usual and she may complain of severe itching (**winter itch**). If the disorder is caused by an allergy, the patient also may complain of shortness of breath, cough, or some gastrointestinal symptoms. The patient also may be able to relate what other factors, such as stress or excitement, could be related to the appearance of the skin lesions.

Physical Assessment

A thorough inspection of the skin under good lighting is essential. Provide privacy and have the room at a moderate temperature so that the patient does not become chilled. The patient should don a gown that allows access to all areas of the skin.

Cultural Considerations

Coin Rubbing

Coin rubbing is a Southeast Asian folk remedy that is intended to draw illness out of the body. An oiled coin is rubbed over the skin surface and creates bruise-like marks or patterns of red lines or welts on the skin. The redness is interpreted as a sign that the remedy is bringing the illness to the surface (D'Avanzo, 2008).

Seborrheic **keratoses** are common in older adults. They appear as wartlike, greasy lesions on the trunk, arms, scalp, and sometimes the face. They are not a cause for concern.

Darkly pigmented people will have areas that are darker than other parts of the skin. This is caused by hormonal influences. The darker areas are the nipples, areola, scrotum, and labia minora. This is true among both African Americans and Asians. When the skin of a darkly pigmented person is damaged, scar tissue may hypertrophy, forming a **keloid** (a thick ridge of scar tissue that stands up from the surrounding skin) (Figure 41-3).



FIGURE 41-3 A keloid scar. (From Lookingbill DP, Marks JG: *Principles of dermatology*, ed. 2, Philadelphia, 1993, Saunders.)

The hair of African Americans differs in texture. It varies from being long and straight to being short, thick, and tightly curled. It is very dry and fragile and requires daily grooming with oil. Asians tend to have straight hair. If an African American child has malnutrition, sometimes the hair will turn a coppery red.

Clinical Cues

When trying to differentiate between a **macule** and a **papule**, shine a flashlight at a right angle to the lesion. A papule will cast a shadow. If there is no shadow the lesion is a macule. To determine

whether there is fluid in a lesion, place the tip of a penlight against the side of the lesion. If the light illuminates it with a red glow, it is fluid filled. If there is no light illumination, the lesion is solid.

Clinical Cues

Pallor in a dark-skinned person presents as an ashen-gray tone to the skin. In a brown-skinned person, pallor gives the skin a yellow-brown color.

The skin should be lightly palpated to detect changes in texture and surface elevations. Palpation also is used to detect pain, areas of increased warmth, and tenderness. When checking the temperature of the skin, the back of the hand should be used. Skin turgor is assessed by lifting a fold of skin on the forearm, chest, or abdomen between two fingers and seeing how fast it falls back into place.

Focused Assessment

Physical Assessment of Skin

Perform a physical examination of the entire skin surface. Proceed from head to toe. Compare from one side of the body to the other. Use the metric system when measuring lesions; document all findings. Check the patient for:

- General appearance of skin surface: texture, elasticity, thickness
- Condition of areas between skinfolds
- Type of lesions and distribution, size, and appearance; photograph or measure and document measurements
- Appearance of skin adjacent to lesions; note whether reddened areas blanch when mild pressure is applied
- Localized or generalized skin edema
- Characteristics of secretions: color, viscosity, amount
- Odor: description of odor; strong or faint; source—local or generalized
- Temperature changes: location of hot spots or cold areas of the skin

In addition:

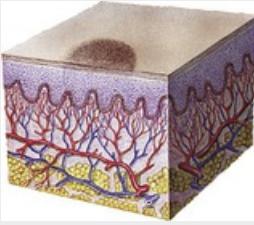
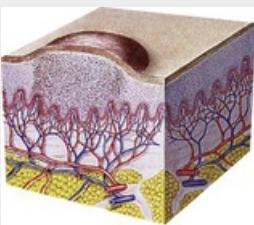
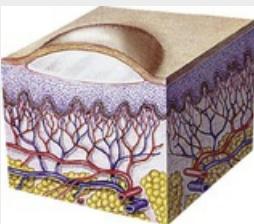
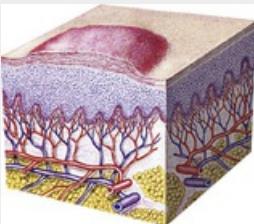
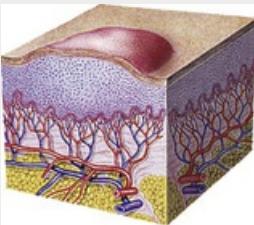
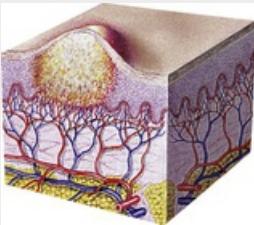
- Check the back and the soles of the feet, including between the toes
- Observe patient for scratching, rubbing, or picking at lesions
- Observe for scratching of the scalp or pubic areas
- Inspect the hair for texture, brittleness, thinning, and cleanliness
- Inspect the nails for chipping, splitting, discoloration, and ragged or inflamed cuticles

Table 41-1 shows characteristics of various types of skin lesions. As you are performing your assessment you can simultaneously teach the patient about self-examination of the skin.

Table 41-1

Types of Skin Lesions

LESION	DESCRIPTION
Macule	Circumscribed, flat area with a change in skin color; <1 cm in diameter

		<i>Examples:</i> Freckles, petechiae, measles, flat mole (nevus)
Papule		Elevated, solid lesion; <1 cm in diameter <i>Examples:</i> Wart (verruca), elevated moles
Vesicle		Circumscribed, superficial collection of serous fluid; <1 cm in diameter <i>Examples:</i> Varicella (chickenpox), herpes zoster (shingles), second-degree burn
Plaque		Circumscribed, elevated superficial, solid lesion; >1 cm in diameter <i>Examples:</i> Psoriasis, seborrheic and actinic keratoses
Wheal		Firm, edematous, irregularly shaped area; diameter variable <i>Examples:</i> Insect bite, urticaria
Pustule		Elevated, superficial lesion filled with purulent fluid <i>Examples:</i> Acne, impetigo

From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby. Figures from Patton KT, Thibodeau GA: *The human body in health and disease*, ed. 6, St. Louis, 2014, Mosby.

Patient Teaching

Self-Assessment of the Skin

Teach the patient that the skin should be examined every few months. For back or other areas, suggest that a family member or close friend examine that area of skin. If any changes have occurred, the patient should consult the provider right away. Advise that warts, moles, or discolorations of the skin should be checked each month for:

- Darkening or spreading of color or increasing unevenness of color
- Increase in size or diameter
- Change in shape; that is, has the lesion become elevated, or have its formerly regular edges become irregular?
- Redness or swelling of surrounding skin, or any other noticeable change around the lesion
- Itching, tenderness, or other change in sensation
- Crusting, scaling, oozing, ulceration, or other change in the surface of the lesion
- When assessing for melanoma, check for the ABCDs: A = asymmetric, B = irregular border, C = color change, D = diameter change greater than $\frac{1}{4}$ inch

Older Adult Care Points

When checking skin turgor on an older adult, test the upper chest, because the skin of the arms and hands of older adults may lose elasticity and is not a reliable index. Gently pinch a small amount of skin and lift up and let go. Note the time it takes for the skin to move back to its normal position. If the skin stays "tent" or takes more than 8 to 10 seconds to return to normal position, the patient is dehydrated. Older adults bruise more easily as the skin becomes thinner and collagen is lost. Patches of **senile purpura**, deep red areas, may occur even from minor injuries.

Assessing the Skin for Signs of Breakdown

Skin should be thoroughly assessed when the patient is admitted to your facility. Skin assessment is performed every shift on immobile patients, noting the condition of skin over bony prominences. Findings must be accurately documented.

Legal and Ethical Considerations

Skin Lesion Documentation

All data gathered when assessing the skin and any lesions should be accurately documented, including location, size, appearance, and characteristics. Measure lesions using a ruler device and note the measurements in the chart. For pressure ulcers, many facilities take photos and enter those in the chart so that healing progress can be demonstrated.

Once every 24 hours, usually during the bath, the skin is totally assessed. When a reddened area is found, it is checked for blanching by pressing gently in the center of the area to see if it turns from red to white, or to a paler color on darker skin. **Blanching usually indicates that the redness is temporary and will resolve when pressure on the area is relieved.** (See [Chapter 42](#) for additional information regarding pressure ulcers.)

Assignment Considerations

Observation While Bathing

Unlicensed assistive personnel are generally assisting with hygiene, and the nurse should give specific instructions to report reddening, bruising, breaks in the skin, or new lesions. **Remember that total skin assessment cannot be delegated; this is the nurse's responsibility.**

Nursing Diagnosis and Planning

Problem statements are based on the analysis of the data gathered from assessment. Problem statements commonly associated with skin disorders are presented in **Table 41-2**. Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Table 41-2

Common Problem Statements, Expected Outcomes, and Nursing Interventions for Patients With Skin Disorders

PROBLEM STATEMENT	GOALS/EXPECTED OUTCOMES	NURSING INTERVENTIONS
Altered skin integrity due to injury and treatment; excoriation or scaling; infectious process	Patient's skin will be intact within 2 wk (4 mo for burns). Number of lesions will decrease within 2 mo. Patient will exhibit no signs of infection within 3 mo.	Cleanse skin and apply topical medications as prescribed. Monitor for signs of adverse reaction to topical medication. Preserve integrity of grafted areas with aseptic dressing technique and splinting. Apply light treatments as prescribed.
Pain due to itching, soreness, or tenderness of lesions, exposure of denuded skin to air, or involvement of nerve tissue	Patient's pain will be controlled by medication and relaxation or distraction techniques.	Apply topical medication as prescribed. Administer analgesia as prescribed and as required (PRN). Provide medicated baths as prescribed. Teach relaxation techniques. Provide distraction activities.
Decreased self-esteem due to disrupted skin surface and lesions	Patient will show increase in self-esteem by socializing with others within 3 wk.	Suggest ways to cover lesions. Help patient list positive aspects and achievements. Encourage socialization with others. Show acceptance and matter-of-fact attitude when dealing with patient's lesions.
Potential for infection due to loss of intact skin barrier	Patient will not experience skin infection before lesions are healed.	Cleanse skin carefully and gently. Use aseptic technique when attending to lesions. Apply prescribed topical medications. Encourage patient to keep hands off affected skin areas. Encourage hand hygiene for patient.
Anxiety due to chronic, recurring nature of skin disorder; reaction to diagnosis of cancer; slow healing	Patient will verbalize feelings within 3 wk. Patient will explore options for treatment of cancer. Patient will identify short-term and long-term goals that realistically match the slow healing process.	Provide atmosphere of acceptance. Allow patient time to verbalize feelings. Assist to recognize positive coping techniques by looking at ways patient has coped with anxiety in the past. Provide information on treatment and prognosis for skin malignancy.
Deficient knowledge regarding cause and treatment of skin disorder	Patient will verbalize knowledge of factors related to appearance of skin disorder. Patient will verbalize knowledge of treatment for disorder. Patient will demonstrate self-care techniques.	Explain the cause of the skin disorder and measures to prevent possible recurrence, if any. Instruct in various methods of treatment. Teach the side effects of medications. Instruct in self-care techniques for medication application, dressing changes, and so on. Obtain feedback of information and skills taught.
Disrupted sleep pattern due to itching or pain	Patient will obtain at least 7 hr of rest per day.	Administer medication to relieve itching. Keep environment cool to decrease itching sensation. Caution patient to take cool or tepid baths or showers to decrease itching. Caution not to scratch lesions; this often makes itching worse. Suggest ways to use distraction (e.g., card or game playing, intense concentration on learning something, or reading an absorbing book) to decrease focus on itching. Administer hypnotic as prescribed. Administer analgesics as prescribed. Encourage use of meditation, relaxation, or imagery techniques to decrease pain. Provide restful, quiet environment. Use massage as appropriate to promote relaxation and sleep. Allow usual bedtime rituals that help patient induce sleep.
Potential social isolation due to long treatment process; disfigurement	Patient will maintain social contact with family and friends. Patient will reintegrate into community within 3-24 mo.	Encourage family and friends to send cards, call, and visit. Encourage patient to continue dialogue with family and friends. Refer to psychologist or social worker for grief work and reintegration of new body image. Refer to support group for expression of feelings and realization patient is not alone with such problems. Encourage return to employment or job training. Encourage return to church or community activities.

Nursing goals for patients with skin disorders are to:

- Restore the skin to normal
- Decrease pain and itching
- Protect the skin from further damage
- Prevent infection
- Prevent scarring as much as possible

Planning of the daily work schedule should include consideration of time necessary for dressing changes, soaks, special baths, and other skin treatments.

Implementation

Some general rules when caring for patients with a skin disease may be helpful as a guide until

specific orders are obtained:

- Bathing with soap is usually contraindicated in all inflammatory conditions of the skin.
- Dressings covering the skin lesions that have been applied by a provider should not be removed when the patient is admitted unless there are specific orders to do so.
- Do not attempt to remove scales, crusts, or other exudates on the skin lesions until the provider has had an opportunity to examine the patient.
- Observe the skin very carefully at the time of the patient's admission, and record observations on the chart or report them to the nurse in charge.
- Avoid excessive handling or rubbing of the skin against the sheets and bedclothes when changing the bed.
- Lotions or other skin products should not be used on the skin unless the provider has approved their use.

Once the provider has determined the type of lesions present, specific treatments will be ordered to relieve the patient's symptoms and promote healing. The two most commonly used treatments are special dermatologic baths and wet compresses or dressings. In addition, lotions, salves, or ointments may be applied locally at frequent intervals.

Although most skin diseases are **not** contagious, nurses should be careful to observe rules of cleanliness and Standard Precautions when caring for any patient with a skin eruption. **Special care is needed to prevent spreading infection from the fluid in all pustules and in the vesicles of fever blisters and cold sores.**

Giving Medicated Baths

Among the agents that may be added to the bath water are sodium bicarbonate, sodium chloride, cornstarch, oatmeal, medicated tars, oils, potassium permanganate, and special bath preparations.

Safety Alert

Prevent Falls

A nonslip bath mat should be used in the tub when giving medicated baths. The substances used for the bath can make the tub very slippery. Showers should have nonslip mats in them as well, especially when showering an older adult.

Patient Teaching

Easy Cleanup After an Oatmeal Bath

Put dry, uncooked oatmeal into an old sock to make an oatmeal sachet. Place the sachet in the tub and squeeze it repeatedly. After the bath is finished, discard the sachet.

During the bath, the patient must be protected from chilling, because the bath usually lasts from 30 minutes to an hour, and most patients with skin diseases have a lowered resistance to cold.

When the patient is removed from the tub, the skin is dried by patting rather than by rubbing. If medication is to be applied locally, it should be put on as soon as the bath is completed to keep **pruritus** (itching) at a minimum. **Medication is applied in a thin layer unless otherwise ordered.**

The medicated bath has a very soothing and relaxing effect on the patient and also helps relieve the itching and burning commonly associated with skin diseases. Encourage the patient to rest in bed and perhaps to take a short nap after each bath.

Laundry Requirements

The bed linens and gowns used for patients with severe skin diseases may need special laundering to eliminate all traces of soap. If the patient is to be cared for at home, vinegar may be added to the rinse water to neutralize the soap. One tablespoon of vinegar is used for each quart of water. Only detergent without perfume or other additives should be used. Dryer sheets should not be used, because they contain chemicals that often cause skin problems. Residue from dryer sheets can

remain in the dryer and affect laundry that has been washed separately for the individual with a skin sensitivity. New clothes should be washed before wearing when skin sensitivity is a problem. Washing removes chemical fabric-finishing products.

Application of Wet Compresses or Dressings

Wet dressings may be applied to the skin in various ways. The two general types used are **open dressings** and **closed dressings**. Open compresses must be changed repeatedly and are never allowed to dry. They usually need to be remoistened every 20 to 30 minutes. The solution used should be at room temperature or warmer. This type of dressing is used when the dermatologist wishes to have air circulating to the skin lesions. Closed dressings are thoroughly soaked with the prescribed solution and wrapped with an airtight, waterproof material. Obtain specific instructions from the dermatologist before applying wet dressings to any skin lesions.

Clinical Cues

When changing wet dressings, inspect the skin adjacent to the wound for signs of maceration from the moisture; this condition could cause the wound to enlarge.

Application of Topical Therapy

Many skin lesions are treated by directly applying medications to the surface of the affected area. This method is called *topical therapy*. Lotion, cream, ointment, powder, or gel may be used. The provider prescribes the kind of medication to be used and the way in which the drug is to be applied. Patients with skin conditions do not always consult a provider and sometimes choose to treat themselves at home. All patients should be instructed in the proper application of topical medications (Box 41-3). Occlusive dressings must not be applied over the area after application of the medication unless ordered by the health care provider (see Table 41-2 and Chapter 42).

Think Critically

If a patient has an order for a topical cream to be applied to an area of rash on the right upper thigh, how would you apply this cream?

Box 41-3

Guidelines for Applying Topical Medications*

Powders

- Dry the area thoroughly before applying powder to prevent caking.
- Do not apply to raw and denuded areas.
- Some powders, such as cornstarch, can actually serve as culture media for the growth of bacteria.

Ointment

- Use only a small amount and gently massage into the skin until a thin film covers the area. An exception is when ointment is used as an occlusive dressing, as for a burn.
- Ointments tend to leave a greasy feeling to the skin. They are best for chronic lesions, because they help the skin retain moisture and natural oils.
- Avoid putting ointment on areas where the skin is creased and overlaps itself.

Gels

- A gel is a semisolid mixture that tends to liquefy when applied to the skin. It is absorbed into the skin and dries quickly, leaving a thin, nonocclusive film.

- If applied to abraded or sensitive areas, alcohol in the base can cause a burning or stinging sensation.

Lotions

- Lotions are actually powders suspended in water; they will leave a residue once the liquid evaporates from the skin. This residue should be washed off before a fresh dose is applied.
- Be sure powder is uniformly dispersed in solution before applying, then use a firm stroke to distribute the medication evenly. Do not “dab” on lotions, as this can be irritating to the skin.

All Types

- Always apply topical medications sparingly and in a thin film that extends beyond the affected area about $\frac{1}{4}$ inch. Thick layers of topical medications are wasteful, and some of these drugs, such as corticosteroids, are very expensive.
- Too much of some topical medications (e.g., antifungal agents) can chemically irritate the skin and delay healing. Thick layers also tend to soften the skin too much.
- If the skin condition appears to be getting worse after a topical agent is applied, or if the patient develops eczema, suspect an allergic contact dermatitis caused by the drug.

* Allergies must be assessed before applying a topical medication.

Evaluation

Evaluation of treatment and nursing interventions for skin disorders is based on improved appearance of the skin, absence of signs of infection, relief from itching and pain, and signs of healing. Many skin disorders are slow to respond to treatment, and patience is required on the part of the patient and the nurse. Even a minor fungal skin infection may take 7 to 14 days to clear with topical medication. A fungal infection of a nail may take up to a year to clear. A major part of evaluation is to determine that treatment is not aggravating the condition.

Get Ready for the NCLEX® Examination!

Key Points

- The skin is essential for the maintenance of life; it is the first line of defense against pathogenic organisms. Skin has two layers, the epidermis and the dermis. New cells to heal the skin are contained in the dermis.
- Factors in the prevention of skin disorders include cleanliness, appropriate diet, proper skin care, limiting exposure to the sun, and careful handling of fragile skin.
- With increased age the skin becomes thinner and more fragile, less elastic, and drier.
- Fragile skin requires special attention: protective clothing (such as long sleeves), lubrication with creams or lotions, bed transfer techniques that prevent shear, padded side rails and assistive devices, use of nonadherent tape, and use of solvent to loosen dressings and peeling them slowly.
- Several types of diagnostic measures are used: biopsy, culture, microscopic examination of scrapings or tissue, special light inspection, diascopy, and skin patch testing.
- A thorough health history is key in the diagnosis of skin disorders (see Focused Assessment on p. 961).
- Teach self-examination of the skin, including the ABCDs: A = asymmetric; B = irregular border; C = color change; D = diameter greater than $\frac{1}{4}$ inch (see Patient Teaching on p. 962).
- Standard precautions are used when touching patients with weeping lesions or when drainage is present.
- Treatments for skin disorders include medicated baths, special laundry precautions, application of compresses or dressings, and topical therapy.
- Systemic therapy may be used for some fungal infections and for serious bacterial infections.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- Agency for Healthcare Research and Quality, www.guideline.gov
- American Academy of Dermatology, www.aad.org
- American Cancer Society, www.cancer.org
- Skin Cancer Foundation, www.skincancer.org

Review Questions for the NCLEX® Examination

1. A nurse notes that a 55-year-old, light-skinned patient has dry, flaky skin. Which action by the patient should alert the nurse to a problem?

1. The patient always puts a moisturizing lotion on her hands after washing them.
2. The patient takes daily showers with soap and hot water.
3. The patient takes a daily multiple vitamin.
4. The patient spends some time outdoors, and uses sunscreen that she reapplies every $1\frac{1}{2}$ to 2 hours.

NCLEX Client Need: Health Promotion and Maintenance

2. A nurse is teaching teenagers regarding the importance of protecting the skin from UV rays. What information should the nurse include? (*Select all that apply.*)

1. Use a sunscreen with a sun protection factor (SPF) of at least 30.
2. Apply sunscreen thinly.
3. Wear light, loose clothing.
4. Gauge exposure while in the sun.
5. Wear sunglasses and a hat.

NCLEX Client Need: Health Promotion and Maintenance

3. A patient with a suspicious skin lesion is scheduled for a punch skin biopsy. What is the most accurate explanation that the nurse would give about the procedure?

1. "It is shaving a top layer off a lesion that rises above the skin line."
2. "It is removing a core from the center of the lesion."
3. "It is removing the entire lesion."
4. "It is aspirating a tissue sample."

NCLEX Client Need: Physiological Integrity: Basic Care and Comfort

4. A patient has a rash of unknown origin. Which assessment question(s) would help determine the underlying cause of the lesion? (*Select all that apply.*)

1. "When did the rash or lesion first appear?"
2. "Can you think of any event or different food you ate or substance you were using just before it appeared?"
3. "What drugs are you taking? Do you take any over-the-counter medications?"
4. "Have you ever had radiation therapy?"
5. "Do you have a history of any skin disorders in your family?"

NCLEX Client Need: Safe and Effective Care Environment

5. What physiologic changes in aging predispose older adults to skin breakdown? (*Select all that apply.*)

1. Thickening of skin
2. Loss of collagen
3. Increased elastic fibers
4. Decreased adipose tissues
5. Reduced sebaceous gland activity

NCLEX Client Need: Physiological Integrity: Physiological Adaptation

6. A nurse needs to apply a dressing to a patient who has fragile skin. Which intervention would the nurse use to protect the patient from skin tears?

1. Ask the provider to give specific orders for wound care.
2. Gently clean and apply a sterile transparent dressing.
3. Tape the dressing with paper tape and prevent tension.
4. Allow any tape and gauze dressing materials to fall off naturally.

NCLEX Client Need: Safe and Effective Care Environment

7. A nurse is observing a nursing assistant provide skin care to an older adult patient. Which action by the nursing assistant indicates a need for further training?

1. Using soap and hot water every day to clean the patient's body
2. Alerting the nurse about a wet dressing
3. Reporting redness and blanching over the sacral area
4. Applying lotion while the skin is still damp

NCLEX Client Need: Health Promotion and Maintenance

8. A nurse is supervising a new graduate nurse (GN) who is examining a new patient with skin lesions. The nurse would intervene if the GN:

1. gently handles the patient's extremities to prevent skin tears.
2. observes the condition of the skin and measures the size of the lesions.
3. removes the scales and crusts from the lesions to clean the skin.
4. assesses for and documents any home remedies that the patient has tried.

NCLEX Client Need: Safe and Effective Care Environment

9. A nurse is taking care of a 75-year-old man who spends most of his time in bed or sitting. What steps should be taken to prevent a skin tear? (*Select all that apply.*)

1. Have the patient wear long sleeves and long pants.
2. Lubricate the patient's skin with cream or lotion twice a day.
3. Massage the skin vigorously, especially over bony prominences.
4. Never use a lift sheet to move or turn the patient.
5. Pad bed rails, wheelchair arms, leg supports, or other equipment where the patient may bump an extremity.

NCLEX Client Need: Safe and Effective Care Environment

10. A nurse reads in a patient's record that the provider observed "circumscribed, superficial vesicles with a collection of serous fluid." The nurse anticipates that the provider will make which recommendation for the patient?

1. A prescription for a topical application for acne
2. Isolation precautions for herpes zoster
3. Over-the-counter antihistamine for an insect bite
4. Patient education to self-monitor the wart

NCLEX Client Need: Physiological Integrity: Basic Comfort and Care

Critical Thinking Questions

Scenario A

You have been asked to give a presentation to a ninth-grade class on skin care and prevention of skin cancer.

1. What specific information would you include on the subject of general skin care?
2. What would you say about lying out in the sun?
3. What information would you give regarding the use of tanning booths?
4. What would you say about protection when out in the sun?

Scenario B

Mrs. Hess, an 83-year-old resident of a long-term care facility, has very dry skin. She asks you to look at spots on her hand that are brown and "ugly."

1. What could this lesion on Mrs. Hess's hand be?
2. What would you tell her?
3. Mrs. Hess asks you why she bruises so easily. She says she hates these reddish purple areas she gets on her arms and legs. What would you answer?
4. What nursing measures should be instituted for skin care for Mrs. Hess's dry skin?

Scenario C

You and a home health aide have been assigned to care for an older adult woman in the patient's home for several days. The patient has a noncontagious itchy rash, and the provider has suggested using oatmeal as a soothing bath and topical application of lotion and has ordered daily assessments to monitor the patient's condition. In addition, the patient's daughter has asked that the linens be washed on a daily basis.

1. Discuss which tasks you (the nurse) should perform.
2. Which tasks can be delegated or assigned to the home health aide? What specific instructions should be given to the home health aide about assigned duties?
3. During one of the home visits the daughter asks the nurse to look at a mole on her own back. "I can't see it very well, and of course my mother is not able to help me either." What would you do and say in this situation?

CHAPTER 42

Care of Patients With Integumentary Disorders and Burns

Objectives

Theory

1. Describe the etiology of dermatitis.
2. Plan psychosocial interventions for a patient who has psoriasis.
3. Compare and contrast the treatment of fungal skin or nail disorders with the treatment of bacterial skin disorders.
4. Choose nursing interventions for a patient with herpes virus infection.
5. Examine the types of acne and their treatment.
6. Present the characteristics of the various types of skin cancer.
7. Analyze the important points of caring for an immobile patient to prevent pressure ulcers.
8. Construct a care plan for each stage of a pressure ulcer.
9. Summarize important assessment points for a patient who has sustained a burn.
10. Illustrate the nurse's role in emergency burn care.
11. Explain the psychosocial needs and interventions for burn patients.
12. Relate the process of rehabilitation for a patient with a major burn.

Clinical Practice

13. Teach a family about care for a patient at home when scabies is present.
14. Assess the skin of family members for signs of skin cancer.
15. Provide care for a patient with a stage III or stage IV pressure ulcer.
16. Apply Standard Precautions and sterile technique for the care of a burn.
17. Visit a burn intensive care unit and observe the wound care of a patient who is in the acute stage of a major burn.

KEY TERMS

allograft (ăl-ō-grăft, p. 992)

autograft (ăw-tō-grăft, p. 992)

autoinoculation (ăw-tō-ĕn-Ö-kū-LĀ-shūn, p. 974)

biologic dressings (bī-ō-LŌJ-īk DRĒS-īngz, p. 992)
biosynthetic (bī-ō-SĪN-thēt-īk, p. 992)
carbuncles (KĀR-būn-kūlz, p. 974)
cellulitis (sēl-ū-LĪ-tīs, p. 974)
Curling ulcer ('kərlīNG, 'əL-sər, p. 986)
dermabrasion (děrm-ă-BRĀ-zhūn, p. 972)
dermatophytosis (DĒR-mă-tō-fī-TŌ-sīs, p. 976)
disseminated (dīs-ĒM-ě-nāt-ěd, p. 976)
eschar (ĒS-kār, p. 983)
escharotomy (ĒS-kā-RŌ-tō-mē, p. 991)
furuncles (fyū-RŪN-kūlz, p. 974)
mycoses (mī-KŌ-sēz, p. 976)
onychomycosis (ōn-ī-kō-mī-KŌ-sīs, p. 976)
purulent (PŪ-rū-lēnt, p. 985)
serosanguineous (SĒR-ō-sāng-GWĪN-ē-ūs, p. 985)
shearing action (shər-iNG, AK-shən, p. 981)
tinea pedis (TĪN-ē-ă pē-dīs, p. 977)
xenograft (ZĒ-nō-grāft, p. 992)

Inflammatory Infections

Many skin diseases result from infection with bacteria, viruses, or fungi or from infestation with parasites. Diseases of this kind require special precautions to prevent spread of the infectious organism or the parasite. Hand hygiene is a first-line measure in the prevention of health care-associated infections and is mandated as one of The Joint Commission's National Patient Safety Goals. The Center for Infectious Diseases, a division of the Centers for Disease Control and Prevention, recommends that Contact Isolation, as well as Standard Precautions, be implemented for a number of these diseases (Box 42-1). Some skin infections are not necessarily contagious; however, it can be difficult to quickly determine whether a particular condition is a contagious type at the initial examination. Therefore isolate the patient, perform hand hygiene, and use Standard Precautions (see [Appendix B](#)) if there is any doubt.

Box 42-1

Review of Contact Isolation Requirements

Specifications for Contact Isolation are as follows:

- A private room is indicated. In general, patients infected with the same type of organism may share a room.
- Gloves are worn when entering the room. Change gloves after contact with infective material, such as wound drainage or feces, and before treating a different location on the body. Perform hand hygiene before donning clean gloves.
- Remove gloves when leaving the room, and perform hand hygiene using an antimicrobial agent.
- Gowns are indicated if soiling is likely, particularly if there is drainage from an uncovered wound or the patient is incontinent.
- Articles contaminated with infective material should be discarded in a biohazard waste receptacle or bagged and labeled before being sent for decontamination and reprocessing.
- Patient care equipment should be used only for the one patient and should be left in the room until no longer needed.
- Skin disorders that require Contact Isolation include:
 - Diphtheria, cutaneous
 - Furunculosis, group A *Streptococcus*
 - Herpes simplex, disseminated, severe primary, or neonatal
 - Herpes zoster (varicella zoster)
 - Varicella (chickenpox)
 - Impetigo
 - Infection or colonization by bacteria with multiple drug resistance (any site)

- Pediculosis
- Scabies
- Skin wound or burn infection, major (draining and not covered by dressing, or dressing does not adequately contain purulent material), including those infected with *Staphylococcus aureus*
- Vaccinia (generalized and progressive eczema vaccinatum)

Dermatitis

Dermatitis is not contagious unless a secondary infection has occurred in the lesions.

Etiology, Pathophysiology, Signs, and Symptoms

Contact dermatitis is a delayed allergic response involving cell-mediated immunity. On contact with the skin, the allergen is bound to a carrier protein and forms a sensitizing antigen. T cells become sensitized to the antigen. Local skin irritation is evident within a few hours or days after exposure to an antigen. Erythema and swelling, pruritus, and the appearance of vesicular lesions follow. Many chemicals; cosmetics; soaps; latex; and poison ivy, oak, and sumac are contact irritants and can cause such a reaction.

Atopic dermatitis affects about 10% of the population and is more common in infancy and childhood but does affect some adults. It results from a complex activation process that involves mast cells, T lymphocytes, Langerhans cells, monocytes, B cells that produce immunoglobulin E, and other inflammatory cells that release histamine, lymphokines, and other inflammatory mediators. Atopic dermatitis does seem to have a genetic, allergic association, because it is more prevalent in families.

Stasis dermatitis generally occurs on the legs as a result of venous stasis and edema and is seen in conjunction with varicosities, phlebitis, and vascular trauma. Erythema and pruritus occur first, after which scaling, development of petechiae, and **hyperpigmentation** (excessive pigmentation) occur. Lesions may become ulcerated, particularly around the ankles and tibia.

Seborrheic dermatitis is a common inflammation involving the scalp, eyebrows, eyelids, ear canals, nasolabial folds, axillae, chest, and back. It is most common on the scalp. The cause is unknown. Lesions appear as scaly white or yellowish plaques with mild pruritus.

Diagnosis and Treatment

Dermatitis is diagnosed by inspection and by compiling a complete history, looking for possible exposure to causative substances.

In general, treatment is aimed at avoidance of the contact irritant or allergen, good skin lubrication, preservation of skin moisture, and control of inflammation and itching. Topical agents are often used. Corticosteroids may be used topically, or sometimes orally or by injection to intervene in a severe episode of dermatitis.

Nursing Management

Teach patients to avoid contact irritants and to properly care for their skin. Instruct them in the proper way to apply topical agents. Caution any patient who is experiencing pruritus to avoid becoming hot, bathe in tepid water, and not puncture vesicles. The skin should be patted rather than rubbed dry.

Acne

Etiology, Pathophysiology, Signs, and Symptoms

Acne is a disorder of the skin characterized by papules and pustules over the face, back, and shoulders. Some types of acne are related to cosmetics or to chemicals in the environment. For

example, occupational acne is caused by prolonged contact with oils and tars.

There are many kinds of acne, but the two major types are **acne rosacea** and **acne vulgaris**. Acne rosacea usually begins between ages 30 and 50 years. It is characterized by erythema (redness), papules, pustules, and telangiectases. It occurs on the face over the cheeks and bridge of the nose. **Comedos** (dilated hair follicles filled with skin debris, bacteria, and sebum) do not occur. Factors that cause facial flushing precipitate worsening. Tea, coffee, alcohol (especially wine), caffeine-containing foods, spicy foods, sunlight, and emotional stress cause flare-ups.

Acne vulgaris is more common than acne rosacea. Factors that contribute to the development of acne include hereditary disposition, increased androgen levels, and premenstrual hormonal fluctuations. Use of heavy creams, use of certain drugs, and exposure to increased heat also contribute to the disorder. Acne vulgaris typically begins in early puberty, continues through the teens, and then begins to subside. Occasionally it persists, or it can recur several years later. The onset of acne vulgaris in adolescents is related to increased release of sex hormones, which stimulate activity of the sebaceous glands, causing increased production of sebum. Ducts leading from the sebaceous glands become plugged with sebum. It is not known why in some persons the ducts from these glands become plugged, but the increased production of sebum triggers the formation of blackheads and whiteheads. The color of blackheads is the result of particles of melanin, the skin's own pigment, combined with sebum and keratin. Accumulations of sebum, skin particles, and dead skin cells can cause an inflammatory reaction. Bacterial infection leads to the formation of pustules. An extensive inflammation can lead to the formation of cysts, with swelling above and below the surface of the skin.

There are many misconceptions about acne vulgaris and its treatment. It is not a contagious disease. It is not caused by uncleanliness or poor personal hygiene. Diet can contribute to the formation of lesions, but generally there is little or no relationship between the intake of certain foods and the appearance of the lesions of acne. Typically, chocolate, colas, and fried foods do not need to be eliminated from the diet in an effort to prevent or cure acne. A well-balanced diet is all that is recommended in the management of acne.

Diagnosis and Treatment

Diagnosis is by history and physical examination. Acne rosacea is treated by avoiding the triggers for flare-ups and with topical antibiotics, metronidazole (MetroGel), and retinoids. Sometimes oral antibiotics are prescribed.

Mild, noninflammatory cases of acne vulgaris respond well to efforts to remove blackheads and whiteheads by promoting dryness and peeling of the top layer of skin. The medication is applied directly on the skin. Nonprescription drugs, such as lotions, creams, and gels that contain sulfur, benzoyl peroxide, or sulfur combined with resorcinol usually are effective for noninflammatory acne.

Among the topical medications, retinoic acid (tretinoin [Retin-A]) is the best agent for **papular** and **pustular** acne problems. It should be used once or twice a day. Benzoyl peroxide is the most commonly used topical agent for acne and is available both by prescription and over the counter. Azelaic acid (Azelex) is applied topically twice a day. The U.S. Food and Drug Administration (FDA) has approved Veltin Gel, a water-based topical agent for the treatment of acne vulgaris in patients 12 years and older ([Drugs.com, 2015](#)). It is quite expensive, but financial assistance is available.

Antibiotics such as tetracycline and erythromycin also are sometimes prescribed topically and orally for cystic acne to inhibit the growth of bacteria in the plugged ducts.

Isotretinoin (13-cis-retinoic acid) has been especially effective in controlling cases of cystic acne that are resistant to other forms of treatment. The drug was initially marketed under the trade name Accutane, but after black box warnings and increasing numbers of reports of adverse events, including gastrointestinal concerns, birth defects, and increased rates of suicide, Roche discontinued making Accutane in 2009 ([Drugs.com, 2015](#)). It is still available in generic form. Accutane is taken by mouth daily for 2 to 4 months and inhibits activity of the sebaceous glands. Its effects are sustained for months to years after it has been discontinued. Almost all patients experience some adverse reaction to this drug. **Accutane is used only for severe cystic acne that is resistant to all other treatment. There are serious adverse side effects, including organ damage and mental problems.** Laboratory testing includes hemoglobin, hematocrit, glucose, triglycerides, uric acid, alkaline phosphatase, and liver enzymes.

For larger areas, lasers or a new light treatment called *photodynamic therapy* have been used with success.

If the patient has deep scarring and pitting as a result of cystic acne, appearance can be improved by **dermabrasion**. This dermatologic procedure involves mechanically scraping away the outer layers of skin and smoothing out its surface by applying motor-driven wire brushes or diamond wheels. Chemical dermabrasion is done by applying phenol or trichloroacetic acid to remove the scars.

Nursing Management

Teach the patient about the nature of the particular skin disease and give support while he is trying to cope with its physiologic and psychosocial effects. Acne can be particularly distressing to adolescents, who are often deeply concerned about their appearance and acceptance by their peers.

The face should be washed gently with a mild soap. Scrubbing the skin and using a harsh soap is damaging and contributes to inflammation. Special medicated soaps do not seem to be any better than a mild face soap. If the hair is oily, it should be shampooed frequently and kept off the face.

Squeezing pimples and pustules is not recommended. This can press the sebum and accumulated material more firmly in the clogged duct, increase the chance of inflammation, and spread an infection to other parts of the skin and body. Blackheads and whiteheads are best removed by applying a prescription medication that causes peeling of the skin. The hands should be kept off of the face.

Because the management of acne can go on for years and requires periodic evaluation by a dermatologist, patients and their families will need continued support and encouragement to follow the prescribed regimen. They will need to know the expected results of prescribed medications, any adverse reactions that might occur, and symptoms that should be reported immediately.

Think Critically

What skin care measures would you recommend to a young teenager who is just beginning to experience face blemishes such as blackheads or whiteheads? The kids at school are calling him "scab face."

Psoriasis

Etiology, Pathophysiology, Signs, and Symptoms

Psoriasis is a noncontagious, chronic, recurring skin disorder that typically appears as inflamed, edematous skin lesions covered with adherent silvery white scales (Figure 42-1). These scales are the result of an abnormally rapid rate of proliferation of skin cells. When the scales are removed, there is pinpoint bleeding. The plaques most often appear on the skin of the elbows, knees, and base of the spine. It also may affect the scalp, in which case it can be confused with **seborrheic dermatitis**. When the fingernails are involved, there can be pitting of the surface of the nails. The palms and soles also can be affected, making it difficult for the patient to carry out activities of daily living (ADLs).



FIGURE 42-1 Psoriasis lesion on the hand. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 6, Philadelphia, 2010, Saunders.)

In some cases the skin eruptions of psoriasis are accompanied by inflammation of the joints, especially those of the fingers and toes. This is called *psoriatic arthritis*. Psoriasis affects about 2% of the U.S. population. There is a genetic predisposition for the disease. It is likely that an immunologic event triggers the disorder, because the first lesion commonly appears after an upper respiratory infection. T cells are mistakenly activated and trigger immune responses that speed up the growth cycle of skin cells. [Maradit-Kremers and colleagues \(2013\)](#) found that patients with moderate to severe psoriasis had a higher incidence of cardiac disease and risk for stroke, but were not at an increased risk for cardiac death.

Diagnosis and Treatment

Diagnosis is by history, physical examination, and ruling out other skin disorders. Each case of psoriasis is treated individually. The disease is unpredictable, tends to go into remission spontaneously, and sometimes will clear up temporarily with or without treatment.

Mild cases usually respond to steroid creams (triamcinolone acetonide [Kenalog]), but there is a possibility that eventually the disease will become resistant to steroids. Sunlight in moderate doses can help, because the ultraviolet (UV) rays slow down the rate at which epithelial cells are produced. Extremes of UV radiation can have the opposite effect, resulting in an aggravation of the condition. Calcipotriene (Dovonex), a vitamin D analog cream, helps to regulate skin cell production, decreasing the incidence of psoriasis plaques.

Tar preparations also act to impede the proliferation of skin cells and have long been used to heal psoriasis lesions. They may be administered in the form of baths, topical applications, or shampoos. Combinations of artificial UV radiation and a coal tar product commonly are prescribed for severe cases. This usually requires hospitalization so that the dosage of each component of therapy can be measured precisely. A form of therapy called *PUVA* combines application of one of a class of drugs called psoralens, which penetrates the skin, with exposure to ultraviolet light type A (UVA).

Antimetabolites have been used to treat severe psoriasis, helping to control the disorder by their antiproliferative action. Methotrexate is the most commonly used antimetabolite for this purpose. Acitretin (Soriatane) or cyclosporine is sometimes used. In a phase II clinical trial, [Leavitt \(2013\)](#) found that brodalumab significantly improved psoriasis symptoms in patients who stayed on the drug for more than 6 months. Other biologic agents shown to be efficacious include infliximab (Remicade), etanercept (Embrel), efalizumab (Raptiva), and alefacept (Amevive).

Nursing Management

Patients with psoriasis will need instruction about the nature of their disease, teaching about the purpose of the prescribed treatment, and information about ways to avoid aggravating it. **The skin should be kept as moist and pliable as possible. Humidifiers to increase moisture in the environment are sometimes helpful.** Lubricating lotions and creams should be approved by the dermatologist before they are applied.

Minor scratches and abrasions and bacterial infections can trigger the formation of lesions at a new site. **Because any irritation or break in the skin seems to stimulate the growth of psoriatic plaques in a person susceptible to psoriasis, the patient should be cautioned to prevent injury of any kind.** This includes hangnails, damaged cuticles, blisters from poorly fitting shoes, scratches from pets, and potentially harmful agents in the environment such as radiation and chemicals.

Stevens-Johnson Syndrome

Stevens-Johnson syndrome (SJS) is an allergic reaction with skin manifestations. It is usually triggered by a medication. The signs and symptoms appear within 14 days of starting drug therapy. Offending drugs are the anticonvulsants carbamazepine (Tegretol) and phenytoin (Dilantin), the antimalarial sulfadoxine-pyrimethamine (Fansidar), and the antibiotic sulfamethoxazole-trimethoprim (Bactrim, Septra). However, over-the-counter medications can cause SJS. Lesions that may be mistaken for chickenpox develop on the face, trunk, palms, extensor surfaces of joints, soles of the feet, and dorsum of the hands. The lesions have irregular borders and may have blistered, necrotic centers.

Treatment of SJS is to discontinue the drug and provide supportive care with fluids and nutrition. Wound care is similar to that for a burn. The lesions are painful, and analgesia is provided. Sedatives may be necessary. If not treated early, SJS can cause death.

Clinical Cues

Assess the skin of every patient daily. Ask assistive personnel if they have observed any changes. If new skin lesions appear, seek an opinion from a provider. Check the medication profile and medication history to see what medications the patient has been receiving. Alert the provider if the patient has been taking a medication known to cause SJS.

Bacterial Infections

Etiology, Pathophysiology, Signs, and Symptoms

Cellulitis is an infection of the dermis and subcutaneous tissue and is generally caused by *Staphylococcus*. It may occur as an extension of a skin wound, as an ulcer, or from furuncles or carbuncles. The area will be erythematous, swollen, and painful. It is treated with systemic antibiotics, and Burow soaks may be used to relieve pain. Burow solution is an astringent and topical antiseptic also called *aluminum acetate solution*.

Furuncles (boils) are inflammations of hair follicles. The organism responsible is usually *Staphylococcus aureus*. Any skin area with hair can be affected. Initially there is a deep, firm, red, painful nodule 1 to 5 cm in diameter. The nodule changes to a large and tender cystic nodule accompanied by cellulitis. The lesion may drain large amounts of pus and necrotic tissue.

Carbuncles are a collection of infected hair follicles and most commonly occur on the back of the neck, the upper back, and the lateral thighs. It begins as a firm mass and evolves into an erythematous, painful, swollen mass. It may drain through many openings in the mass. Abscesses may develop with fever, chills, and malaise.

Diagnosis, Treatment, and Nursing Management

Diagnosis is by history and examination. Treatment of both furuncles and carbuncles is application of warm compresses to provide comfort, promote localization, and cause spontaneous drainage. Abscess formation requires incision and drainage. Recurrent episodes are treated with systemic antibiotics.

Nursing interventions are aimed at healing the infected areas and preventing recurrence. Rinsing very well after bathing to eliminate soap residue is recommended. The patient is taught to avoid using cosmetic products and over-the-counter topical remedies on the affected areas. A clean washcloth and towel should be used for bathing each day until the carbuncle or furuncle is healed. Linens should be washed in hot soapy water and thoroughly dried before reuse.

Viral Infections

Herpes Simplex

Herpes simplex virus type 2 (HSV-2) is most often associated with genital herpes, whereas herpes simplex virus type 1 (HSV-1) lesions are primarily nongenital (Figure 42-2). Either type can cause lesions in the genital area as well as other regions of the body. **Autoinoculation** of the virus is possible by direct contact, for example, lips to fingers to genitals or lips to fingers to eyes.

Health Promotion

Preventing Spread of Herpesvirus

Patients with genital herpes need to be aware that the disorder can be transmitted even when no lesions are present. When a person has a “cold sore,” the virus can be transferred to others. Contact with the lesion should be prevented. Care should be taken not to share drinking glasses and eating utensils, lipstick, or other items that touch the lesion.

Complementary and Alternative Therapies

Lemon Balm for Cold Sores

Lemon balm in a concentrated cream base has often been used to relieve the symptoms of **herpes labialis** (infection of the lips; commonly known as *cold sores* or *fever blisters*) (Sierralupe, 2015).



FIGURE 42-2 Herpes simplex virus lesions. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 5, Philadelphia, 2006, Saunders.)

Etiology and Pathophysiology

When initial infection occurs, the virus is imbedded in a nerve ganglion that innervates the site of the lesion. Reactivation of the virus causes new lesions to occur at the same site. The virus travels along the nerve to the site of the original infection. Reactivation is brought about by exposure to ultraviolet light, skin irritation, fever, fatigue, or stress.

Signs and Symptoms

An infection with HSV-1 appears as lesions on the lips and nares that are commonly called *cold sores* or *fever blisters*. As with other types of herpesvirus infections, no drug will completely cure the infection.

Diagnosis, Treatment, and Nursing Management

Diagnosis is by physical examination and history. Sometimes topical and oral acyclovir (Zovirax), famciclovir (Famvir), or valacyclovir (Valtrex), available by prescription, hastens healing. The

symptoms of itching and burning that accompany oral herpes infection sometimes can be minimized by applying warm compresses to the sores, followed by local application of tincture of benzoin or spirits of camphor to aid drying and facilitate healing. The disease usually is self-limiting, which means that it does not progress and will subside on its own, but it can recur. Contagion is possible up to 5 days after appearance of the lesion. Docosanol cream (Abreva) sold over the counter is a helpful treatment for this disorder.

Patients should be cautioned to use good personal hygiene to prevent spreading the virus to the eyes and genital area and other body parts. Hand hygiene is a very simple, but essential, part of preventing spread of the virus.

Herpes Zoster

Etiology and Pathophysiology

Herpes varicella-zoster causes chickenpox (varicella), mostly in young children, and shingles (herpes zoster) in all ages. In herpes zoster, the herpes viruses replicate in the peripheral nerve ganglia, where they lie dormant until reactivated by trauma, malignancy, possibly stress, or local radiation ([Figure 42-3](#)). Approximately 1 million cases per year occur in the United States, and about 1 in 3 people will be affected at some point in their lifetime ([CDC, 2014](#)). The risk is greater for immunocompromised individuals (those with cancer or HIV/AIDS). A vaccine is available for children to prevent chickenpox.

Older Adult Care Points

Approximately 50% of individuals who live past 80 years of age develop shingles. There is a vaccine available (Zostavax) that is about 50% effective in preventing shingles; it appears to be effective in attenuating the disorder if it occurs and is effective for about 6 years ([CDC, 2014](#)).



FIGURE 42-3 Herpes zoster (shingles). (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

Signs and Symptoms

Herpes zoster begins with vague symptoms of chills and low-grade fever and possibly some gastrointestinal disturbance. There may be only aching or discomfort along the nerve pathway with or without erythema. About 3 to 5 days after onset, small groups of vesicles appear on the skin. They usually are found on the trunk and spread halfway around the body, following the nerve pathways leading from the spinal nerve to the skin.

Safety Alert

Danger of Herpes Zoster Transmission

No health care worker, or visitor, should be in contact with a patient who has chickenpox or shingles if they have never had the disease. A pregnant woman should not care for a patient with chickenpox or herpes zoster. The virus is highly contagious and can harm a fetus.

The vesicles eventually change from small blisters to scaly lesions and are accompanied by pain and itching. The lesions usually affect only one side of the body or face. The pain of shingles often is quite severe. Pain can persist for several days or weeks after the skin lesions are completely healed. The pain of postherpetic syndrome is not easy to control.

Diagnosis and Treatment

Diagnosis is by history and physical examination. There is no cure for herpes zoster. The condition can persist for months, especially in older and debilitated patients. Herpes infections may be recurrent, because complete immunity does not occur. **The earlier the condition is diagnosed and treatment begins, the better are the chances to decrease the amount and duration of the associated pain (CDC, 2014).**

Symptomatic treatment typically involves administering an analgesic to relieve pain. Capsaicin, an over-the-counter analgesic that is applied topically five times a day, decreases pain for some patients. A paste made from aspirin and water placed on the lesions decreases pain for others. Antibiotics may be prescribed prophylactically against secondary bacterial infection of the lesions. Most providers prescribe oral acyclovir (Zovirax), famciclovir (Famvir), or valacyclovir (Valtrex) to diminish the extent or duration of the lesions. Valacyclovir is used only in otherwise healthy patients. Famciclovir, if given within the first 2 to 3 days of the outbreak, seems to shorten the duration of the chronic pain that typically follows shingles. Systemic corticosteroids may be used to decrease pain and in an attempt to prevent postherpetic pain syndrome. Their use is controversial. Tricyclic antidepressants and gabapentin (Neurontin), an anticonvulsant drug, have been used with variable success at controlling pain.

Narcotic analgesics are avoided if possible, because they can lead to addiction when used for an extended time. If the pain persists and is intractable, the provider prescribes a corticosteroid to reduce inflammation. Vidarabine, administered intravenously (IV), is sometimes given to patients who have an immune deficiency. It is usually effective in reducing, if not completely relieving, the pain.

Although shingles may be difficult to live with while the disease is running its course, the only lasting complication from the disease is postherpetic neuralgia (unless the virus attacks the eye, in which case it can cause blindness). However, the prognosis is less favorable in patients who have an underlying malignancy or who are immunocompromised.

Nursing Management

Care includes symptomatic relief from the pain and itching and prevention of a secondary bacterial infection.

Complementary and Alternative Therapies

Tai Chi Boosts Immunity to Shingles

Research has shown that practicing tai chi resulted in a level of immune response close to that of the varicella vaccine and that tai chi boosted the positive effects of the vaccine. The meta-analysis studied seven randomized, controlled trials, four controlled clinical trials, and five retrospective case-controlled studies (Ho et al, 2013).

Cold compresses, calamine lotion, and diversional activities are sometimes helpful. Rest and adequate nutrition can promote healing and shorten the acute phase of shingles. Teaching imagery, deep muscle relaxation, or use of distraction activities may help decrease pain. Evidence supports initiation of isolation procedures based on symptoms rather than waiting for a confirmed diagnosis. If lesions are **disseminated**, meaning widely dispersed, or if the patient is immunocompromised, airborne and Contact Isolation are necessary. If the lesions are localized and the patient is not immunocompromised, Standard Precautions are sufficient. Transmission precaution isolation is

needed until all the blisters are crusted ([CDC, 2011](#)).

Fungal Infections

Fungal infections are called **mycoses**; systemic fungal infections involving the lungs and other internal organs are called *systemic mycoses*. There are two groups of fungi that cause infections in humans: (1) fungi that are truly pathogenic to humans and (2) fungi that cause **opportunistic infections** (can cause an infection when the host has an altered immune system).

True pathogenic fungi can cause infection in an otherwise healthy person, but relatively few fungi are able to do this. Fungal infections are rarely fatal if they involve only the superficial tissues of the body. Nevertheless, mycotic skin infections can be exasperating because they are difficult to diagnose and are often resistant to treatment.

The most common types of fungal infections involving the skin are **tinea pedis** (athlete's foot or **dermatophytosis**), **tinea cruris** (jock itch), **tinea of the scalp** (commonly known as *ringworm*), and **tinea barbae** (barber's itch). **Moniliasis** (thrush) is a fungal infection that can attack the mucous membranes of the mouth, rectum, and vagina (**candidiasis**). (This condition is discussed more fully in [Chapter 11](#).)

The skin fungal infections produce itching, some swelling, and a breakdown of tissue. Because fungi thrive in warm, moist places, a tropical climate or other environmental factors that produce prolonged heat and moisture can encourage the development of fungal infections.

Older adults are prone to develop fungal infections of the fingernails or toenails (**onychomycosis**) ([Figure 42-4](#)). Hands and feet should be thoroughly dried after becoming wet, with special attention to drying between the toes after the bath or shower. Nails should be cut straight across without rounding the edges. Wearing clean socks daily helps prevent fungal growth. In the toenails, the condition may become quite painful. Treatment requires oral antifungal medication daily for several months or topical agents daily for a year or more.

Complementary and Alternative Therapies

Treatment of Nail Fungus

Tea tree oil used topically daily on the nail and cuticle has been successfully used for treatment of yeast and fungal infection ([Weil, 2015](#)). It must be used regularly to be effective and may take weeks or months to cure the infection. Another inexpensive treatment that may work with consistent daily use is the topical application of Vicks VapoRub twice a day. This salve contains camphor, menthol, and eucalyptus. It seems to arrest the development of further fungal growth, allowing a fungus-free nail to grow. It takes about 6 months of treatment and is not effective for everyone.



FIGURE 42-4 Onychomycosis (nail fungus).

There are many side effects of the oral antifungal medications. Liver function should be monitored during drug administration. Diagnosis of fungal infections is confirmed by microscopic examination of skin scrapings that have been treated with potassium hydroxide (KOH) solution. Fungal specimens generally show the typical filaments of fungal organisms. Patients should be taught how to prevent recurrence of fungal infections.

Patient Teaching

Preventing Recurrent Fungal Infection

Instruct the patient to do the following:

- Wear shoes that provide ventilation for the feet. Wear cotton socks when rubber-soled shoes or sneakers must be worn.
- Wash and dry the feet at least daily, being careful to completely dry the skin between the toes.
- Sprinkle an antifungal powder on the feet and between the toes if there is a tendency for athlete's foot. An antifungal spray may be used rather than powder.
- Change hose or socks daily; do not wear them more than 1 day without washing.
- Change underpants or shorts daily; do not wear them more than 1 day without washing.
- Use only clean towels, changing them at least every other day. Do not share towels or washcloths.
- Change bed linens at least once a week and wash in hot water.
- Do not use the combs, hairbrushes, hair clips or hair ties of others, and do not allow them to use yours.
- Inspect pets regularly for ringworm. Have a veterinarian check the animal if an infection is suspected.

Tinea Pedis

Tinea pedis (athlete's foot) affects the feet, particularly between the toes. The infection may spread

to the entire foot and cause blistering, peeling, cracking, and itching. If it continues unchecked, it can spread to other parts of the body. The condition can be complicated by a severe bacterial infection.

Etiology, Pathophysiology, Signs, and Symptoms

Most cases of tinea pedis are contracted and spread in swimming pools, spas, showers, and other public facilities of this type. *Trichophyton mentagrophytes* and *Trichophyton rubrum* are the usual infecting agents. These organisms may be normal flora that spread easily under conditions of excessive warmth and moisture. The skin between the toes becomes inflamed and develops cracks that become painful fissures. Intense itching is common.

Diagnosis and Treatment

Diagnosis is by physical examination. Treatment of tinea pedis consists of keeping the area dry, clean, and exposed to the air and sunlight as much as possible. Clean cotton socks should be worn every day, and the affected areas between the toes should be separated by gauze or cotton. Soaks of Burow solution help. Various topical antifungals can be prescribed, including ciclopirox (Loprox), miconazole, clotrimazole (Mycelex), econazole (Spectazole), ketoconazole (Nizoral), and naftifine (Naftin). Some medicated powders, such as undecylenic acid-zinc undecylenate, work to keep the feet dry and also help control fungal growth. Other treatments are available without prescription. Systemic treatment for stubborn infection includes oral itraconazole (Sporanox) and terbinafine (Lamisil).

Nursing Management

Encourage the patient to keep the feet clean and dry and to wear clean cotton socks every day. Daily application of the topical agent must be done diligently to eradicate the problem. The patient should only use his own towel, and the shower or tub should be thoroughly cleaned and disinfected after bathing to prevent transmission to other family members. Personal footwear should be used in public places, such as the swimming pool and in the showers at fitness centers, and feet should be washed and dried thoroughly after using public facilities.

Parasitic Infections

Pediculosis and Scabies

Etiology and Pathophysiology

The parasites that cause **pediculosis** and **scabies** are found throughout the world in all types of climates. They can infest anyone. The parasites are particularly troublesome, however, where people live under crowded conditions and are negligent in their personal hygiene. The occurrence of pediculosis and scabies in the United States has recently increased significantly because of the growth of the homeless population and communal living. These parasites are often found among schoolchildren. The parasites are also found in nursing homes, dormitories, and sometimes hospitals.

Three basic types of lice that infest human beings are (1) the head louse, *Pediculus humanis capitis*; (2) the body louse, *Pediculus humanis corporis* (Figure 42-5); and (3) the pubic or crab louse, *Phthirus pubis*. In addition, human beings also may be infested by *Sarcoptes scabiei*, the mange mite that produces scabies. The lice are oval and 2 to 4 mm long. All types are acquired by contact with infested people or their clothing, bed linen, and bedding. Pets have also been known to carry lice and the scabies mite.

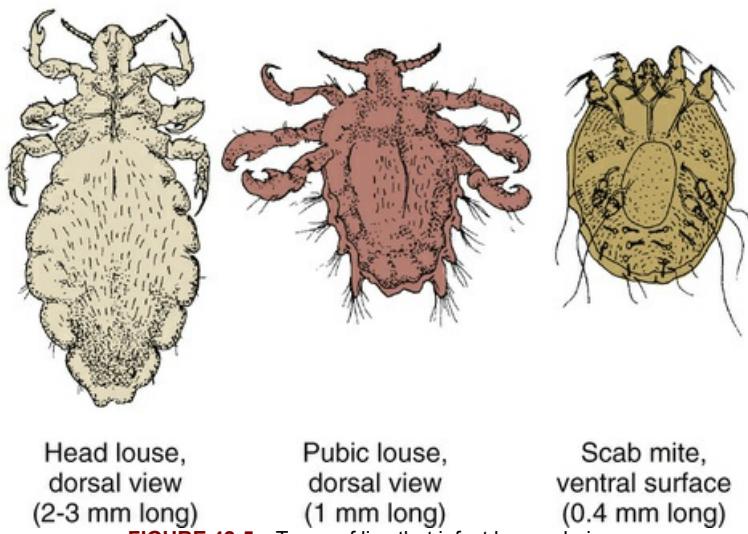


FIGURE 42-5 Types of lice that infest human beings.

Signs and Symptoms

The most prevalent symptom of louse infestation is severe itching. The resultant scratching can lead to excoriation of the skin and secondary infection causing impetigo, furunculosis, and cellulitis. Systemic infections are not commonly associated with louse infestation, but they can and do occur in the forms of glomerulonephritis, septicemia, pneumonia, and cystic abscesses. If the lice infest the eyelids and eyelashes, the eyelids become red and swollen. Swelling may also occur in the lymph glands of the neck of a person heavily infested with head lice. The body louse can transmit typhus fever, trench fever, and some other diseases. Other types of lice are not known to be transmitters of disease.

The scabies mites burrow under the top layers of the skin and live their entire life there. They are more likely to be found in the skin between the fingers and toes, in the groin, and in other areas where there may be folds of skin. Excretions from the mites produce irritation with intense itching and blistering. Secondary infection is not uncommon with scabies, and some deaths have occurred when the scabies infestation has led to pneumonia or septicemia.

Diagnosis

Diagnosis is by body inspection and by examination of skin scraping of a lesion under the microscope. Lice eggs (known as nits) are deposited at the base of hair shafts and can be seen on close inspection. Scabies causes curved or linear white or erythematous ridges in the skin that are easily visible.

Treatment

The prescription drugs most commonly used and considered most effective against lice and scabies are permethrin (Nix, Elimite), pyrethrins (RID), and malathion (Ovide). These substances must be carefully used and the patient's liver functions monitored, because they can be very toxic. They are available as creams, lotions, and shampoos. Lindane has been found to be especially harmful and is no longer recommended. A fine-toothed (nit) comb is then used to remove the nits (eggs) that may have remained on the hair. Benzyl alcohol lotion 5% (Ulesfia) is effective for head lice. It works by suffocating the lice. The amount required is based on the length of the hair, and a second treatment is required in 7 days (Buck, 2012).

Nursing Management

Contact Isolation is recommended. In addition, clothing, bedding, hats, stuffed animals, and other infested articles must be decontaminated to prevent reinfection. Laundering in hot water and machine drying using the hottest cycle is effective. Dry cleaning of nonwashable bed coverings or clothing can be effective. Mattresses, upholstered furniture, carpets, and other articles should be sprayed with a specific disinfectant. All combs and brushes should be soaked in very hot water for more than 5 minutes. For items that cannot be cleaned, such as some stuffed animals, sealing them in plastic bags with the air expelled for 14 days can be effective. All family members must receive instruction about the infection and ways to prevent reinfestation.

Think Critically

How would you approach and instruct the parents of an 8-year-old who has scabies?

Noninfectious Disorders of Skin

Skin Cancer

Skin cancer is often neglected, because there is no pain associated with it and patients fear that treatment will involve extensive or disfiguring surgery. More than 2 million cases a year of basal cell and squamous cell cancers occur in the United States. These are highly curable cancers. It is expected that 73,870 persons will have been diagnosed with melanoma, the most serious type of skin cancer, in 2015 and that 9940 deaths from melanoma will occur ([American Cancer Society, 2015](#)). Most melanoma deaths could have been averted through early diagnosis and treatment. Kaposi sarcoma and T-cell lymphoma are discussed in [Chapter 11](#).

Etiology and Pathophysiology

Several factors predispose an individual to developing skin cancer. Among these are internal changes in the cells that may be caused by hereditary factors and external influences such as chronic exposure to ionizing radiation, petrochemicals, or vinyl chloride or to other irritants in the environment. Sunburn as a child is a particular risk factor. Because characteristics are inherited, susceptibility to skin cancer tends to run in families. Blue-eyed blondes and redheads seem to be most susceptible, probably because they lack sufficient pigment to protect the skin cells from outside irritants. Those with a light complexion have a 24-fold greater risk of developing melanoma than African Americans, and before age 45 years the risk is higher for women than men ([American Cancer Society, 2015](#)).

A major cause of skin cancer today is the alteration in the ozone layer of the earth's atmosphere that allows more UV radiation to reach the earth's surface. This type of radiation is inflicting much quicker damage to skin with much less sun exposure than in years past. Another problem is that the quickly proliferating skin cells of the younger generation are even more susceptible to this type of damage, and it is mostly the young who spend large amounts of time in the sun. Nurses should instruct all people about the dangers of sunning without an appropriate protective sunscreen.

Think Critically

You and a friend are going on a beach vacation. Your friend invites you to go to a tanning salon before the trip. "We want to look tan and sexy out there." How will you respond?

Signs, Symptoms, Diagnosis, and Treatment

Signs and symptoms vary according to the type of lesion. Diagnosis is by examination, biopsy, and pathology study. The three main types of skin malignancy are basal cell carcinoma, squamous cell carcinoma, and melanoma. **Basal cell carcinoma** usually appears first as a small, scaly area and tends to become larger as the disease progresses ([Figure 42-6](#)). It occurs most commonly on the face and trunk. As the scales shed, there is a small amount of bleeding and a scab will form. When the scab is shed, the affected area becomes wider, and it is bordered by a waxy, translucent, raised area. **If such a sore has not healed within a month, it may be a basal cell carcinoma.** This spreading may continue very gradually during several months or years. Even though these malignancies do not metastasize, they can invade underlying tissues, and death can result from complications such as infection or hemorrhage from encroaching into a blood vessel. Small lesions can be removed under local anesthesia in a doctor's office. Larger lesions respond well to radiation therapy.



FIGURE 42-6 Basal cell carcinoma. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

Squamous cell carcinoma is caused by sunlight, affects the epidermis, and can become invasive and metastasize to other areas of the body. It appears on the head and neck most frequently. The tumor begins as a small nodule that rapidly becomes ulcerated ([Figure 42-7](#)). Treatment must begin early if the condition is to be relieved before the skin cells sustain extensive damage. Surgical procedures involve total removal or destruction of the lesions and the surrounding tissues that have been invaded. Radiation therapy is advised for patients who are poor surgical risks or who are fearful of surgery.

Older Adult Care Points

Actinic keratoses are very common among older adults. They appear on fair-skinned people as a small, scaly, red or grayish papule particularly on areas of skin that are often exposed to the sun. These lesions should be removed, because they can evolve into a squamous cell carcinoma that can grow rapidly and metastasize.



FIGURE 42-7 Squamous cell carcinoma. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

Malignant melanoma is the least common form of skin cancer. It arises from pigment-producing cells and varies in its course and prognosis according to its type ([Figure 42-8](#)). Causative factors are genetic predisposition, solar radiation, and steroid hormone influence. There are several types of melanoma, but the three major kinds of malignant melanoma are superficial spreading, nodular, and lentigo maligna melanoma. In general, the superficial lesions can be cured, but the deeper lesions tend to metastasize more readily through the lymphatic and circulatory systems. Characteristics of the three main types of skin cancer are shown in [Table 42-1](#).



FIGURE 42-8 Melanoma. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

Table 42-1
Three Major Types of Skin Cancer

Type	Characteristics
Basal cell carcinoma	Slowly enlarging, firm, scaly papule. Crusted or ulcerated center that may be depressed; has pearly (semitranslucent) raised border. Dilated capillaries around lesion. Accounts for 70% of all skin cancers. Rarely spreads and is easily treated.
Squamous cell carcinoma	Appearance variable. Commonly seen as well-defined, irregularly shaped nodule or plaque. May be elevated, nodular mass, or fungated mass. Varying amounts of scale and crusting. May have ulcerated center. Predominantly on sun-exposed areas: head, neck, hands; 75% occur on the head. Spreads rapidly.
Malignant Melanomas	
Superficial spreading melanoma (SSM)	Appears in a variety of colors: white, red, gray, black, blue over a brown or black background. Has irregular surface and notched border. Small tumor nodules may ulcerate and bleed. Horizontal growth can continue for years. Vertical growth worsens prognosis.
Nodular malignant melanoma (NMM)	Nodules with uniformly grayish black color; resembles a blackberry. May be flesh-colored with specks of pigment around base of nodule. Itching, oozing, and bleeding may occur. Prognosis less favorable than superficial type.
Lentigo maligna melanoma (LMM)	Relatively rare. Arises from a lesion that resembles a large flat freckle that is of variable color from tan to black. Has irregularly spaced black nodules on the surface. Typically located on the back of the hand, on the face, and under fingernails. Develops very slowly; may ulcerate. Tends to metastasize; prognosis poor.

Malignant melanoma always requires surgical removal of the tumor and excision of adjacent tissues and possibly nearby lymphatic structures. Chemotherapy may be employed to destroy tumor cells believed to have migrated beyond the tumor site. Radiation therapy usually is not indicated unless there is extensive metastasis. The radiation does not eliminate the disease, but it can relieve symptoms by reducing tumor size. Interferon alfa-2b has been found to prolong life in patients who have undergone malignant melanoma surgery and are at high risk for systemic recurrence (American Cancer Society, 2015). In advanced cases, a newer immunotherapy drug, ipilimumab (Yervoy), has been shown to prolong life. An oral agent, vemurafenib (Zelboraf), is being used for late-stage melanoma and is the first drug approved that uses fragment-based drug discovery. In this method, small chemical fragments are grown or combined to produce a drug with a higher affinity for binding with the biologic target. In patients with malignant melanoma and a known *BRAF* mutation, treatment with vemurafenib has a response rate of 50%; when combined with other drugs, overall survival can reach 84% (Patrawala and Puzanov, 2012). In 2013, dabrafenib (Tafinlar)—another drug that targets the *BRAF* mutation—was approved and when used in combination with rametinib (Mekinist) has shown a 31% reduction in hazard for survival over treatment with vemurafenib alone (Robert, 2014).

The type of removal of cancerous skin tissue will depend on the type of malignant growth present. **In all but the most extensive growths, treatment is relatively simple and completely successful if started early.** Although benign precancerous lesions do not inevitably develop into malignant lesions, the most advisable course of action is to remove them when they are first diagnosed. Removal is performed by surgery, **electrodesiccation** (tissue destruction by heat), **cryosurgery** (tissue destruction by freezing with liquid nitrogen), topical application of 5-fluorouracil (5-FU), interferon therapy, laser therapy, and molecular therapy. Radiation therapy is sometimes used to destroy the cancer.

Nursing Management

While performing daily care of patients, you often are in a position to notice these lesions in their early stages and should do your best to persuade the person with such a lesion to seek prompt medical attention. It is also helpful to teach assistive personnel the cues and clues that help recognize these developments.

Assignment Considerations

Report Different Skin Lesions

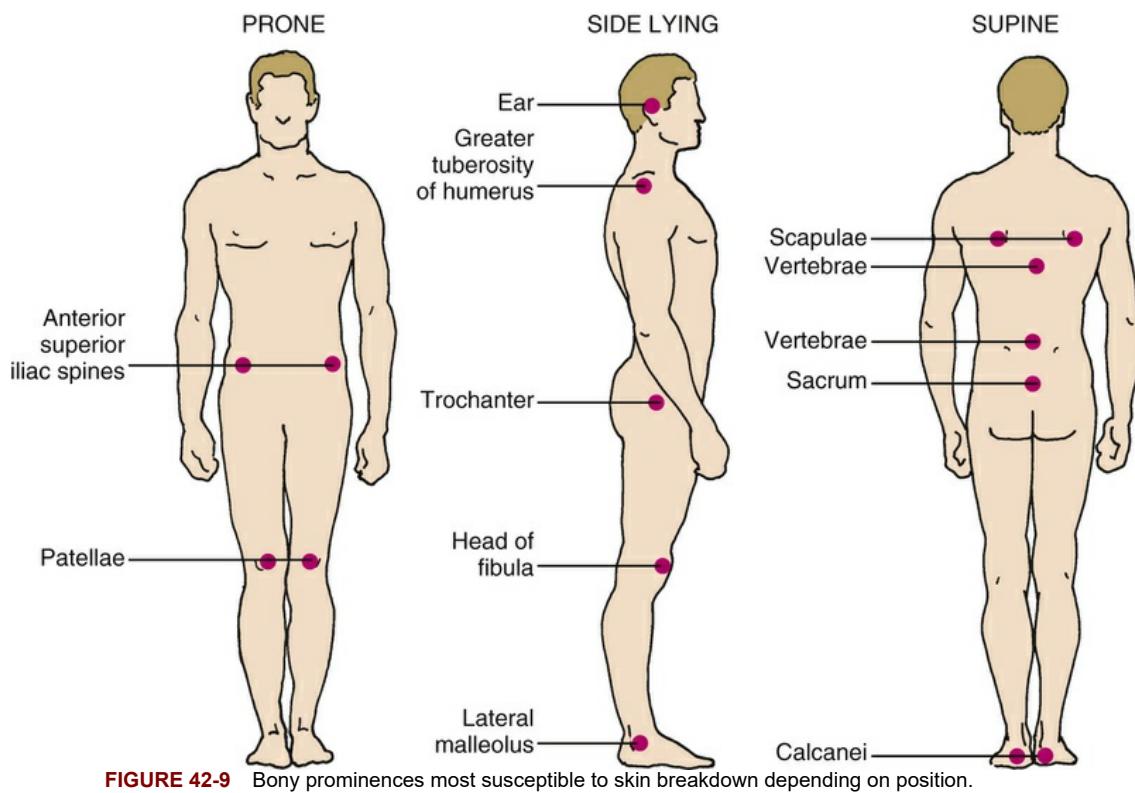
When assigning hygiene care to unlicensed assistive personnel, ask them to report any odd-looking lesions they find on the patient's skin. Skin cancers are often discovered on further assessment of suspicious lesions.

Because people who have skin cancer run a high risk of eventually developing another malignancy, either at the original site or elsewhere in the body, they should visit a provider at least once a year after the skin cancer has been cured. Although most skin cancers are easily curable, they should not be considered harmless and something to forget about after treatment (see [Chapter 8](#)).

Another nursing function is educating the patient about the type of cancer and helping to decrease fear. For many people, the diagnosis of “cancer”—even of an easily cured skin lesion—causes a change in body image and, possibly, in self-esteem. You can assist patients to talk about concerns and the future, point to community resources and support groups, and answer questions about treatment.

Pressure Ulcers

When a patient is on bed rest, or constantly sitting because of paralysis, pressure against the skin in various areas interferes with circulation. Because cells die very quickly without adequate blood supply, a pressure ulcer can develop. Depending on the patient's general condition, weight, and other factors, skin damage may occur within a few hours to a few days. Areas most prone to pressure ulcer formation are those over bony prominences. When the patient is placed in a position in which the bone is pressing on the skin where the skin is against the bed, the circulation to that area is compromised ([Figure 42-9](#)). **Shearing action** (in which superficial layers of tissue are pulled and stretched across deeper layers of tissue) can cause damage to the skin if the patient is slid along the sheets for positioning, rather than lifted. The National Pressure Ulcer Advisory Panel (NPUAP) defines pressure ulcers as injury to the skin caused by pressure alone, or in combination with shear ([NPUAP, 2012](#)).



Risk Factors and Prevention

Every patient needs and deserves good skin assessment, but there are risk factors that make some patients more susceptible to problems, such as confinement, immobility, incontinence, malnutrition, decreased level of consciousness or confusion, obesity, diabetes mellitus, dehydration, edema, excessive sweating, and extreme age. Preventing pressure ulcers is far more desirable, more cost-effective, and less time-consuming than treating them. In fact, the importance of excellent nursing care is now a financial issue, because Medicare and Medicaid no longer reimburse for hospital-acquired pressure ulcers (Coomer and McCall, 2013). Pressure relief, positioning, padding, use of pressure-relief devices, adequate nutrition, and excellent skin care are the hallmarks of pressure ulcer prevention. Box 42-2 presents interventions for preventing pressure ulcers based on the Institute for Clinical Systems Improvement health care protocol. Pressure ulcers can be very costly to the health care system, and an average stage IV ulcer has a treatment cost of \$129,248 per admission (Tzeng et al, 2013). One study showed that numbers of hospital-acquired pressure ulcers are directly related to call bell response time (Tzeng et al, 2013).

■ Nutrition Considerations

Nutrition and Wound Healing

Ongoing research is being conducted about the optimal amounts; however, increased energy (calories); protein; zinc; and vitamins A, C, and E have been shown to reduce pressure ulcers in high-risk patients by 25% (Sernekos, 2013).

Box 42-2

Best Practice for the Prevention of Pressure Ulcers

- Assess the skin of all patients every 8 to 24 hours (interval depends on condition), paying particular attention to the bony prominences (see Figure 42-9).

- Reposition patients on bed rest at least every 2 hours; use a written schedule for systematically turning and repositioning each patient.
- Use positioning devices, such as pillows, foam wedges, and padding, for patients on bed rest to keep body prominences from being in direct contact with one another.
- For patients on bed rest who are completely immobile, use devices that totally relieve pressure on the heels by raising the heels off the bed. Do not use donut-type devices.
- When the side-lying position in bed is used, avoid positioning directly on the trochanter.
- For patients on bed rest, maintain the head of the bed at the lowest degree permitted by the medical condition. Limit the time the head of the bed is elevated.
- Use lifting devices, such as a trapeze or bed linen, to move patients rather than dragging those who cannot assist during transfers and position changes.
- For patients with limited mobility, use a pressure-reducing device on the bed, such as a foam, static air, alternating air, gel, or water mattress.
- Minimize skin injury caused by friction and shear forces by proper positioning and correct transferring and turning techniques. Reduce friction injuries by using lubricants, protective films, protective dressings, and protective padding.
- Skin cleansing should occur at the time of soiling and at routine intervals based on patient need and preference. Do not use hot water, and use a mild cleansing agent that minimizes irritation and dryness of the skin. Cleanse gently, minimizing the force and friction applied to the skin.
- Keep the environmental humidity above 40% and prevent exposure to cold. Treat dry skin with moisturizers.
- Do not massage bony prominences.
- Minimize skin exposure to moisture from incontinence, perspiration, or wound drainage. When sources of moisture cannot be controlled, underpads or briefs that absorb moisture and present a quick-drying surface to the skin should be used. Use an incontinence management program for incontinent patients. Check for incontinence at least every 2 hours.
- Correct inadequate dietary intake of protein and calories with nutritional intervention either by oral supplementation or enteral or parenteral feedings.
- For wheelchair-bound patients, use a pressure-reducing device such as those made of foam, gel, air, or a combination of items. Do not use donut-type devices.
- Positioning of wheelchair-bound patients should include consideration of postural alignment, distribution of weight, balance and stability, and pressure relief by device or repositioning.
- Any person at risk for developing a pressure ulcer when sitting in a chair or wheelchair should be repositioned, shifting the points under pressure at least every hour (every 15 minutes is preferable); patients who are able should be taught to shift weight every 15 minutes.
- If a potential for improvement of mobility and activity status exists, institute a rehabilitation program. Maintain current activity and mobility status with a range-of-motion exercise program.

Signs and Symptoms

Once a patient has developed a pressure ulcer, treatment depends on the stage of the ulcer. Several kinds of preprinted forms can be used to assess the risk of developing pressure ulcers. These assessment tools take into account the general condition of the skin, control of urination and defecation, mobility, mental status, cleanliness, and nutritional status. They provide a more

systematic approach to evaluate a patient's potential for pressure ulcer development. Many agencies use either the Braden scale system (Figure 42-10) or the Norton system for systematic assessment of the skin.

Patient's Name _____	Evaluator's Name _____	Date of Assessment			
SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	<p>1. Completely limited: Unresponsive (does not move, flinch, or sleep) to painful stimuli, due to diminished level of consciousness or sedation. OR Limited ability to feel pain over most of body surface.</p> <p>2. Very Limited: Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness. OR Has a sensory impairment that limits the ability to feel pain or discomfort over half of body.</p>	<p>3. Slightly Limited: Responds to verbal commands, but cannot always communicate discomfort or need to be turned. OR Has some sensory impairment that limits ability to feel pain or discomfort in one or two extremities.</p>	<p>4. No Impairment: Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.</p>		
MOISTURE Degree to which skin is exposed to moisture	<p>1. Constantly Moist: Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.</p>	<p>2. Very Moist: Skin is often, but now always moist. Linen must be changed at least once a shift.</p>	<p>3. Occasionally Moist: Skin is occasionally moist, requiring an extra linen change approximately once a day.</p>	<p>4. Rarely Moist: Skin is usually dry, linen only requires changing at routine intervals.</p>	
ACTIVITY Degree of physical activity	<p>1. Bedfast: Confined to bed</p>	<p>2. Chairfast: Ability to walk severely limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair.</p>	<p>3. Walks Occasionally: Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.</p>	<p>4. Walks Frequently: Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.</p>	
MOBILITY Ability to change and control body position	<p>1. Completely Immobile: Does not make even slight changes in body or extremity position without assistance.</p>	<p>2. Very Limited: Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.</p>	<p>3. Slightly Limited: Makes frequent though slight changes in body or extremity position independently.</p>	<p>4. No Limitations: Makes major and frequent changes in position without assistance.</p>	
NUTRITION Usual food intake pattern	<p>1. Very Poor: Never eats a complete meal. Rarely eats more than a third of any food offered. Eats two servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement. OR Is NPO and/or maintained on clear liquids or IVs for more than 5 days.</p>	<p>2. Probably Inadequate: Rarely eats a complete meal and generally eats only about half of any food offered. Protein intake includes only three servings of meat or dairy products per day. Occasionally will take a dietary supplement. OR Receives less than optimum amount of liquid diet or tube feeding.</p>	<p>3. Adequate: Eats over half of most meals. Eats a total of four servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered. OR Is on a tube feeding or TPN regimen that probably meets most of nutritional needs.</p>	<p>4. Excellent: Eats most of every meal. Never refuses a meal. Usually eats a total of four or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.</p>	
FRICITION AND SHEAR	<p>1. Problem: Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, even from high position, with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.</p>	<p>2. Potential Problem: Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.</p>	<p>3. No Apparent Problem: Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.</p>		
				Total Score	

At risk = 15-18; Moderate risk = 13-14; High risk = 10-12; Severe Risk = 9.

Key: IV, intravenously; NPO, nothing by mouth; TPN, total parenteral nutrition.

FIGURE 42-10 Braden scale for predicting pressure sore risk. (Copyright Barbara Braden and Nancy Bergstrom, 1988. Reprinted with permission. All Rights Reserved.)

The presence and stage of an ulcer must be documented on admission to any health care facility or service. Classifying an ulceration can also be helpful in evaluating the effectiveness of treatment and progress toward healing and repair. The NPUAP has updated pressure ulcer definitions for the prediction and prevention of pressure ulcers and a staging system for classification⁹:

- **Suspected deep tissue injury:** Intact skin with a purple or maroon discolored tissue may be firm, boggy, painful, cool, or warm.
- **Stage I:** An area of intact skin that is reddened, deep pink, or mottled that does not blanch (Figure 42-11).



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FIGURE 42-11 Stage I pressure ulcer. (From the National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel: *Pressure ulcer prevention and treatment: Clinical practice guideline*. Washington, DC: National Pressure Ulcer Advisory Panel, 2009.)

- *Stage II:* Partial-thickness skin loss involving the epidermis and/or dermis. The skin appears blistered or abraded, or has a shallow crater. The area surrounding the damaged skin is reddened and probably will feel hot or warmer than normal ([Figure 42-12](#)).



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FIGURE 42-12 Stage II pressure ulcer. (From the National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel: *Pressure ulcer prevention and treatment: Clinical practice guideline*. Washington, DC: National Pressure Ulcer Advisory Panel, 2009.)

- *Stage III:* The skin is ulcerated. There is a crater-like ulcer, and the underlying subcutaneous tissue is involved in the destructive process. The ulcer may or may not be infected. Bacterial infection is almost always present at this stage, however, and accounts for continued erosion of the ulcer and the production of drainage ([Figure 42-13](#)).



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FIGURE 42-13 Stage III pressure ulcer. (From the National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel: *Pressure ulcer prevention and treatment: Clinical practice guideline*. Washington, DC: National Pressure Ulcer Advisory Panel, 2009.)

- *Stage IV:* There is deep ulceration and necrosis involving deeper underlying muscle and possibly bone tissue. The ulcer can be dry, black, and covered with a tough accumulation of necrotic tissue, or it can be made up of wet and oozing dead cells and purulent exudates. Depth can be determined ([Figure 42-14](#)).



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FIGURE 42-14 Stage IV pressure ulcer. (From the National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel: *Pressure ulcer prevention and treatment: Clinical practice guideline*. Washington, DC: National Pressure Ulcer Advisory Panel, 2009.)

- *Unstageable:* Full-thickness wounds with eschar and/or tissue that obscures depth determination.

■ Assignment Considerations

“On-Time”

The On-Time Quality Improvement for Long-Term Care was developed by the Agency for Healthcare Research and Quality (AHRQ). Part of the program includes assessment tools that can be completed by certified nursing assistants. The tool provides information about nutritional status, behavior, incontinence, and contributing factors. Data are then made available to providers, nurses, dieticians, and other care providers. The program fosters teamwork and communication

and helps to identify patients who are at risk for pressure ulcers ([AHRQ, 2012](#)).

A new technology called *pressure mapping* may help to identify areas of high pressure. The patient lies (or sits) on a sensor-filled mat, and the mat sends data to a computer, which creates a display of color-coded images. Red areas indicate higher pressures, and blue or green images suggest lesser pressures. The patient can then be repositioned accordingly. The technology is an adjunct to, not a replacement for, good nursing assessment ([Behrendt et al, 2014](#)).

Treatment and Nursing Interventions

Débridement.

Removal of any **eschar** (dead, necrotic tissue) has to occur for a pressure ulcer to heal. The exception is a heel ulcer with dry eschar that has no edema, erythema, drainage, or boggy tissue.

Débridement can be done surgically with forceps and scissors or mechanically. Mechanical débridement is accomplished by whirlpool baths, wet-to-dry saline dressings, dextranomer beads sprinkled over the wound, or other proteolytic enzymes or chemical products that break down the dead tissue and absorb the exudate. When wet-to-dry dressings are used, the patient should be medicated for pain before the dressing is pulled from the wound, because pulling necrotic tissue pulls some viable tissue with it. **This method is not recommended because of the damage that occurs to new granulation tissue.** Carefully read the instructions for whatever product is being used. Surgical débridement may be done in the patient's room, the provider's office, or the surgical suite depending on the depth and extent of the wound. Surgical débridement may require a skin graft to cover the area exposed. Whenever surgical débridement, forceful irrigation, or whirlpool débridement is to occur, provide sufficient analgesia for the patient, because the procedure is painful.

Cleansing and dressing.

Many hospitals and larger long-term care facilities have a wound care nurse specialist who oversees wound treatment; nurses should consult these specialists for valuable advice about wound cleansing and dressing materials. After sharp débridement with bleeding, clean and dry dressings are used for 8 to 24 hours, then moisture-retaining dressings are applied. Ulcers are cleaned whenever the dressing is changed. Normal saline or other nontoxic solutions, such as Shur-Clens, and light mechanical action with sponges or irrigation equipment is a way of cleansing that prevents disruption of granulation tissue. At least 250 mL of solution and a 30-mL syringe with a small catheter or 18-gauge needle attached is used to irrigate and to reach undermined areas and tunnels. A reddened wound bed requires gentle irrigation with a 30- to 50-mL needleless syringe to prevent damage to newly developing tissue.

Wound dressings are selected according to the characteristics of the wound. Common dressing materials include moisture retentive dressings, hydrogel dressings, hydrocolloid wafers, alginates, biologic dressings, and absorptive dressings. Use hypoallergenic tape when tape is necessary. Choose a dressing that keeps the ulcer moist and the surrounding skin dry. Prevent abscess formation by loosely filling all cavities with dressing material. Pressure must be kept off the wound for it to heal.

Other treatment methods.

[Franek and colleagues \(2012\)](#) found that application of electrical stimulation increased the rate of healing of pressure ulcers for patients with spinal cord injuries. In this study, high-voltage electrical stimulation (HVES) was applied to the wound area (stage II or greater). At 6 weeks, the size of the wounds was reduced and appearance was improved.

In some facilities, vacuum-assisted wound closure is being used. A suction tube covered by a special sponge is sealed into place for 48 hours. Low negative suction pressure is applied through the tube. This seems to stimulate the formation of granulation tissue. This treatment is used for chronic ulcers ([Gestring, 2011](#)).

For an ulcer that will not heal with other methods, hyperbaric oxygen therapy may be prescribed if the equipment is available in the community. The patient is placed in the hyperbaric oxygen chamber for the treatments. Tissue becomes flooded with more oxygen than is normally available

when breathing atmospheric-pressure air. This is an effective treatment for other difficult-to-heal wounds as well ([Bhutani and Vishwanath, 2012](#)).

Documentation.

Pressure ulcers should be measured and documented when they are discovered and at least once a week thereafter. Document the characteristics of the wound and any exudate present. Exudate is usually **purulent** (containing pus) or **serosanguineous** (containing serum and blood). Serosanguineous exudate is amber colored and blood tinged. Purulent drainage may be one of several colors ([Table 42-2](#)).

Table 42-2
Color of Purulent Exudate and Probable Pathogen

Color Exudate	May Indicate
Beige with a fishy odor	Proteus
Brown with a fecal odor	Bacteroides
Creamy yellow	Staphylococcus
Green-blue with a fruity odor	Pseudomonas

All aspects of risk assessment, preventive measures instituted, objective description and measurement of pressure ulcers, treatment, and progress toward healing are documented regularly in the patient's chart. The Pressure Ulcer Scale for Healing® (PUSH) tool is a good way to objectively document your findings. Photographs are usually taken of the ulcer on discovery and during treatment to document progress.

Burns

Etiology and Pathophysiology

Burns are injuries to the skin caused by exposure to extreme heat, hot liquids, electrical agents, strong chemicals, or radiation. Inhaling smoke or fumes also causes injury. About 450,000 Americans seek care for burns each year. Most burns are relatively minor, but approximately 40,000 patients are hospitalized for burns each year. Fire and burns kill approximately 4000 people each year in the United States ([American Burn Association, 2013](#)). Thirty years ago most patients with burns over 50% of the body did not survive. Today, because of fluid resuscitation, burn wound excision and grafting techniques, new skin coverings, and nutritional supplementation, a patient may survive a 99% burn.

Electrical burns damage tissue deep within the body. The extent of damage is not always visible, and the entrance site and exit site may appear small. Cardiac monitoring should be initiated even if the patient does not complain of chest pain.

Chemical burns result from accidents in homes or industry. The severity of the injury depends on the duration of contact and the concentration of the chemical. The amount of tissue exposed to the chemical and the action of the chemical affect severity. Alkalies (e.g., industrial cleaners and fertilizers) cause greater injury and burn by liquefying tissue. Acids damage the tissue by coagulating cells and proteins. Chemicals for swimming pools, rust removers, and bathroom cleaners are acids. Organic compounds damage tissue by their fat solvent action.

Radiation skin injury is typically from therapeutic radiation treatment. In industries in which radioactive isotopes are used, the degree of injury depends on the amount and type of energy deposited over time. See [Chapter 8](#) for care of skin damaged by radiation treatments.

Burns cause an acute inflammatory response (see [Chapter 6](#)). Serious burns have local and systemic effects. **All burns should be considered potentially life threatening until they are thoroughly assessed.** When a burn area is large, the inflammatory response can result in a massive shift of water, electrolytes, and protein into the tissues. This causes severe edema. Evaporation from denuded areas is four times that from intact skin. Hyperkalemia occurs when potassium is released from the damaged cells. Hyponatremia is caused by the stress response and potassium shifts. Metabolic acidosis develops. The loss of fluids from the vascular space leads to hypovolemia with low blood pressure and possible hypovolemic shock. Hematocrit will be increased because of concentration of the blood, which is missing the components that have shifted into the tissues. The increased viscosity of the blood causes slowing of blood flow in the small vessels, which in turn causes tissue hypoxia. There is danger of kidney failure from both the hypovolemia and the cellular

debris that the kidneys must clear from the body. If the burn was caused by a fire, lung tissue injury from inhalation of heat and smoke may cause alveolar edema.

The decreased perfusion to other organs causes changes in the gastric mucosa that impair its integrity. A type of ulcer called a **Curling ulcer** can occur within 24 hours.

The stress response to the trauma releases catecholamines, aldosterone, cortisol, and antidiuretic hormone. A hypermetabolic state results, and unless nutrition needs can be met, the body falls into negative nitrogen balance. A low-grade fever may develop as core temperature rises.

Signs, Symptoms, and Diagnosis

Burn severity depends on the cause, the temperature and duration of contact, the extent of burned area, and the anatomical site of the burn. Signs and symptoms vary from slight reddening of the skin to full loss of tissue down to bone with black, charred areas. Blisters may form. A dry, scablike crust forms over a superficial burn. Eschar is a hard, leathery layer of dead tissue that results when there has been a full-thickness injury. It is dark brown to black.

Diagnosis of the depth of burn is made based on a classification system.

Classification of Burns

The classification of burns is based on the amount of the body surface that has been burned and the depth of the burn. The extent of a burn is roughly calculated outside of the hospital according to the “rule of nines” and is expressed as a percentage of total body surface (Figure 42-15). The figures used in this method are fairly accurate for gross assessment in adults. The Lund-Browder classification or the Berkow chart can be used to compute the depth of the burn and the extent of the injury according to relative age, and the total burn estimate is used as the basis for treatment. Burns are a prevalent pediatric injury as well, and children cannot be assessed using the standard rule of nines. Special pediatric charts are available and should be used (Toon et al, 2011).

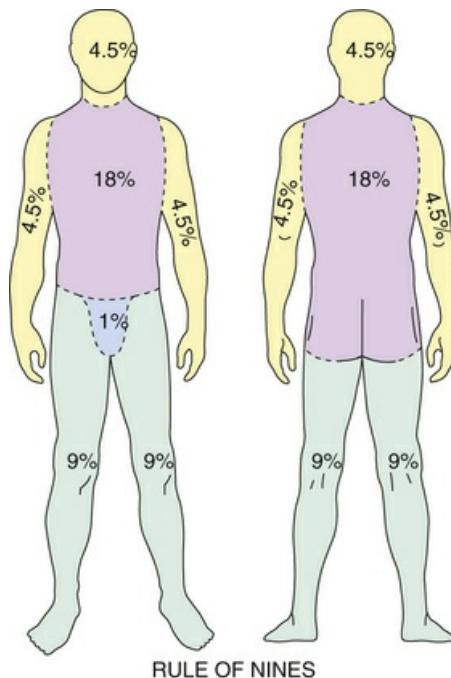
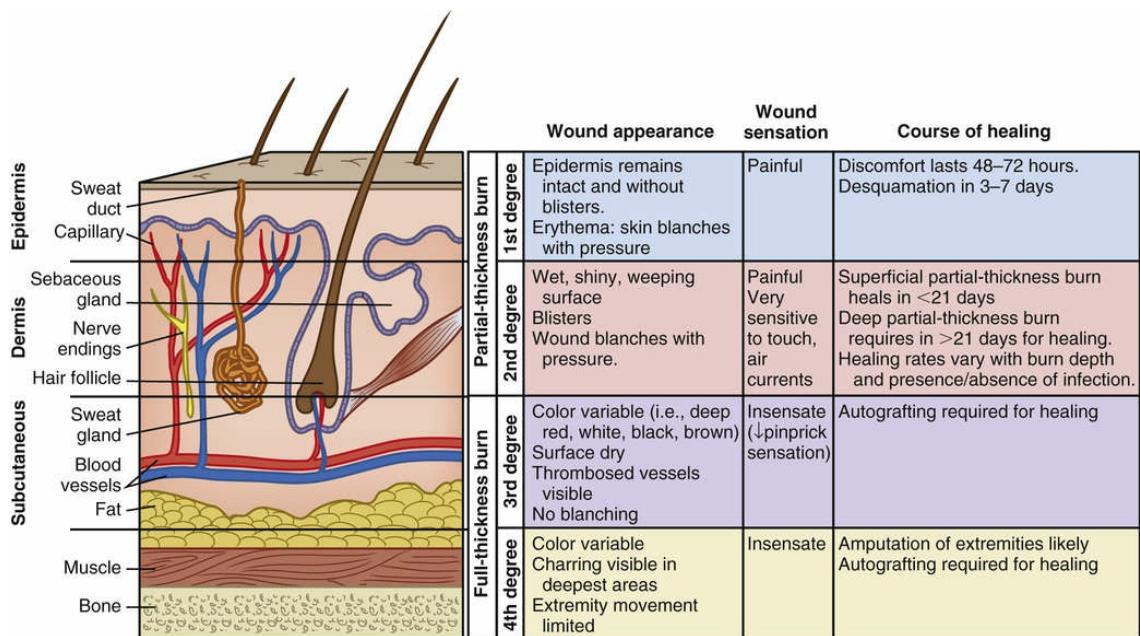


FIGURE 42-15 Chart used for burn area estimate (“rule of nines”).

The depth of a burn is more difficult to determine, because various gradations of injury are sustained in a major burn. Some small patches may be more deeply burned than the areas adjacent to them. Burn depth originally was classified according to degrees, a first-degree burn being the most superficial and a fourth-degree burn being the deepest.

A more current method to evaluate the depth of burns is based on the layers of skin that have been damaged (Figure 42-16). **Partial-thickness wounds** (Figure 42-17) are those in which the epidermal appendages (sweat and oil glands and hair follicles) are not destroyed and the wound

will heal by itself if no further injury occurs from either infection or inappropriate treatment (see [Table 5-1](#) for the phases of wound healing). Grafting may or may not be necessary. **Full-thickness wounds** ([Figure 42-18](#)) involve all layers of skin and the destruction of the epidermal appendages. Wounds of this type will require grafting for the wound to heal and for optimal function to be restored. [Table 42-3](#) provides a guide for estimating the depth of a burn.



The diagram illustrates the cross-section of skin layers: Epidermis (Sweat duct, Capillary), Dermis (Sebaceous gland, Nerve endings, Hair follicle), and Subcutaneous (Sweat gland, Blood vessels, Fat, Muscle, Bone). To the right is a table comparing burn severity across four degrees:

		Wound appearance	Wound sensation	Course of healing
Epidermis	Partial-thickness burn 1st degree	Epidermis remains intact and without blisters. Erythema: skin blanches with pressure	Painful	Discomfort lasts 48–72 hours. Desquamation in 3–7 days
	Partial-thickness burn 2nd degree	Wet, shiny, weeping surface Blisters Wound blanches with pressure.	Painful Very sensitive to touch, air currents	Superficial partial-thickness burn heals in <21 days Deep partial-thickness burn requires >21 days for healing. Healing rates vary with burn depth and presence/absence of infection.
Dermis	Full-thickness burn 3rd degree	Color variable (i.e., deep red, white, black, brown) Surface dry Thrombosed vessels visible No blanching	Insensate (↓pinprick sensation)	Autografting required for healing
	Full-thickness burn 4th degree	Color variable Charring visible in deepest areas Extremity movement limited	Insensate	Amputation of extremities likely Autografting required for healing

FIGURE 42-16 The tissues involved in burns of various depths. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)



FIGURE 42-17 Partial-thickness burn injury. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)



FIGURE 42-18 Full-thickness burn injury. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 8, Philadelphia, 2009, Saunders.)

Table 42-3
Classification of Burn Depth

Characteristic	Superficial Burn	Superficial Partial-Thickness Burn	Deep Partial-Thickness Burn	Full-Thickness Burn	Deep Full-Thickness Burn
Color	Pink to red	Pink to red	Red to white	Black, brown, yellow, white, red	Black
Edema	Mild	Mild to moderate	Moderate	Severe	Absent
Pain	Yes	Yes	Yes	Yes and no	Absent
Blisters	No	Yes	Rare	No	No
Eschar	No	No	Yes, soft and dry	Yes, hard and inelastic	Yes, hard and inelastic
Healing time	3-5 days	Approximately 2 wk	2-6 wk	Weeks to months	Weeks to months
Grafts required	No	No	Can be used if healing is prolonged	Yes	Yes
Example	Sunburn, flash burns	Scalds, flames, brief contact with hot objects	Scalds; flames; prolonged contact with hot objects, tar, grease, chemicals	Scalds; flames; prolonged contact with hot objects, tar, grease, chemicals, electricity	Flames, electricity, grease, tar, chemicals

From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2012, Saunders.

Emergency Treatment

First, all burn patients are treated as trauma patients. Establishment and maintenance of an airway is the first priority. The patient may have other life-threatening injuries besides their burns. Hemorrhage does not usually occur with burns. If a burned patient shows signs of bleeding, he must be checked for some other type of injury, such as a penetrating wound, fracture, or laceration that occurred at the same time that he was burned.

Generally, patients are undressed and covered with a sterile or freshly laundered sheet; however, clothing that is stuck to the burn area is not removed before the patient is in the hospital. Rings, bracelets, and watches should be removed from injured extremities to prevent a tourniquet effect when swelling occurs. Salves, ointments, or any greasy substance should not be applied to a burned area, because the removal of greasy substances is very painful and increases the possibility of infection. Blisters should not be disturbed initially, because they serve as a protective covering over the wound. **Box 42-3** outlines first aid for minor burns.

Box 42-3

First Aid for Minor Burns

- Run cool water over the burn continuously for 10 to 15 minutes.
- Apply cool compresses if continuous water flow is not available.
- Do not apply ice, ice water, butter, or ointments.

- Do not pop blisters.
- Cover loosely with a sterile gauze bandage.
- Take ibuprofen or acetaminophen for pain.

Patients with serious burns are generally given nothing by mouth. Oxygen is administered if pulse oximetry indicates a problem with respiratory function or if inhalation injury is suspected. Assessment for carbon monoxide inhalation includes checking the mucous membranes for a cherry-red color. Intravenous fluid therapy and more extensive medical treatment are started as soon as possible. The American Burn Association has identified criteria for minor and major burn injuries. It recommends that all major burn injury patients be treated in a burn center. Every emergency department has guidelines that indicate whether a burn victim needs to be transferred to a burn center.

Emergent Phase of Burns

The emergent phase averages 24 to 48 hours but may last as long as 3 days. It begins with fluid loss and edema formation and lasts until edema fluid is mobilized and diuresis begins.

The first hour of treatment after burning can be crucial to the eventual outcome of a serious burn. Other life-threatening injuries must be treated first.

If possible, details of the nature of the accident should be obtained so that a more thorough assessment can be made. Knowing the causes of the burn and whether there is any possibility of thermal damage to the respiratory tract can alert the team to the specific needs of the patient. The depth and extent of the burn area are estimated, and multiple IV lines are established. A tetanus toxoid injection is given in the emergency department; it is the only intramuscular injection given initially.

Respiratory support.

There is a potential for respiratory obstruction if upper airway passages have been burned. Swelling will occur, and it will become increasingly difficult for the patient to breathe. Signs of respiratory distress such as increased respiratory rate, use of accessory muscles, nasal flaring, retractions, restlessness, and confusion may occur. Early intubation is recommended for an extensive upper airway injury.

Lower airway injury (damage to lung parenchyma) is caused by breathing in smoke and soot from the fire. This type of injury may also require intubation and ventilation and may be life threatening.

Patients who should be watched closely for signs of developing respiratory problems include those who have:

- Burns of the face and neck
- Singed nasal hair or darkened membranes in the nose and mouth
- Smoky-smelling breath
- Dark or black sputum
- Burning sensation in the throat or chest
- A history of having been burned in an enclosed space

Watch for increasing restlessness, coughing, hoarseness, rapid shallow respirations, stridor (high-pitched musical sound on inspiration), and falling oxygen saturation (below 95%).

Humidified oxygen is given if the patient is experiencing respiratory distress; intubation and mechanical ventilation may be required. Keep necessary equipment at hand and constantly assess the patient's respiratory effort. Employ the use of an incentive spirometer, coughing, turning, and early ambulation to maintain good respiratory function. Respiratory therapy treatments may be ordered.

Fluid resuscitation and prevention of shock.

A major concern in the care of a burn victim is to prevent shock from circulatory collapse. The two most important measures used to relieve profound shock in a burn patient are:

- Replacement of lost fluids and electrolytes (fluid resuscitation)
- Enhancement of tissue perfusion

The loss of fluids and electrolytes results from the sudden capillary leak and shifting of the blood plasma and tissue fluids from their normal site to the area of the burn. This shift occurs in the first 24 to 48 hours after the burn. The fluids are then lost by movement from the vascular space to the interstitial spaces. Fluid resuscitation needs are based on one of several burn formulas. The Parkland formula for fluid resuscitation is:

$$4 \text{ mL Ringer's lactate (RL)} \times \% \text{ burn} \times \text{weight in kg}$$

One half of the required fluid should be given within 8 hours of the time of the burn. The second half is given over the next 16 hours. After that, fluids are based on specific volume and electrolyte imbalances and response to treatment. **Fluid replacement is calculated from the time of injury, not from the time of arrival at the medical facility.** Important nursing functions are to keep IV access sites patent and secured in place and to ensure that the fluids are administered at the ordered rates.

Clinical Cues

In trauma patients, a Foley catheter is inserted to monitor hourly urine output and provide data to determine whether fluid resuscitation is adequate. The minimum acceptable urine flow for an adult is 30 mL/hr. To obtain accurate hourly measurements, the standard drainage bag should be changed to a drainage bag that has a urometer.

Unless fluids are replaced immediately, the cardiac output will drop, and the resultant profound shock may be fatal to the patient. The patient's vital signs must be checked hourly and recorded accurately. A blood pressure reading taken by cuff from an extremity may not be reliable. An arterial line may be inserted for more accurate monitoring of blood pressure changes. The state of sensorium or level of consciousness is another key observation in the assessment of tissue perfusion. Constantly assess the patient's level of alertness and clarity of thinking, asking the patient who he is, where he is, his age, what happened, and so on. There are significant dangers to fluid resuscitation; for example, excessive fluid potentiates adult respiratory distress syndrome, and extreme fluid deficit will cause acute renal failure. It is very important to monitor the signs of adequate fluid resuscitation and know when to increase or decrease the fluids based on clinical findings.

After the first 24 hours, 5% dextrose in water (D_5W) is given to maintain a serum sodium level of 135 to 145 mEq/L. Fluid intake and output and daily weights are measured as long as the patient has open wounds. Laboratory data are checked frequently for evidence of either a deficit or surplus of specific electrolytes.

Pain management.

As soon as IV lines are established and fluid resuscitation is begun, pain control can begin. Measures to relieve pain include the administration of IV morphine or hydromorphone hydrochloride (Dilaudid). Doses of IV morphine may be higher than you are accustomed to seeing: 2 to 4 mg every 5 to 10 minutes is the standard starting dose, and the patient may require a much larger total dose because of the severe pain (Conolly, 2011). Fentanyl is another powerful opioid medication that can be combined with a benzodiazepine, such as midazolam, before painful wound care procedures. Ketamine and propofol are anesthetic agents that are used for control of pain during procedures. The massive fluid shifts that occur after a burn injury make absorption from an intramuscular site unpredictable in the first 24 hours after the burn.

For chronic pain, gabapentin and methadone can be prescribed. Nonsteroidal anti-inflammatory drugs (NSAIDs) work to control pain but may not be used if ongoing grafting is necessary or because of stress ulcers.

Acute Phase of Burns

The acute phase extends from the time of fluid mobilization and diuresis to when the burned area is

completely covered by skin grafts or when burns are healed. Goals during this phase include management of pain and anxiety, prevention of wound infection, promotion of nutritional intake, and rehabilitation therapy.

Prevention of infection.

Although wound infection is no longer the major cause of death in burn victims (the main cause of death is pneumonia), its prevention is important to recovery. Today patients are taken to the operating room very early after the burn. Burn eschar is excised away from the wound and the area is covered with a biologic or biosynthetic skin. During the granulation stage of repair, the wound should look slightly pink and somewhat shiny. Healthy granulation tissue does not emit exudates. **A very wet wound that has a foul odor indicates infection.** A greenish blue wound exudate is a sign of *Pseudomonas* infection. Signs of inflammation, such as redness and swelling of the tissues adjacent to the wound, may indicate **cellulitis** (acute inflammation of the subcutaneous tissues). Signs of infection should be reported to the provider. If wound sepsis occurs, IV antibiotics specific to bacteria in the wound are given and topical antibacterial soaks are applied to the wound.

Critically burned patients have a high risk for ventilator-acquired pneumonia. [Quinn and colleagues \(2013\)](#) reported that strict adherence to ventilator-acquired pneumonia (VAP) surveillance protocols decreased the complications and the mortality rate associated with VAP, although there was no decrease in ventilator use, intensive care unit (ICU), or hospital days. Examples of Core Measures for ICU patients include protocols to prevent deep vein thrombosis, tighter glucose control, elevation of bed to 30 degrees, and reinforcement of mandatory weaning and spontaneous breathing trials.

Wound treatment.

There are six general principles for the daily care of burn wounds ([Nurselabs, 2014](#)):

1. Cardiopulmonary status should be monitored during the procedure.
2. Tubes and catheters are a source of infection and must not become wet.
3. Patient must be kept warm; heat lamps or radiant heat shields can be used.
4. Infection must be prevented via use of gowns, gloves, masks, and so on, and cleansing should progress from “cleaner to dirtier” wounds.
5. Analgesia and sedation should be preadministered. Provide adequate stress management.
6. Motion must not be impaired (except for new grafts).

Burn wounds are cleansed using sterile technique at least once daily with diluted chlorhexidine. The goal is to remove excess exudate and drainage and to minimize the danger of infection. Wounds of the face or ears are left undressed. After the wounds are cleaned, a topical ointment such as bacitracin is usually applied every 8 hours to prevent infection and promote healing. Burns on the hands, extremities, or trunk may be cleansed at the bedside, on a shower table in the burn unit treatment room, or in a whirlpool bath. Cleansing is done at least once a day, and these wounds are dressed. Dressings are composed of layers of sterile gauze saturated with topical medications, biologic dressings, synthetic dressings, or artificial skin. The wound is then wrapped with stretch gauze, such as Kling, or with elastic mesh webbing. Silver sulfadiazine has long been used for burn care and is still frequently used; however, it is poorly absorbed through eschar and it releases silver for only a few hours. Other preparations include hydrogels, ionic silver powder, alginate combinations, and silver site dressings. [Table 42-4](#) lists the most common topical medications and their nursing implications.

 **Table 42-4**

Topical Medications Commonly Used to Treat Burns

Medication	Action	Nursing Implications
Silver sulfadiazine (Silvadene, Flamazine)	Interferes with DNA synthesis by binding to bacterial cell	Assess for allergy to sulfonamides. Observe for rash, itching, or burning, which may indicate allergic reaction. Observe for leukopenia. Not effective against <i>Pseudomonas</i> infections. Cream must be removed and reapplied once or twice per day.

	membrane.	
Mafenide acetate (Sulfamylon)	Bacteriostatic agent; effective against both gram-positive and gram-negative organisms.	Assess for allergy to sulfonamides. Observe for signs of allergic reaction. May cause metabolic acidosis; monitor blood gases and electrolyte levels. Application may cause pain for 30-40 min; medicate before applying. Penetrates eschar and is effective against Pseudomonas. Very effective for electrical burns.
Silver nitrate	Antimicrobial action.	Dressings must be kept continually wet with 0.5% solution. Stings on application; stains fabric. Monitor electrolyte levels; may cause imbalances. Penetrates wound only 1-2 mm.
Sodium hypochlorite solution (Dakin solution)	Bactericidal action; inhibits blood clotting and may dissolve clots.	Observe for signs of irritation. Keep dressings moist with the solution at all times. Helps dry wounds and assists débridement.
Collagenase (Santyl) with polymyxin B (Polysporin) powder	Digests collagen in necrotic tissue; powder prevents infection.	Monitor for wound infection.
Gentamicin sulfate (Garamycin)	Interferes with protein synthesis in bacterial cell.	Monitor for ototoxicity and nephrotoxicity. Use with caution if decreased renal function is present. Monitor creatinine clearance during treatment. Used when there is resistance to other drugs.
Polymyxin B-bacitracin	Wide-spectrum antibiotic action.	May cause itching, burning, and inflammation. Will not penetrate eschar. Must be applied q2-8h.
Nystatin	Interferes with fungal DNA replication.	May cause itching or allergic reaction. Requires long-term use to clear fungal infection.

Escharotomy.

Eschar is a source of infection, and it impairs healing. Removal of eschar and skin grafting are usually done within 1 week after the burn (Figure 42-19). When tissue perfusion or quality of respiration is compromised because of eschar constriction, an **escharotomy** is performed. **An incision into the burn eschar with a scalpel or electrocautery relieves pressure caused by circumferential burns that encircle an extremity or that constrict movement of the chest.** The incisions extend into the subcutaneous tissue. If the pressure is not relieved, arterial blood flow in the extremity will be compromised, possibly causing necrosis; nerve damage from the pressure also may occur. An escharotomy on the chest improves lung expansion and oxygenation. The procedure does not cause discomfort, because the nerve endings have been destroyed by the burn. No anesthesia is required.



FIGURE 42-19 Escharotomy of the lower extremity. (From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2011, Mosby.)

Be alert for compartment syndrome, which occurs when increased pressure within a compartment (e.g., arm, leg) causes compromise of circulation to the area. Fluid accumulation from edema can cause compartment syndrome in burn patients. Monitor for increasing pain, paleness and tenseness of the tissue, numbness or tingling, discoloration in the distal portion of the extremity, and decreased sensation (**paresthesia**).

Débridement.

Débridement involves removing the eschar and necrotic material from underlying tissues. It is

usually done in the operating room. Whirlpool tubs are used 3 to 4 days after grafting procedures. Pain medication is given before the bath. Enzyme compounds, such as collagenase (Santyl), containing proteolytic agents may be applied topically to digest necrotic tissue. They are used in conjunction with a polymyxin B (Polysporin) powder to prevent bacteria from the wound from entering the bloodstream. Surgical débridement and grafting may require IV anesthetic agents, sedation, nitrous oxide, or narcotic analgesia.

Grafting.

Surgical removal of eschar and applications of biologic dressings are done within the first week after the burn injury. **Biologic dressings** are materials obtained from cadavers or from animals. It is most desirable to graft the patient's own skin (**autograft**), but when this is not possible, a **homograft** (the skin of another person [**allograft**], obtained from a cadaver), a heterograft (**xenograft**, usually obtained from a pig), or artificial (**biosynthetic**) skin, such as Biobrane, can be used as a temporary measure. Biobrane is a nylon fabric with a silicone film that allows exudate to pass through. The many synthetic dressings available consist of silicone, plastics, or alginate (brown seaweed combined with other substances) and remain in place for 1 to 14 days. **The patient's own skin is the only permanent graft material.** Some success has been achieved in growing skin cells harvested from the patient in cultures, but this is a slow, expensive process. The epithelial sheets grown are then used for grafting.

When autografting is performed, there is a donor site from which a split-thickness piece of skin has been removed. That piece of skin may be used intact, or it may be cut into a mesh pattern (Figure 42-20). It takes longer for a mesh graft area to heal, because the skin cells need to grow into the holes between the links of skin. Artiss is a fibrin sealant used for adhering skin grafts for burn patients. Recovery time from a split-thickness skin graft is rapid, commonly less than 3 weeks (Jaliman, 2014).

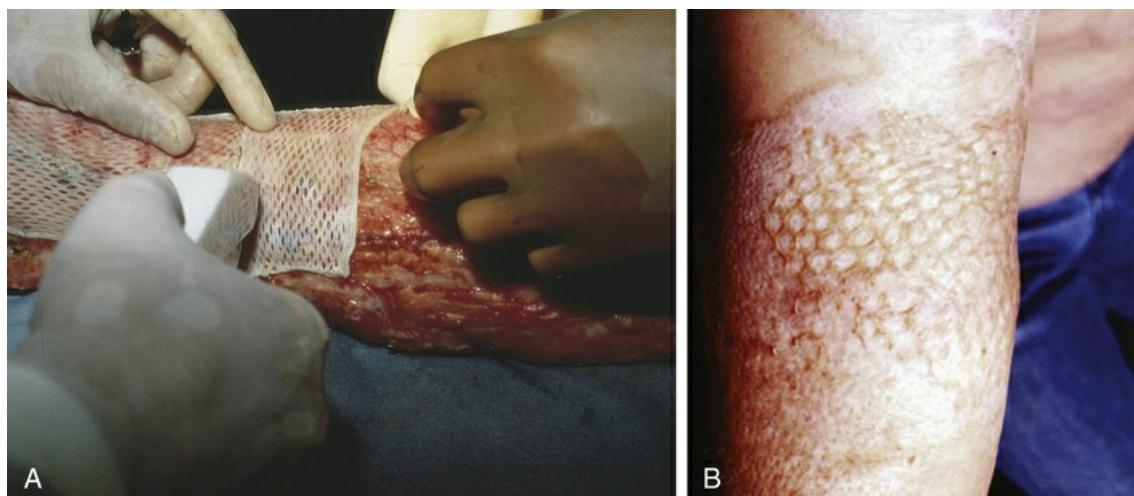


FIGURE 42-20 Typical appearance of meshed autografts. **A**, Appearance during application of meshed autograft. **B**, Appearance of meshed autograft after healing. (From Ignatavicius DD, Workman ML: *Medical-surgical nursing: Patient-centered collaborative care*, ed. 7, Philadelphia, 2013, Saunders.)

Donor sites may be covered by a film dressing to hasten healing and decrease pain. The donor site is often more painful than the graft site. Once the donor site has healed completely, skin may be harvested from that site again.

Pressure dressings are worn as soon as grafts heal to decrease scarring that can inhibit mobility. The pressure dressing may be an elastic wrap or a custom-fitted, elasticized piece of clothing that provides uniform pressure over the burned area. These pressure dressings must be worn 23 hours a day, every day, until the scar tissue is mature. Scar maturity takes 12 to 24 months. Daily exercise and splint applications are used to prevent contracture formation. After burns are fully healed and the scar tissue has matured, plastic surgery may be performed to try to rebuild lost structures, such as the nose or an ear, or to enhance appearance.

Complications

When a sizable burn occurs, blood flow is shifted to the brain, heart, and liver because of the fluid changes that occur. The gastrointestinal tract receives decreased blood, and gastric motility is impaired. Monitor peristalsis and be alert to signs of paralytic ileus. Severe abdominal distention may occur. A Curling ulcer may develop, inducing gastrointestinal bleeding. Stools are monitored for signs of occult blood. A histamine (H_2)-receptor antagonist, such as cimetidine (Tagamet), ranitidine (Zantac), famotidine (Pepcid), or nizatidine (Axid), may be administered IV to prevent this complication.

Contractures always are a threat with major burns and sometimes with minor burns. Proper positioning and regular exercise are essential to prevent musculoskeletal deformities after a burn. Although the motion of physical therapy exercises may be painful, the muscles and skin must be exercised and stretched every day for normal motion to be maintained. Sometimes it is necessary for the patient to continue visiting the physical therapist for several months after discharge from the hospital. Ambulation two or three times a day is begun as soon as the fluid shift has stabilized for patients who have no fractures or serious injuries to the feet or legs.

Rehabilitation Phase of Burns

A patient who has experienced a major burn is transferred to a rehabilitation facility. The rehabilitation phase begins with wound closure and ends when the patient reaches the highest level of function possible. This phase may last for years. The phases of burn rehabilitation have been referred to as the first 2 minutes; the first 2 hours; the first 2 days; the first 2 weeks; the first 2 months; and the first 2 years (Price and Milner, 2012). Continued physical therapy and psychological care are essential to help the patient achieve his optimal level of function. Some patients must learn to use adaptive devices or alter the way they formerly accomplished tasks.

When the patient is ready to accept some responsibility for self-care, preparation for release from the hospital begins. Teach the patient how to apply topical agents without contaminating the wound and how to change dressings if these are used. A family member, if available, is included in burn care education.

Maturing scars usually appear red, hard, and raised before they eventually begin to fade and soften. Pressure garments and masks help prevent thick and disfiguring scars but are uncomfortable (Figure 42-21). The patient may resist wearing them unless he understands their intended purpose. Your encouragement and reinforcement of the purpose can help.



FIGURE 42-21 Pressure garments are individually fitted. (Courtesy Medical Z.)

Reintegration into roles, community activities, and employment takes time. Participation in a support group of burn victims is sometimes helpful. In this way the patient and family realize that they are not alone in their struggles with the many problems that the injury has brought. Assessment of the home environment and family interaction is essential before discharge. Knowing how the patient formerly coped with stressful situations helps professional personnel involved support him. Having friends visit and making short trips out in public is helpful in dealing with the reactions of others to burn scars and disfigurement. Referral for job retraining may be required if the patient will be unable to return to a former occupation because of residual physical deficits. See [Chapter 9](#) for rehabilitation goals and principles.

❖Nursing Management

Care of a burn patient is interdisciplinary and includes the services of the provider, surgeon, nurses, dietitian, respiratory therapist, physical therapist, occupational therapist, psychologist or psychiatrist, and social worker. Other health professionals are added to the team as needed. Collaborative planning meetings are scheduled at least once a week initially. Input for the plan of care is contributed by all members of the team.

■ Assessment (Data Collection)

A thorough assessment of all body systems and psychological response is performed on admission and continues throughout because of the potential for complications. The patient's vital signs and pain level must be checked and recorded at regular intervals. The condition of the wounds also should be assessed systematically to determine whether healing is taking place as it should and infection is being prevented. Wounds are carefully assessed at each dressing change. Signs that indicate infection include:

- Strong odor
- Color change to dark red or brown
- Redness around edges extending to unburned skin
- Texture change

- Exudate and purulent drainage
- Sloughing of graft
Such signs should be reported, because a culture or biopsy should be performed.

Think Critically

What would you do if, when taking vital signs, you find that the pulse on the burned arm is weaker than that on the other, unburned extremity?

Nursing Diagnosis

Care of a burn patient is extremely complex. The plan of care must be frequently revised and updated. Problem statements/nursing diagnoses commonly used for burn patients are included in [Nursing Care Plan 42-1](#). Additional problem statements include:

- Altered nutrition due to increased caloric demands and inability to orally ingest sufficient calories
- Anxiety due to pain, guilt associated with injury, financial concerns, appearance, treatment, and prognosis
- Altered body image due to disfigurement secondary to burn injury
- Altered family coping due to alteration in roles
- Insufficient knowledge due to home care

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Nursing Care Plan 42-1

Care of a Patient With a Burn

Scenario

Mr. Young, age 33 years, sustained partial- and full-thickness burns over both arms when a container of gasoline he was carrying ignited. He also suffered superficial partial-thickness burns on his hands and face. In the emergency department, his wounds were cleaned and a topical agent was applied; no dressings were applied. Intravenous lines were established, and fluids were administered to prevent potential fluid and electrolyte imbalance. He received morphine for pain and on admission to the unit was fairly comfortable, conscious, and oriented. He is in the emergent phase.

Problem Statement/Nursing Diagnosis

Fluid volume deficit/*Deficient fluid volume related to fluid shift and loss of fluids via open burn wounds.*

Supporting Assessment Data

Objective: Partial-thickness burns over hands and face with full-thickness burns on arms; burn areas becoming edematous.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have adequate circulating blood volume as evidenced by blood pressure (BP), pulse, and urine output.	Monitor vital signs q2h.	Falling BP and rising pulse can indicate hypovolemia.	BP 120/80. Pulse 78/min. Respirations 24/min. Temperature 98.6°F (37°C).
	Monitor urine output, report drop below 0.5 mL/kg/hr.	Urine output may also indicate hypovolemia, because kidneys will be less perfused.	Urine output at 45 mL/hr.
	Monitor laboratory values for electrolyte imbalances.	Changes in fluid volume may alter electrolyte balance.	Potassium is 4.5 mEq/L. Sodium is 140 mEq/L.
	Maintain IV fluids on schedule.	Adequate fluid resuscitation prevents hypovolemia.	IV fluids on schedule. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for infection/*Risk for infection related to burn damage to skin.*

Supporting Assessment Data

Objective: Skin on face, hands, and arms damaged by burns.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will not experience infection of burn wounds as evidenced by normal vital signs and normalization of WBC count.	Assess for medication allergy. Use strict aseptic technique for wound care.	Medication prescribed may be contraindicated. Infection is the greatest cause of burn wound depth.	No allergies to medication. Strict aseptic technique provided to wounds.
	Do not submerge catheters or insertion sites during cleansing.	Invasive catheters are potential portals of infection.	Peripheral IV catheter and site covered with plastic for cleaning process.
	Assign private room and use Contact Isolation Precautions. Use Standard Precautions, including hand hygiene.	Major burns generally require Contact Isolation Precautions (follow facility procedures). Hand hygiene is a first line measure to prevent infection.	Contact Isolation Precautions initiated. Isolation supplies gathered and placed outside the door. Sign posted for isolation procedures and instructing visitors to see the nurse before entering.
	Apply topical silver sulfadiazine as ordered to wounds tid.	Suppresses bacterial growth and promotes healing.	Wounds cleansed, silver sulfadiazine applied, and wounds redressed.
	Monitor WBC count for signs of infection; assess and cleanse wounds tid.	Cleansing wounds helps prevent infection and promotes healing.	Results for WBC count pending. No signs of wound infection. Not taking food as yet. Continue plan.
	Encourage adequate nutrition.	High caloric intake with sufficient vitamins and minerals is needed for healing.	

Problem Statement/Nursing Diagnosis

Pain/Acute pain related to burn wounds and cleansing procedures.

Supporting Assessment Data

Subjective: States is in constant pain at an 8-10 level.

Objective: Grimacing and holding body rigid.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient's pain will be controlled to tolerable levels with analgesia.	Assess for quality, location, and intensity of pain. Assess patient's "acceptable" level.	Pain is subjective, and patient must report own experience. "Acceptable" level reflects the patient's expectations and tolerance.	Reports pain at 4/10 currently; medicated 3 hours ago. Acceptable level is 4/10, but requests additional medication before dressing change.
	Assess for and control noxious social or environmental stimuli.	Perception of pain is affected by various noxious stimuli, such as loud noise, visitors, dirty sheets, bad odors.	Reports that visitors are laughing loudly in the stairwell; would like to have door closed.
	Administer IV analgesia as ordered, giving boluses as appropriate before procedures and at bedtime.	IV narcotic analgesia is best for burn pain control initially.	Bolus given for pain of 4/10 before dressing change.
Patient's pain will be controlled with oral medication before discharge.	Teach relaxation and imagery techniques to assist with pain control.	Relaxation and imagery techniques have proven helpful in pain control.	Began instruction on relaxation technique.
	Supply diversionary activities to diminish pain awareness.	TV, card games, visitors, computer games, and reading help divert attention from pain.	Is watching TV; not ready for greater activity yet. Continue plan.

Problem Statement/Nursing Diagnosis

Altered self-care ability/Self-care deficit: hygiene, feeding, toileting, and grooming related to inability to use hands and arms.

Supporting Assessment Data

Objective: Burns on hands and arms being treated and grafted; unable to use hands and arms for self-care activities.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will assist with self-care activities within 3 mo.	Assist with hygiene, toileting, grooming, and feeding as needed.	Assistance as needed must be provided to prevent infection and increase well-being.	Requires full assistance with ADLs today.
	Allow him to make decisions as much as possible to lessen feelings of helplessness.	Participation in care decreases feelings of dependency and increases feelings of control.	Choosing time for bath. Unable to use hands and arms at this time.
	Allow him to do as much as he is able to do.	Gradual resumption of activities can occur with encouragement and time.	"At least I can walk to the bathroom by myself." Continue plan.

Problem Statement/Nursing Diagnosis

Decreased self-esteem/Situational low self-esteem related to burned hands and worries about role in family as "bread winner."

Supporting Assessment Data

Subjective: "With my hands and arms burned, I won't be able to work anymore. I'm not much of a man anymore if I can't take care of my family."

Objective: Unable to use hands and arms because of burns.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize frustrations and concerns before discharge.	Establish trusting relationship, actively listen to concerns and frustrations.	A trusting relationship helps him to freely verbalize concerns and facilitates acceptance of treatment plan.	Expressed concerns about helplessness.
	Help him establish his active role in recovery of use of hands and arms.	Collaboration helps improve his self-esteem.	States wants to recover self-sufficiency.
	Allow him to do whatever ADLs are possible for him.	Performing self-care helps increase self-esteem.	Unable to perform any arm or hand movements yet.
	Praise him for his efforts with PT exercises and use of splints.	Praise encourages his actions.	Passive PT thus far.
	Help him establish small, accomplishable goals on a weekly basis.	Accomplishing small goals increases self-esteem.	Is thinking about goals for next week.
	Review past successes in overcoming obstacles.	Reflecting on past strengths helps patient to envision transferring success to current challenges.	Recalls having a broken arm as a child and remembers learning to adapt and function with a cast in place.
Patient will discuss possible job retraining if needed.	Refer for job retraining if needed.	Extensive burns may affect ability to perform in current employment role.	Need for job retraining unknown at this time. Continue plan.

Critical Thinking Questions

- With partial-thickness burns on his hands, do you think Mr. Young will be able to use his hands as a mechanic again?
- Because he had burns on his face, what specific assessments should be made to determine whether there has been an inhalation injury?
- Will he probably need skin grafting? If so, where? Is it likely that autografts could be used?

ADLs, Activities of daily living; *IV*, intravenous; *PT*, physical therapy; *WBC*, white blood cell count.

■ Planning

Examples of appropriate expected outcomes are written for the individual patient, such as:

- Patient will regain nutritional balance.
- Patient will decrease anxiety.
- Patient will integrate the altered body image.
- Patient will develop new coping mechanisms.
- Family will develop ways to cope with caring for patient at home.
- Patient and family will learn to provide good care at home.

■ Implementation

Managing Pain

Use gentleness and care in handling the patient as he is turned or treatment is administered. This reduces the amount of pain, and the less the patient is handled, the less danger there is of contaminating the wounds. **Despite advances in burn care, research studies show that pain continues to be undertreated, and even experienced clinicians tend to overestimate the efficacy of opioids.** Morphine or hydromorphone hydrochloride should be administered with a patient-controlled analgesia pump when possible. Boluses are necessary before treatments or surgical procedures and at bedtime. Sedatives such as lorazepam (Ativan), midazolam (Versed), and haloperidol (Haldol) should be used along with analgesia. Burn pain can be distressful for years after the burn occurs (Wiechman and Sharar, 2014).

Pain continues even after the wound appears to have healed completely. Exercises to prevent contractures can cause pain because they stretch the skin while it is very tender. Splints to prevent musculoskeletal complications can also cause discomfort. Analgesics will allow the patient to get sufficient rest, but they should be given judiciously as the pain becomes less acute. If a patient begins to depend too much on one kind of analgesic, alternative drugs can be given.

■ Complementary and Alternative Therapies

Helping Patients to Cope with Pain

Proper body positioning, distraction therapy, music, television, games, and virtual reality technologies may help burn patients to cope with pain. These adjunctive interventions do not

replace medication or attentive nursing care ([Melville, 2013](#)).

Preventing Infection

An aseptic environment is needed for burn care. Standard Precautions are used for all burn care, and protective isolation techniques are used. Those in attendance usually wear sterile caps, gowns, shoe covers, and gloves while caring for the patient. Contact Isolation measures are used for infected wounds. Gloves are worn for all contact with open wounds and are changed when handling wounds on different areas of the patient's body and between handling soiled and sterile dressings. **Patient care items are not shared, and great attention is paid to maintaining asepsis for all patient care.** Bed linen is changed daily and whenever soiled, and a bed cradle or some other device is used to support the weight of the top covers to keep them off the burned areas.

Managing Itch

Administer antihistamines proactively before itching becomes intense ([Richardson et al, 2014](#)). Nonpharmacologic measures to reduce  itching, such as massage, transcutaneous electrical nerve stimulation (TENS), music therapy, and botulinum toxin are used along with medication. Therapeutic touch may prove helpful. Acupressure and acupuncture may assist with pain and itch relief.

Nutritional Support

Enteral feedings are started shortly after the fluid resuscitation is completed for a patient with a severe burn. Patients with large burns often develop paralytic ileus as a response to the trauma. The stomach stops working when this occurs, and a nasogastric tube must be inserted and attached to intermittent suction. Bowel sounds should return 48 to 72 hours later, and then intake may begin with high-protein, high-calorie drinks if tolerated.

A diet high in protein and calories is necessary for healing. The patient has increased metabolic needs directly proportional to the size of the burn area. Nutritional needs may be increased 50% to 150% above normal, and increased requirements can continue for 9 to 12 months. Caloric needs are calculated to include the patient's weight, age, and percentage of burn over total body surface ([Prins, 2013](#)). Only high-calorie liquids are given to drink. Free water intake is restricted. Dietary supplements include vitamins, especially vitamins A, C, and D. Minerals such as zinc and copper are supplied, because deficiencies are seen in burn patients. Consultation with a nutritionist is essential because of the dietary issues that can occur for burn patients. There appears to be a maximum glucose load, and high carbohydrate intake can lead to hyperglycemia, dehydration, and respiratory problems. Excessive lipid intake has been associated with impaired wound healing, and ability to tolerate protein is related to renal function and fluid balance ([Prins, 2013](#)).

Complementary and Alternative Therapies

Helping Burn Patients to Relax

In a small study, it was found that jaw relaxation techniques lowered anticipatory anxiety states for burn patients ([Rafii, Mohammadi-Fakhar, and Orak \(2014\)](#)).

Psychosocial Support

Burn patients may face loss of mobility and independence or disfigurement involving the face or other parts of the body usually visible to others. Many experience post-traumatic stress syndrome, and others may feel guilt, anger, or depression. Strive to develop an attitude of acceptance of the patient, a calm approach to dressing changes and discussions of scar formation, and an optimistic emphasis on what the patient can do and will be able to do in the future. When a patient has difficulty coping with the physical and psychosocial effects of a severe burn, effective nursing intervention can help the patient deal with his fears, anxieties, and sense of loss. Assist the patient through the grief process and encourage the patient to relate what is experienced and his feelings about what has happened or is happening. Encourage him to ask questions and to verbalize his concerns about the care and the treatment plan. You can reinforce the patient's self-esteem by emphasizing the strengths you have noticed when the patient was coping with pain, inconvenience,

or some other unpleasant situation. Involving the patient in performing self-care as much as possible and giving some sense of control over the situation are helpful.

The patient's body image may have been severely disrupted. Assist the patient to grieve over the loss and integrate the present body image. If the burns were caused by a suicide attempt or a risky behavior, psychiatric therapy will probably be necessary to deal with feelings of guilt. Although males and children younger than 4 years are more likely to experience burns, female patients tend to have greater adjustment difficulty with altered body image (Rowley-Conwy, 2014). A psychiatric clinical nurse specialist should be consulted to help the staff and the patient work through the complex psychological issues. Referrals to a psychologist, psychiatrist, social worker, or religious leader may also be necessary.

Clinical Cues

Noise, lights, or certain people—visitors or staff—may be very irritating to the patient; these factors usually can be adjusted. If the patient is unhappy about being isolated, bringing in a television, radio, computer games, mobile phone, and books may help.

Patient and Family Education

The patient and family are taught about daily skin and wound care before discharge. They must be familiar with dressing instructions, lubrication of grafts, and donor site care. Moisturizing with an alcohol-free skin moisturizer is necessary at least three times a day. Pressure dressings or garments must be worn for 23 hours daily. Direct sunlight should be completely avoided for 1 year after injury because of increased sensitivity to ultraviolet rays.

Information regarding medication dosages, precautions, and potential side effects are sent home with the patient. Nutritional needs and particular diet recommendations are discussed. Adequate protein and calories are very important to full recovery. Referral is made to support groups or peers and counseling as needed for readjustment to life after the burn incident. The need for follow-up care is stressed, and appointment dates and times are established. See [Nursing Care Plan 42-1](#) for interventions for selected problems in a burn patient.

Evaluation

Although the provider chooses the type of medication to be applied topically or administered systemically for pain, infection, and wound healing, the nurses are responsible for continued assessment of the burn wounds to evaluate the effectiveness of the prescribed treatments. A systematic and ongoing assessment of scar tissue formation should be performed and evaluated to determine whether the patient is making an adjustment to the fact that burn scars may take as long as 12 to 24 months to mature completely. If outcomes are not being met, interventions are changed.

Community Care

Nurses in the community can do much to educate the public about the dangers of unprotected sun exposure and the signs of skin cancer. Nurses vigilantly assess changes in skin lesions that may indicate cancer. Skin self-screening is taught at every opportunity.

School nurses perform assessments for signs of lice and scabies. They teach families how to deal with these problems and how to prevent their spread.

One of the objectives for *Healthy People 2020* is to reduce the number of hospitalizations for older adults that result because of pressure ulcers; therefore nurses employed outside the hospital setting are tasked with the challenge of prevention. Long-term care nurses must promote good skin integrity in all residents, handling older adults with special care to prevent tearing of the skin. Patients who are immobile are turned diligently to prevent pressure ulcers, and skin is inspected regularly. Home care nurses can encourage older adult patients to use skin emollients to moisten and protect the skin.

Teaching fire safety to children and parents and to workers in various occupational settings helps to decrease fire injury. Home care nurses must continually assess patient homes for fire dangers and reinforce teaching to prevent home fires.

Get Ready for the NCLEX® Examination!

Key Points

- Dermatitis causes erythema and itching; a thorough history is necessary to locate the offending agent. Teach patients to avoid causative factors and how to apply topical medications.
- Acne often occurs at puberty; there is an accumulation of sebum and dead skin cells, which causes an inflammatory reaction. Drying agents that cause peeling work best to rid the skin of blackheads and whiteheads.
- There is a genetic predisposition to psoriasis, which appears as inflamed, edematous skin lesions with adherent silvery white scales. It can be controlled, but not cured.
- SJS is a potentially life-threatening allergic reaction usually triggered by medication.
- Hospitalized patients with bacterial skin infections require Contact Isolation.
- Viral skin disorders are caused by herpesviruses.
- Herpes zoster lesions follow nerve pathways; it is a very painful condition, and postherpetic neuralgia can occur. Anyone who has not previously had chickenpox or the immunization should not care for a patient with herpes zoster.
- Fungi prefer warm, moist places; for example, tinea pedis is one of the most common fungal infections and occurs on the feet.
- Treatment of pediculosis and scabies requires treating both the patient and objects that may harbor the parasites.
- Exposure to ultraviolet radiation (sunlight) is a major cause of skin cancer. Encourage use of a hat and sunglasses and sunscreen with UVB protection and a sun protection factor (SPF) of 30.
- Skin cancer has increased in incidence but is highly curable if treated in the early stages. All patients should be screened for skin cancer lesions and taught prevention measures and self-screening.
- Basal cell, squamous cell, and melanoma are the usual carcinomas arising from the epidermis.
- Actinic keratoses are a premalignant lesion common on the skin of older adults.
- If squamous cell carcinoma is not treated early, it can become invasive and metastasize.
- Melanoma is the most aggressive of the skin cancers and needs to be treated early to prevent metastasis.
- Pressure ulcers are a potential problem for all immobile patients. Assessment includes risk factors and staging. Pressure ulcers should be measured and documented on discovery and then measured and documented regularly to show progress in healing. Treatment depends on the stage and location.
- Burns are caused by extreme heat, hot liquids, electrical agents, strong chemicals, or radiation. Treatment is based on classification.
- Burn care is divided into phases: emergency care, emergent care, acute care, and rehabilitation. Pain control is a major concern in every phase.
- Burn patients must be assessed for signs of respiratory problems. Suspect an inhalation injury if there are burns on the face or neck, singed nasal hair, darkened membranes in nose or mouth, or a history of burn in a small space.
- With a major burn, fluid shifts can cause hypovolemic shock. Early fluid resuscitation is essential to prevent death.
- Burn care is aseptic. Eschar must be removed and wounds must be débrided. Débridement can be very painful but is essential for healing and prevention of infection. Contracture prevention begins at the time of admission; special splints and positioning are used to preserve anatomical alignment.
- Early grafting with biologic or synthetic substances helps burn wounds heal more quickly. When skin grafts are healed, pressure dressings or garments are used to prevent excessive scarring.
- Burn patients can have problems with body image and also experience grief, loss, anger, or depression.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

Online Resources

- Acne and Rosacea, www.acnesociety.org
- Acne Treatment and Community, www.acne.org
- American Academy of Dermatology, www.aad.org
- American Burn Association, www.ameriburn.org
- American Cancer Society, www.cancer.org
- American Melanoma Foundation, www.melanomafoundation.org
- The Grossman Burn Foundation: www.grossmanburnfoundation.org
- International Society for Burn Injuries: www.worldburn.org
- Melanoma Education Foundation, www.skincheck.com
- National Cancer Institute, www.cancer.gov
- National Pressure Ulcer Advisory Panel, www.npuap.org
- Phoenix Society for Burn Survivors: www.phoenix-society.org
- Skin Cancer Foundation, www.skincancer.org

Review Questions for the NCLEX® Examination

1. In managing dermatitis, the nurse should provide which instruction(s)? (*Select all that apply.*)

1. “Avoid the irritant or allergen.”
2. “Provide adequate skin lubrication.”
3. “Wash skin frequently with germicidal soaps.”
4. “Maintain skin moisture.”
5. “Apply steroid-based preparations.”

NCLEX Client Need: Physiological Integrity: Physiological Adaptation

2. A major type of skin disorder is acne rosacea. What information may be valuable for the patient education plan? (*Select all that apply.*)

1. Acne rosacea usually occurs in adolescence and then begins to subside during adulthood.
2. Diet is important, and flare-ups may be caused by caffeine-containing foods, spicy foods, sunlight, and alcohol.
3. Comedos may occur on the face, upper shoulders, and back.
4. The primary location for occurrence is on the face over the cheeks and bridge of the nose.

5. Treatments may include metronidazole, retinoids, and occasionally antibiotics.

NCLEX Client Need: Physiological Integrity: Physiological Adaptation

3. A male patient has inflamed, edematous skin of the elbows and knees accompanied by swelling of the joints of the fingers and toes. On examination, the skin is found to be covered with adherent silvery white scales. Which question would provide more information regarding the patient's condition?

1. "What do you do for a living?"
2. "How much do you smoke?"
3. "Have you had an upper respiratory tract infection recently?"
4. "Have you recently changed your laundry detergent?"

NCLEX Client Need: Health Promotion and Maintenance: Data Collection

4. A patient has skin lesions on the face, trunk, palms, extensor surfaces of joints, soles of the feet, and dorsum of the hands. On inspection, the lesions are found to have irregular borders and blistered, necrotic centers. The provider makes the medical diagnosis of SJS. What is the priority problem for this patient?

1. Altered body image.
2. Altered self-care ability.
3. Potential for infection.
4. Acute pain.

NCLEX Client Need: Health Promotion and Maintenance

5. A school-age girl with evidence of severe itching in the scalp is checked for pediculosis. The problem of insufficient knowledge regarding management of the disease is identified for the child and the parent. What instructions would the nurse include? (*Select all that apply.*)

1. "Machine wash clothes and bedding using the cold cycle."
2. "Share combs and hairbrushes with family members, but not with friends."
3. "Soak all combs and brushes in very hot water for more than 5 minutes."

4. "Seal items that cannot be washed in air-expelled plastic bags for 14 days."
5. "Reinfestation is unlikely if all family members are treated."

NCLEX Client Need: Health Promotion and Maintenance: Self-Care

6. The nurse is developing a plan of care for a wheelchair-bound patient. To prevent development of pressure ulcers, which nursing interventions must be implemented? (*Select all that apply.*)

1. Maintain postural alignment.
2. Use pressure-relieving devices.
3. Teach to shift weight every 15 minutes.
4. Use donut-type devices.
5. Reposition in the chair every hour.

NCLEX Client Need: Safe and Effective Care Environment: Safety and Infection Control

7. Place these patients in order from 1 to 4 (1 being the highest risk, 4 having the lowest risk) for their risk for developing a pressure ulcer based on the Braden scale.

1. _____ Older adult who is NPO for procedure; able to independently ambulate and accomplish ADLs
2. _____ Patient who is paraplegic, well nourished, with strong upper body strength to self-transfer to wheelchair
3. _____ Thin older adult patient who walks occasionally, but has limited mobility and cognitive impairments; reluctant to eat
4. _____ Patient who is comatose and unresponsive after a near-drowning accident; receives enteral feedings and is incontinent.

NCLEX Client Need: Health Promotion and Maintenance: Disease Prevention

8. The nurse notes a reddened area on a patient's sacral area and checks for blanching. What is the best rationale that supports this nursing action?

1. Blanching suggests that the redness is probably temporary and will resolve when the pressure to the area is relieved.

2. Checking for blanching is part of the daily routine for assessing any patient who is at risk for pressure ulcers.
3. Evidence of blanching indicates that the patient is at high risk for a pressure ulcer according to the Braden scale.
4. Occurrence of blanching indicates that the redness is associated with a localized skin infection.

NCLEX Client Need: Physiological Integrity: Basic Care and Comfort

9. The nurse makes a home health visit 1 year after a patient was burned over 30% of his body. What problem may the patient be experiencing at this stage? (*Select all that apply.*)

1. Concern with body image due to extensive scarring.
2. Chronic pain due to contractures and nerve compartmentalization.
3. Continued risk for infection due to reconstruction wounds.
4. Increased risk for falls due to joint contractures.

NCLEX Client Need: Physiological Integrity: Physiological Adaptation

10. While the nurse is performing an initial assessment, a patient with extensive burn injuries suddenly develops increasing hoarseness and stridor. Pulse oximetry is 86%. What is the priority nursing action?

1. Encourage the patient to take deep breaths.
2. Provide humidified oxygen.
3. Administer respiratory treatments.
4. Suction respiratory secretions.

NCLEX Client Need: Adaptation: Medical Emergencies

Critical Thinking Questions

Scenario A

Mrs. Nash, age 32 years, has been assigned as your patient on the evening shift. She has severe dermatitis, which is probably allergic in origin. Her provider has ordered a topical lotion, dermatologic baths twice a day, and an antihistamine to relieve itching.

1. What kinds of data would you include in your ongoing assessment of Mrs. Nash's skin disorder?
2. What nursing care problems is Mrs. Nash likely to present?
3. What objectives and nursing measures to meet them would you include in Mrs. Nash's nursing care plan?
4. What would you teach Mrs. Nash about the application of topical agents when she returns home?

Scenario B

Ms. Moore, age 22 years, was badly burned when her clothing caught fire while she was grilling hamburgers on her patio. She has partial-thickness and full-thickness burns over her abdomen and down the front of both upper legs.

1. What is the priority of care after assessment when Ms. Moore reaches the emergency department?
2. What nursing measures should be taken to prevent infection of her burns?
3. What nursing measures would be included in the patient's nursing care plan to ensure that she did not suffer from an undetected fluid and electrolyte imbalance?
4. How is Ms. Moore's pain treated? Why?
5. List some specific things you and the other nurses could do to help her handle her sense of loss and altered self-image as a result of the appearance of the burns and scars.

Scenario C

Mrs. Chaco is an older adult who was admitted to your unit for dehydration and malnutrition. She responds to verbal commands, but seems somewhat confused by your questions. She will quietly sit in a chair, with some movement of her arms, but makes no attempts to walk or stand. She can feed herself, but her appetite and food and fluid intake are very poor. She has had one episode of incontinence with a scant amount of dark yellow urine.

1. Rate this patient's risk for pressure ulcers using the Braden scale.
2. Discuss interventions that you will use to address her positioning and apparent lack of spontaneous mobility.
3. Discuss interventions that you could use to address her nutritional issues.
4. What instructions will you give to the nursing assistant about cleaning the skin?

UNIT XV

Emergency and Disaster Management

OUTLINE

Chapter 43 Care of Patients During Disasters, Bioterrorism Attacks, and Pandemic Infections

Chapter 44 Care of Patients With Emergencies, Trauma, and Shock

CHAPTER 43

Care of Patients During Disasters, Bioterrorism Attacks, and Pandemic Infections

Objectives

Theory

1. Analyze differences between an emergency situation and a disaster.
2. Discuss an emergency preparedness plan for a health care facility.
3. Compare the stages of psychological response that occur with a disaster.
4. Compare and contrast the parameters used in the triage system for victims after a disaster versus the routine triage that occurs in hospital emergency departments.
5. Identify responsibilities and duties of nurses in the care of disaster victims.
6. Explain safety measures to be employed for a chemical emergency.
7. Demonstrate knowledge of measures to be taken in the event of a nuclear disaster.
8. Explain warning signs that suggest a bioterrorism attack has occurred.
9. Differentiate the signs and symptoms of the various agents that could be used for a terrorist attack.
10. Recognize the importance of debriefing of health care personnel after a disaster.

Clinical Practice

11. Participate in a disaster drill.
12. Gather supplies for a “bug out” bag and other disaster preparedness items.
13. Teach a group of adults how to prepare safe water after a disaster has disrupted the water supply.
14. Identify the measures you would take for your own safety when assisting others after a disaster has occurred.

KEY TERMS

- bioterrorism (p. 1015)**
debriefing (p. 1022)
decontamination (dē-kōn-tām-ē-NĀ-shūn, p. 1015)
disaster (p. 1002)
mass casualty (p. 1010)
pandemic (p. 1020)

surge capacity (p. 1003)
triage (TRĒ-ăhzh, p. 1004)

Disaster Preparedness and Response

An extraordinary event, such as a multi-victim incident involving an explosion or a train crash, requires a rapid and skilled response to manage the wounded. There may be walking wounded, critically wounded, and fatally wounded victims. This type of event usually can be handled by the community's emergency medical services and the hospital emergency departments.

A **disaster** exists when the number of casualties exceeds the resource capabilities of the area; thus the community's existing emergency resources may be overwhelmed. Natural disasters include epidemics, earthquakes, explosions, hurricanes, tornadoes, fires, and floods. Intentional terrorist attacks or accidental man-made disasters may result from transportation incidents or events involving chemical, biologic, or nuclear materials. A disaster causes mass casualties, psychological as well as physical trauma, and permanent changes within the community.

The governmental agencies for disaster planning are the Department of Homeland Security, the Office of Domestic Preparedness, Federal Emergency Management Agency (FEMA), and the U.S. Public Health Service. The American Red Cross is a voluntary organization that traditionally provides the basic essentials of shelter, food, and first aid during a natural disaster (Figure 43-1). In most communities, the local Office of Emergency Services (OES), the Red Cross, and the Salvation Army work together to formulate disaster plans. They coordinate their services with each other and with other agencies in planning for essential services, such as shelter, transportation, communication, and welfare. The Centers for Disease Control and Prevention (CDC) has a website with information on all types of disasters, weather events, and mass casualty events (<http://emergency.cdc.gov/disasters/alldisasters.asp>).



FIGURE 43-1 A Red Cross volunteer checks on a resident affected by the extreme heat in Algiers, Louisiana, after Hurricane Katrina. (Courtesy the American Red Cross, printed with permission. Copyright The American Red Cross.)

Special courses in civil defense and disaster nursing are offered by the OES, the Red Cross, and professional organizations. These courses help nurses and volunteer workers to understand the function and coordination of agencies involved in a particular type of disaster. To increase availability of volunteer health care professionals, registries such as the Emergency Systems for Advance Registration of Volunteer Health Professionals (ESAR-VHP) have been designed to proactively verify credentials, provide disaster response training, and coordinate deployment of professionals in conjunction with local, state, and national response plans. Other legislation identifies responsibility, accountability, and liability for health care professionals working outside of their licensure state (Buck, 2013).

Hospital Preparedness

The Joint Commission requires that hospitals have an emergency preparedness plan in place. There are guidelines for emergency preparedness by type of facility. Emergency department providers undergo formal training for disaster events. Emergency department nurses are encouraged to obtain certification in emergency preparedness. You should **proactively** (take action in preparation) seek out disaster training at your work setting and advocate for sufficient emergency supplies and support. Health care systems must self-evaluate **surge capacity**, which is defined as the maximum services that a facility can offer when every resource is mobilized (Bayram et al, 2013). This is also termed *crisis capacity* by the **Institute of Medicine (IOM)** in a 2012 report. The emergency plan should be tested with drills at least twice a year.

Hospitals must plan for many possible scenarios from trauma to chemical contamination. Plans also must be in place for whether or not the incident affects the physical functioning of the facility. If a storm or earthquake damages the hospital building or eliminates power or water sources, decisions on evacuation of patients will have to be made. If the hospital is intact and functional, then focus moves to management of a large volume of patients. Hospital disaster plans outline the command and decision-making structure in addition to details of communication and triage.

The emergency preparedness plan will identify who will be in charge and the chain of command for the facility. The designated communications officer is responsible for internal communication, such as keeping the staff informed, and for external communication, such as contacting other agencies for help or reporting data about infection or chemical contamination that could have widespread effects. There^{will} be a hospital incident commander (provider or administrator) who assumes responsibility for launching the emergency preparedness plan. This person's role as commander is to view the entire situation, bring in needed human and supply resources, and facilitate the flow of patients through the system. Usual hospital routine will be altered to accommodate care for high numbers of patients. Departmental roles will be changed. Physical therapy and other departments may close down usual operations and become the minor treatment area for the nonurgent patients. The concept of "reverse triage," or sending relatively stable patients home, can be used to free up beds. Reports from actual disaster events have shown that inpatients discharged a day earlier than planned showed no adverse outcomes.

A medical command provider will focus on determining the number, acuity, and medical needs of the casualties arriving from the scene of the disaster. This person will organize the emergency health care team response to the injured or ill patients. Specialists trained for the particular type of disaster will be called in to help as the need is foreseen. Decisions will be made about who is to be evacuated to a facility with specialty care not available at the sending facility.

A triage officer, usually a provider, with the assistance of triage nurses, will rapidly evaluate each patient at the hospital and send the patient to the appropriate area for immediate or eventual treatment. The emergency department supervisor or charge nurse collaborates with the medical command provider and triage officer to organize nursing and ancillary personnel to meet patient needs. The disaster call list will be activated to call in off-duty staff as needed. In addition to these personnel, there will be a supply officer, communications officer, infection control officer, and public information officer. The public information officer will manage the media. Hospital staff, at all levels, will be called on to assist with whatever care is needed. Long-term care facilities may need to evacuate residents, or they may need to take in people from other facilities or the community.

Crisis standards of care (CSC) were developed by the IOM at the request of the U.S. Department of Health and Human Services. The publication outlines preparation for a crisis surge response and decision-making guidelines for delivering the best possible medical care to patients when there are not enough resources to provide the level of care normally given (IOM, 2012).

Triage

After a disaster, prehospital care of victims is prioritized according to a **triage** system that is different from regular emergency department triage (Table 43-1). Those with life-threatening conditions and a good chance of survival are cared for first. When there are more victims of a disaster than medical personnel to treat them, those who are likely to survive are treated first; these patients are given red, yellow, or green tags (some classification systems may also include a white tag). The mortally wounded and those who are not expected to survive are attended later,

and these patients are issued a black tag (Figure 43-2). The choice of issuing tags is difficult for most nurses, but in a disaster, the good of many must prevail over benefit to the few.

Table 43-1
Disaster Triage System

Classification	Triage Tag	Typical Conditions	Treatment
Class I: Emergent	Red tag	Immediate threat to life, such as airway compromise or hemorrhagic shock	Immediate
Class II: Urgent	Yellow tag	Major injuries, open fractures, large wounds	Within 30 min to 2 hr
Class III: Nonurgent	Green tag	"Walking wounded" (closed fractures, sprains, strains, contusions)	Wait for more than 2 hr
Class IV: Minor	White tag	Minor injuries not requiring provider care (abrasion, bruises)	Dismiss
Class V: Dead or expected to die	Black tag	Dead, or imminently dying with little chance of survival	None

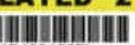
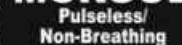
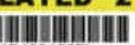
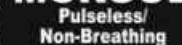
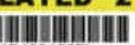
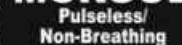
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FIGURE 43-2 Example of triage tags. (Courtesy Disaster Management Systems, Inc., Pomona, Calif.)

Even though triage may have been done in the field, triage is performed again at the emergency care facility. Green-tagged patients usually comprise the greatest number in large-scale disasters. Patients need to be managed until they are able to be treated. If not managed, patients can become a health hazard by walking around with infection, radioactivity, or chemical contamination. A special bracelet with a disaster number may be applied to tagged patients.

Nursing Roles and Responsibilities During Disaster

Your nursing skills will be called into play under disaster conditions; for example, you could be asked to:

- Perform emergency nursing measures

- Evaluate the environmental and physical risks and shortages (e.g., no electrical power)
- Know measures for prevention and control of environmental health hazards (e.g., hand hygiene and food and water safety)

There are many variables to be managed in a disaster setting. Preparation and training are key to effective treatment of large volumes of patients. You are held accountable to practice within the scope of practice of your licensure and training when in your work setting. You may be called on to provide care that you have not performed since your initial training but is within your scope of practice. Nurses should ask for help when needed and focus on delivering the best possible care. The Uniform Emergency Volunteer Health Practitioner Act (UEVHPA) provides immunity from lawsuits when nurse volunteers are providing care within the scope of practice of the state of licensure.

During emergency care, you will perform needed procedures such as inserting catheters, nasogastric tubes, and possibly intravenous (IV) lines and drawing blood. Basic principles of nursing apply in a disaster, but adaptation to “crisis standards” is necessary if there is a disparity between need and availability of equipment, supplies, or personnel. Performing nursing procedures in a disaster situation demands skill and judgment to provide for the good of the greatest number of people. You may be asked to help cook, serve food, pass out water, or do whatever else is a priority need at the time. Observing, recording, and reporting information about patients to appropriate authorities must be done in an organized manner. General physical and mental conditions of patients and signs and symptoms that may indicate change in condition must be quickly identified. During a disaster, preventing the spread of infection is a primary nursing concern. **Table 43-2** identifies the communicable diseases that can become epidemic after a disaster. Infection control is a top priority when large groups of people are together in a shelter, because the incidence of communicable disease is much greater. Although the National Patient Safety Goal is intended for the prevention of health care–related infections under normal circumstances, hand hygiene has an even greater potential as a basic infection control measure to protect large groups of people who may gather together after a disaster.

Table 43-2
Communicable Diseases With Epidemic Potential (All Except Tetanus) in Natural Disasters

Disease	Transmission	Agent	Clinical Features	Incubation Period	Diagnosis	Treatment	Prevention/Control
Waterborne							
Cholera	Fecal/oral, contaminated water or food	<i>Vibrio cholerae</i> serogroups O1 or O139	Profuse watery diarrhea, vomiting	2 hr-5 days	Direct microscopic observation of <i>V. cholerae</i> in stool	Intensive rehydration therapy; antimicrobials based on sensitivity testing	Hand hygiene, proper handling of water/food and sewage disposal
Leptospirosis	Fecal/oral, contaminated water	Leptospira species	Sudden-onset fever, headache, chills, vomiting, severe myalgia	2-28 days	<i>Leptospira</i> -specific IgM serologic assay	Penicillin, amoxicillin, doxycycline, erythromycin, cephalosporins	Avoid entering contaminated water; safe water source
Hepatitis	Fecal/oral, contaminated water or food	Hepatitis A and E viruses	Jaundice, abdominal pain, nausea, diarrhea, fever, fatigue, and loss of appetite	15-50 days	Serologic assay detecting anti-HAV or anti-HEV IgM antibodies	Supportive care; hospitalization and barrier nursing for severe cases; close monitoring of pregnant women	Hand hygiene, proper handling of water/food and sewage disposal; hepatitis A vaccine
Bacillary dysentery	Fecal/oral, contaminated water or food	<i>Shigella dysenteriae</i> type 1	Malaise, fever, vomiting, blood and mucus in stool	12-96 hr	Suspect if bloody diarrhea; confirmation requires isolation of organism from stool	Antibiotic treatment is usually not necessary. If treated, fluoroquinolones, ceftriaxone; hospitalization of seriously ill or malnourished; rehydration	Hand hygiene, proper handling of water/food and sewage disposal
Typhoid fever	Fecal/oral, contaminated water or food	<i>Salmonella typhi</i>	Sustained fever, headache, constipation	1-3 days	Culture from blood, bone marrow, bowel fluids; rapid antibody tests	Fluoroquinolones, ceftriaxone, ciprofloxacin	Hand hygiene, proper handling of water/food and sewage disposal; mass vaccination in some settings
Acute Respiratory							
Pneumonia	Person to person by airborne respiratory droplets	<i>Streptococcus pneumoniae</i> , <i>Haemophilus influenzae</i> , or viral	Cough, difficulty breathing, rapid breathing	1-3 days	Clinical presentation; culture respiratory secretions	Treatment is pathogen driven. Macrolides for outpatient. Beta-lactam for inpatients. Combination therapy is most common	Isolation; proper nutrition; if cause is <i>Streptococcus</i> , polyvalent vaccine to high-risk populations
Direct Contact							
Measles	Person to person by airborne respiratory droplets	Measles virus (Morbillivirus)	Rash, high fever, cough, runny nose, red and watery eyes; serious post-measles complications (5%-10% of cases)—diarrhea, pneumonia, croup	7-21 days	Throat or nasopharyngeal swab. Tested for measles-specific IgM antibody and measles RNA	Supportive care; proper nutrition and hydration; vitamin A; control fever; antimicrobials in complicated cases with pneumonia, dysentery; treat conjunctivitis, keratitis	Rapid mass vaccination within 72 hr of initial case report (priority to high-risk groups if limited supply); vitamin A in children 6 mo-5 yr of age to prevent complications and reduce mortality risk)
Bacterial meningitis (meningococcal meningitis)	Person to person by airborne respiratory droplets	<i>Neisseria meningitidis</i> serogroups A, C, W135	Sudden-onset fever, rash, neck stiffness; altered consciousness; bulging fontanel in patients younger than 1 year	10-12 days	Examination of CSF—elevated WBC count, protein; gram-negative diplococci	Penicillin, chloramphenicol, ampicillin, ceftriaxone, cefotaxime, co-trimoxazole; supportive therapy; diazepam for seizures	Rapid mass vaccination
Wound-Related							
Tetanus	Soil	<i>Clostridium tetani</i>	Difficulty swallowing, lockjaw, muscle rigidity, spasms	2-10 days	Entirely clinical	Tetanus immune globulin	Thorough wound cleansing, tetanus vaccine
Vector-Borne							
Malaria	Mosquito	<i>Plasmodium</i>	Fever, chills, sweats, head and	7-30 days	Parasites on	Chloroquine phosphate,	Mosquito control; insecticide-treated

	(Anopheles species)	<i>falciparum</i> , <i>P. vivax</i>	body aches, nausea and vomiting		blood smear observed using a microscope; rapid diagnostic assays if available	hydroxychlorquine,	nets, bedding, clothing
Dengue fever	Mosquito (<i>Aedes aegypti</i>)	Dengue virus-1, -2, -3, -4 (Flavivirus)	Sudden-onset severe flulike illness, high fever, severe headache, pain behind the eyes, and rash. Severe cases can become hemorrhagic.	4-7 days	Serum antibody testing with ELISA or rapid dot-blot technique	Intensive supportive therapy	Mosquito control; insecticide-treated nets, bedding, clothing
Japanese encephalitis	Mosquito (<i>Culex</i> species)	Japanese encephalitis virus (Flavivirus)	Quick-onset, headache, high fever, neck stiffness, stupor, disorientation, tremors	5-15 days	Serologic assay for JE virus IgM-specific antibodies in CSF or blood (acute phase)	Intensive supportive therapy	Mosquito control, isolation of cases, mass vaccination
Yellow fever	Mosquito (<i>Aedes</i> , <i>Haemagogus</i>)	Yellow fever virus (Flavivirus)	Fever, backache, headache, nausea, vomiting; toxic phase – jaundice, abdominal pain, kidney failure	3-6 days	Serologic assay for yellow fever virus antibodies	Intensive supportive therapy	Mosquito control, isolation of cases, mass vaccination

CSF, Cerebrospinal fluid; ELISA, enzyme-linked immunosorbent assay; HAV, hepatitis A virus; HEV, hepatoencephalomyelitis virus; IgM, immunoglobulin M; JE, Japanese encephalitis; WBC, white blood cell.

From Waring SC, Brown BJ: The threat of communicable diseases following natural disaster: A public health response. *Disaster Management and Response* 3(2), 44-45, 2005 with permission from the Emergency Nurses Association. All information verified to be current via CDC website 2015.

The emotional and physical comfort and safety of large numbers of disaster victims must be attended to with limited supplies, equipment, utilities, and personnel. You must understand the emotional stress caused by fear, problems of displacement and separation of families, personal and material losses, crowded living conditions, increasing anxiety, and continuing danger. Nurses will need to help people of different cultural backgrounds and religious beliefs accept and adapt to temporary living conditions in crowded and often adverse situations (Danna and Bennett, 2013). People should be encouraged to verbalize their concerns and fears. **In a disaster situation, the nurse should provide basic instructions about appropriate self-care within the current environment and encourage people to provide for their own needs. The prepared nurse will:**

- Be prepared for self-survival (i.e., stock your own household with emergency supplies)
- Know the disaster plan for your workplace and identify your duties accordingly
- Know the meaning of warning signals of disaster and the action to be taken
- Know measures for protection against radioactive, chemical, or biologic contamination
- Know the community disaster plans and community health resources
- Know and interpret community resources for citizen preparedness, such as first aid and medical self-help courses

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Think Critically

You have just started your new nursing job. During your orientation and preceptorship you do not receive any training about the hospital's disaster plan or what your role would be as a staff nurse. What should you do?

Community Preparedness

Whether the disaster is natural or man-made, it will involve physical injuries, loss of property, and interruption of the normal activities of daily living. People often will need food, water, clothing, shelter, medical and nursing or hospital care, and other basic necessities of life.

Preparedness by health care professionals involves both personal and employment-related responsibilities. Disaster supplies, with all the recommended items, should be prepared by every household.

Every family should have a contact person out of the geographic area where extended family members can call to receive information about the welfare of their relatives. Communication into and out of the disaster region is often cut off. Each member of a family living together should know whom they are to call if separated from one another. Even if telephone communication is functional, the service is usually overwhelmed with activity. Texting or social media uses a different bandwidth and may be a more successful mode of communication.

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Think Critically

If a disaster occurred in your community and you were not injured, where would you call, or go, to see how you could help?

Health Promotion

Community members should be encouraged to prepare for a disaster. Preparations should include a minimum of 3 days' supplies. At a minimum, have the basic supplies listed here. Keep supplies in a kit that you can use at home or take with you in case you must evacuate.

- Water in plastic containers (1 gallon per person per day). Change the supply every 6 months.
- Nonperishable food that requires no refrigeration, preparation, or cooking and little water. Disposable dishes and eating utensils, or camping or military "mess kit" and manual can opener, are ideal.
- Flashlight
- Battery-operated or hand-crank radio (National Oceanic and Atmospheric Administration [NOAA] Weather Radio, if possible)
- Extra batteries
- First aid kit containing an assortment of bandages, scissors, tweezers, gloves, antiseptic, antibiotic ointment, thermometer, and moistened towelettes
- Supply of essential prescription medications and nonprescription drugs: pain relievers, antacids, vitamins, laxatives, anti-inflammatory agents
- Sanitation and personal hygiene items (e.g., hand sanitizer, soap, disinfectant wipes)
- Extra set of clothing
- Copies of personal documents (medication list and pertinent medical information, proof of address, deed/lease to home, passport(s), birth certificate(s), insurance policies, copies of insurance cards and official identification)
- Cell phone with chargers
- Family and emergency contact information
- Extra cash or traveler's checks
- Emergency blanket
- Map(s) of the area

Add to the kit any items specific to the types of disaster common to your geographic area. Also include any items specific to individual family members such as infants or people with special needs.

A 3- to 6-week supply of food and water is recommended. In a disaster situation, it may take several days for rescuers to arrive. Food items should be used and replaced every 6 months to maintain freshness.

Data from American Red Cross. *Be Red Cross Ready*. Retrieved from <http://www.redcross.org/prepare/location/home-family/get-kit>.

Most people know about these recommendations, but few are truly prepared. According to an annual report by the Federal Emergency Management Agency (FEMA), preparedness has improved in the time since the September 11, 2001, terrorist attacks. There is still much more to be put in place on federal and state levels. Natural disasters including tornados, flooding, wildfires, hurricanes, and earthquakes are frequent and seasonal in some areas. Knowing that such events are likely means preparation is prudent and responsible. In addition to the standard disaster supplies, items specific to the event may be needed. The CDC website at www.emergency.cdc.gov gives instructions on how to prepare, what to do if the event occurs, and what resources are available. All nurses must encourage people in the community to prepare.

The local law enforcement agency, the city or county emergency management department, and the state public health department are responsible for coordinating efforts to assist people when a disaster happens. The American Red Cross may disperse personnel and supplies to assist with essential needs and medical care. If the state requests assistance, Homeland Security determines whether FEMA is to be called. If so, FEMA brings personnel and aid to the area. If a disaster is of major proportions, a Disaster Medical Assistance Team (DMAT) may be activated at the state or federal level. These units bring medical, paraprofessional, and support personnel along with medical equipment and supplies to sustain an operation for a minimum of 72 hours. The team provides **triage** (sorting out of casualties by priority of need for treatment), evacuation, primary health care, and assistance to local health care facilities that are overwhelmed. The emergency management team sets up a communications system, and the emergency medical services (EMS) personnel at the scene notify the emergency departments at the hospitals of the situation. Essential personnel are notified of a disaster or **mass casualty** (many-victims incident). If electronic communication systems are functional, alert messages are sent via telephone, computer, pagers, and other devices. In the event of communication failure amateur radio operators can provide essential communication services.

Community residents are instructed about what to do in the event that an earthquake, wildfire, hurricane, tornado, or flood occurs in their area.

Safety Alert

Fire

In the event of a fire, if told to evacuate, leave quickly. If at home and the smoke detector goes off, do not wait to dress or gather belongings—get out of the dwelling. If fire or smoke is evident, drop to the floor and crawl to the exit. Cover your mouth and nose with a moistened cloth if smoke is present. Feel any door before opening it. If it is hot, find another way out. If clothes catch on fire, drop to the ground and roll to suffocate the fire. Keep rolling until flames are out.

Safety Alert

Tornado, Hurricane, and Flood

Choose ahead of time where you could go if evacuation is necessary. Evacuate when you are told to do so. Listen to a NOAA Weather Radio or local radio or television stations for evacuation instructions. Keep road maps handy, because you may have to take unfamiliar routes and your electronic devices may not be functional. Bring the following with you:

- Prescription medications and medical supplies, glasses, hearing aid, and other assistive devices
- Bedding and clothing, including sleeping bags and pillows
- Bottled water, battery-operated radio and extra batteries, first aid kit, and flashlight
- Documents, such as driver's license, Social Security card, proof of residence, insurance policies, wills, deeds, birth and marriage certificates, and tax records, if they are readily available within the home

If advised to evacuate the area, residents should gather essential belongings, medications, pets, and keepsakes and leave immediately. If tornado sirens are sounded, people should take refuge in a basement or in an inner room without windows, such as a closet or a bathroom, to avoid flying debris. Getting into the bathtub and covering oneself with cushions or a mattress can also protect a person from flying debris. If outside, it is best to lie in a culvert or ditch below ground level.

Think Critically

Consider your current level of nursing knowledge and your personal circumstance at home to

include your family, pets, and any preparations that you have (or have not!) made for a disaster event. What would be your reaction if your instructor called you and asked you to help because of a local environmental disaster?

Psychological Responses to Disaster

Any intense event results in an emotional response. Natural disasters or massive injuries from a man-made event have both physical and emotional effects. The phrase “they are in shock” is used to explain the emotional state of the victims after one of these events. Although emotions can trigger physical signs and symptoms, the condition is usually not life threatening unless the individual affected has a preexisting condition that puts her at risk.

Signs and symptoms of emotional shock include headaches, nausea, and chest pain. Preexisting medical conditions may worsen because of the stress. Remaining calm and seeing to immediate physical needs can reassure the patient that someone is in charge that has control over the situation. Severe emotional trauma, such as post-traumatic stress disorder, may take years of therapy to process.

After a major disaster, psychological events occur in stages. The stages are not always linear, and people progress through them at different rates ([CDC, 2012](#)):

- *Impact stage.* Survivors are stunned, apathetic, and disorganized. For several hours after the initial event, they may have difficulty following directions and will need strong support and firm guidance.
- *Heroic stage.* Individuals want to be helpful, and may minimize or ignore their own injuries and demonstrate rescue behavior that is risky to self.
- *Honeymoon stage.* Survivors are grateful that they are still alive. There is a strong sense of brotherhood and community spirit.
- *Disillusionment stage.* Reality of loss occurs. Ongoing physical and emotional fatigue can result in substance abuse and discouragement. Survivors feel abandoned and ignored by the larger community because of the gap between resources and need.
- *Reconstruction stage.* This stage may continue for years as people rebuild lives and even begin to see the crisis, in retrospect, as a growth and opportunity period.

Individuals in communities that are affected by a disaster will need time to cope with events. Ineffective coping requires follow up. Signs and symptoms that should prompt a mental health referral are severe anxiety, suicidal thoughts, inability to care for self, abuse of alcohol or drugs, depression, or domestic violence.

Think Critically

Are you and your family prepared for a disaster? Do you have a disaster kit on hand? If you have children, do you have measures in place for their care by others if you are unable to reach them? Is there an out-of-state contact person for family to call and inform of their status?

Care of Special Populations

Ideally, there should be a community database that includes the needs of vulnerable groups (older adults, disabled, and immunocompromised persons) that require special assistance, because a delay can result in death. Loss of electrical power is a serious issue for those who require oxygen or other life-sustaining mechanical equipment. Patients requiring hemodialysis may need to be temporarily relocated to areas with intact power and water resources. Older adults may be without their prescriptions for chronic or other serious health conditions. Eyeglasses or hearing aids may be lost, and many older adults cannot see or hear well without these aids. Developmental concerns should be considered; for example, infants need diapers, bottles, formula or powdered milk. Infants are especially vulnerable to diarrhea and dehydration related to contaminated water sources.

Individuals with disabilities may need a means of mobility if they are separated from their belongings. They may need assistance with bathing, eating, and general activities of daily living. Immunocompromised people need special attention and care to prevent infection when in large crowds.

Water and Food Safety

Disruption or contamination of the water supply is probable when a disaster occurs. Floodwater or storm water should not be used to wash dishes, brush teeth, wash and prepare food, wash hands, make ice, or make baby formula. People will need to be taught how to purify water.

Health Promotion

Preparing Safe Water

When the normal water supply is disrupted, water may be purified by:

- Bringing it to a rolling boil for 3 to 5 minutes. Let the water cool before drinking.
- Adding household liquid bleach containing 5.25% sodium hypochlorite. Add 16 drops of bleach to a gallon of water and let stand for 30 minutes.
- Distilling the water. To distill, fill a large pot halfway with water. Tie a cup securely to the handle on the pot's lid so that the cup will hang right side up when the lid is upside down. Set the lid upside down on the top of the pot so that the cup hangs down into the pot below the lid (the cup should not dangle in the water). Boil the water for 20 minutes. The water that drips from the lid into the cup is distilled. This method frees water of microbes that may remain after bleach treatment.

Data from United States Environmental Protection Agency (EPA): Ground water and drinking water. Retrieved from <http://safewater.supportportal.com/ics/support/default.asp?deptID=23015>; American Red Cross: Be Red Cross ready—Get a kit. Make a plan. Be informed (Brochure), Washington, DC, 2009; Federal Emergency Management Agency (FEMA) and American Red Cross: Food and water in an emergency (Brochure), Jessup, MD, 2006.

Healthy People 2020 objectives include improved food and water safety; during a disaster, special attention is required to safeguard food and water supplies. If there is a power outage, and people can stay in their homes, they will need to know how to keep their food supply safe to eat ([CDC, 2014](#)) ([Box 43-1](#)).

Box 43-1

Keeping Food Safe to Eat

Perishable foods should not be kept warmer than 40° F (4.4° C) for more than 2 hours. A closed refrigerator will ordinarily keep food chilled to below 40° F for 2 to 4 hours during a power outage. It is wise to have a quick-response digital thermometer on hand. If a power outage occurs, do the following:

- Keep the refrigerator and freezer doors closed. A freezer that is half full will keep food safe for up to 24 hours; a full freezer will keep food safe for 48 hours.
- If it appears that the outage will be for more than 2 to 4 hours, pack refrigerated milk, dairy products, mayonnaise, meats, fish, poultry, eggs, gravy, stuffing, and leftovers into coolers and surround them with ice.
- When uncertain as to how long the power has been out, check the internal temperature of foods in your refrigerator with the quick-response thermometer. If the internal temperature is higher than 40° F, throw the food away.
- Throw away food that may have come into contact with flood or storm water.
- Throw away food that has an unusual odor, color, or texture.
- Food containers with screw-on caps, snap-on lids, crimped caps (beer bottles), twist-off caps, and snap-open caps, as well as home-canned foods, should be discarded if they have come into contact with floodwater, because they cannot be disinfected.

- If cans have come into contact with floodwater or storm water, remove the labels and wash them with hot soapy water or dip them in a solution of 1 cup of bleach in 5 gallons of clean water. Relabel the cans with a marker.

Data from American Red Cross: Food safety guidelines. Retrieved from <http://www.redcross.org/prepare/disaster/food-safety>; and CDC: Keep food and water safe after a disaster or emergency. Retrieved from <http://emergency.cdc.gov/disasters/foodwater/facts.asp>.

Nursing Management in the Reconstruction Stage

Working toward restoring community and family life after the disaster—according to available resources—involves the nurse and other members of the health care team. Individual self-help and work therapy are encouraged, as are activities of daily living, with adaptations designed to attain and maintain a clean and healthy environment. Existing community facilities and resources must be used as much as possible for continued patient care.

You can promote the effectiveness of the health service agency in disaster preparedness by knowing and helping implement the agency's disaster plan. You should understand the relationship among the plans of health agencies, local government, and community agencies. Trying to maintain and restore community health by controlling environmental health hazards is an important responsibility for every nurse.

Preparing for Chemical, Nuclear, or Biologic Disasters

Chemical Disaster

A chemical emergency can occur from a transportation accident or an explosion at a chemical plant. Chemical agents such as the Sarin gas used in the Tokyo subway attack and more recently in Syria can also be used by terrorists. Awareness of a chemical attack or accident is difficult because most chemical agents vaporize quickly from their liquid form. A lesson learned during the Sarin attack is that chemical agents are difficult to identify, and front-line staff are not always informed.

Many chemical agents give off no odor or have a familiar odor such as that of newly mown grass, peach kernels, or almonds. Indications that a chemical attack has occurred might include ([National Terror Alert, 2014](#)):

- Foglike or low-lying cloud suddenly appearing in the atmosphere
- Many dead birds, domestic animals, or insects within a particular area
- Many dead, dying, or sick people in an area or downwind from a suspicious cloud or fog
- An atypical, unexplained odor for the location

Chemical agents ([Table 43-3](#)) that might be used in a terrorist attack include pulmonary/choking agents, blood agents, vesicant (blistering) agents, and nerve agents ([Jagminas, 2015](#)). These agents may be delivered through aerosol sprays, in explosive devices, or through food or water, depending on the action of the substance. Chemical agents may be dispersed as a terror action rather than with the intent of mass destruction ([Shea, 2013](#)).

Table 43-3
Chemical Agent Symptoms and Care

Clinical Presentation	Decontamination Procedures	Treatment
Vesicant Agents (e.g., Phosgene, Mustard, Lewisite)		
<i>Ocular:</i> Eyelid swelling and inflammation, severe pain, conjunctivitis, and keratitis. <i>Dermal:</i> Pain, erythema, blisters, and burning followed by necrosis. <i>Respiratory:</i> Immediate upper airway irritation; burning of mucous membranes, laryngitis, shortness of breath, productive cough; inhalation and systemic absorption may cause pulmonary edema and death. <i>Gastrointestinal:</i> Nausea and vomiting, diarrhea, and abdominal pain. <i>Cardiovascular:</i> High-dose of lewisite exposure may cause capillary permeability and subsequent intravascular fluid loss, hypovolemia, and organ congestion. <i>Renal:</i> High levels of lewisite may cause renal failure caused by hypotension. <i>Hepatic:</i> High levels of lewisite may cause hepatic necrosis and hypoperfusion.	Decontamination for eyes must begin immediately by flushing eyes with water 5-10 min and washing skin to minimize tissue damage. Decontaminate before bringing into health care facility. Negative-pressure room if available. All clothing is removed and skin washed with soap and water. If showers are available, showering with water alone is adequate. Place contaminated clothing and personal belongings in biohazard bag. Contain decontamination runoff. Patients whose clothing or skin is contaminated can contaminate health care providers by direct contact or through off-gassing vapor.	<i>For phosgene:</i> Restrict fluids. Obtain chest radiographs and blood gases. Oxygen/PEEP. <i>For mustard:</i> Possible tracheostomy. Establish IV: Do not push fluids as with thermal burns. Drain vesicles and large blisters and irrigate with topical antibiotics. Antibiotic eye ointment. Morphine as needed (PRN). <i>For lewisite:</i> Treat affected skin with British anti-lewisite (BAL) ointment, if available. Treat affected eyes with BAL ointment, if available. Treat pulmonary symptoms. BAL deep IM; repeat q4h × 3. Morphine PRN. Severe poisoning: shorten interval for BAL injections to q2h.
Nerve Agents (e.g., Sarin)		
<i>Respiratory:</i> Bronchial constriction and spasm; severe respiratory distress or apnea; miosis; rhinorrhea. <i>Gastrointestinal:</i> Do not induce emesis.	Decontaminate before bringing into health care facility. Negative-pressure room. Contain decontamination runoff. Patients whose clothing or skin is contaminated with liquid or solid nerve agents can contaminate health care providers by direct contact or through off-gassing vapor. If exposed to liquid nerve agent, irrigate eyes 5-10 min with water or saline within minutes of exposure to limit injury. If exposed to liquid nerve agent, cut and remove all clothing and wash skin immediately with soap and water. If shower is not available, wash with 0.5% bleach solution. If exposed to vapor only, remove outer clothing and wash exposed skin with soap and water or 0.5% bleach solution. Place contaminated clothing and personal belongings in biohazard bags.	<i>Nerve agent protocol:</i> Intubate and ventilate as needed. Atropine. Pralidoxime chloride (2-PAM C1). Diazepam for seizures. Reevaluate q3-5m for worsening.
Blood Agents (e.g., Cyanide)		
<i>Dermal:</i> Possible cherry red color to skin. <i>Respiratory:</i> Respiratory distress from cellular hypoxia, tachypnea, dyspnea, bradypnea, apnea.	Decontaminate before bringing into health care facility. Negative-pressure room. Contain decontamination runoff.	<i>For cyanide:</i> Administer antidotes: cyanide poisoning antidote kits containing amyl nitrite perles and infusion, sodium thiosulfate, and hydroxocobalamin are available.
<i>Cardiovascular:</i> Dysrhythmias caused by acidosis. <i>Neurologic:</i> Syncope, seizures, lethargy, confusion, coma.	Patients whose clothing or skin is contaminated with cyanide can contaminate health care providers by direct contact or through off-gassing vapor. Patients exposed only to vapor require no decontamination. Prevent dermal contact with gastric contents that may contain ingested cyanide-containing materials. Remove contaminated clothing and wash with soap and water.	Amyl nitrite, sodium nitrite, sodium thiosulfate. Hydroxocobalamin. Sodium bicarbonate for acidosis.
Pulmonary/Choking Agents (e.g., Chlorine)		
Acute exposure to gas can cause immediate coughing, eye and nose irritation, tearing.	Health care providers are at minimal risk of secondary contamination from patients who have been exposed to	<i>For chlorine:</i> Dyspnea.

<i>Dermal:</i> Skin irritation, burning pain, inflammation, and blisters. Treat as thermal burns. Liquefied, compressed chlorine can cause frostbite. Treat by rewarming affected areas in a water bath of 102°–108° F (38.8°–42.2° C) for 20–30 min. Continue until flushing has returned to affected area. <i>Ocular:</i> Do not irrigate frostbitten eyes; if exposed to vapor, irrigate for at least 15 min; check for corneal damage. <i>Respiratory:</i> Airway constriction, pulmonary edema, and hemoptysis may occur.	chlorine gas. Remove contaminated clothing and wash with soap and water. Flush exposed skin and hair with plain water for 2-3 min; then wash twice with soap and water. Clothing or skin soaked with industrial-strength bleach or similar solutions may be corrosive to personnel and may release chlorine gas.	Oxygen by mask. Chest radiograph. Bronchodilators. Give supportive therapy and treat other problems.
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IM, Intramuscular; *IV*, intravenous; *PEEP*, positive end-expiratory pressure.

The public should be informed of what to do in the event of a chemical disaster.

Safety Alert

Chemical Disaster

When a chemical disaster has occurred in your neighborhood, you should do the following (unless you are told to evacuate immediately):

- Close all windows and doors to the dwelling.
- Turn off all fans, heaters, and air conditioning systems.
- Close the fireplace damper.
- Wet some towels and jam them in the cracks under the doors. Use plastic garbage bags or plastic sheeting and duct tape to cover doors, windows and skylights, electrical outlets, exhaust fans or vents, window air conditioners, and heat registers.
- Go to an above-ground room with the fewest windows and doors.
- Take your emergency kit and a portable radio with you.
- Stay inside until you are told all is safe or you are asked to evacuate.

Chemicals are dispersed as a gas or liquid or are aerosolized and may contaminate skin, clothing, and any object they touch. The vapor from a liquid or solid toxic chemical also is harmful. Those exposed to toxic chemicals should be decontaminated in the field before transport to a medical facility. Decontamination is usually done with running water and scrubbing. Most emergency departments have an isolated decontamination area in which the water from the shower area goes into a special holding tank. If multiple victims need decontamination, a portable tent may be placed outside of the facility ([Figure 43-3](#)).



FIGURE 43-3 Inflatable decontamination shower for ambulatory victims. (Courtesy PeaceHealth Southwest Medical Center.)

The Tokyo Sarin attack highlights the importance of decontamination to protect staff and preserve the hospital environment: 110 staff members developed signs and symptoms of Sarin exposure as well as 10% of the ambulance staff (Byers, 2014). Chemical warfare agents can produce immediate respiratory distress if inhaled; therefore respirator masks are essential. First responders must use personal protective gear and have training to respond to chemical emergencies. Recognition that a chemical attack has occurred is the first step in adequate protection for the patient, the first responders, and the emergency department personnel.

Patient Teaching

Removal and Disposal of Contaminated Clothing

If you are in an area where a chemical spill has occurred and the liquid or solid comes into contact with your clothing, you will need to (1) remove and bag contaminated clothing and (2) decontaminate your skin. Chemicals will penetrate the clothing and contaminate the skin. If the exposure to a chemical was by vapor (gas), you will only need to remove your clothing and the source of the toxic vapor. Up to 90% of the contaminant can be eliminated by removal of clothing (Emergency Medical Services Agency, 2012). Perform the following steps:

- Quickly take off clothing that has a chemical on it. Any clothing that has to be pulled over the head should be cut off instead of pulling it over the head.
- When helping others remove clothing, be careful not to touch any contaminated areas. Remove clothing as quickly as possible.
- As quickly as possible, wash any chemicals from your skin with large amounts of soap and water. If the eyes are burning, rinse with plain water for 10 to 15 minutes.
- If contact lenses are worn, remove them and place with the contaminated clothing.
- After washing yourself, carefully place all contaminated clothing and contact lenses into a plastic bag. Avoid touching contaminated areas; use tongs, a stick, or a tool to place the clothing in the bag. Place the implement within the bag as well when finished using it.
- Thoroughly wash eyeglasses worn at time of chemical contamination before wearing again. Wash hands thoroughly again after cleaning glasses.

- Carefully seal the bag and place it within another plastic bag and seal the outer one.
- Dress in clothing that has not been contaminated (i.e., clothes that have been in the closet or dresser drawers).
- When health department or emergency personnel arrive, have them handle the bags and arrange for disposal.

Adapted from CDC: Chemical Agents: Facts about personal cleaning and disposal of contaminated clothing. Retrieved from <http://www.bt.cdc.gov/planning/personalcleaningfacts.asp>.

Depending on the chemical agent, there may be an antidote that can be used (see [Table 43-3](#)). Each hospital should have a set of protocols in place. Symptomatic supportive care is supplied with oxygen, IV fluids, and comfort measures.

Nuclear Disaster

A nuclear disaster may be the result of an accident at a nuclear power plant, a disruption of a nuclear power plant by terrorists, or a nuclear or “dirty bomb” (one containing radioactive substances). The amount of damage to each person depends on the type of radiation, the dose received, the length of time of exposure, and the route of the exposure. **Time, distance, and shielding are key to the quantity of radiation an individual will receive.** The shorter the time of exposure, the farther away from the radiation source, and whether or not the person was shielded by materials that are impermeable to radiation are details pertinent to radiation risk ([World Nuclear Association, 2015](#)) (see [Chapter 8](#)). Some types of radiation produce particles, and other types produce rays. Particles will adhere to airborne dust particles; may be inhaled; and will settle on clothes, crops, water supplies, and other surfaces.

Decontamination is done with showering and scrubbing the skin to remove particles. Radiation exposure to rays does not require decontamination, although rays can cause serious health effects or death, because they do internal damage to tissues. However, if the exposure is from a terrorist attack, it would not be immediately known if the exposure to radiation was in the form of particles or rays. Therefore everyone exposed, or suspected of being exposed, will need to be decontaminated. Personnel performing triage and decontamination must be protected from radioactive particulates and contaminated dust.

Usually, specially trained units supply personnel to handle decontamination. Minimal protective equipment includes protective gear for clothes and shoes (Tyvek suit), double gloves (one under clothing and taped to the skin, and one over the clothing cuffs), and a high-efficiency particulate air (HEPA) respirator mask with a full facepiece. If no such mask is available, a fit-tested N-95 respirator mask such as used for tuberculosis precautions is better than no mask. Radiation detection badges are worn underneath the protective clothing. After disposing of the protective gear in specially marked biohazard containers, each person will be assessed to make certain radiation contamination has been eliminated ([Radiation Emergency Medical Management, 2014](#)).

Exposure to high doses of radiation rays that penetrate the body even for a few minutes may result in acute radiation sickness syndrome. Three subsyndromes may occur, depending on the dose of radiation received: bone marrow syndrome, gastrointestinal syndrome, and cardiovascular/central nervous system syndrome. Bone marrow tissue is affected first; then with increased dosage, the gastrointestinal lining is affected. A person who receives a high enough dose of radiation to cause cardiovascular/central nervous system syndrome will experience effects on the bone marrow and gastrointestinal system as well. The effects of radiation are progressive as the dosage increases. Signs and symptoms may include nausea, vomiting, diarrhea, leukopenia, signs of bleeding or hemorrhage, lethargy, confusion, ataxia, convulsions, hair loss, and respiratory complications with fever and pneumonia ([Table 43-4](#)). Treatment of life-threatening injuries takes precedence over the radiologic damage ([Pae, 2015](#)).

Table 43-4
Acute Radiation Syndrome

Signs and Symptoms*	Time of Onset*	Duration	Treatment
Initial or Prodromal (Dose Dependent)			

Nausea, vomiting, diarrhea Progressive cognitive impairment at high doses	Minutes to days after exposure	May last for several days	Serial CBC (for lymphocyte count) obtained every 2-3 hr for 8-12 hr; then every 4-6 hr for 2-3 days. Record all symptoms and time of onset (vomiting is correlated with prognosis). Fluids and antiemetics. Chelating, blocking, excretion, or diluting agents.
Latent			
Feels and appears relatively healthy	Hours to weeks after prodromal phase	May last several weeks	Patient education about significance of latent stage, need for infection control, and possible progression to phase of manifest illness. Continue to monitor for symptoms and CBC.
"Manifest Illness" (Obvious Illness)			
Signs and symptoms of leukopenia purpura, hemorrhage Pneumonia Hair loss Diarrhea, fever, electrolyte disturbance Convulsions, ataxia, tremor, lethargy	Hours-weeks	Hours to months	Supportive and symptomatic treatment. Isolation for leukopenia as needed. Possible stem cell replacement.
Recovery or Death			
Death	Days to years Death may occur within 1-2 days at >3000 rads; death occurs 3 wk-6 mo at >200-600 rads	Recovery lasts from several weeks up to 2 years.	Educate those who recover about increased future risk for cancers and advise to have frequent health checkups.

*Progression through phases and symptoms depends on the dose and type of radiation received.

CBC, Complete blood count; rads, unit of absorbed radiation dose.

From Radiation Emergency Medical Management: <http://www.remm.nlm.gov/index.html>.

Once injuries are managed and decontamination is complete, nursing care is supportive, with strict infection control procedures in place. Maintaining an accurate record of the onset and duration of the clinical symptoms is essential for the provider to decide on treatment strategies. Record hair loss, inflamed mucosa, and locations of erythema hourly and, if possible, record skin symptoms with a camera. Serial blood counts will be performed. Nausea is treated with antiemetics. Blood problems may be treated with blood component transfusions.

When the radiation exposure is in the form of particulates that have entered the body, treatment depends on the type of radiologic substance. The four types of agents used to reduce the radiation damage by reducing exposure to the radiologic substance are chelating agents, isotope-specific blocking agents, excretion agents, and diluting agents.

Chelating agents bind with the radioactive material and allow it to be excreted without being absorbed into the tissues. Radioactive iodine exposure is treated with potassium iodide, an isotope-specific blocking agent, to prevent the thyroid cancer this type of radiation causes. Excretion agents are used when radioactive material has been ingested; these reduce the time the radiologic material is in the gastrointestinal tract. Diluting agents reduce the concentration of the radioactive material. Water is the best example of a diluting agent. Special precautions need to be used when administering a mobilizing or diluting agent, because the fluids produced could be radiologically contaminated ([Radiation Emergency Medical Management, 2013](#)).

Biologic Disaster

Bioterrorism involves the deliberate release of microorganisms or toxins derived from living organisms that cause disease or death to humans or to the animals or plants on which we depend for food. The CDC lists more than 40 pathogens that have potential as biologic weapons; however, anthrax, plague, smallpox, botulism, viral hemorrhagic fevers, and tularemia are category A because they pose a threat to national security ([CDC, n.d., Bioterrorism agents](#)). These organisms cause a high death rate and are easily transmitted. Public panic and fear is likely to accompany any breakout. The organisms are invisible to the naked eye and are easily transported without detection.

Recognizing a Bioterrorism Event

Many of the likely bioterrorism agents do not produce symptoms right away. Certain signs or events may present a warning that a bioterrorism attack has occurred. Some of the signs include ([Jagminas, 2015](#)):

- Large numbers of patients with similar symptoms of disease
- Higher than expected illness and death incidence with common disease
- Unusual disease presentation
- Large numbers of patients with unexplained symptoms, diseases, or deaths
- Disease typical to the area with a sudden unexplained increase in incidence
- Atypical incidence of disease in patients not usually affected
- Sudden death of many animals in the community

Biologic Agents

Biologic agents ([Table 43-5](#)) are divided into three groups ([CDC, 2013](#)):

- **Category A agents:** Easily disseminated, and some may be transmitted from person to person as well. These could cause mass casualties and require a well-organized and extensive health care system response for management.
- **Category B agents:** Delivered through water and food sources. These produce moderate amounts of illness and low death rates. Public health department action is needed for management. Examples are Q fever, brucellosis, glanders, ricin toxin, epsilon toxin of *Clostridium perfringens*, and *Staphylococcus aureus* enterotoxin B.
- **Category C:** Agents that have yet to be weaponized, but have the potential for high morbidity and mortality. These agents are plentiful and easy to produce and disseminate. Examples include *Hantavirus*, tick-borne encephalitis, yellow fever, and multidrug-resistant tuberculosis.

Table 43-5
Category A Agents of Bioterrorism

Pathogen and Description	Clinical Manifestations	Transmissibility	Treatment
Anthrax (<i>Bacillus anthracis</i>)			
Inhalational			
Bacterial spores multiply in the alveoli Toxins cause hemorrhage and destruction of lung tissue High mortality rate	Incubation period: 1-2 days to 6 wk Abrupt onset Dyspnea, diaphoresis, fever, cough, chest pain, septicemia, shock, meningitis, respiratory failure, widened mediastinum (seen on chest radiograph)	No person-to-person spread Found in nature and most commonly infects wild and domestic hoofed animals Spread through direct contact with bacteria and its spores Spores are dormant, encapsulated bacteria that become active when they enter a living host	Antibiotics prevent systemic manifestations Effective only if treated early Ciprofloxacin (Cipro) is the treatment of choice Penicillin Doxycycline Postexposure prophylaxis for 30 days (if vaccine not available) Vaccine has limited availability
Cutaneous			
95% of anthrax infections Least lethal form Toxins destroy surrounding tissue	Incubation period: up to 12 days Small papule resembles an insect bite Advances to a depressed, black ulcer Swollen lymph nodes in adjacent areas Edema	Spores enter skin through cuts or abrasions Handling of contaminated animal skin products	Oral doxycycline or quinolones are the antibiotics of choice
Gastrointestinal			
Intestinal lesions in ileum or cecum Acute inflammation of intestines	Nausea, vomiting, anorexia, hematemesis, diarrhea, abdominal pain, ascites, sepsis	Ingestion of contaminated, undercooked meat	Penicillin, doxycycline, or ciprofloxacin may be prescribed
Botulism (<i>Clostridium botulinum</i>)			
Spore-forming anaerobe Found in soil Seven different toxins Lethal bacterial neurotoxin	Incubation period: 12-72 hr Abdominal cramps, diarrhea, nausea, vomiting, cranial nerve palsies (diplopia, dysarthria, dysphonia, dysphagia), skeletal muscle paralysis, respiratory failure	Spread through air or food No person-to-person spread Improperly canned foods Contaminated water Contaminated wound	Antitoxin given immediately Mechanical ventilation Penicillin No vaccine available Toxin can be inactivated by heating food or drink to 185° F (85° C) for at least 5 min
Plague (<i>Yersinia pestis</i>)			
Bacteria found in rodents and fleas Forms: Bubonic (most common) Pneumonic Septicemic (most deadly)	Incubation period: 2-4 days Hemoptysis, cough, high fever, chills, myalgia, headache, respiratory failure, lymph node swelling	Direct person-to-person spread Transmitted through flea bites Ingestion of contaminated meat	Antibiotics only effective if administered immediately Drug of choice: streptomycin or gentamicin Vaccine under development Hospitalization Isolation for containment
Smallpox			
Variola Major and Minor Viruses			
United States ended routine vaccination in 1971 Global eradication declared in 1980	Incubation period: 7-17 days Sudden onset of symptoms Fever, headache, myalgia, malaise, back pain Lesions progress from macules to papules to pustular vesicles	Highly contagious Direct person-to-person spread Transmitted in airborne droplets Transmitted by handling contaminated materials (i.e., linens)	No known cure. Vaccinia immune globulin (VIG) is first line therapy Cidofovir (Vistide) may be used under an investigational drug protocol Isolation for containment Vaccine available for those exposed
Tularemia (<i>Francisella tularensis</i>)			
Bacterial infectious disease of animals Mortality rate about 35% without treatment	Incubation period: 3-10 days Sudden onset Fever, swollen lymph nodes, fatigue, sore throat, weight loss, pneumonia, pleural effusion, ulcerated sore from tick bite	No person-to-person spread Aerosol or intradermal route Spread by rabbits and ticks Contaminated food, air, water	Gentamicin treatment of choice Streptomycin, doxycycline, and ciprofloxacin are alternatives Vaccine in developmental stage
Hemorrhagic Fever			
Caused by several viruses, including Marburg, Lassa, Junin, and Ebola Ebola virus is life threatening	Fever, conjunctivitis, headache, malaise, prostration, hemorrhage of tissues and organs, nausea, vomiting, hypotension, organ failure	Carried by rodents and mosquitoes Direct person-to-person spread by body fluids Virus can be aerosolized	No intramuscular injections No antiplatelet drugs Isolation for containment Ribavirin (Virazole) effective in some cases No FDA approved treatment available

Adapted From Lewis SL, Heitkemper MM, Dirksen SR, et al: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.

Symptoms from exposure to a biologic agent are not immediate. There are various incubation periods. So, unless someone knows that she has been exposed to a strange powder or substance, decontamination does not take place. Nurses particularly need basic knowledge about the category A agents because they are easily disseminated and spread from person to person.

Anthrax.

Anthrax is a category A agent caused by the gram-positive bacteria *Bacillus anthracis*, which forms spores. It is primarily a disease of sheep and cows. Animal vaccination programs have controlled naturally occurring anthrax in the United States. There are three forms of the disease: cutaneous (95%), gastrointestinal (less than 1%), and inhalational (5%). Aerosolized inhalable anthrax is most likely to be used for a terrorist attack. The greatest chance of inhaling the spores after aerosolization is during the first day after the event, before the particles hit the ground. Symptoms in those who have inhaled the spores will resemble a nonspecific influenza at first. A rapid downhill progression is then seen with respiratory failure, shock, and possibly death over a 2- to 5-day period. Features that differentiate anthrax illness from flu are shortness of breath, a nonproductive cough, chest discomfort, myalgia, and fatigue. The lack of a sore throat and rhinorrhea and the appearance of nausea and vomiting are also flu symptoms. Treatment is with ciprofloxacin (Cipro) or doxycycline (Vibramycin) for 14 days. Antibiotics are adjusted after culture and sensitivity results are known. Treatment continues for 60 days if infection is confirmed, because the disease can continue to develop from germinating spores up to that time. Otherwise prophylaxis lasts for 10 to 14 days when cultures are completed and results obtained. Other care is supportive for respiration, fluid and electrolyte balance, and comfort. Extended precautions are not necessary, because anthrax is not transmissible from person to person. There is a vaccine, but no controlled trials have been completed, so its effectiveness is unknown ([Cunha, 2014](#)) (see Online Resources). From plasma of individuals that were immunized with the vaccine, a new immunoglobulin treatment has been FDA approved for inhaled anthrax. The medication is given intravenously. The antibodies present in the medication neutralize the toxins produced by the anthrax bacteria. This does not replace antibiotic therapy which should be continued ([FDA, 2015](#)).

Botulism.

Botulism is a category A agent caused by the botulinum toxins produced by *Clostridium botulinum*. There are six forms of botulism described by how they are obtained: food-borne, wound, injection-related, inhalational; and adult intestinal and infant botulism, which are acquired in a similar manner. Foods can become contaminated with botulism spores when canned or processed under conditions favorable for toxin production (e.g., insufficient heat). Botulism is not contagious, and the organism is destroyed by the addition of chlorine to water supplies or by boiling foods for 10 minutes ([CDC, 2014a](#)). Organisms are naturally present in the soil and can cause wound infection. Inhalational botulism does not occur naturally and would most likely indicate a terrorist attack.

Double vision, drooping eyelids, and difficulty swallowing and speaking may be the early symptoms of botulism. A triad of symptoms is classic for the disorder:

- Symmetrical descending flaccid paralysis progressing to respiratory weakness
- Absence of fever
- Alertness and orientation without sensory deficits

Respiratory support may require intubation and mechanical ventilation. If a large number of persons are infected, the community health care resources would be taxed to provide adequate care for all. Treatment is with botulinum antitoxin if the toxin type is A or B. The CDC and public health departments stock these antitoxins. Early treatment is required, because the antitoxin does not reverse the muscular paralysis that has already occurred. Supportive therapy may be needed for several weeks until new synapses can grow to replace those damaged by the toxins (see Online Resources).

Plague.

Plague is a category A agent caused by a gram-negative bacillus, *Yersinia pestis*. The bubonic form starts as a skin infection and spreads to the lymph nodes; it is naturally transmitted by infected fleas that bite rodents or people. Pneumonic plague is the most likely type to be spread by a terrorist attack with aerosolized plague organisms. Fortunately, plague bacilli are killed by sunlight and remain viable in aerosolized form for only about an hour after release. Clinical signs are an abrupt onset of pneumonia with bloody sputum (**hemoptysis**) that follows a rapidly progressive course. Disseminated intravascular coagulation (DIC) can develop and lead to multiorgan system failure. Death is likely within 24 hours of infection if treatment is not started.

Gentamicin (Garamycin) is the intravenous drug of choice for this organism. Streptomycin given intramuscularly is the first-line treatment. Ciprofloxacin and doxycycline are used to treat

pneumonic plague and are given for 7 to 10 days. If treated early, the infection is usually not fatal. Plague can be transmitted from person to person, and respiratory droplet precautions along with Standard Precautions are necessary until 48 hours after treatment has been initiated. Researchers are currently working on a vaccine ([Dufel, 2013](#)).

Smallpox.

Smallpox is caused by variola virus. It is communicable, has no known effective treatment, and has a high mortality rate. The disease was declared eradicated worldwide in 1980, but laboratory strains of the virus still exist. Because it is so lethal and highly contagious, it is listed as a category A agent.

Smallpox has an average incubation period of 12 to 14 days. Symptoms begin with fever for 1 to 4 days and then a rash occurs. High fever may be accompanied by headache, backache, malaise, vomiting, and delirium. The rash contains firm, deep-seated vesicles or pustules all in the same stage of development on any one area of the body ([Figure 43-4](#)). The rash starts on the buccal and pharyngeal mucosa; spreads to the face, hands, and forearms; and then spreads to the rest of the body over several days. A cough may develop. Lesions progress from macules to papules to vesicles to pustules to scabs, with each stage lasting 1 or 2 days. It must be differentiated from chickenpox. With chickenpox, the lesions appear before illness symptoms and are usually concentrated on the trunk. Chickenpox lesions are usually more superficial and are "flimsy," rather than firm, as in smallpox. Chickenpox lesions do not usually occur on the palms and the soles of the feet; smallpox lesions do occur in those areas ([Figure 43-5](#)). Chickenpox lesions are often in various stages within the same area of the body, whereas smallpox lesions are all in the same stage within a body area.



FIGURE 43-4 Face lesions on a boy with smallpox. (Courtesy CDC, Public Health Images Library.)



FIGURE 43-5 Comparison of smallpox and chickenpox lesions. **A**, Smallpox. **B**, Chickenpox. (Courtesy CDC, Public Health Images Library.)

Smallpox is communicable from the onset of rash until all scabs have separated from the skin. Patients should be treated with strict Airborne Infection Isolation and Contact Precautions and be placed in a negative-pressure room with a HEPA-filtered exhaust system. All linens should be placed in biohazard bags and autoclaved before being laundered or incinerated.

Although there is no treatment for smallpox, receiving the smallpox vaccine within 4 days of exposure can reduce the severity of the disease. The vaccine is not available in large amounts, and for that reason isolation and quarantine of infected patients will be the most likely course of action. Smallpox vaccine has significant possible side effects. If health care workers are to be vaccinated, they will receive all the necessary information about the vaccine and how to take care of the vaccination site. Medical management is supportive, with antimicrobial drug treatment for secondary infection of lesion sites, fluid and electrolyte replacement, and nutritional therapy. The first dose of smallpox vaccine lasts 3 to 5 years with decreasing immunity. Those who had multiple vaccinations may have longer-lasting immunity.

Think Critically

Can you explain to someone how to distinguish smallpox lesions from those of chickenpox?

Tularemia.

Tularemia is a category A agent caused by a gram-negative coccobacillus, *Francisella tularensis*. It is a

vector-borne illness that is transmitted by an infected tick, mosquito, or deer fly bite, by direct exposure to contaminated animal tissues and fluids, or by ingestion of contaminated food or water. A variety of small mammals are natural reservoirs of the organism. It is seen throughout the United States except in Hawaii. If aerosolized, it could be inhaled, and this is the most likely form for a terrorist attack. The disease is not spread by person-to-person contact.

Tularemia occurs in three different forms: cutaneous, pneumonic, and typhoidal. The pneumonic form is the one most likely to occur in a terrorist attack. The pneumonia caused by the inhaled form is difficult to differentiate from other pneumonias. Symptoms include abrupt onset of fever, chills, headache, muscle aches, nonproductive cough, and sore throat. Laboratory testing can establish the correct diagnosis.

Treatment or prophylaxis is with streptomycin and gentamicin, the drugs of first choice. Doxycycline and ciprofloxacin may also be used. The course of treatment should extend through 10 to 14 days depending on the drug used. Tularemia is fatal if not treated with the proper antibiotics. Standard Precautions are used, but the inhalational form is not transmitted by person-to-person contact, and no other extended precautions are necessary. A vaccine for protection from tularemia is under review by the U.S. Food and Drug Administration.

Viral hemorrhagic fevers.

The hemorrhagic fevers are a group of illnesses caused by four families of viruses: arenaviruses, filoviruses, flaviviruses, and bunyaviruses. The viruses, which are within the category A agents, cause Ebola, Marburg, and Lassa hemorrhagic fevers. Junin, Machupo, Guanarito, and Sabia hemorrhagic fevers are more common in the Southern Hemisphere. There are no vaccines available for these diseases. These occur in different geographic parts of the world. Reservoirs for the viruses are rodents and arthropods. Human infection usually occurs by being bitten by an infected arthropod, by contact with infected animal carcasses, or by inhaling aerosolized rodent excreta. Once contracted, the virus can be transmitted from person to person by blood and body fluids. Contact and Airborne Infection Isolation Precautions are necessary. The CDC has guidelines on personal protective equipment (PPE) for caregivers ([CDC, 2014b](#)). Only special biosafety laboratories can test for the viral hemorrhagic fevers. Such tests are performed at the CDC. It is thought that an aerosolized form of Ebola or Marburg virus might be used for a terrorist attack. Travelers from a region experiencing an outbreak could also carry the virus into other countries ([CDC, 2013](#)).

The incubation period is between 2 and 42 days, depending on the virus, and there is a prodromal syndrome that lasts less than a week. Signs and symptoms are marked fever, fatigue, dizziness, muscle aches, and loss of strength. Symptoms may progress to abdominal pain, nonbloody diarrhea, weakness, and exhaustion. Later, bleeding begins, starting with bleeding under the skin causing petechiae and progressing to spontaneous bleeding and DIC. Many body systems are affected. Hypotension, conjunctivitis, pharyngitis, and skin rash may reflect increasing capillary permeability. Shock, nervous system malfunction, seizures, delirium, and coma may occur. Mortality rates can be very high with Ebola but are not always so with the other viruses.

There is no specific treatment for these hemorrhagic fevers; treatment is supportive. Early identification is essential for supportive treatment to be effective. A point-of-care fingerstick test for Ebola is being evaluated ([Broadhurst, Kelly et al, 2015](#)). The antiviral ribavirin may be useful in treating Lassa fever. Contact and Airborne Expanded Precautions are essential. Double gloves, impermeable gowns, leg and shoe coverings, face shields, eye protection, and an N-95 mask are required for patient contact. A negative-pressure room is desirable.

Prevention measures include use of insect repellent, bed nets, window screens, and proper clothing and the eradication of rodents from living spaces. Mosquito abatement is performed in areas of outbreak, when possible. Vaccines are available for yellow fever and Argentine hemorrhagic fever but not for the others. All linens should be treated as infectious and either carefully disinfected or incinerated.

Pandemic influenza infection.

Pandemic infection is an international outbreak of disease. Most people have had firsthand experience with the flu, but the H1N1 (swine) flu episode in 2009 heightened awareness of how readily a disease moves back and forth across international borders. The severe acute respiratory syndrome (SARS) outbreak in China made health care professionals feel particularly vulnerable to

airborne respiratory infections (see [Chapter 14](#)). Flu is seasonal, and there are always fatalities associated with influenza. Unless the death rate is significantly elevated with international epidemiology, it is not labeled a pandemic.

Preparations for pandemic flu include teaching people to be prepared to stay at home for at least 2 weeks. Nurses also need to reassure people that basic measures for prevention of respiratory infection can be effective. These include healthy lifestyle to support the immune system, hand hygiene, covering the mouth during coughing or sneezing, disposing of tissues, and staying away from public places if at all possible.

Nurse's Role in Preparedness and Response

In addition to learning about hospital protocols, community resources, and specific knowledge related to disaster care, you should explore your feelings about professional participation in a disaster event. Under normal circumstances, such as caring for infectious patients, a nurse's duty to care is high, because the risk of harm to self is low; however, when the danger to the nurse is unclear or apparent—such as in the SARS outbreak—the nurse could decide that preservation of self is reasonable ([Blum, 2014](#)). Studies have shown that nurses do not feel prepared to function in a disaster situation. Education and hands-on training are recommended to increase nurse preparedness ([Baack and Alfred, 2013](#)). Ethical questions regarding the obligation of health care providers to render care to Ebola-infected patients are discussed in a bioethics forum on the Hastings Center website ([Frader and Ross, 2014](#)), which is an example of the bioethical discussions taking place nationally. Arming yourself with knowledge, preparing your own household, and having ethical discussions with colleagues will help you in your decision-making process.

The nurse's role during a bioterrorism event includes:

- Recognizing clusters of cases or unusual cases suggestive of a biologic event
- Promptly evaluating and assisting with medical management
- Promptly communicating with the local public health department and infection control department
- Working closely with law enforcement, emergency management, public health, and other government agencies

Nursing management.

When such patterns are discovered, nurses should implement the hospital and community response plan. **All staff must strictly adhere to infection control procedures and policies.**

If your assessment has aroused suspicion of a biological event, ask these questions:

- Was there a sudden onset of severe respiratory or gastrointestinal problems?
 - Has the illness progressed rapidly?
 - Has the patient been healthy otherwise?
 - Are the patient's family, friends, or colleagues ill?
- If the answers indicate that an infectious agent is present, immediately take the following steps:
- Notify your supervisor and the infection control department regarding the situation.
 - Put a surgical mask on any patient who is coughing.
 - Pay strict attention to Standard Precautions and hand hygiene, and encourage the patient and family to do the same.
 - Wear an N-95 or P-100 respirator mask (one certified by the Occupational Safety and Health Administration [OSHA]).
 - If indicated, isolate the patient in a negative-pressure room; obtain specimens for laboratory testing.
 - Use all recommended personal protective equipment whenever caring for the patient, and pay strict attention to Standard and Expanded Precautions.

When a known terrorist airborne event has occurred and victims are triaged to the hospitals and to emergency field medical units, victims will need to be decontaminated before being brought into the medical facility. Outside shower areas will be set up to accomplish the decontamination.

Whether the agent used in the attack is biologic or nuclear, the outside of the body must be thoroughly scrubbed. Personnel in biohazard suits handle this task ([Figure 43-6](#)). Clothing must be

removed and sealed in plastic biohazard bags to prevent contamination of others. The skin should be scrubbed in every area with warm soapy water for at least 30 seconds. The hair should be soaped and shampooed several times.



FIGURE 43-6 Personnel wearing biohazard suits perform a decontamination scrub during a hospital bioterrorism drill. (Courtesy AP/Wide World Photos.)

In a crisis situation, firm directions should be given with a kindly tone. People need to know what will happen next. Active listening and assisting with problem solving provides needed psychosocial support. If a family has been separated, health care workers can help locate children and other family members. Nurses should direct people to available support services to meet physical and psychological needs.

Active Shooter

Other critical incidents may occur in a public or health care setting that require a trained response from the health care team. One that is rare but can be deadly is an active shooter. First responders are trained and law enforcement officers are armed to manage a shooting situation. When it happens in a health care setting, there is much less preparation. The Joint Commission and OSHA require hospitals to address an active shooter scenario in their workplace violence plan. Some facilities have an overhead page to notify staff of the situation. Many hospitals are using the designation "Code Silver."

The general guidelines include first of all to be aware of potential violence based on behaviors, actions, and speech. Security or community law enforcement should be called as appropriate. Potential violence may come from patients, staff, or visitors. If a firearm is seen, health care workers should evacuate if possible, hide in a location not visible to the shooter, lock the doors, and silence pagers and cell phones. A call to 911 should be made when it is safe to do so. As a last resort and if life is in imminent danger, incapacitating or acting with physical aggression and throwing items at the shooter may be attempted. Even more important is what to do when law enforcement arrives. They know someone is using deadly force and they do not know who is the perpetrator. Bystanders should immediately raise their hands and spread their fingers to show they are not holding a weapon, remain calm, and follow instructions. They should avoid making quick movements, pointing, or yelling. If there are shooting victims, law enforcement will determine when it is safe to render aid, while maintaining the integrity of the crime scene; if there are fatalities, the area becomes off limits to health care personnel and regular hospital activities may need to be relocated.

Debriefing.

Critical incident stress **debriefing** (CISD) teams provide sessions for small groups of personnel to help with effective coping strategies. After the turmoil and the emotional impact of the disaster or critical incident, including its aftermath, personnel may find it difficult to return to their normal routine. Without intervention, some may develop post-traumatic stress disorder (see [Chapter 45](#)). There is strict confidentiality and unconditional acceptance of any information shared during the sessions. Participants are encouraged to bond by talking about where they were and what they were doing when they first heard about the disaster, and to describe what they saw, heard, or smelled during the event. They are asked to share how they felt during the event, discuss how they feel now, and describe physical symptoms that have occurred since the incident. Facilitators reassure that strong reactions are normal, and they offer coping strategies. These coping strategies may include avoiding the use of alcohol or drugs, making sure to eat a well-balanced diet, watching for obsessing or fixation, taking time off from work, socializing with friends and coworkers, and getting professional help if necessary.

Get Ready for the NCLEX® Examination!

Key Points

- A disaster exists when the number of casualties exceeds the resource capabilities of the area.
- Nurses should be proactive in being familiar with the facility's disaster plan, encouraging people to stock a disaster kit at home, and teaching the public about what to do when a disaster occurs (see Health Promotion on p. 1009).
- A chain of command is set in place when a disaster occurs, and it must be followed to ensure that appropriate notification and information is provided to the Office of Emergency Services.
- The stages of psychological response include impact, heroic, honeymoon, disillusionment, and reconstruction.
- Triage for a disaster is based on treating those with life-threatening conditions who have a likelihood of survival and identifying those whose treatment can be delayed.
- Reverse triage can be used to increase surge capacity.
- First aid, safety measures, and prevention and control of health hazards are priorities.
- Special populations such as older adults, infants, people who have disabilities, and immunocompromised individuals need help to stay safe and meet basic life requirements.
- People must be taught how to purify water (see Health Promotion on p. 1011).
- Knowledge of food safety when there has been a power outage or a flood is essential (see Box 43-1).
- Warning signs that a bioterrorism event has occurred include large numbers of patients with similar symptoms, illness and death rates higher than expected for common diseases, unusual disease presentation, increase in unexplained symptoms, diseases or deaths and sudden death of animals.
- Decontamination of individuals affected by a chemical, radiologic, or bioterrorism event is performed before they are allowed into the health facility.
- Debriefing by a trained team after a disaster helps prevent long-term psychological problems among the personnel involved in caring for people affected by the event.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

 Online Resources

- American Red Cross, www.redcross.org
- Anthrax, www.bt.cdc.gov/agent/anthrax
- Botulism, www.bt.cdc.gov/agent/botulism
- Chemical agents, www.bt.cdc.gov/planning/personalcleaningfacts.asp
- Safety Kits, www.ready.gov/build-a-kit
- Weather Safety, www.nws.noaa.gov/safety.php/brochures/hurr.pdf

Review Questions for the NCLEX® Examination

1. A large number of patients are arriving at the hospital from the scene of a chemical disaster. What is the nurse's priority action?

1. Take vital signs to determine which patients are in distress.
2. Call poison control for assistance in determining antidotes.
3. Decontaminate all patients outside the hospital by showering.

4. Instruct all caregivers to don personal protective equipment.

NCLEX Client Need: Safety and Infection Control

2. At a disaster scene, a nurse notices that a person has been triaged with a black tag who has respiratory distress and severe total body burns. What should the nurse do?

1. Immediately obtain a portable oxygen tank and apply an oxygen mask.
2. Seek out emergency services personnel to transport the patient to the hospital.
3. Try to locate family members so that they can be present when the person dies.
4. Stay with the person for as long possible to give support and comfort.

NCLEX Client Need: Coordinated Care

3. A nurse is participating in a disaster drill. A mock victim with a green tag asks, "What does this tag mean?" What is the nurse's best response?

1. "You can go home because you no longer need health management."
2. "You potentially pose a health hazard so you must sit in the green area."
3. "You will have to wait for care because your injuries are not life threatening."
4. "You will be seen and treated immediately by a provider."

NCLEX Client Need: Health Promotion and Maintenance

4. While admitting a young, previously healthy patient with a severe respiratory illness, a nurse becomes suspicious of a bioterrorism event. Which question would the nurse ask to confirm the suspicion?

1. "Have you been washing your hands frequently?"
2. "Has the illness progressed rapidly?"

3. "Do you have a fever?"
4. "Are you a local resident?"

NCLEX Client Need: Safety and Infection Control

5. A patient is tentatively diagnosed with chickenpox. During skin assessment, what is the nurse likely to find that confirms the diagnosis?

1. Skin lesions are firm.
2. Skin lesions are found on palms and soles.
3. Skin lesions occur in various stages.
4. Skin lesions occur with other signs and symptoms.

NCLEX Client Need: Physiological Adaptation

6. A nurse is teaching a group of people about water and food safety after a disaster. Which comments by the learners indicate successful teaching? (*Select all that apply.*)

1. "Contaminated water should be boiled for at least 20 minutes."
2. "Sixteen drops of bleach to a gallon of water will purify the water."
3. "A full freezer will keep food safe for 48 hours."
4. "Any food that has an unusual odor, color, or texture should be thrown away."
5. "Tightly sealed containers of food are safe to use even if in contact with flood waters."

NCLEX Client Need: Health Promotion and Maintenance

7. Which patient needs to be put immediately into isolation?

1. Diagnosed case of botulism poisoning
2. Probable case of inhalational anthrax
3. Known exposure to a high dose of radiation rays

4. Suspected smallpox, but probable chickenpox

NCLEX Client Need: Safety and Infection Control

8. Which behavior by the nurse indicates that there is a need for additional counseling beyond the counseling offered through a critical incident stress debriefing?

1. Talks openly about the incident, but is not ruminating
2. Avoids coworkers and friends for a prolonged period
3. Takes extra vacation time away from the city
4. Attempts to resume a healthy lifestyle, but is not sleeping well

NCLEX Client Need: Psychosocial Integrity

9. In the event of a disaster requiring evacuation of homes, what items should be in a "go bag"? (*Select all that apply.*)

1. All personal valuables.
2. Water and medications.
3. Flashlight and batteries.
4. Camp stove and eating utensils.
5. Clothing and important documents.

NCLEX Client Need: Health Promotion and Maintenance

10. There is a power outage, and the IV pumps are no longer functional. The nurse must deliver a fluid bolus of 500 mL over 20 minutes. The drip factor for available IV tubing is 10 gtt/mL. What is the drip rate in drops/minute? _____

NCLEX Client Need: Pharmacological Therapies

Critical Thinking Questions

Scenario A

A hurricane has hit the town in which you live. There is widespread wind damage in much of the town, many streets are flooded, and a lot of people are injured. The power is out and the phones are dead. Your neighbor has a gash in his lower leg and is bleeding.

1. Describe how you would stop the bleeding.
2. How would you transport him to a health care facility? What precautions would you take on the journey?

3. If teenagers want to go out and wade in the floodwater and see if they can rescue stranded people or animals, what would you tell them?

Scenario B

You and several other health professionals have been asked to come and teach a community group about what to do in the event of a disaster or bioterrorism attack.

1. Outline what should be included in the teaching plan.
2. If questions arise about a nuclear disaster, what would you say about measures they could take?

Scenario C

You are working in a busy walk-in clinic. You recognize that emergency departments and clinics are likely to be the first places where infected people will begin to show up if there is a biologic event. You must be vigilant for clusters of cases or unusual cases that may suggest that a bioterrorism event has occurred among the population that serves the clinic.

1. What signs or events would suggest that a bioterrorism event has occurred?
2. What assessment questions would you ask if you suspect a patient has been exposed to a bioterrorism agent?
3. If you determine that an infectious agent is likely, what should you do?

CHAPTER 44

Care of Patients With Emergencies, Trauma, and Shock

Objectives

Theory

1. Evaluate how your personal attitudes, experiences, beliefs, and values affect your ability to care for victims of abuse.
2. Explain the basic principles of first aid.
3. Summarize the importance of mechanism of injury and index of suspicion in caring for patients with traumatic injury.
4. State the key components of assessing a trauma patient.
5. Discuss prevention of injuries from extremes of heat and cold.
6. Determine specific interventions appropriate in the emergency care of accidental poisoning by ingestion and inhalation.
7. Describe emergency care of victims of insect stings, tick bites, and snakebites.
8. Review the appropriate nursing actions and care needed for a patient who has experienced a respiratory or cardiac arrest.
9. Identify signs and symptoms of shock.
10. Compare and contrast the treatment of cardiogenic, hypovolemic, and distributive shock.

Clinical Practice

11. Role play with fellow students, practicing techniques to calm a combative patient.
12. Observe how the triage nurse in the emergency department sets priorities for patient care.
13. Observe how the emergency team works together on a major accident victim.

KEY TERMS

- anaphylaxis** (ă-nă-fă-LĂK-sĭs, p. 1038)
angioedema (än-jĕ-Ö-ĕ-DĒ-mă, p. 1045)
automated external defibrillator (AED) (ĂW-tō-mă-tĕd ēks-tĕr-năl dē-fib-rĭ-LĂ-tōr, p. 1040)
C-A-B (chest compressions, airway, breathing) (p. 1040)
flail chest (FLĀL CHĒST, p. 1032)
hands-only CPR (p. 1040)
hypovolemia (hī-pō-vō-LĒ-mē-ă, p. 1043)
index of suspicion (p. 1029)

mechanism of injury (p. 1029)
multisystem organ dysfunction syndrome (MODS) (p. 1046)
perfusion (pĕr-FŪ-zhūn, p. 1041)
poison control center (p. 1036)
push hard, push fast (p. 1040)
shock (shōk, p. 1041)
systemic inflammatory response syndrome (SIRS) (p. 1046)
triage (TRĒ-āhzh, p. 1029)
vasoactive (vă-zō-ĀK-tīv, p. 1045)

Prevention of Accidents

Home Safety

Accidents in the home and community rank fifth as a leading cause of death for all age groups ([Medical News Today, 2015](#)). People younger than 5 years and older than 65 years are the principal victims of fatal mishaps occurring in the home. Attention to home safety for the very young and the elderly could potentially prevent many of these fatalities and injuries ([Box 44-1](#)).

Box 44-1

Home Safety

Kitchen

- For a gas, coal, or wood-burning stove, use the vents or flues; keep windows open a crack. Never light the stove with kerosene or gasoline. Turn off all flames after cooking. Repair any gas leakage.
- Use pot holders. Keep handles of pots and pans turned away from edge of stove.
- Keep matches; sharp instruments; and poisons, such as bleach and household cleaners, out of children's reach. Place child safety locks on storage cabinets.
- Wipe up spills on floor.
- Keep electrical appliances in good working order.
- Place broken glass in a heavy paper sack to prevent cuts through plastic bags.

Storage Areas

- Always keep cellars, attics, and garages neat.
- Clean and disinfect the area where garbage is kept, and dispose of garbage frequently.
- Never place poisonous substances in drinking glasses, cold drink bottles, or other containers that have been used for food or drink.
- Always label poisonous compounds; read labels of poisons and store the containers out of reach.

Living Room

- Be sure floors are not slippery. Use rubber mats under rugs to prevent slipping.
- Replace frayed or torn carpets.
- Cover electrical sockets.
- Replace frayed electrical cords. Keep electrical cords off floor where people walk.
- Place heaters a safe distance from walls. Use screens around fireplace.
- Pad sharp edges on furniture as necessary.
- Check ashtrays for lit matches or cigarettes when going to bed or leaving the house.

Furnace

- Have a professional check and maintain the furnace every year, especially for leaks.
- Change filters monthly.

Bathroom

- Use a rubber mat in the tub.
- Store medicines out of children's reach. Keep all medicines capped and labeled. Throw out old medicines. Keep phone number of poison center close to telephone.
- Be cautious in using appliances plugged into a wall plug near water.
- Keep hot water heater set at 120° F (48.8° C) or lower.

Bedroom

- Do not smoke in bed.
- Use rubber mats under scatter rugs.

Stairways

- Cover with carpeting or rubber safety treads.
- Replace torn or frayed carpeting. Keep stairs clear of toys and cleaning equipment.
- Install handrails and proper lighting.
- Use gates at top and bottom for young children and confused older adults.

General Areas

- Install smoke and carbon monoxide alarms throughout the house.
- Make sure candles are away from flammable materials. Never leave a lit candle unattended.

Highway Safety

Motor vehicle accidents are the leading cause of accidental death in the United States. Improper driving, which is responsible for almost 90% of all accidents, can be caused by the influence of alcohol and/or drugs, distractions, fatigue, excessive speed, or emotional instability. Emphasis on using seat belts, better enforcement of laws against driving drunk, and discouraging use of cell phones have helped to decrease accidents and injury. According to the Centers for Disease Control and Prevention (CDC), every 16 minutes someone dies in a motor vehicle crash in the United States. Motor vehicle crashes are the leading cause of death for Americans in the first three decades of life ([CDC, 2013](#)).

Water Safety

Water safety rules include selecting safe swimming areas, ensuring supervision of children and adults who are not strong swimmers, diving where the water is sufficiently deep and is free of rocks or obstacles, never swimming alone, and never swimming distances beyond one's ability. Every day about 10 people die of unintentional drowning ([CDC, 2014](#)). **The victim of a diving injury preferably should not be removed from the water until emergency medical services (EMS) arrives because of possible neck and spinal cord injury. Bystanders should immobilize the head and neck, keeping the victim's face out of the water** ([American Red Cross, 2012](#)). Bystander intervention makes a critical difference in the survival of drowning victims. First, the rescuer should call for help. If possible, try to reach the victim without going into the water. After the rescued person is brought out of the water, he must be given cardiopulmonary resuscitation (CPR) and

rescue breathing if he is not breathing and is pulseless. If he is breathing, he should be placed on his side ([Figure 44-1](#)) and his head should be turned to one side to prevent aspiration. Near-drowning victims should be transported to a medical facility. Although they may appear to be uninjured, they may have aspirated water, and pulmonary edema may occur. Bacterial or fungal pneumonia may follow aspiration of fresh water. There is danger of delayed cardiac irregularities for any victim who struggled in the water. Hypothermia has a protective effect, especially in young children, and can increase survivability; however, prolonged immersion negates this effect.

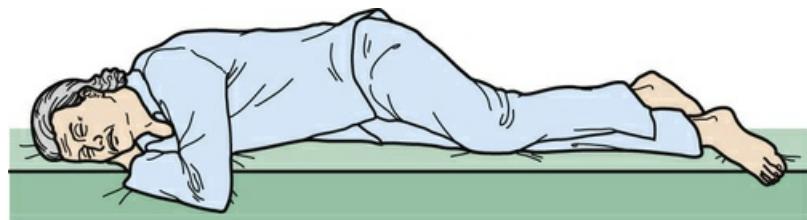


FIGURE 44-1 Recovery position. (From Elkin M, Perry AM, Potter PA: *Nursing interventions and clinical skills*, ed. 5, St. Louis, 2012, Mosby.)

First Aid and Good Samaritan Laws

Most states have adopted “Good Samaritan” laws that protect medical personnel and nonmedical civilians from liability when rendering emergency medical care for victims of accidental injury. These laws guard against liability for care, as long as medically trained individuals act in good faith and to the best of their ability. Individuals who offer care are held to the standard of care consistent with their level of training. If a nursing assistant stops to provide emergency care, she will be held to a different standard than a physician who stops at the same accident scene. Both are expected to do the best they can in the circumstances. A bad outcome is not proof of improper care. Even in states in which there are no such protective laws, malpractice suits of this kind very rarely occur. **Table 44-1** shows guidelines for first aid. Some states require medical personnel to render aid if they witness or come upon an accident scene. You should know the laws in your state.

Table 44-1
General Principles of First Aid

ACTION	REASONING
Before attending to the victim or victims of an accident, quickly survey the accident scene to determine whether there are further hazards to yourself and the victims.	Spillage of gasoline after a motor vehicle accident can cause a fire or explosion, or there may be danger to the victim, yourself, and onlookers from oncoming traffic and secondary collisions. In both highway and home accidents, live electrical wires may be in the vicinity. Whenever there is a high risk of death from hazardous conditions in the immediate environment, the victims should be moved at once, regardless of the nature of their injuries. Victims may receive severe burns from lying on a sun-baked street or sidewalk while waiting for the ambulance. Although it may not be safe to move the victim to a shaded area, it is advisable to place clothing, newspaper, or some other protective covering between skin and the hot pavement.
If there are several victims of the accident, make a quick check on each one before beginning treatment.	The most serious and life-threatening injuries must be treated first; those victims who do not seem to be in immediate danger can be attended to by someone else who is capable of watching them and reporting any change in their condition.
Use a calm tone and short sentences to explain what you are doing. You must sound as if you are in control of yourself and the situation.	Giving reassurance to the victim will decrease anxiety and promote cooperation. Using short, simple explanations facilitates understanding during duress. Forcing yourself to remain calm can increase your own ability to function in an emergency situation.
Do not move the victim unless he is in immediate danger or until you have immobilized injured parts.	This is particularly true if spinal injury is suspected. Moving the victim can cause further injury if precautions are not taken.
Do not remove an object that has penetrated a part of the body and is still in place.	A knife, piece of metal, or sliver of wood that is protruding from the chest or abdomen should be left as is until it can be removed in a controlled situation by trained professionals. Removal of the object can cause further damage and make bleeding worse. Bandages are applied around the object to stabilize it and control bleeding as necessary.
Look for a Medic-Alert bracelet or necklace.	If the victim is wearing one or has some other identification showing specific medical needs, bring this to the attention of the ambulance or hospital personnel.
Try to determine the mechanism of injury.	This will give clues about the type of injury sustained and the treatment required. When evaluating the victim, begin at the head and work downward to the toes (see <i>Focused Assessment</i> on p. 1030).
Do not try to give anything by mouth to a person who is unconscious or has a decreased level of consciousness or has injuries that might require surgery.	Aspiration of the material into the air passage may occur, causing breathing difficulty or complete airway obstruction.
Give an organized and chronologic report to the EMS or provider, including details of incident (if you were a witness), assessment of injuries, and care rendered.	Any details of events leading to the incident, mechanism of injury, baseline assessment data, and care rendered will be useful in the emergency care at the hospital. Being brief and organized is important, because the EMS personnel must simultaneously intervene and take a history if the victim is in critical condition.

The Cardiac Arrest Survival Act is a Good Samaritan law covering the use of automated external defibrillators (AEDS) in the event of a cardiac arrest. Each state has specific guidelines for implementation.

Think Critically

You come upon an automobile accident in which several people were involved and stop to render aid. How would you assess the situation for safety for yourself and the victims? How would you act to ensure safety at the scene?

Psychological and Social Emergencies

The Combative Patient

Half of all health professionals have been verbally assaulted, and one quarter have been physically assaulted. Patient factors associated with an increased incidence of attacks on health care personnel include paranoid schizophrenia, personality disorders, dementia, substance abuse, and a history of abuse or violence (LaGrossa, 2013). Patients who are not diagnosed as mentally ill can also become violent when nurses and other health care personnel fail to respect their rights and needs or when they feel threatened. Pain, cognitive impairment, and being under the influence of mind-altering substances can contribute to a patient's lashing out. Signs and symptoms that usually precede an attack include increasing agitation or resistance, aggressive behavior, pacing, frowning, hyperalertness, increasing demands, and glaring. Health care workers should approach such patients in a nonthreatening manner, use a calm tone of voice, and remain calm (Box 44-2).

Language barriers and hearing difficulties need to be considered as possible contributors to an escalating situation. It may be necessary to help the patient by exerting control. Physical force should be used only when there is threat of physical danger and verbal intervention is ineffective. One may simply tell the patient to stop screaming, to sit down, or to put down a weapon-like object. If physical restraint becomes necessary, enough people must be available to control the patient (see Chapter 47).

Safety Alert

The Occupational Safety and Health Administration (OSHA) requires employers to provide a workplace "free from recognized hazards that are causing or are likely to cause death or serious physical harm." Patient violence toward health care workers falls in this category. Workplaces are required to have a violence prevention program. The CDC offers an online Workplace Violence Prevention for Nurses program that can be accessed at http://www.cdc.gov/wpvhc/Course.aspx/Slide/Intro_1.

Box 44-2

Strategies for Approaching a Combative Patient

- Offer help on a one-to-one basis. Several people trying to simultaneously talk to or subdue the patient may add to fear and disorientation.
- Establish eye contact.
- Use the person's name frequently.
- Explain who you are and what you are trying to do.
- Express genuine concern about the situation.
- Use a soft voice.
- Make sure the patient can hear and understand what is being said.
- Observe for signs of drug or alcohol use.

Domestic and Intimate Partner Violence

According to a report released in 2013 by the U.S. Department of Justice analyzing intimate partner violence from 1993 to 2011, violence declined 72% for females and 64% for males (Catalano, 2013). Although this is an encouraging report, the problem is still significant and has a profound impact on society and health care.

Nurses are mandated reporters in most states and need to recognize signs of physical and

psychological abuse. Physical signs include bruises, swellings, lacerations, fractures, hematomas, blackened eyes, abdominal injuries (especially during pregnancy), burns, and open wounds that do not match the description of how they occurred. Bruises or fractures in various stages of healing and signs of old lacerations and wounds in the presence of new ones indicate a need for a thorough assessment for abuse. Often the victim may explain all of the injuries as the result of logical accidents rather than disclose that battering by an intimate partner has occurred.

Psychologically the person may display signs of depression, low self-esteem, anxiety, and stress. **Box 44-3** presents the types of questions that might be asked to elicit more information. Asking these questions after establishing rapport with the patient may encourage honest sharing of thoughts and feelings. Research shows that women actually welcome the opportunity to talk about domestic violence, but health care personnel do not routinely ask unless there is a high index of suspicion. If battering is revealed, the person is referred to an appropriate shelter and community resources, and the incident is reported to the appropriate agency. **Most states have laws requiring health care providers to report domestic violence.**

Clinical Cues

Financial concerns, fear of reprisal against children or pets, lack of social support, and limited work experience may all prevent a woman from permanently leaving her abuser. As a nurse, you may feel frustrated, astonished, or helpless as you meet women who repeatedly return to their abusers. Understanding that leaving the abusive relationship does not guarantee safety can help you provide the needed resource referrals so the victim can escape safely. Although statistically women are more likely to be abuse victims, annually 1 in 10 men are victimized and need referrals and support ([CDC, 2014a](#)).

Box 44-3

Questions to Detect Abuse

- Have you been hit or hurt in any way in the past year?
- Who injured you? Has it occurred before?
- Are you afraid of anyone?
- Do you feel safe at home?
- Does your partner use drugs or alcohol? How does his or her behavior change after using them?

Child Abuse

If a child and caregiver make frequent trips to a clinic or emergency department (ED) for unexplained or questionable injuries, abuse could be occurring. Suspicion increases when the mechanism of injury reported by the caregiver (or child) does not match the injury pattern. **The law requires that child abuse or suspicion of child abuse must be reported.**

Think Critically

A caregiver reports that a child reached for a hot surface; there is a perfectly round burn in the middle of the palmar surface. What might you conclude about the caregiver's explanation?

Elder Abuse

The population of people older than 65 years is the fastest growing demographic. Just by sheer numbers alone, elder abuse will increase. Underreporting of events makes it difficult to get a true picture of the extent of the problem. It is estimated that 3% to 10% of older adults are affected ([Sellas, 2013](#)). Neglect is the most common form, but also assess for physical, emotional, psychological, or financial abuse. Older adults should be assessed for signs of fear, withdrawal, anxiety, or evasiveness. The caregiver should be assessed for a hostile, critical, or unsympathetic

attitude. The same signs of physical abuse listed for domestic abuse should be assessed for, as should signs of malnutrition, uncleanliness, or severe depression. **The law requires that signs of elder abuse must be reported.** Immediate safety must be established, but referrals to support groups, counseling, respite care, Meals on Wheels, and transportation services can alleviate stress for caregivers. Elders with dementia are at higher risk for abuse.

Emergency Care

A nurse may need to give emergency care in a variety of community, clinic, or hospital settings, but emergency nursing is generally associated with care of patients in the ED of a hospital. In a survey of hospital ED directors, 90% said that overcrowding and long wait times are an issue. One of the *Healthy People 2020* objectives is to reduce the proportion of patients who wait beyond the recommended time frame to see an emergency provider. A new Joint Commission Core Measure holds hospital facilities accountable for the time patients wait in the ED for transport to an inpatient bed, the time from assessment to treatment, and the efficiency of the throughput process. A variety of conditions contribute to overcrowding, which leads to decreased patient satisfaction, frustration for health care personnel, and increased risk for poor outcomes. Lack of beds for admitted patients, nursing staff shortages, increased patient volume, and increasing complexity and acuity of patients requiring more time and resources are some of the factors that contribute to overcrowding. This causes delays in treatment of time-sensitive conditions such as acute coronary syndromes, antibiotic administration, and pain management (Carter, Pouch, and Larson, 2014).

Emergency nurses need excellent assessment and clinical decision-making skills and the ability to prioritize care under stressful conditions. Emergency nurses routinely follow protocols to initiate diagnostic testing or to start therapy, such as oxygen administration or peripheral intravenous (IV) access. Clinical decisions, prioritization, and use of protocols are based on (1) events or incidents that preceded the emergency visit, (2) mechanism of injury, and (3) index of suspicion. For example, two patients arrive at the hospital in an unresponsive state. For the first patient, friends report, "She was drinking and taking a lot of drugs for fun, and then we found her passed out with vomit on her mouth." For the second patient, bystanders report hearing him complain of chest pain and needing his heart medication, and finding him unresponsive in the parking lot. Both patients are unresponsive, but preceding events suggest that the first patient is an overdose with possible aspiration, whereas the second is more likely to have an acute cardiac problem.

Mechanism of injury refers to how the injury occurred; an experienced clinician may use this information to predict damage and complications. For example, toddlers commonly sustain dramatic-looking "goose eggs" on the forehead by falling against a coffee table, but these incidents are usually more traumatic for the parents than the child. A high **index of suspicion** is required to detect problems that are not initially obvious. For example, a patient reports being kicked and punched several times in the abdomen. At first the patient appears to be stable with minor abrasions; however, this patient will require a series of abdominal assessments to detect slow hemorrhage or internal tissue damage. Maintaining a high index of suspicion is important in a busy emergency setting, because everyone (including the patient) is anxious for discharge or transfer to make room for others in the waiting room.

Triage: Initial (or Primary) Survey

The process of setting priorities for treatment is known as **triage**. One of the most common methods for triage of patients uses "ABCDE" as a memory trigger for the sequence of assessment. *A* is airway, *B* is breathing, and *C* is circulation. *D* is assessment of neurologic disability. *E* is exposure: all areas of the body should be exposed so that injuries are not missed underneath clothing. The *E* can also mean environmental controls, such as decontamination and warming. This is a good systematic method for assessing inpatients who have had a change in condition so that critical assessments are not overlooked. Abnormalities identified that are life threatening should be addressed before moving on to the next assessment.

Airway

A patent airway and adequate oxygenation are priorities. A simple way to assess airway is to ask the person to tell you his name and to ask how he is feeling. If the airway is partially obstructed, the voice quality may sound muffled or coarse. With severe shortness of breath, a person cannot complete full sentences. A confused answer suggests possible decreased cerebral perfusion and oxygenation. If the patient is unconscious, look for the rise and fall of the chest.

The most common cause of airway obstruction in an unconscious person is the tongue. The

head tilt–chin lift maneuver repositions the trachea and tongue and opens the airway. The jaw thrust method should be used if a spinal injury is suspected. For this, the provider positions himself at the head of the victim, placing his hands on either side of the patient's head and his thumbs on the patient's lower jaw near the corners of the mouth and pointing toward his feet; the fingertips are positioned around the bone of the lower jaw, which is then lifted ([Figure 44-2](#)). (Note: Jaw thrust is not taught to lay rescuers; however, health care professionals must learn this maneuver.)

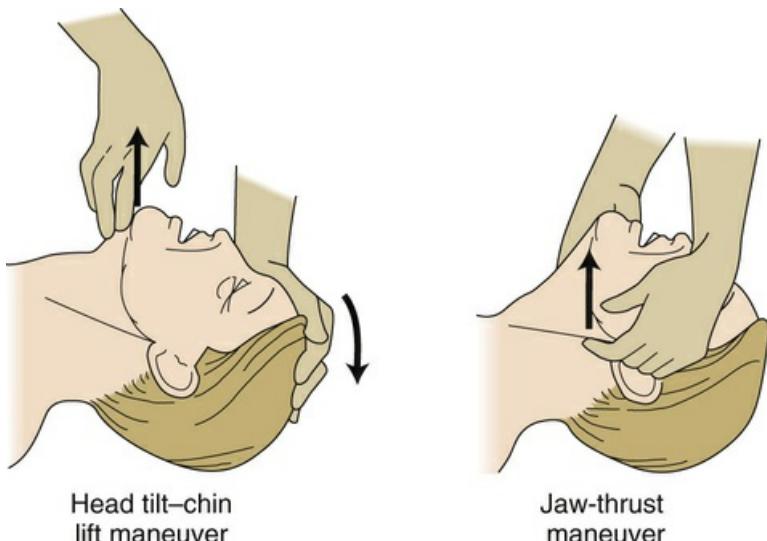


FIGURE 44-2 Opening the airway. (From Elkin M, Perry AM, Potter PA: *Nursing interventions and clinical skills*, ed. 2, St. Louis, 2000, Mosby.)

Breathing

After ensuring that the airway is patent, assess chest rise and effort of breathing, noting rate and any respiratory distress. A pulse oximetry reading is taken and oxygen provided as needed; respiratory rate and effort are monitored. Emergency equipment for resuscitation and intubation should be checked every day, and use of the equipment should be reviewed periodically. If the patient is not breathing, the bag-valve-mask resuscitation bag should be used to ventilate the patient.

Clinical Cues

During emergency situations, “verbal orders” may appear to be the norm to inexperienced bystanders; however, the health care team members are working off well-established algorithms, such as Advanced Cardiac Life Support (ACLS). Nurses are responsible to seek clarification of orders; even under extreme circumstances, the excuse of misunderstanding a verbal order is not acceptable. The provider is responsible for writing or entering orders as soon as the crisis has passed.

Focused Assessment

Evaluation of Accident and Emergency Patients

AREA OF ASSESSMENT	MODE OF ASSESSMENT	RATIONALE
PRIMARY SURVEY	ABCDE	A systematic approach is needed for assessment.
A: Airway	Assess for signs of breathing and respiratory distress, gasping, wheezing, stridor (high-pitched sound made by partial airway obstruction), choking. Check mouth for easily removable foreign body. Do not tilt head and hyperextend neck; immobilize cervical spine (C-spine) as needed for suspected injury.	Adequate air exchange is necessary for the body's oxygen needs. The tongue may block the airway in an unconscious patient. Any patient with an unknown degree of trauma is at risk for cervical spine injury. Movement may worsen the injury.
B: Breathing	Quickly assess breathing. Watch chest and abdomen for rhythmic rise and fall. Note rate and quality of respirations.	Normal breathing requires no intervention. Abnormal breathing should be further evaluated and assisted as needed.
C:	Feel for pulse in carotid or femoral artery; note rate and quality. Check blood	Absence of a pulse indicates cardiac arrest or obstructive shock. A rapid

Circulation/hemorrhage	pressure Check for bleeding.	bounding pulse may indicate fright or hypovolemia. A rapid thready pulse may indicate further blood loss, leading to shock.
D: Disability (neurologic status)	Note if alert, oriented to time, place, person. Note response to verbal stimuli. Check for Medic-Alert identification. Assess ability to move all extremities.	Additional assessment of trauma patients helps identify injuries.
E: Exposure/environmental controls	Remove clothing to look for injuries that may be covered, especially if the patient is not alert or cannot communicate. Look for life-threatening injuries. Provide decontamination as needed. Keep patient warm.	The only way to verify whether there are other injuries is to look. Protect patient privacy.
SECONDARY SURVEY	Head to toe	Initiated after life-threatening injuries are addressed.
Head, face, neck, neurologic status	Look for bleeding, bruising, abrasions. Inspect pupils, assess level of consciousness. Note and record Glasgow Coma Scale score for baseline. Maintain cervical spine precautions, assess for neck injury.	Alterations in level of consciousness can be caused by a variety of conditions such as head trauma, stroke, hypoglycemia, or drug overdose. Neck injuries may be hidden by the cervical collar.
Chest	Listen to breath sounds. Look for equal chest expansion.	Tension pneumothorax can develop after a chest injury.
Abdomen/genitourinary system	Auscultate for bowel sounds. Palpate for tenderness, guarding, and fullness. Look for bloody urine. Note bruising or abrasions, such as Grey Turner or Cullen sign.	Abdominal trauma can result in ruptured spleen or bladder, or liver damage. External trauma may indicate internal damage.
Limbs	Assess adequacy of circulation in all extremities.	Dislocations or fractures can compress nerves and blood vessels.
Log roll	Using at least four people, stabilize the neck and head and gently log roll the victim to assess the back of the head, neck, back, and buttocks.	Bleeding and fractures may obscure additional injuries that are located on the back. In penetrating injuries observe for entrance and exit wounds.

Control of Bleeding

Severe bleeding can rapidly lead to irreversible hypovolemic shock. Arterial blood is bright red and gushes in spurts at regular intervals. Blood from a severed or punctured vein leaks slowly and steadily and is dark red. Even major bleeding can usually be stopped by **applying pressure directly** over the wound. When in a health care work setting, CDC and OSHA requirements mandate use of personal protective equipment that includes barrier devices such as gloves when in contact with body fluids. In a community setting, adapt available material.

Safety Alert

Protective Gear

In a community setting, personal protective equipment may not be present where needed. If gloves are not available, create a barrier with plastic or multiple layers of cloth. Hands and any other skin in contact with blood should be washed as soon as possible.

A guideline published by the American College of Surgeons Committee on Trauma in 2014 recommends for prehospital control of bleeding that direct pressure be held on the area of bleeding. If this is ineffective or impractical, then a tourniquet may be implemented. If available, a topical hemostatic agent may also be used. Elevation of an injured extremity is no longer recommended (Bulger et al, 2014).

Clinical Cues

Many patients are on antiplatelet drugs such as aspirin, clopidogrel (Plavix), prasugrel (Effient), or ticagrelor (Brilinta) or anticoagulants such as warfarin (Coumadin), dabigatran (Pradaxa), rivaroxaban (Xarelto), or apixaban (Eliquis) to treat heart and vascular conditions. If there is injury, bleeding will be significant and may be difficult to stop.

If bleeding is copious and cannot be stopped with pressure and a tourniquet, occlusion of the arterial input may help stop or slow the bleeding. It is not always possible to compress the artery at the needed location, so this is not a first-line intervention. Pressure points for control of arterial bleeding are shown in [Figure 15-3](#). If compression of the pressure point is successful, the distal pulse will be absent and the patient will notice a tingling and numbness in the area. Compression of pressure points on the neck and head should not be used unless there is no other choice, because this will interfere with the blood supply to the brain.

Neck and Spine Injuries

Neck or spinal injury should be suspected in any situation in which the individual has sustained multiple injuries, has fallen, or is unconscious. Examples of accidents that would increase index of suspicion for spinal injury include motor vehicle collisions, diving, biking, or any situation in which the neck receives significant force. In emergency or accident situations, the rescuer may be distracted by severe bleeding or other life-threatening conditions and thus overlook the possibility

of a spinal cord injury.

Safety Alert

Cervical Spine Immobilization

In any traumatic injury, spinal injury must be considered. Cervical spine immobilization is implemented as indicated. Regardless of mechanism of injury, if the patient is awake, alert, conversant, and without significant distracting injury or intoxication, spinal immobilization is not necessary. New evidence-based guidelines have reduced the number of patients who require prehospital spinal immobilization ([Morrissey, 2013](#)). Once in place, spinal immobilization is maintained in the health care facility until spinal injury is ruled out.

If a victim must be moved to safety before EMS arrives, the neck may be immobilized with a coat or towel rolled in the shape of a collar. The goal is to keep the neck as straight as possible, preventing it from flexing or hyperextending. Applying a cervical collar or other commercial device and maintaining traction on the head requires advanced training ([Figure 44-3](#)). A cervical collar is not particularly comfortable for the patient, and it partially obscures assessment of the neck, jaw, and upper midchest, but removal of the collar is strictly at the discretion of the provider (see [Chapter 22](#)).

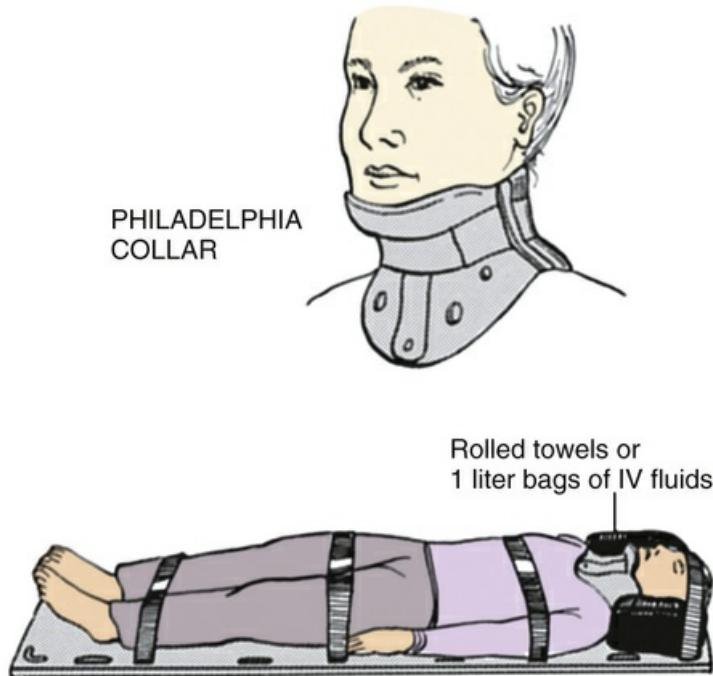


FIGURE 44-3 Spinal immobilization. (From Black JM, Hawks JH: *Medical-surgical nursing: Clinical management for positive outcomes*, ed. 7, Philadelphia, 2005, Saunders.)

Chest Trauma

Penetrating thoracic trauma is less common but is more likely to be fatal than blunt chest trauma. Any of the structures located in the chest may be involved in the injury. There can be contusion of the myocardium, puncture of lungs, rupture of the aorta, diaphragm rupture, and tracheobronchial injuries in addition to bone fractures. Communities with access to a trauma center and shorter transport times have increased survival rates for penetrating chest trauma. ([Swaroop et al, 2013](#)).

Fractured ribs are very painful, because breathing causes movement at the site of injury. The treatment goal is to decrease pain so that the patient can breathe adequately. NSAIDs and ice to the

injury are first-line pain interventions. Intercostal nerve block with local anesthesia may be used to control pain. Narcotic drug therapy is used cautiously, because it can depress respirations. **Binding the ribs is not used as treatment, because it impairs the ability to take deep breaths, causing atelectasis and possibly pneumonia.**

When three or more ribs are broken in two or more places, the chest wall becomes unstable. This condition is called **flail chest**, which produces **paradoxical chest movement**. When the patient breathes in, the fractured portion of the chest is drawn inward instead of expanding outward as the rest of the chest does; with exhalation, the flail portion expands outward as the rest of the chest collapses normally. This process interferes with oxygenation, because the lungs cannot expand normally. Emergency treatment consists of turning the patient onto the affected side so that the ground or bed will act as a splint and reduce the pain of breathing. The patient is observed for signs of external and internal bleeding, pneumothorax, and shock; the force needed to break multiple ribs in multiple locations will also injure the underlying structures which may result in bleeding.

Once the patient is in an emergency facility, flail chest is treated by intubation and mechanical ventilation while the ribs heal. The patient is usually given sedatives and pain medications to prevent fighting the action of the ventilator. Intermittent dosing or continuous infusion may be used depending on the needs of the patient. A study by the American College of Surgeons published in 2013 found that surgical fixation of the flail segment reduced length of stay in the intensive care unit and ventilatory requirements ([Marasco et al, 2013](#)).

Pneumothorax, Hemothorax, and Tension Pneumothorax

An open, or “sucking,” chest wound is one in which pneumothorax (accumulation of air) or hemothorax (accumulation of blood) results from external penetration of the pleural cavity. Symptoms of pneumothorax or hemothorax include labored, shallow respirations that cause bubbling of blood at the site of the wound, lack of movement on one side of the chest when the person inhales and exhales, and chest pain. The patient should be placed in a semi-Fowler position if possible. Once the patient is in an emergency facility, treatment includes chest tube insertion with closed-system drainage (see [Chapter 14](#)).

Tension pneumothorax develops when air enters the pleural space on inspiration but remains trapped there rather than being expelled on expiration. It can occur from trauma, mechanical ventilation, or rib fracture during cardiopulmonary resuscitation. The air in the pleural space increases with each breath, and the pressure within the chest builds, which gradually collapses the lung. If unrelieved, this increasing pressure will cause a **mediastinal shift**: The structures in the mediastinum—the heart, great vessels, trachea, and esophagus—are all shifted to the unaffected side of the chest. This shift puts pressure on the heart so it cannot fill with blood. Decreased cardiac output results, causing a decrease in blood pressure. Emergent treatment is a needle thoracostomy. A chest tube with a drainage device or Heimlich valve may be placed to remove the air from the pleural cavity.

Cardiac Trauma

Blunt chest trauma often causes myocardial contusion, but it also can cause tears in the great vessels and massive bleeding. Blunt force trauma directly on the sternum can cause cardiac arrest. Contusion may result in cardiac dysrhythmia. Symptoms may mimic those of a myocardial infarction (MI), because cardiac tissue has been damaged. Treatment is much the same as for an MI. The patient's cardiac rhythm is monitored closely when such trauma has occurred.

Penetrating trauma usually causes a hemothorax. Cardiac tamponade can occur from blunt force or penetration if bleeding into the pericardial sac occurs. Blood collects in the pericardial sac, which will not stretch, compressing the myocardium; the heart cannot fill or pump effectively. Heart sounds become muffled and distant, and hypotension occurs along with increased central venous pressure evidenced by neck vein distention. Shock and death will result if the bleeding is not stopped and the fluid removed. Surgical repair may be necessary.

Abdominal Trauma

Penetrating abdominal trauma is usually the result of a knife or gunshot wound. Particularly with gunshot injuries, exit and entrance wounds are anticipated; thus all clothing must be removed by

the EMS or ED staff, and the anterior and posterior body surfaces must be examined. Patient management depends on the means of injury, location, associated injuries, and hemodynamic and neurologic status of the patient. (Offner, 2014).

Blunt trauma is less dramatic but can result from improperly worn seat belts or physical assault. Rapid changes in speed, crushing, or shearing actions result in hemorrhage and damage to internal organs. The overall prognosis for blunt abdominal trauma is good, but the patient must be observed closely for symptoms of shock, and serial abdominal assessments must be performed. A bluish tinge around the umbilicus may indicate abdominal hemorrhage (Cullen sign). Ecchymosis or bruising along the flank can be a sign of retroperitoneal or intraperitoneal bleeding (Grey Turner sign).

Focused abdominal sonography for trauma (FAST), peritoneal lavage, or computed tomography may be performed to diagnose intra-abdominal bleeding. Additional diagnostic tests include serial hemoglobin and hematocrit, blood chemistries, and urinalysis. Treatment includes two large-bore IV lines, nasogastric tube, Foley catheter, and type and crossmatch for blood. Hemodynamically stable patients may not need immediate surgical intervention even if the FAST scan is positive (Legome, 2014).

Multiple Trauma

The most common cause of multiple trauma is motor vehicle accidents. Among older adults, falls are the most common cause. Head injury, fractures, and chest and abdominal injuries are anticipated. Airway management is always the first priority (see [Focused Assessment on p. 1030](#)). In head trauma, ventilation and oxygenation may be compromised because of decreased level of consciousness, and C-spine precautions must be observed when performing airway interventions. Threats to breathing may include injuries such as pneumothorax, rib fractures, or open chest wounds. A multiple-trauma patient has a high risk for hypovolemic shock. Tension pneumothorax and cardiac **tamponade** (compression) can also compromise circulation and lead to shock. To manage these critically ill patients, evidence-based practice protocols are implemented based on Advanced Trauma Life Support, developed by the American College of Surgeons. More information can be found at <http://www.facs.org/trauma/atls/>.

Think Critically

What do you have available at home or in your car that could be used to hold pressure on a bleeding wound? Are you prepared to respond to an emergency?

Metabolic Emergencies

Insulin Reaction or Severe Hypoglycemia

Brain cells need a constant supply of glucose. If glucose levels drop, level of consciousness is altered and blood vessels dilate from lack of function of the vasomotor center in the brain. The classic clinical picture of a patient who has received too much insulin includes altered level of consciousness; cold, clammy skin; and hypotension, dizziness, and tachycardia. Most, but not all, patients experiencing hypoglycemia have diabetes.

Treatment

A glucose reading should be obtained first if possible; if glucose monitoring equipment is not available, but hypoglycemia is suspected, treatment should be initiated without delay. If the patient is awake, he should be given a glass of juice or milk. Glucose tablets or hard candy may also be used. Alteration in level of consciousness often results in impaired swallowing. Attempts to give glucose by mouth could result in aspiration. If a patient has a decreased level of consciousness, IV glucose may need to be given. If an IV line is not in place, intramuscular glucagon can be given by medical personnel or trained family members. Mental status should improve within minutes of receiving glucose. The patient should be given a protein meal, such as a meat sandwich, as soon as he is alert enough to eat. Follow-up care includes teaching about prevention of hypoglycemic episodes, recognition of the signs and symptoms of hypoglycemia, and emergency treatment.

Clinical Cues

Many patients with chronic renal failure are diabetic. If they become hypoglycemic, do not give orange juice—it is high in potassium. Use apple, cranberry, or grape juice.

Other Metabolic Emergencies

Other metabolic emergencies include thyroid storm, Addisonian crisis, and diabetic ketoacidosis (see [Chapters 36](#) and [37](#)).

Injuries Caused by Extreme Heat and Cold

Heat Illness

The body responds to heat exposure in various ways. Initially rash and edema may occur, progressing to cramps and syncope with nausea and vomiting. These symptoms are diagnosed as heat exhaustion. This may progress to heatstroke, which is the most severe heat illness and is identified by a body temperature higher than 106° F (41.1° C) with neurologic dysfunction.

Heatstroke is the result of a serious disturbance of the heat-regulating center in the brain and can be exertional or nonexertional. Exertional heatstroke tends to occur in young, healthy individuals who engage in prolonged physical activity in a hot environment. The very young, very old, those with chronic disabilities, those on medications such as anticholinergics, or those with weight or alcohol abuse problems are at risk for nonexertional heatstroke ([Helman, 2014](#)). Normally, the body is able to regulate body temperature even with increased activity or changes in environmental temperatures by increasing perspiration and by using other internal mechanisms. In heatstroke, these mechanisms fail to function properly and the patient's temperature rises, the skin becomes dry and hot, and there may be convulsions and collapse. Alteration in neurologic function is common with both types of heatstroke. Other symptoms include visual disturbances; dizziness; nausea; and a weak, rapid, irregular pulse.

Prevention

Precautions are necessary in hot weather or when active in warm weather. Drinking plenty of fluids that are nonalcoholic, noncaffeinated, and low in sugar content (the wrong fluids can increase fluid loss) is important, as is not waiting until thirsty to drink fluids. Staying indoors during extremely hot weather, or, if air conditioning or adequate cooling is not available in the home, going to a public place with air conditioning should be encouraged ([CDC, 2011](#)).

Lightweight, light-colored, loose-fitting clothing should be worn in the heat. Limiting outdoor activities to morning and evening hours and using sun protection such as wide-brimmed hats, sunglasses, and sunscreen will help prevent heat-related illness. Those out in the heat should rest often in shaded areas and limit exertion if possible.

Treatment

A person suffering from heatstroke should be placed in the shade and cooled immediately by sprinkling with water and fanning until EMS arrives. Active cooling measures at the hospital include removal of extra clothing or coverings, wiping the skin with cool wet towels or application of ice packs to the groin and axillae, use of a cooling blanket, and infusion of cold fluids. Active cooling measures are discontinued when the rectal temperature reaches 102.2° F (39° C); this prevents rebound hypothermia ([Helman, 2014](#)).

Hypothermia

People most at risk for hypothermia are older adults, very young and thin children, the mentally ill, the homeless, and others unable to alter their ambient environment. Hypothermia is a serious lowering of the total body temperature caused by prolonged exposure to cold. The extremities can withstand lower temperatures (20° to 30° F). When the core (central) temperature drops even 2° or 3° F, fatal cardiac dysrhythmias or respiratory failure can occur.

Symptoms of hypothermia range from mild shivering, complaints of feeling cold, and loss of coordination to eventual loss of consciousness and a deathlike appearance. Mild or moderate hypothermia may be hard to identify in some patient populations. The symptoms of confusion, dizziness, chills, or shortness of breath may be misdiagnosed. In severe hypothermia, the body's protective mechanisms drastically slow the metabolic processes and require less than half the normal oxygen. Pulse and respiration are barely detected, reflexes are absent, and the person is unconscious.

Prevention

Prevention of hypothermia includes eating high-energy foods, exercising, wearing layers of

clothing, and covering the head. Between one half and two thirds of the body's heat is lost through the head. Hypothermia in older adults can easily be misdiagnosed, because the symptoms resemble those of many diseases to which older adults are most susceptible. Mild hypothermia (90° to 95° F [32° to 35° C] body temperature) is usually tolerated fairly well. Moderate hypothermia (84° to 90° F [29° to 32° C] body temperature) results in a mortality rate of about 21%. Severe hypothermia (core temperature below 82° F [28° C]) has an even higher mortality rate.

Most oral clinical thermometers used in hospitals and clinics do not register temperatures below 94° F (34.5° C). In the ED, rectal, bladder, or esophageal probes will be used to monitor true core temperature throughout the warming process.

Older Adult Care Points

With aging, the body's ability to withstand the cold decreases. Older people may also be less active, thus generating less body heat. Older adults are at risk for accidental hypothermia after exposure even to mild cold weather or a small drop in temperature (Box 44-4).

Box 44-4

Prevention of Hypothermia in Older Adults

- Room temperature should not be lower than 65° F (18° C). An indoor thermometer should be kept in the house and checked daily during the cool seasons.
- An energy audit with suggestions from the utility company can prevent heat loss from the home.
- Suggest heating one or two rooms and closing off the other rooms of the house.
- Suggest aids such as a throw or quilt, extra socks, and warm hats to be worn indoors.
- Recommend wearing several loose layers of clothing to retain body heat.
- A head covering should be worn even while sleeping to prevent heat loss.
- Advise against using fireplaces in extremely cold weather, because a substantial amount of heat is lost through the flue.
- Arrange for someone to check in daily with older adults who live alone.
- Suggest an early alert system be installed, allowing the individual to call for help by pressing a button if unable to get to the phone.

Treatment

Once hypothermia is diagnosed, the core must be rewarmed first and continuous monitoring implemented. The goal is to prevent lactic acid or cold blood that has pooled in the extremities from being rapidly shunted to the heart, which can cause ventricular fibrillation. **The heart is extremely sensitive when cold, and the patient must be handled carefully to prevent dysrhythmias.** Rewarming outside a health care facility should be more gradual by wrapping the patient in a blanket and moving him to a warm location.

Frostbite

Frostbite is a localized injury to tissue caused by freezing. Exposure of the tissues to extreme cold constricts the blood vessels, damages vessel walls and tissue cells, and leads to the formation of blood clots. Frostbite is most common in the fingers, toes, cheeks, and nose, where exposure usually is greatest and blood supply is most easily hampered. Frostbite can be categorized by four degrees of severity; however a simplified classification divides injury into superficial or deep (Loar et al, 2015). The full extent of injury cannot be detected upon first examination. The appearance of a first-degree injury (superficial) includes reddened skin, swelling, waxy appearance, hard white plaques,

and sensory deficit. Second-degree injury (superficial) also has redness and swelling and formation of blisters filled with clear or milky fluid that form within 24 hours of injury. In third-degree injury (deep), the blisters are blood filled, and black eschar forms over several weeks. Fourth-degree injury (deep) involves full-thickness damage affecting muscles, tendons, and bone, resulting in tissue loss.

Prevention

Like hypothermia, frostbite can be prevented by wearing protective clothing and avoiding exposure to extreme cold. Those who are intoxicated or under the influence of drugs may not realize they are suffering from frostbite; likewise, when a person is significantly hypothermic, cognition and judgment are impaired. Friends, family members, or bystanders must take the initiative to direct impaired individuals toward shelter and warmth.

Treatment

Once the patient is removed from the cold, the affected area should be warmed in the field by forced warmed air; however, the **rewarming process should not be started if there is a chance of refreezing. Refreezing of thawed tissue is more damaging than prolonged freezing (Mechem, 2013)**. After the patient arrives at the health care facility, rewarming is accomplished in a whirlpool bath with water at 40° to 42° C for 15 to 30 minutes for superficial injuries and up to an hour for deep injuries. Health care workers must handle the frostbitten part gently. Skin that has been frozen should **never** be rubbed or massaged. Rubbing snow or ice on the part is dangerous and can cause further damage to the fragile tissues. The affected area should be wrapped in bulky clean or sterile bandages, separating skin areas, such as between the fingers, and elevated. The patient should not be given alcohol or sedatives, which tend to further depress function. A tetanus immunization is given if not up to date. Débridement of dead tissue and skin grafting or amputation will be necessary if the deeper tissues have been destroyed. Extent of tissue injury may be unknown for several months.

Safety Alert

Frostbite

Do not try to hasten the warming process by using water that is hotter than recommended, because this can add to the damage.

Poisoning

Accidental Poisoning

According to the CDC, the incidence of prescription drug overdose has steadily increased and has now become the leading cause of injury and death in the United States, the rate exceeding that of motor vehicle accidental injury and death. Nine out of 10 poisoning deaths are caused by prescription medications. The drugs most commonly related to pharmaceutical overdose are opioids and benzodiazepines (CDC, 2014b). Cardiovascular drugs and antihistamines are also increasing in number of exposures (Mowry et al, 2013). Many states have passed laws or are in the process of doing so to further control prescription and dispensing of schedule II medications.

Children younger than 5 years are at risk of accidental poisoning. Children 12 years and older more commonly have an intentional ingestion. Prescription medications of family members are the most common poisoning emergency in the 5 years and younger age group. Substances ingested by children may include cosmetics, personal care products, cleaning substances, insecticides, and plants. Children explore their environment by sight, touch, smell, and taste; thus children are at risk for ingestion of a variety of substances including poisonous mushrooms, plants, or toxic berries. Older adults are also at risk for accidentally taking too much prescribed medication because of forgetfulness, confusion about dosage or frequency, or inability to read small print on a medication bottle. The Joint Commission requires medication reconciliation for patients in an effort to prevent duplication of medications from different providers that could contribute to overdose.

Older Adult Care Points

If medications have not been adjusted as a patient has aged, dosages that were appropriate when prescribed may later lead to overdosage. Metabolic changes with aging include decreased liver and kidney function, both of which are responsible for drug metabolism.

Prevention

Prevention of accidental poisoning begins with a realization that there are literally thousands of poisonous substances in an individual's environment. Every home has a variety of poisons in the medicine cabinet; under the kitchen sink; or in the laundry room, utility room, and garage. Encourage families to look at their environment through the eyes of their children and older adults to discover potential poison sources. Make sure adequate teaching has been done for use of prescription medications and their potential complications, including proper disposal of transcutaneous drug patches.

Symptoms

The symptoms of poisoning vary according to the substance ingested and the time that has elapsed since it first entered the body. Poisoning should be suspected if the victim becomes ill very suddenly and there is an open poison or drug container nearby. A peculiar odor to the breath may be present; for example, a garlic smell is associated with organophosphate poisoning. Other symptoms of poisoning include pain or burning sensation in the mouth and throat, an increase or decrease in pulse or respiratory rate, nausea, vomiting, disorientation, visual disturbances, loss of consciousness, or a deep unnatural sleep.

Treatment

The health care team must first ensure circulation, airway, and breathing. Nurses should listen carefully to the patient, family, or EMS personnel, because they provide invaluable information as to **what** was taken (or inhaled) and **when** the event occurred. Availability of the container and any of the contents may help in identifying the poison. The **poison control center** (at 1-800-222-1222) should be immediately consulted, and the caller should be prepared to give the patient's age; weight; medical and medication history; allergies; what, when, and why the substance was taken; current signs and symptoms with vital signs and laboratory results; and any treatment rendered. Poison control gives advice about the severity of toxicity and treatment options.

Health Promotion

Poison Prevention

- Dispose of all medicines that are no longer being used by delivering them to an approved collection location. Many pharmacies and health care facilities will accept medications for disposal. Some drugs undergo chemical changes with age and become toxic compounds.
- Store poisons and inedible products separately from edible foods.
- Do not transfer poisonous substances from their original container to an unmarked one. **Never** place a poison in a container that is normally used for edible solids or liquids (such as a soft drink bottle).
- Never tell children that medicine is candy. Explain that medicine will make the child feel better and that it must be taken only as the doctor has directed.
- Always read the labels of chemical products before using them.

Safety Alert

Never dispose of unused or outdated medications in the sewage or water system. Measurable amounts of prescription medications have been found in drinking water. The Food and Drug Administration (FDA) has issued guidelines on drug disposal (see www.fda.gov/ForConsumers/ConsumerUpdates/ucm101653.htm).

Treatment of ingested poisons.

Remember to ask about first-aid measures that were initiated before arrival at the hospital. Syrup of ipecac is not recommended as a home remedy. However, if ipecac was given at home, initiate aspiration precautions, because vomiting is likely to occur. A sample of vomitus should be saved for analysis and identification.

Treatment in the ED is targeted to the specific substance. Treatment for drug ingestion may include activated charcoal to decrease absorption of poison, gastric tube insertion (a sample of stomach contents should be saved for analysis), irrigation to remove stomach contents, sorbitol to enhance bowel excretion, and antidotes that are specific to the poisons. If a caustic substance was ingested, evacuation of stomach contents by a nasogastric tube may be helpful if done quickly. Lavage, activated charcoal, and other standard interventions are contraindicated (Kardon, 2012). If the nonmedication substance can be identified, the Safety Data Sheet (SDS) will provide treatment recommendations.

Inhaled Poisons

When a person has inhaled a poisonous substance, emergency help is necessary. Do not attempt to rescue a person without notifying someone of your location. If it is safe to do so, the person can be removed from the danger of the gas, fumes, or smoke. Windows and doors should be opened to remove the fumes. The rescuer should take several deep breaths of fresh air, and then hold his breath when entering, holding a wet cloth over his nose and mouth. Lit matches or lighters should not be used as a light source, because some gases can catch fire.

After rescuing the person from danger, clothing around the neck and chest should be loosened. The person's pulse, airway, and breathing should be checked and monitored. If necessary, CPR or rescue breathing should be initiated (see American Heart Association recommendations for rescue breathing and CPR).

Symptoms that may indicate inhaled poison include excessive coughing; shortness of breath, wheezing, and a burning sensation of the nose and throat; pale or bluish color to skin; dizziness, headache, nausea, and vomiting; and chest pain or tightness. Carbon monoxide (CO) is the most commonly inhaled poison and results in a **cherry red color of the mucous membranes**. A carboxyhemoglobin level should be obtained and the patient should be treated with 100% oxygen.

until the carboxyhemoglobin level is less than 10%. In carbon monoxide poisoning, the readings of pulse oximetry and the values of arterial blood gases can appear normal despite significant toxic exposure. Hyperbaric oxygen (HBO) therapy eliminates CO from hemoglobin more rapidly than just oxygen administration. HBO is not available at many facilities, and studies have not shown a clear benefit in patient outcomes. Current CO poisoning treatment guidelines do not include HBO therapy; however, it is frequently implemented at facilities with HBO capability ([Shochat, 2015](#)).

Safety Alert

In addition to smoke alarms, carbon monoxide detectors are required in certain residential buildings in most states.

Bites and Stings

Human Bites

A human bite that breaks the skin is termed an *occlusive bite*. When a tooth meets the skin and muscle of a clenched fist, it is aptly named a *clenched-fist injury*. Infection occurs in 10% to 15% of human bite injuries and can be severe because of delay in seeking treatment. Occlusive bites are of concern because of the potential disruption of tissue, tendons, bones, and structures underlying the area of bite injury. Copious irrigation is required to clean the wound, which may or may not be closed. Prophylactic antibiotics are indicated ([Barrett, 2014](#)).

Animal Bites

Family pets, especially dogs and cats, are the most common source of animal bites. Dog bites are more common than cat bites and occur most frequently in adults. However, children tend to sustain bites to the head and neck, which warrant more intensive medical care ([Doud Galli, 2014](#)). When a wild animal, such as a squirrel or fox, attacks and bites a human being without provocation, rabies should always be suspected as the cause of the animal's unusual behavior.

Treatment

Bite wounds should be cleaned immediately with soap and rinsed with warm running water for 5 to 10 minutes. The affected area is then treated with antibiotic ointment, covered with a clean bandage, and immobilized. Medical attention includes copious irrigation; suturing may be done if the wound is on the face or hand. Puncture wounds on the arms or legs are typically left unsutured and allowed to drain. If the patient has not had a tetanus shot in the past 5 years, a booster will be given.

The possibility of rabies infection must always be considered in an animal bite. The local animal control agency should be contacted to catch the animal if necessary. If it has been killed, animal control will take the body for examination. If a diagnosis of rabies in the animal has been confirmed or if there is no proof that the animal has been immunized against rabies, the victim is given rabies immune globulin (20 units/kg infiltrated around the wound and the remainder given intramuscularly). A series of intramuscular injections of human diploid rabies vaccine is given at the time of injury and on postinjury days 3, 7, and 14. Antibiotics are given for deep puncture wounds, particularly cat bites ([Doud Galli, 2014](#)).

Snakebite

In the United States 4000 to 7000 snakebites occur annually; approximately 2000 are from poisonous snakes. Fatalities are rare. In a 20-year review of data 97 fatalities were identified ([Daley, 2014](#)). There are four kinds of poisonous snakes in the United States: copperheads, rattlesnakes, coral snakes, and cottonmouths (or water moccasins). Copperheads, rattlesnakes, and cottonmouths are all called pit vipers because they have pits or depressions behind their nostrils; coral snakes are small snakes with characteristic red, black, and yellow bands. Coral snakes have shorter fangs and smaller mouths than the pit vipers, and their venom injection resembles a chewing motion.

A venomous snakebite usually can be distinguished by two fang marks (though there may be only one on a small surface, such as a toe or finger), severe pain and swelling in the area, discoloration at the site of injection of venom, nausea and vomiting, respiratory distress, changes in vision, and increased sweating and saliva production. If prompt intervention is not taken, shock may occur. Nonpoisonous snakebites usually appear as either small scratches or lacerations.

Treatment

Nonpoisonous snakebites are treated as simple wounds and require only a cleansing of the wound with soap and water and the application of a mild antiseptic. First aid for a poisonous snakebite includes washing the wound, lowering the extremity or area and immobilizing it, keeping the victim calm so the venom does not circulate as quickly, and seeking medical attention as soon as possible. Getting a description of the snake can help with treatment. In the field, rescuers should

not apply suction, make incisions over the wound, apply ice, or give alcoholic beverages or stimulants. Prehospital care is centered on supporting the ABCs and prompt transport to a medical facility.

When a snakebite victim reaches a hospital or clinic, the victim is treated based on evaluation of the extent of the envenomation, whether it is localized or systemic, and whether coagulation abnormalities exist. Newer antivenins are recommended earlier in the treatment with more liberal dosing. Prevention of compartment syndrome has been noted with earlier administration. Most victims are admitted for observation for up to 24 hours and provided a tetanus immunization, antibiotic prophylaxis, and symptom management (Daley, 2014).

Bug Bites and Stings

Systemic reactions to the bites and stings of insects and bees account for more deaths each year in the United States than do snakebites. A systemic reaction is caused by hypersensitivity to the venom of bees, wasps, hornets, fire ants, harvester ants, puss caterpillars, scorpions, or spiders. Symptoms of a systemic reaction include hives, swelling, general weakness, tightness in the chest, abdominal cramps, constriction of the throat, loss of consciousness, and possibly death from severe **anaphylaxis**. When the interval between the sting or bite and the development of symptoms is short, the possibility of death increases. Most bug bites result in local reactions and are not reported. Symptom relief is provided, and medical help is sought only if there are complications to the bite or sting.

Safety Alert

A severe local reaction to a bug bite or sting puts the patient at risk for a systemic reaction with a subsequent exposure.

The black widow and the brown recluse spiders are the best known spiders that have a potentially serious bite. The symptoms of a black widow spider bite may not be obvious initially; the bite may feel like a pinprick with some slight redness and swelling. Within a few hours abdominal pain and muscle cramps occur. Other symptoms include nausea, vomiting, chest pain, and respiratory distress. A brown recluse spider bite usually goes unnoticed initially. Symptoms usually develop 2 to 8 hours after the bite and include severe pain and itching at the site, nausea, vomiting, fever, and muscle pain. The tissue may heal without problems, or blistering and development of necrotic tissue may occur, requiring surgical intervention.

Older Adult Care Points

Anyone older than 65 years should seek medical attention if bitten by a brown recluse or black widow spider. Older adults are more at risk for developing complications related to the bite.

Treatment

Treatment for a systemic reaction is to subcutaneously or intramuscularly inject aqueous epinephrine (1 : 1000 solution) in dosages of 0.3 to 0.4 mL for adults and 0.15 to 0.3 mL for children. An antihistamine, such as diphenhydramine (Benadryl), is given. An ice pack may be applied to reduce swelling and relieve pain. Patients who appear to be in shock should be kept warm and should remain lying down with the legs elevated and the head flat. If symptoms persist after 20 minutes and the patient has not yet reached a medical facility, a second injection of epinephrine should be given. Many patients who have a known allergy carry autoinjectable epinephrine in a prefilled syringe device that delivers a measured dose of medication when activated.

The female worker honeybee injects a venom sac that may remain embedded in the victim's skin. **The “stinger” should be removed as quickly as possible.** Do not use tweezers to remove an insect stinger; this may cause squeezing of the venom sac and increase the severity of the symptoms. Use a credit card or any rigid item with a smooth, flat edge to scrape out the stinger.

An emergency kit that contains drugs, syringe, tourniquet, towelette, and tweezers is available by prescription and is used for treatment of systemic reactions to stings and bites. Individuals with known hypersensitivity to insect and bee venom should carry medical identification and an

emergency kit and be thoroughly familiar with its use **before** the need arises. Persons who have systemic reactions or even severe local reactions with swelling beyond two joints should be referred for hyposensitization therapy.

Applying a paste of baking soda and water or household ammonia and a cold compress treats less serious stings of bees, wasps, yellow jackets, and hornets. Meat tenderizer also has been found effective in relieving the symptoms of minor insect sting reactions. Topical cortisone cream can relieve inflammation and itching.

Bites from venomous spiders, scorpions, and other poisonous insects are treated in the same manner as poisonous snakebites. Antivenin specific to the spider, scorpion, or other poisonous creature is available at hospital EDs and clinics that serve rural areas.

Ticks can carry Rocky Mountain spotted fever or Lyme disease. The tick is removed by grasping it as close to the skin as possible with tweezers and pulling it straight out without twisting. Applying turpentine, mineral oil, petroleum jelly, nail polish, or insecticide on the tick is not recommended, because the tick may regurgitate stomach contents into the skin ([CDC, 2014c](#)). After the tick is removed, the area should be washed with soap and water and a mild disinfectant applied. A provider can be consulted for possible infection or disease symptoms.

Electrical Injuries and Burns

When an electrical current passes through the body, it can cause severe damage to the entire body, including cessation of breathing, circulatory failure, and serious burns. The current travels along the path of least resistance, which is usually the fluid-filled blood vessels, and may be conducted through the heart. The amount of voltage and current involved, the length of time in contact with the electricity source, and the condition of the skin all play a role in how much damage may occur as a result of an electrical shock.

Emergency treatment of electrical shock involves CPR if breathing has ceased or the heart has stopped and treatment of burns or other concurrent injuries. The proper procedure for separating a victim from a live conductor of electricity is shown in [Figure 44-4](#). **Remember that water serves as a conductor of electricity, and wet objects can transmit a fatal electric current to a person trying to rescue the victim of electrical shock.** All electrical shock victims, including those struck by lightning, must be observed for cardiac dysrhythmias and evidence of internal injury.

Safety Alert

Lightning

There are no safe locations outside during a lightning storm. The National Weather Service slogan is "When thunder roars, go indoors." When camping or participating in other outdoor activities, plan ahead for shelter. If no safe shelter is available, avoid water, high ground, open spaces, and metal objects. Do not seek shelter under canopies, small picnic or rain shelters, or trees. If out in the open, do not lie down, but keep moving toward shelter. If inside, avoid plumbing fixtures and electrical appliances, including computers and cord phones. If in the car, do not touch surfaces that readily conduct electricity (National Oceanic and Atmospheric Administration, *National Weather Service Lightning Safety*, n.d.).

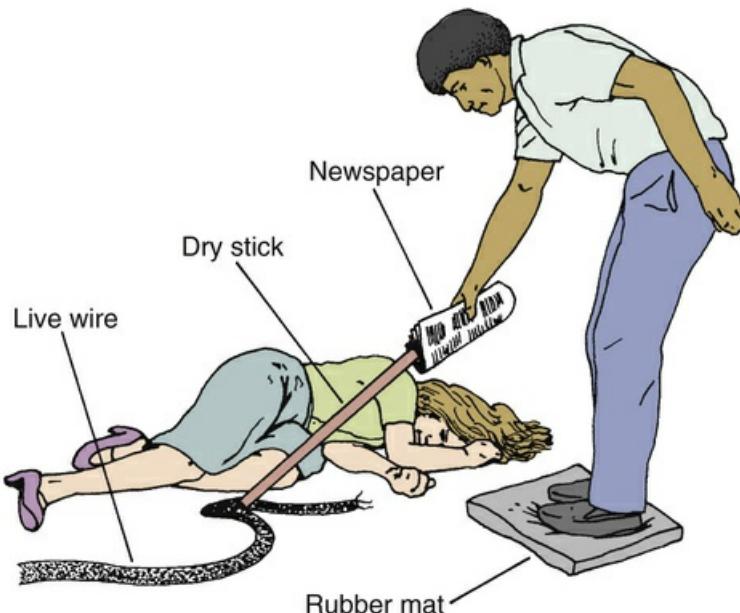


FIGURE 44-4 Separating a victim from a live electrical wire while avoiding similar shock.

Chemical Injury

Strong chemicals capable of burning the skin and mucous membranes will continue to destroy tissue unless they are diluted and removed immediately. For this reason, any area burned by chemicals must be quickly flushed with large amounts of water (with some exceptions) until all traces of the chemical have been removed; the burned area is then covered with a dressing.

Water is not used for burns caused by dry lime or phenol. Dry lime should be brushed from the skin and clothing unless there is enough water to remove *all* traces of the powder. Small amounts of water will react chemically with the lime to produce a highly **corrosive** (destroys gradually) substance. Phenol (carbolic acid) is not water soluble. The phenol is first removed by alcohol, and the burned area is then rinsed with water. **If a corrosive chemical has been ingested, the poison control center should be contacted for instructions and proper dosage of an antidote.** Vomiting should **not** be induced or encouraged. No attempt should be made to neutralize an ingested chemical substance, because this can cause further damage to the esophagus and stomach.

Patients with chemical burns should be transported to a hospital as soon as possible. If possible, the treating provider should be informed about (1) the offending agent, physical form, and concentration; (2) the route and volume of exposure; (3) the timing and extent of irrigation; and (4) any coexisting injuries.

Choking Emergencies

Obstructed airway is the sixth leading cause of accidental death. Adults as well as children can become choking victims and need immediate intervention to prevent death from asphyxiation. Both partial and complete airway obstruction should be treated promptly, even a partial obstruction can result in inadequate air flow. **If the person is conscious and able to cough or speak, he may not need assistance in expelling the object from his throat.** In this situation, he should be encouraged to cough vigorously and breathe as deeply as he can. His coughing efforts are more effective than outside intervention; others present should stay with him and call for help as needed. When the choking victim cannot speak, cough, or independently expel the foreign object, abdominal thrusts are used to force the object up and out (see [Chapter 13](#)).

Think Critically

You are dining in a restaurant and observe someone at another table apparently choking. What steps would you take to assist?

Cardiopulmonary Resuscitation

Many phenomena cause sudden cessation of breathing and circulation, from electrical shock to drowning to cardiac arrest. CPR is indicated when the person shows (1) absence of response to stimuli, (2) absence of respirations, and (3) absence of a carotid pulse. When a person stops breathing spontaneously and his heart stops beating, "clinical death" has occurred. Within 4 to 6 minutes, the cells of the brain, which are most sensitive to lack of oxygen, begin to deteriorate. If the oxygen supply is not restored immediately, the patient suffers irreversible brain damage and "biologic death" occurs.

The American Heart Association (AHA) Guidelines for CPR are revised every 5 years to reflect the most current research and consensus by international experts. The 2010 guidelines implemented the **C-A-B (chest compressions, airway, breathing)** sequence and the 2015 guidelines have not changed the recommendation. The guidelines emphasize the importance of high-quality CPR. The guidelines are based on research that indicates that the highest survival rates for cardiac arrest among adults occurs for witnessed ventricular fibrillation (VF) or pulseless ventricular tachycardia in which the critical interventions of chest compressions and defibrillation are implemented. There should be minimal delay or interruption to chest compressions for pulse checks or any other action. The AHA recommends **hands-only CPR** for the lay rescuer. The idea of hands-only CPR for lay rescuers is intended to encourage bystanders to intervene only with chest compressions and to **push hard, push fast** at a rate of at least 100 compressions per minute. Beyond the fear of contagion, it was determined that the positioning of the head and delivering the initial breaths was delaying the delivery of chest compressions. In the health care setting, high-quality CPR means that the chest compressions must be delivered with the correct depth and rate with adequate recoil and that any pauses for ventilation, pulse checks, or switching rescuer positions or procedures such as application of equipment or defibrillation must be kept to the absolute minimum.

Health care providers are held to a higher standard of care, and intervention must be based on assessment of the patient and tailored to address the most likely cause. For example, if a nurse witnesses a sudden collapse of a patient in the hospital, VF would be a likely assumption. The sequence would be to establish unresponsiveness and breathlessness, activate the response team, check the pulse in 10 seconds or less, start compressions, defibrillate with the **automated external defibrillator (AED)** as soon as it is available, and ventilate with an Ambu bag. Adapt and delegate as personnel and equipment arrive at the scene.

In the community, the use of the AED combined with activation of the EMS response system and CPR gives a victim of VF the best chance for survival. AEDs are now located in most public buildings, health clubs, airlines, malls, and sporting venues. As soon as the AED is brought to the scene, the device must be turned on; it will audibly give step-by-step instructions. When the AED indicates that it is analyzing the rhythm, all CPR and any direct contact with the victim must stop. If the AED identifies a shockable rhythm, it will either automatically charge or give instructions to charge the device. Once the AED is charged, the instructions will state to "stand clear" of the victim. To prevent being shocked, everyone must avoid touching the victim when the charge is delivered. If indicated, a single shock is delivered and CPR is immediately resumed.

Table 44-2 presents current techniques of CPR. For the most up-to-date science, refer to a current CPR handbook. Recertification is generally required every 2 years; however, studies show that skills are not retained for that length of time unless reviewed.

Table 44-2

Cardiopulmonary Resuscitation for Adults

COMPONENT	ACTION FOR LAY RESCUER	ACTION FOR HEALTH CARE PROVIDER
Recognize symptoms and need for assistance	If victim is unresponsive, or is not breathing or gasping only. Call for help.	The sudden collapse of an adult is likely to be cardiac in origin; call for help, start CPR, and defibrillate as soon as the AED is available. Any adult that is unresponsive or has breathing issues needs EMS care. The sooner the call is placed, the sooner help will arrive.
Pulse check	Lay rescuers are not taught this step.	≤10 sec, carotid.
CPR sequence	C-A-B.	C-A-B.
Compression rate	At least 100-120/min. Pushing hard, pushing fast, and allowing for the chest to recoil between compressions has been found to be the most effective.	At least 100-120/min. Pushing hard, pushing fast, and allowing for the chest to recoil between compressions has been found to be the most effective. Consider using an automated chest compression device for consistent high-quality chest compressions.
Compression depth	At least 2 inches (differs for children and infants).*	At least 2 inches (differs for children and infants).*
Compression interruption	Minimize interruptions in chest compressions.	Limit interruptions to less than 10 sec (i.e., rotating compressors, delivering shock, pulse check). Rescuers should change compressors q2min to prevent fatigue and decreased efficiency of compressions.
Airway	Untrained lay rescuers should not delay compressions to open the airway. Head tilt–chin lift; use jaw thrust if cervical injury is suspected.	

Compression ratio to rescue breathing (no advanced airway placed)	Compressions only for untrained lay rescuers.	30 : 2 for one or two health care rescuers. Use one-way valve for mouth to mask ventilations. Use bag-valve-mask as soon as available.
AED use	Use as soon as possible.	Use as soon as possible. For an out-of-hospital, unwitnessed cardiac arrest, EMS may initiate 1.5 to 3 min of CPR before attempting defibrillation.

*Consult a pediatrics text and the American Heart Association guidelines for additional data that are specific to children and infants.

AED, Automated external defibrillator; C-A-B, chest compressions, airway, breathing; *CPR*, cardiopulmonary resuscitation.

Shock

Shock is a condition that starts at the cellular level and gradually spreads to produce clinical signs and symptoms. The hallmark of shock is lack of adequate **perfusion** (blood supply) to tissues, which results in lack of oxygen and nutrients. This deficit causes anaerobic metabolism and the production of lactic acid and organ dysfunction. Conditions of low circulating volume (hypovolemic shock), decreased cardiac output (cardiogenic shock), impairment of circulation (obstructive shock), or maldistribution of volume (neurogenic, anaphylactic, or septic shock) cause decreased perfusion (Table 44-3). Perfusion requires adequate blood volume; the blood vessels must be intact, without obstruction to flow and the pump (the heart) must be working correctly.

Table 44-3
Comparison Chart of Shock

TYPE	CAUSE	CLINICAL SIGNS AND SYMPTOMS	MANAGEMENT
Hypovolemic	External blood loss Trauma GI losses Burns Internal bleeding	↓ BP ↑ HR Tachypnea Oliguria Cool, pale skin Altered mentation	Stop fluid loss Replace lost volume
Cardiogenic	Myocardial infarction Cardiomyopathy Valve dysfunction	↓ BP ↑ HR Dysrhythmias Oliguria Cool, pale skin Altered mentation Chest pain	Improve contractility with medications Mechanical support as needed Prevent/treat dysrhythmias
Obstructive	Cardiac tamponade Tension pneumothorax Pulmonary embolism Aortic stenosis	↓ BP ↑ HR dysrhythmias Oliguria Cool, pale skin Altered mentation Chest pain JVD	Eliminate the source of obstruction or compression
Distributive			
Neurogenic	Cervical spinal cord injury Spinal anesthesia	↓ BP ↓ HR Hypothermia Warm, dry, flushed skin Oliguria Altered mentation	Eliminate and treat the cause. Maintain BP with IV fluids
Anaphylactic	Chemicals (latex, perfume, soap) Drugs (antibiotics, contrast media, blood products) Food (peanuts, shellfish, eggs, wheat, nuts, milk) Bites or stings (wasps, bees, spiders, fire ants)	↓ BP ↑ HR dysrhythmias Tachypnea Chest pain Warm, dry, flushed skin Oliguria Dyspnea, cough stridor	Remove offending agent or slow absorption Maintain airway Modify or block effects of mediators: epinephrine, antihistamines, steroids
Septic	Bacteria Immunosuppression Malnutrition Invasive procedures and devices Traumatic wounds or burns Infection elsewhere in the body (urinary tract, peritoneum, respiratory tract)	↓ BP ↑ HR Oliguria Cool, pale skin Altered mentation Hyperthermia	Identify source of infection Antibiotic therapy Medical asepsis Support BP with fluids and pressors if needed Avoid NPO status; initiate and maintain nutrition Control hyperthermia

BP, Blood pressure; GI, gastrointestinal; HR, heart rate; IV, intravenous; JVD, jugular venous distention; NPO, nothing by mouth.

Adapted from Sole ML, Klein DG, Moseley MJ: *Introduction to critical care nursing*, ed. 6, Philadelphia, 2012, Saunders.

Signs and Symptoms

Early recognition and treatment of impending shock results in better outcomes. Compensated shock occurs when the body is able to maintain blood pressure and perfusion by increasing heart rate and vasoconstriction of peripheral vessels. The only clinical signs at this point may be increased heart rate and cool skin. The clinical symptoms associated with the second stage of shock reflect lack of oxygen to essential organs; this is decompensated shock. Signs and symptoms reflect decreased cardiac output, such as confusion, restlessness, diaphoresis, rapid thready pulse, increased respiratory rate, cold clammy skin, decreased blood pressure, and diminishing urinary output to less than 20 mL per hour (Figure 44-5). Decompensated shock can quickly move to the third stage, which is irreversible shock from which recovery is impossible.

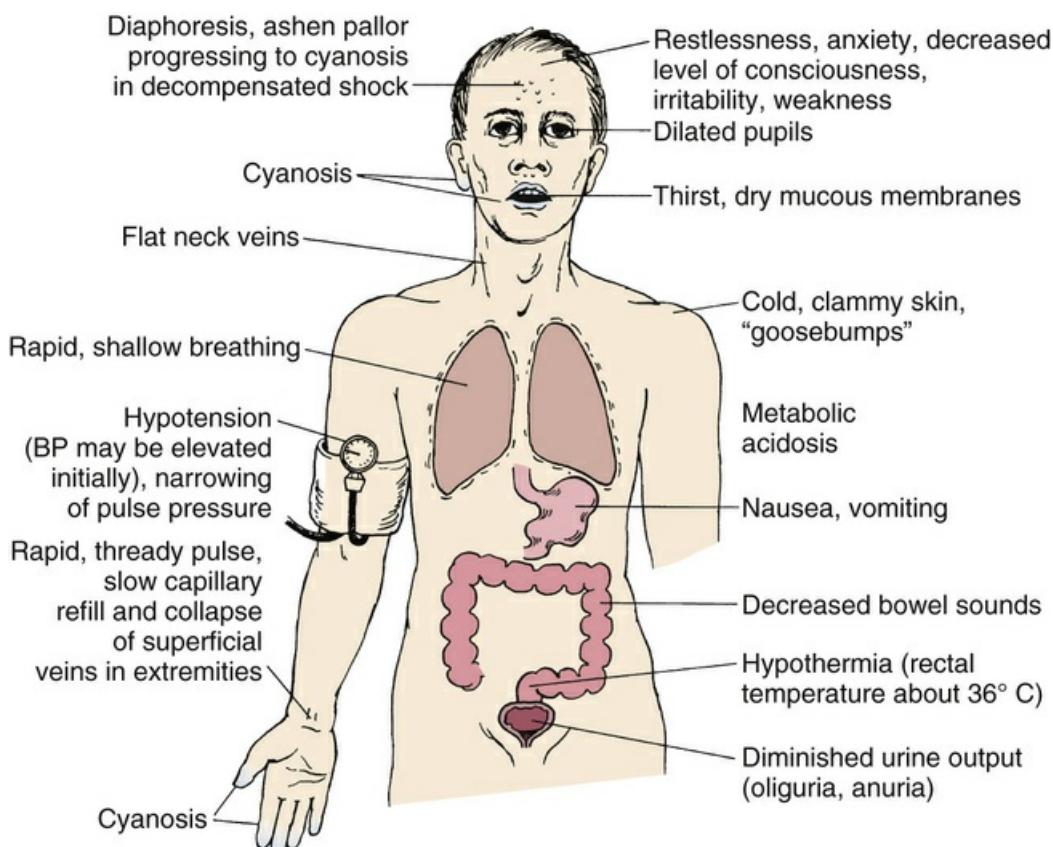


FIGURE 44-5 Clinical signs of shock. BP, Blood pressure.

Hypovolemic Shock

Hypovolemic shock is the most common form of shock. A blood loss of even 500 mL in a typical adult may cause hypovolemic shock. [Table 44-4](#) shows the amount of blood loss and consequent clinical manifestations. Any significant loss of fluid volume can result in hypovolemic shock ([Figure 44-6](#)). Blood loss from trauma or gastrointestinal (GI) bleeding, plasma leaking from a burn, severe vomiting and diarrhea, and internal bleeding from pancreatitis are examples of conditions that may lead to hypovolemia.

Older Adult Care Points

Older adults may develop shock with smaller blood loss because of decreased vascular tone and impaired cardiac function. Many are on antihypertensive medications that impair the vasoconstrictive ability of vessels.

Table 44-4
Clinical Manifestations of Blood Loss

VOLUME LOST	CLINICAL MANIFESTATIONS
10%	None
20%	At rest, no signs or symptoms; slight postural hypotension when standing; tachycardia with exercise
30%	Blood pressure and pulse normal when supine; postural hypotension and tachycardia with exercise
40%	Below-normal blood pressure, central venous pressure, and cardiac output at rest; rapid, thready pulse and cold, clammy skin
50%	Shock and potential death

Adapted from Lewis SL, Dirksen SR, Heitkemper MM, Bucher L: *Medical-surgical nursing: Assessment and management of clinical problems*, ed. 9, St. Louis, 2014, Mosby.

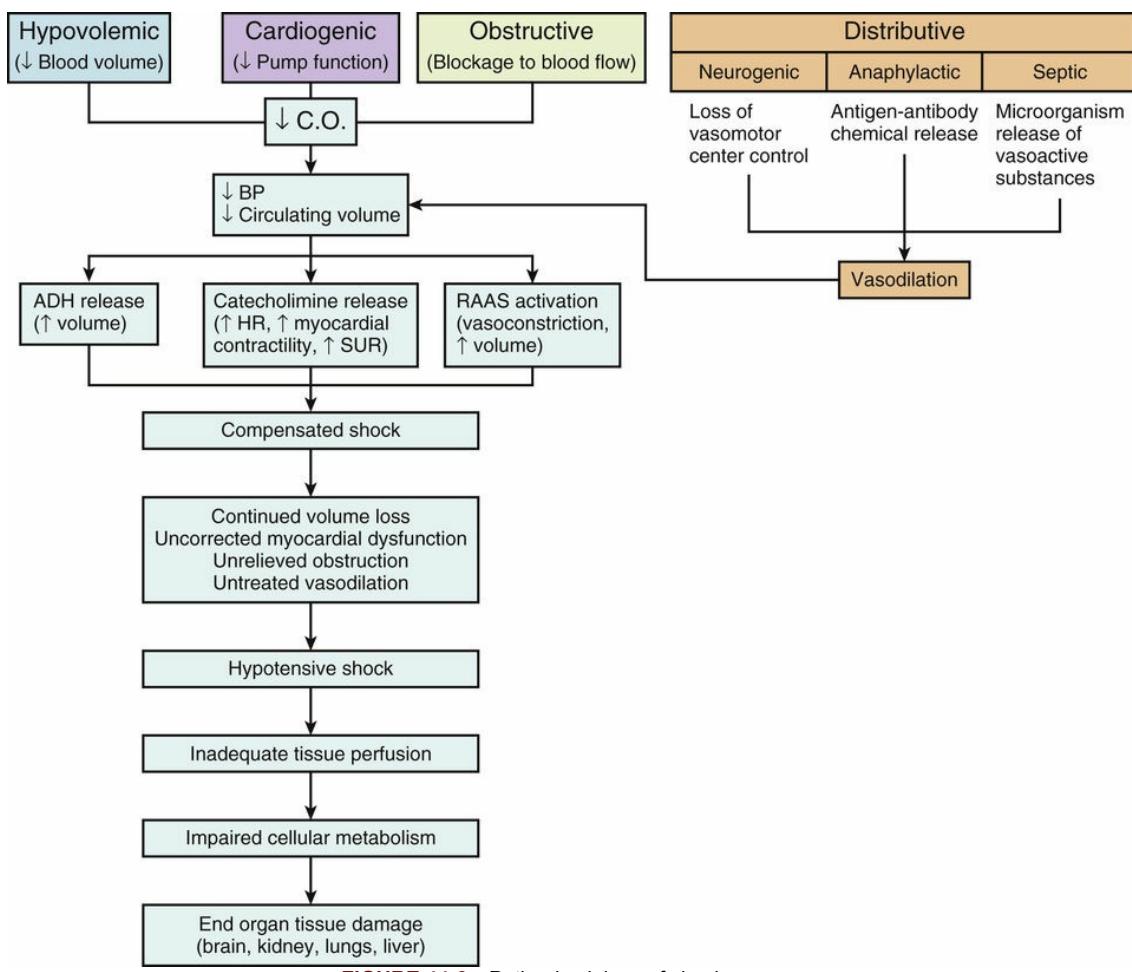


FIGURE 44-6 Pathophysiology of shock.

Treatment

The primary interventions for **hypovolemia** are to stop the fluid loss, if possible, and to replace fluids. In all situations of hypovolemic shock, **volume replacement is essential**. To infuse large volumes of fluid and/or blood products, adequate IV access is extremely important. Two large-bore peripheral IV sites or placement of a central line with multiple lumens are needed. If IV access cannot be obtained, intraosseous access may be implemented (Kolecki, 2014). If large volumes of fluid are required for fluid resuscitation, warming of the fluids can help prevent hypothermia. If hemorrhage is present, crystalloids (i.e., normal saline or lactated Ringer solution) or colloids (e.g., albumin or hetastarch) will be infused until blood products are available for transfusion. Packed red cells are given to replenish cell volume. Units of packed cells contain citrate as an anticoagulant. If multiple units of blood are rapidly infused, the citrate can bind with ionized calcium, decreasing the amount of circulating calcium. This can depress cardiac function and alter coagulation; therefore in massive transfusions, IV calcium is also given. If a large volume of blood is lost, clotting factors will also need to be replaced. Fresh frozen plasma is given for replacement of clotting factors. Platelets may also be given.

If fluid loss is from GI sources, isotonic solutions will be used to replenish the fluid and electrolytes. Burn patients require replacement of lost plasma, which is rich in protein. Crystalloids containing salt and colloids, such as albumin, will be administered to rehydrate burn victims (see Chapter 42). Monitoring of vital signs, level of consciousness, and urine output helps to assess response to therapy.

Clinical Cues

Oxygen should always be administered to patients in shock or suspected shock.

Think Critically

You are caring for a patient who has vomited large amounts of blood. You expect to see a compensatory increase in pulse, but in fact the pulse rate remains between 50 and 60 beats per minute. Why would you want to double-check this patient's medication history?

Cardiogenic Shock

Cardiogenic shock occurs when the heart is incapable of pumping enough blood to meet the needs of the body because of a primary cardiac injury or dysfunction. MI is the primary cause of coronary cardiogenic shock because of the direct damage of the heart muscle from a heart attack. The heart also can be rendered ineffective as a pump by noncoronary causes, such as cardiomyopathy or valvular dysfunction.

Treatment

In cardiogenic shock, the first-line treatment is to restore myocardial function if possible. Myocardial ischemia resulting from acute coronary syndromes is the primary cause of cardiogenic shock. Percutaneous coronary intervention or coronary artery bypass grafting can help restore oxygen to the myocardium, improving function. Chemical and mechanical treatments are used with the goal of supporting the impaired heart muscle without increasing the workload of the heart. Vasopressor agents (e.g., norepinephrine and dopamine), inotropic agents (e.g., dobutamine), or phosphodiesterase inhibitors (e.g., inamrinone) are used to increase the contractility of cardiac muscle (positive inotropy) (Ren, 2014). However, as the heart works harder, it requires more oxygen. If the heart is already damaged, pushing it to do more will only worsen the inadequate circulation.

In conjunction with the positive inotropes, vasodilators (e.g., nitroglycerin or nitroprusside) are judiciously used to decrease cardiac workload by decreasing afterload. When the heart ejects blood into the systemic circulation, it has to overcome the pressure of the closed aortic valve and the resistance of the peripheral blood vessels. The blood vessels constrict as part of the compensatory mechanisms, similar to an adjustable nozzle on a hose: as the nozzle opening is enlarged, less pressure is required than if the nozzle is turned to the smallest setting. Similarly, if the blood vessels are dilated, the heart does not have to work as hard to expel the blood. Diminished workload lessens the oxygen demand of the cardiac muscle. Vasodilators must be used cautiously to enhance cardiac performance without compromising blood pressure. The intra-aortic balloon pump (IABP) is a mechanical left ventricular assist device that supports cardiac function; IABP is used in critical care units^E (see [Figure 19-3](#)).

Obstructive Shock

Tissue perfusion can be impaired when there is a mechanical obstruction to blood flow. In conditions such as pericardial tamponade, tension pneumothorax, or constrictive pericarditis, there is a physical obstruction that prevents adequate filling or emptying of the heart. In conditions such as aortic dissection or massive pulmonary embolus, there is a problem in the blood vessels that prevents forward flow of blood.

Treatment

Pericardial tamponade is treated by inserting a needle into the pericardial sac and removing the fluid that is compressing the heart. Tension pneumothorax is also treated by needle decompression. A needle or thoracostomy tube is inserted to release the air trapped in the chest that is putting pressure on the heart. Constrictive pericarditis does not usually have a sudden onset. It is typically a chronic problem with acute episodes. Medical treatment with anti-inflammatory medications may help, but the only definitive treatment is surgery. Aortic dissection is one of many causes of chest pain and diagnosis can be difficult, but the patient must be taken immediately to the operating room for repair of the vessel. Massive pulmonary embolus (PE) is usually fatal. A less severe PE will be treated with heparin to prevent further clot formation. Thrombolytic therapy in PE is controversial.

Distributive Shock (Maldistribution of Fluids)

Distributive shock involves a maldistribution of the fluid within the vascular system. If the vessels dilate and the volume of fluid stays the same, the pressure decreases (vasogenic shock). All forms of distributive shock involve vasodilation of blood vessels, resulting in a "relative hypovolemia." There is no actual volume loss, but physiologically the patient appears to be hypovolemic.

Anaphylactic Shock

Acute allergic reactions can result in life-threatening anaphylactic shock. Classic anaphylaxis is a massive immune response set up by a previous exposure to the antigen. However, the body can respond to substances without prior exposure causing the same clinical signs and symptoms. In anaphylactic shock, the antigen-antibody reaction that occurs releases **vasoactive** substances that cause massive vasodilation as well as increased capillary permeability. This combination of factors results in hypotension. These mediators can also cause bronchoconstriction and **angioedema** of the laryngeal tissue, causing an acute airway emergency. Other signs and symptoms may include skin rash and generalized flushing, headache, or light-headedness.

Treatment

If possible, the antigen should be removed immediately. With a bee sting, prompt removal of the stinger may help. If the anaphylaxis results from an ingested or inhaled substance, removal may not be possible, so treatment begins immediately. Treatment of anaphylactic shock includes airway management, including intubation when necessary, and administration of epinephrine intramuscularly in the vastus lateralis (thigh). Epinephrine helps maintain blood pressure, counteracts the effects of the released mediators and inhibits further release of mediators from mast cells and basophils. Bronchodilators may also be administered.

Administration of fluid is also needed. Although the actual circulating volume reduction from leaking capillaries is not enough to cause hypotension, vasodilation is more than enough to cause a significant drop in blood pressure. An antihistamine such as diphenhydramine (Benadryl) is given; dexamethasone or methylprednisolone is given to reduce the inflammatory response. Patients should be monitored for several hours even if response to treatment is good, because antihistamines and epinephrine will wear off ([Mustafa, 2014](#)).

Neurogenic Shock

Neurogenic shock, the rarest form of shock, has a triad of symptoms: hypotension, bradycardia, and hypothermia. Spinal injury or anesthesia can cause a blockage in sympathetic outflow from the vasomotor center of the brainstem. Most blood vessels are never completely constricted or completely dilated. This in-between state is known as *vascular tone* and allows for constriction or dilation as necessary. The sympathetic nervous system maintains this state of readiness. When spinal cord injury happens or high levels of spinal anesthesia are administered, the sympathetic impulses regulating the state of the blood vessels are blocked, and passive vasodilation occurs. The volume of fluid circulating in the blood vessels is the same, but the space within the blood vessels enlarges. This results in a lower blood pressure leading to hypotension and a shock state. Proper stabilization of spinal injuries can prevent or minimize conditions that lead to neurogenic shock.

Treatment

Treatment includes administering crystalloids to maintain blood pressure. Dopamine is given for a combination of hypotension, bradycardia, and decreased cardiac output. Hypothermia is treated with warming blankets and environmental temperature control.

Systemic Inflammatory Response Syndrome, Sepsis, and Septic Shock

Systemic Inflammatory Response Syndrome

The inflammatory response is part of the cascade of events that is part of the body's immune response. Once the threat has been dealt with, feedback mechanisms inhibit the release of

chemicals, and the immune system goes back into a state of readiness. In some situations, this does not happen, and the substances that cause inflammation continue to be released. This clinical picture is known as **systemic inflammatory response syndrome (SIRS)**. SIRS can occur because of an infection or from noninfectious conditions.

SIRS is the first part of a continuum that leads to sepsis, then severe sepsis, and ultimately **multisystem organ dysfunction syndrome (MODS)**, defined as two or more organ systems showing signs of dysfunction. The usual clinical progression starts with symptoms indicating SIRS, moving into sepsis, then severe sepsis and MODS complicated by disseminated intravascular coagulation (DIC). If this sequence of events continues, mortality rates range from 28% to 80%. The wide range is affected by multiple variables such as age, preexisting illnesses, and access to treatment. Early recognition and effective treatment of this cascade of events are the most significant factors in reducing mortality risk.

A patient presenting with two or more of the following is diagnosed with SIRS:

1. Temperature greater than 102.2° F (39° C) or less than 96.8° F (36° C)
2. Heart rate greater than 90 beats per minute
3. Respiratory rate greater than 20 breaths per minute or Paco_2 less than 32 mm Hg
4. White blood cell count greater than 12,000 cells/mm³ or less than 4000 cells/mm³ or more than 10% bands

Many hospitalized patients meet these criteria. Nurses need to pay attention to vital signs and laboratory results so notification can happen quickly. Early recognition is the key to treatment (Kaplan, 2014).

Meeting the SIRS criteria in the presence of an infection is diagnosed as *sepsis*. *Severe sepsis* is defined as sepsis with organ dysfunction. Septic shock is severe sepsis with hypotension despite adequate fluid resuscitation. These terms reflect deterioration in the patient's status and a more profound risk to life.

Symptoms of septic shock that reflect the hypotensive state include altered mental status, hypoxemia, oliguria, ileus, and decreased capillary refill.

During septic shock, the inflammatory process, in addition to causing clotting and activation of the immune system, releases chemicals that cause vasodilation and increased capillary permeability. The vasodilation, as with the other forms of distributive shock, causes blood pressure to fall. The leaking capillaries cause fluid loss, which increases the severity of the hypotension. The infecting organism secretes toxins from the cell wall that also react with the blood vessels and cell membranes, causing further increased capillary permeability and further loss of fluid from the vascular space, cellular injury, and greatly increased cellular metabolic rate.

Bacteria are the organisms most commonly associated with infections leading to sepsis and septic shock. Gram-negative bacteria such as *Pseudomonas aeruginosa*, *Escherichia coli*, and *Klebsiella pneumoniae* and gram-positive bacteria such as *Staphylococcus* and *Streptococcus* are normally present in the environment. Health care-associated infections can lead to sepsis with deadly outcomes. Meticulous care must be taken with IV sites, Foley catheters, and other devices that disrupt the body's protective mechanisms.

Treatment and nursing management.

In 2003, 11 international organizations launched the "Surviving Sepsis Campaign." Since then the recommendations have been revised several times to reflect current research. Recommendations include initiation of a sepsis resuscitation bundle as soon as hypoperfusion is recognized. Early detection of sepsis is a cornerstone to successful outcomes; thus the importance of good nursing assessment and prompt reporting of findings is underscored. When a patient is at risk for sepsis, nurses should monitor for slight changes in condition: warm, dry, flushed skin; full, bounding pulse; normal to high blood pressure; and elevated urine output. The temperature may be normal or slightly elevated. Some patients do experience a high temperature with sepsis; however, older adults or others may experience hypothermia when septic.

When sepsis is identified, be vigilant for signs of septic shock. **If hourly urine output begins to decrease, the provider should be notified.** Monitor breath sounds for crackles; check for an

increasing heart rate; and assess for increased fatigue, feelings of anxiety, and changes in mental status. Dependent edema may develop. If shock occurs, the skin will become cool and clammy and the peripheral pulses will be weak and thready. Blood pressure will fall as hypovolemia becomes more pronounced.

Once sepsis is suspected, appropriate treatment begins immediately. This includes fluid resuscitation with crystalloids or colloids to maintain blood pressure and oxygenation; intubation and mechanical ventilation may be required. Blood cultures are obtained, and broad-spectrum antibiotic therapy is started within 1 hour of diagnosis of septic shock. Norepinephrine or epinephrine may be ordered to maintain blood pressure. Dobutamine may be used if the blood pressure and cardiac output do not respond to fluid challenge or vasopressors ([Society of Critical Care Medicine, 2015](#)).

When the immune system initiates the inflammatory response, it also initiates the clotting cascade. The body is responding to an unknown threat and prepares to fight off foreign organisms and/or to stop bleeding, so both systems are activated. In sepsis, the heightened coagulant state of the body leads to multiple small clots forming in the microcirculation, which is known as *disseminated intravascular coagulation (DIC)*. These small clots clog up the circulation to organs. This clotting leads to organ damage throughout the body.

The extensive clotting that occurs throughout the body in DIC uses up most of the clotting factors in the blood. As a result, bleeding occurs easily. Patients may ooze blood from previously dry wounds, from their gums, and around IV catheters and may bruise very easily. The clinical sign most noticeable is bleeding from any break in the skin.

If an event occurs that triggers clotting, normally the process to dissolve the clot is also activated. This allows the clot to stop the bleeding and then be reabsorbed when no longer needed, conserving the clotting factors for reuse. In DIC this process is altered. To restore the normal sequence, anticoagulants are given to stop the clotting factors from being used up. Although it may seem contradictory to give a medication that will prevent clots when the patient is bleeding, the clots that have formed in the small blood vessels are harming the patient by blocking blood flow to vital organs. The clotting factors are being used for clots that are harmful while not being available in the areas they are needed.

❖ Nursing Management

You must be vigilant in identifying patients who are at risk for developing shock. For example, postsurgical patients are always at risk for hemorrhage, which could lead to hypovolemic shock or infection, potentially causing sepsis and septic shock. Maintaining adequate fluid volume and blood pressure are key components in adequately managing shock.

■ Assessment (Data Collection)

Ongoing evaluation of the patient's level of consciousness, vital signs (including temperature), skin signs, and urine output is essential to the recognition and management of shock. Serial assessment data are compared with the previous data and with the baseline assessment. **Watching for changes and trends in physical and laboratory findings is extremely important.** This information must be reported to the provider so she can make treatment decisions. In accordance with National Patient Safety Goals, recognition and response to changes in a patient's condition is particularly applicable to the prognosis of shock. The Joint Commission requires the availability of rapid response teams to help with the assessment and management of patients who are unstable. Early activation of appropriate help can save lives.

■ Nursing Diagnosis, Planning, and Implementation

The primary problem for a patient in shock is altered tissue perfusion. The planning of care for a patient in shock should include measures to monitor and maintain a patent airway, tissue perfusion, body temperature, and skin integrity ([Nursing Care Plan 44-1](#)).

Nursing Care Plan 44-1

Care of a Patient Exhibiting Symptoms of Shock

Scenario

Bob Jones, a 22-year-old, was involved in a motor vehicle accident and sustained an abdominal injury and multiple fractures.

Problem Statement/Nursing Diagnosis

Fluid volume deficit/*Deficient fluid volume related to blood loss.*

Supporting Assessment Data

Objective: BP 90/40, P 150, skin pale and clammy. Patient alert and oriented with complaints of 10/10 pain.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will have adequate BP to maintain vital organ perfusion.	Monitor vital signs, central venous pressure (when used), urine output q 5 min to 1 hr as indicated by patient condition.	Maintain a high index of suspicion for hypovolemia and shock. Early detection and treatment of shock prevents complications.	BP is maintained at greater than 90 mm Hg systolic and urine output is ≥ 30 mL/hr.
	Maintain patent IV sites. Administer fluids as ordered.	Volume replacement is essential and requires adequate access.	IV fluid bolus of 500 mL given. IV fluids infusing at 150 mL/hr via peripheral IV sites in both forearms (total of 300 mL/hr).
	Note quality/strength of peripheral pulses with vital signs.	Weak, thready pulses indicate decreased cardiac output.	Pulses are weak and thready.
	Monitor laboratory and radiography results.	Evaluate patient's response to therapy.	Laboratory and radiograph results are pending.

Problem Statement/Nursing Diagnosis

Potential for altered gas exchange/*Risk for impaired gas exchange related to altered blood flow.*

Supporting Assessment Data

Objective: BP 80/40, blood loss secondary to trauma, respiratory rate 32/min.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
ABGs, pulse oximetry, and respiratory rate will be within patient's normal range.	Maintain patent airway. Elevate head of bed if tolerated by BP and spinal fracture is ruled out.	Enhances lung expansion.	Patient breathing is rapid, but not labored at 32/min. Supine position maintained for BP 90/40.
	Administer oxygen to keep $SaO_2 \geq 95\%$. Monitor pulse oximetry.	Maximizes the oxygen-carrying capacity of the available hemoglobin.	SaO_2 is $\geq 95\%$. Pulse oximetry reading is 99% with patient on nonrebreather mask.
	Auscultate breath sounds q2-4h.	The patient is at risk for ARDS.	Lung sounds clear or changes are identified and reported promptly.
	Investigate alterations in level of consciousness.	Decreased levels of oxygen can cause alterations in sensorium.	No change in level of consciousness. Is alert, talkative, and seems anxious.

Problem Statement/Nursing Diagnosis

Fear of possible death/*Patient/family fear related to presence of a life-threatening situation.*

Supporting Assessment Data

Subjective: Patient states that he is scared and wants to know if he will live.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient/family will express concerns and fears.	Maintain a calm and reassuring presence.	This will reduce anxiety and the patient's oxygen need.	Patient/family is reassured when the nurse is present.
	Explain activities, medications, treatments, and equipment simply and honestly.	Information facilitates cooperation and increases feelings of control.	The patient/family states that all of their questions were answered.
	Demonstrate concern and respect for patient and family.	Extending an attitude of concern makes it easier for patients/families to discuss concerns.	The patient/family discussed concerns with the health care team.

Critical Thinking Questions

- What complications is this patient at risk for developing?
- If this patient were 72 instead of 22 years old, how would that change your care?

ABGs, Arterial blood gases; *ARDS*, acute respiratory distress syndrome; *BP*, blood pressure; *IV*, intravenous; *P*, pulse; SaO_2 , percentage of hemoglobin saturated with oxygen.

The treatment goals for shock are to restore circulating volume and to treat the underlying cause, if possible. In most types of shock, blood pressure responds to administration of IV fluids. The exception to this is cardiogenic shock, in which the pump cannot manage the fluids that are already present and pump support is needed. If an IV is not in place, volume can be redistributed to the

central circulation by laying the patient flat and elevating the legs 10 to 12 inches.

Evaluation

If interventions are effective, there should be improvement in tissue perfusion. This can be evaluated by evaluating blood pressure, urine output, and level of consciousness. These are key indicators of adequacy of blood flow to vital organs. Other indicators to monitor include capillary refill, color and temperature of the skin, and the amplitude of pulses in the extremities. With adequate fluid and medication administration, blood pressure should be maintained above 90 mm Hg systolic. This should provide enough blood flow to the kidneys to generate 20 to 30 mL of urine output per hour. If there are no preexisting neurologic problems, the patient should return to previous level of consciousness.

Get Ready for the NCLEX® Examination!

Key Points

- Good Samaritan laws protect medical personnel from liability when offering emergency medical care for victims of accidental injury.
- Signs and symptoms that usually precede aggression or attack include increasing agitation or resistance, aggressive behavior, pacing, frowning, hyperalertness, increasing demands, or glaring.
- Victims of domestic abuse and violence may be reluctant to voluntarily reveal abuse or identify the abuser.
- Three elements that emergency nurses use for clinical decisions are (1) events or incidents that preceded the emergency visit, (2) mechanism of injury, and (3) index of suspicion.
- **Triage** is the process of setting priorities for treatment.
- Neck or spinal injury is suspected in multiple injuries, falls, or blunt force impact.
- Flail chest occurs when three or more ribs are broken in two or more places; flail chest compromises respirations, because the chest wall is unstable. Treatment includes intubation and mechanical ventilation.
- Symptoms of pneumothorax or hemothorax include labored, shallow respirations; lack of movement on one side of the chest when the person inhales and exhales; and chest pain.
- Penetrating abdominal trauma is frequently associated with gun or knife wounds. Patients with blunt trauma to the abdomen should have serial assessments to identify slow hemorrhage or occult injury.
- Poison control centers need the following information to assist in diagnosis and treatment: patient's age; weight; medical and medication history; allergies; what, when, and why the substance was taken; current signs and symptoms, with vital signs and laboratory results; and any treatment rendered.
- Bite wounds should be cleaned immediately with soap and warm running water for 5 to 10 minutes.
- Chemical burns should be flushed with large amounts of water (with some exceptions) until all traces of the chemical have been removed.
- The American Heart Association guidelines emphasize C-A-B (chest compressions, airway, breathing) and the importance of high-quality CPR and recommend hands-only CPR for the lay rescuer.
- Treatment of shock generally includes infusion of large volumes of IV fluid.
- Blood pressure support in cardiogenic shock involves support for the pump (the heart) rather than adding volume.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- American Association of Critical Care Nurses <http://www.aacn.org/>
- American Heart Association
http://www.heart.org/HEARTORG/HealthcareResearch/GetWithTheGuidelines/GetWithTheGuidelines/Resuscitation/Get-With-The-Guidelines-Resuscitation_UCM_314496_SubHomePage.jsp
- Emergency Nurses Association <https://www.ena.org/practice-research/Practice/Pages/default.aspx>
- Society for Critical Care Medicine <http://www.survivingsepsis.org/guidelines/Pages/default.aspx>

Review Questions for the NCLEX® Examination

1. To control a gushing bleed of the lower leg, what should the nurse do initially?

1. Apply direct pressure to the wound.
2. Compress the artery above the wound.
3. Check the circulation to the foot.
4. Snugly secure a bulky dressing.

NCLEX Client Need: Physiological Adaptation

2. In the event of any type of poisoning that occurs in the home setting, what is the initial course of action?
1. Save the poison container and contents.
 2. Save a sample of vomitus for analysis.
 3. Call poison control.
 4. Induce vomiting.

NCLEX Client Need: Safety and Infection Control

3. A teenager—alert, oriented, and in no apparent distress—is brought to the ED by EMS on a backboard with spine immobilization in place. He reports diving into a lake and bumping his head. Based on the mechanism of injury, which assessment is the nurse most likely to initiate?
1. Assessment of water safety behavior
 2. Serial abdominal assessments with hematocrit
 3. Frequent vital signs to monitor for shock
 4. Peripheral motion and sensation with mental status checks

NCLEX Client Need: Reduction of Risk Potential

4. A nurse makes a home visit to a 70-year-old patient on a cold winter day. On her arrival, the patient demonstrates excessive coughing, shortness of breath, drowsiness, and confusion. Mucous membranes are cherry red. What is the nurse's first action?
1. Question the patient about recent food or fluid consumption.
 2. Call for emergency help and open the windows.
 3. Search the house for evidence of poisons and then call poison

control.

4. Locate the source of odors or try to get the patient to walk out of the house.

NCLEX Client Need: Physiological Adaptation

5. The nurse is talking to a community group about strategies to prevent heat-related illness. What advice is appropriate to give to the group? (*Select all that apply.*)

1. Drink fluids that are nonalcoholic, noncaffeinated, and low in sugar content.
2. When you are thirsty, drink fluids and avoid eating salty foods.
3. Stay indoors with cooling systems.
4. In the heat, wear lightweight, light-colored, loose-fitting clothing.
5. Limit outdoor activities to spring or fall when the weather is cooler.
6. Use sun protection such as wide-brimmed hats, sunglasses, and sunscreen.

NCLEX Client Need: Reduction of Risk Potential

6. A 24-year-old man is brought to the ED with respiratory distress after being stung by a bee. Which order from the provider should the nurse anticipate as a priority intervention?

1. Administer racemic epinephrine by inhalation.
2. Establish peripheral IV access.
3. Give 0.03 mg of epinephrine intramuscularly in the lateral thigh.
4. Draw blood for laboratory tests.

NCLEX Client Need: Physiological Adaptation

7. A patient is brought to the ED with severe gastrointestinal bleeding and hypovolemic shock. What is the priority intervention for this patient?

1. Insert a nasogastric tube and attach to low wall suction.

2. Draw a blood sample for a type and crossmatch.
3. Measure the amount of emesis and check for blood.
4. Establish two large-bore peripheral IV sites.

NCLEX Client Need: Coordinated Care

8. When taking care of a patient with sepsis, what is the first sign that would signal impending septic shock?

1. Increasing urine output
2. Decreasing heart rate
3. Decreasing blood pressure
4. Change in mental status

NCLEX Client Need: Physiological Adaptation

9. A patient is 6 hours postoperative with signs of deficient fluid volume. The provider orders a fluid challenge of 200 mL lactated Ringer solution stat over 20 minutes. What would be considered a desirable response to the treatment?

1. Decrease in blood pressure
2. Increase in urinary output
3. Increase in body weight
4. Increase in pulse rate

NCLEX Client Need: Pharmacological Therapies

10. A patient was bitten by a stray dog and rushed to the ED. Which measure must be done first?

1. Apply antibiotic ointment on affected sites.
2. Cover with a clean bandage and immobilize.
3. Rinse wound with soap and warm running water for 5 to 10 minutes.
4. Give tetanus booster shot if patient has not had one in the past 5

years.

NCLEX Client Need: Coordinated Care

Critical Thinking Questions

Scenario A

While watching a sporting event from the stands, you notice the person sitting in front of you has slumped over. You touch her shoulder and ask if she is all right. There is no response and you see no signs of breathing.

1. What is the most likely explanation for this witnessed event of sudden unconsciousness?
2. What should you do first?
3. An AED is on scene. What is your role in use of this equipment?
4. How do "Good Samaritan Laws" affect you and any interventions that you may perform on this woman?

Scenario B

You are on your way home from work and you see a car hit a teenage boy on a bicycle. You stop to help the bicyclist. He is unconscious, has a large scalp laceration that is bleeding profusely, and has an obviously fractured left leg.

1. If you need to open his airway, what method should you use?
2. What should you do about the scalp laceration and broken leg?
3. What is your legal obligation in this setting?

Scenario C

While working as a student nurse in the hospital's emergency unit, you notice that patients who have been injured or are very ill sometimes become hostile and combative. Some try to assault members of the emergency team and others use abusive and threatening language.

1. Discuss with your classmates some reasons why patients may behave in these ways when they are injured or very ill.
2. What are some ways in which violent patients who are not mentally ill can be handled to prevent assault and encourage cooperation with the emergency staff?
3. What resources are available to help manage combative patients?
4. What patient history or information might help to clarify aggressive behavior?

Scenario D

Your 80-year-old male patient, admitted yesterday for pneumonia, has become confused, hypotensive, oliguric, clammy, and pale.

1. What are the possible explanations for his clinical signs and symptoms?
2. What are your priorities for his care?
3. Discuss what treatment is indicated.
4. How will you know if your treatment has been effective?

UNIT XVI

Mental Health Nursing of the Adult

OUTLINE

Chapter 45 Care of Patients With Anxiety, Mood, and Eating Disorders

Chapter 46 Care of Patients With Substance Abuse Disorders

Chapter 47 Care of Patients With Cognitive Disorders

Chapter 48 Care of Patients With Thought and Personality Disorders

CHAPTER 45

Care of Patients With Anxiety, Mood, and Eating Disorders

Objectives

Theory

1. Analyze the significance of anxiety in the general adult population.
2. Compare and contrast normal anxiety with anxiety disorders.
3. Describe the signs and symptoms and treatment for anxiety disorders.
4. Present assessment factors, nursing diagnosis, and nursing interventions for patients with anxiety disorders.
5. Determine the variances of normal mood and discuss mood alterations that become debilitating.
6. Discuss assessment, nursing diagnosis, and nursing interventions for patients with bipolar disorder and major depressive disorder.
7. Summarize factors that are essential when assessing a suicidal patient.
8. Correlate the effects of family, peer, and media pressure on patients with eating disorders.
9. Describe assessment, nursing diagnosis, and nursing interventions for patients with eating disorders.

Clinical Practice

10. Watch the movie *As Good as It Gets* and discuss behaviors that are debilitating for the main character.
11. Implement a teaching plan for a patient with a mood disorder to increase medication compliance.
12. Write at least six interventions for the problem of potential for self-directed violence due to suicidal ideations.

KEY TERMS

affect (ăf-ĕkt, p. 1058)

anorexia nervosa (ăn-ō-RĒK-sē-ă nĕr-VŌ-să, p. 1066)

bipolar disorder (bī-PŌ-lär dīs-ÖR-dĕr, p. 1057)

bulimia nervosa (bū-LĒ-mē-ă nĕr-VŌ-să, p. 1067)

dual diagnosis (dū-ăl dī-ăg-NŌ-sis, p. 1061)

dysthymia (dīs-THī-mē-ă, p. 1057)

electroconvulsive therapy (ECT) (ě-LĒK-trō-kōn-VŪL-sīv THĒR-ă-pē, p. 1062)

flight of ideas (p. 1057)

generalized anxiety disorder (GAD) (jěn-ěr-ǎl-ÍZD ǎng-ZÍ-ǐ-tě dǐs-ŐR-děr, p. 1052)

hypersomnia (hǐ-pěr-SÖM-ně-ǎ, p. 1058)

hypomania (hǐ-pō-MĀN-ě-ǎ, p. 1057)

insomnia (ǐn-SÖM-ně-ǎ, p. 1058)

lanugo (lǎ-NŪ-gō, p. 1067)

major depressive disorder (MĀ-jör dě-PRĚ-sív dǐs-ŐR-děr, p. 1061)

mania (MĀ-ně-ǎ, p. 1057)

obsessive-compulsive disorder (OCD) (öb-SĚS-ǐv cōm-PÜL-sív dǐs-ŐR-děr, p. 1053)

phobic disorder (FŌ-bǐk dǐs-ŐR-děr, p. 1053)

post-traumatic stress disorder (PTSD) (pōst-träw-MĀT-ǐk strěs dǐs-ŐR-děr, p. 1053)

pressured speech (p. 1057)

psychomotor retardation (sǐ-kō-MŌ-těr rē-tär-DĀ-shǔn, p. 1061)

Anxiety and Anxiety Disorders

Anxiety is considered normal and healthy unless it becomes debilitating and prevents a person from functioning in everyday life. Abnormal or debilitating anxiety is intense and feels life threatening to the individual. One in four people will experience symptoms of an anxiety disorder during his or her lifetime. A genetic association has been concluded after studying families with individuals prone to anxiety. Older adults are at high risk for anxiety disorders because of physical illness; psychosocial stress; depression; cognitive impairment; and personal factors related to female gender, lower education, or substance abuse.

Anxiety is often self-limiting and alleviated without specific medical or nursing intervention. However, intervention may be necessary to prevent potential harm toward self or aggression toward others. Nurses can be instrumental in helping a patient recover from a panic level of anxiety. **Table 45-1** describes the various levels of anxiety and their nursing management, and **Figure 45-1** depicts the relationship among stress, anxiety, and related behaviors. By remaining calm and supportive, the nurse provides a safety net for the patient. Panic-level anxiety is challenging and commonly requires medication. Patients with increased anxiety need teaching about how to prevent further attacks. They need to be taught how to relax and should attempt to determine the underlying cause of their anxiety. Anxiety can recur at a greater level of severity; therefore early intervention is important. Patients with anxiety disorders may have another mental health issue such as major depressive disorder or substance abuse.

Think Critically

Recall a time when you felt very anxious. What were your feelings and behaviors? What strategies did you use to manage your own anxiety?

Table 45-1
Nursing Management for Levels of Anxiety

LEVEL OF ANXIETY	ASSESSMENT	NURSING GOAL	NURSING MANAGEMENT
Mild	Increased alertness, motivation, and attentiveness.	To assist patient to tolerate some anxiety	Help patient identify and describe feelings. Help patient develop the capacity to tolerate mild anxiety, and use it conscientiously and constructively.
Moderate	Perception narrowed, selective inattention, physical discomforts.	To reduce anxiety; long-term goal directed toward helping patient understand cause of anxiety and new ways of controlling it	Provide outlet for tension such as walking, crying, working at simple, concrete tasks. Encourage patient to discuss feelings.
Severe	Behavior becomes automatic; connections between details are not seen; senses are drastically reduced.	To assist in channeling anxiety	Recognize own level of anxiety. Link patient's behavior with feelings. Protect defenses and coping mechanisms. Identify and modify anxiety-provoking situations.
Panic	Overwhelmed; inability to function or communicate; possible bodily harm to self and others; loss of rational thought.	To be supportive and protective	Provide nonstimulating, structured environment. Avoid touching. Stay with patient. Medicate patient with tranquilizers if necessary.

Adapted from Zerwekh J, Garneau A: *Illustrated study guide for the NCLEX-PN exam*, ed. 7, Chandler, Ariz., 2014, Nursing Education Consultants, Inc.

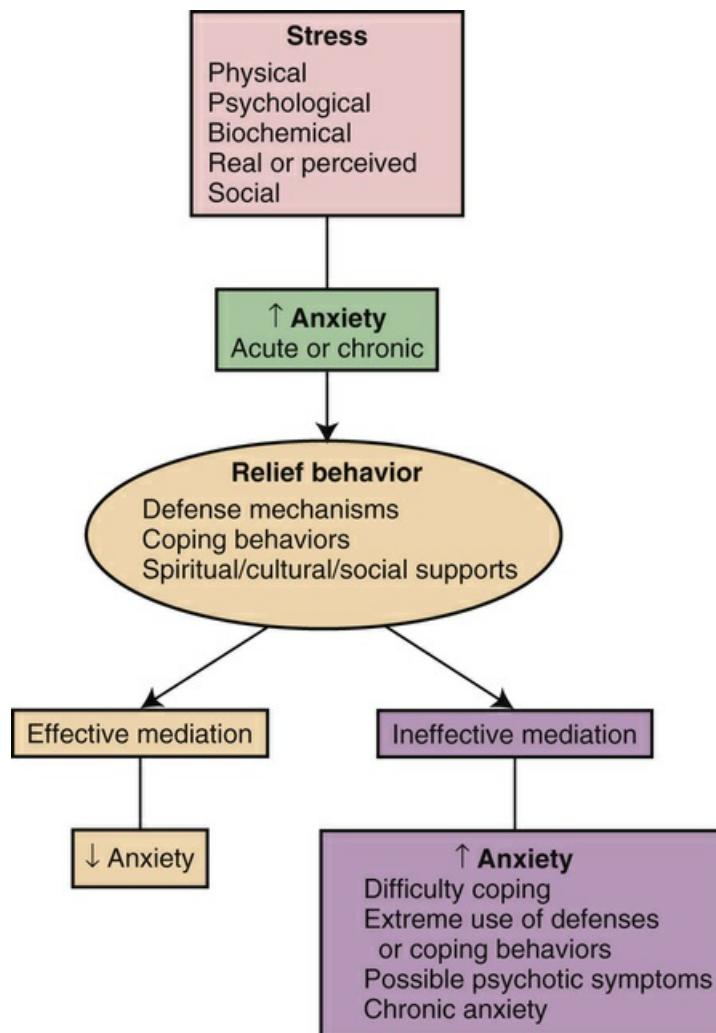


FIGURE 45-1 Stress, anxiety, and behavioral effects.

Generalized Anxiety Disorder

A person who experiences persistent, unrealistic, or excessive worry about two or more life circumstances for 6 months or longer is exhibiting symptoms associated with **generalized anxiety disorder (GAD)**. GAD usually develops slowly and is chronic in nature. As a case study, consider John Evans. John has GAD. He worries about his work performance, despite good evaluations. John worries that his children are not happy, smart, popular, or excelling, and he worries constantly about their future. John worries about paying the bills, and he worries about the well-being of his older adult parents. There are currently no actual problems, yet despite his wife's support and reassurance, John cannot stop worrying. He experiences the signs and symptoms of excessive physiologic response such as tachycardia, restlessness, sweating, fatigue, muscular tension, and shortness of breath. His cognitive symptoms include difficulty with problem solving and poor concentration. John also demonstrates limited coping skills.

Phobic Disorder

A person with a **phobic disorder** experiences excessive fear of a situation or object. This fear can lead to avoidance or extreme anxiety that interferes with normal responsibilities and routines. As another case study, consider Max Payne. Max has a specific type of phobia known as social anxiety disorder. Max is chronically unable to hold a job; he fears scrutiny of his abilities and is afraid of being embarrassed by coworkers or supervisors. Work settings cause him to feel pressured, overwhelmed, and distressed, and he experiences physical symptoms such as trembling, blushing, and nausea. He avoids opportunities by creating a variety of excuses not to pursue them, and this

further lowers his self-esteem. He acknowledges that his fears are unreasonable, but he continues to make excuses to avoid professional challenges or situations of occupational risk-taking.

Obsessive-Compulsive Disorder

When a person has an **obsessive-compulsive disorder (OCD)**, she experiences an **obsession**, recurrent or intrusive thoughts that she cannot stop thinking about, and these thoughts create anxiety. A **compulsive act** is an act that the person feels compelled to perform. For example, a person may experience anxiety and so performs repetitive handwashing in an attempt to reduce that anxiety. Time spent in these thoughts and rituals can become overwhelming to the point of interfering with normal life. Consider the case study of Jane Forman, who is constantly thinking about the boyfriend who left her. Jane does not want to think about him; however, she **ruminates** (repeatedly talks or thinks about the same topic) on their relationship. She scrubs and cleans everything that he might have touched. Jane begins to miss work and stops socializing with friends because she cannot stop cleaning. Her compulsive thoughts have led to obsessive behavior, and Jane has an obsessive-compulsive disorder.

Post-Traumatic Stress Disorder

Post-traumatic stress disorder (PTSD) is characterized by a previous event that involved threatened death or serious injury to self or others during which the individual experienced intense fear, helplessness, or horror. The remembrance of such events produces feelings of intense distress along with anxiety, nightmares, and/or flashbacks that are recurrent. PTSD can occur after any traumatic event that was outside of usual experience. Military combat, detention as a prisoner of war, natural disasters, plane or train accidents, assault, and rape are examples of traumatic experiences that may cause PTSD. Symptoms typically begin within 3 months of the trauma, but a delay of months or years before its onset is not uncommon. Flashbacks are dissociative experiences in which the event is relived. The person acts as if the traumatic event is happening now. There is continued avoidance of any stimuli associated with the trauma, including talking about it or participating in activities that are reminders of the event. People who remind the individual of the trauma are avoided. The person with PTSD may have difficulty sleeping, be very irritable, have difficulty concentrating, and be hypervigilant. Difficulty with relationships of all kinds usually accompanies PTSD, and trust is difficult to establish. The person usually feels detached from others. Chemical abuse may occur in an effort to relieve anxiety.

Cultural Considerations

Post-Traumatic Stress Disorder and Military Personnel

Many veterans who served in combat zones develop PTSD, particularly those who were injured, were present when comrades were killed or seriously injured, or were involved in fighting where many civilians were killed. In studies of war veterans, there was a greater risk for PTSD among those who were young, female, Hispanic, or African American, and for those who had more combat exposure or were injured ([National Center for PTSD, 2014](#)).

Consider Holly Harris, who was a rape victim 2 months ago. Holly frequently relives the traumatic experience in her mind, although she tries to avoid thinking or talking about what happened. She feels detached from others and disinterested in her normal activities. She fears she may not ever be able to have loving feelings toward a man and feels bleak about the future in general. She is irritable and has difficulty sleeping and concentrating. She is hypervigilant, yet she startles very easily.

Cultural Considerations

Post-Traumatic Stress Disorder and Immigrant Patients

Patients who have emigrated from war-torn countries such as Vietnam, Iraq, or Afghanistan are at

risk for PTSD. Language differences and a reluctance to seek professional help for psychiatric problems are barriers to care.

The following websites provide screening tools for PTSD and other resources to help veterans with PTSD:

- www.ptsd.va.gov/professional/assessment/overview/index.asp
- www.maketheconnection.net
- www.ptsd.va.gov/public/treatment/therapy-med/va-ptsd-treatment-programs.asp
- www.realwarriors.net/veterans/treatment/ptsdtreatment.php

Desensitization; support groups; exercise regimens; and medications such as sleep aids, antidepressants, and anxiolytics can be very helpful. There are several websites for civilians to find help, such as Bridge to Recovery and the National Center for PTSD.

A relatively new short-term therapy for PTSD is eye movement desensitization and reprocessing (EMDR). While the patient thinks about the distressing event, she shifts her gaze from one side to the other. As unpleasant feelings are uncovered, the therapist redirects the eye movements using EMDR, and this helps the patient to release the emotions. In another new therapy for PTSD, the patient wears a headset and is exposed to a virtual reality environment. The clinician controls what the patient hears, sees, and smells, and the patient learns to tolerate anxiety (National Center for PTSD, 2014).

Diagnosis of Anxiety Disorders

To help clinicians define and diagnose behavioral disorders more consistently, the American Psychiatric Association publishes a regularly updated manual that establishes guidelines for how diagnoses are made. The *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition, text revision (DSM-5) provides a set of diagnostic criteria (specific behaviors) and a specific time frame for each mental health disorder. For example, a patient might feel mildly anxious for 1 or 2 days before surgery, but mild anxiety for a short period before such an event would be considered normal; therefore that patient would not meet the criteria for any of the anxiety disorders. In contrast, a person such as John Evans (described previously) is **dysfunctional** because of **continuous worry for at least 6 months** and his behavior would meet the criteria for GAD. PTSD was moved into the chapter on Trauma- and Stressor-Related Disorders in the DSM-5.

Treatment of Anxiety Disorders

People with anxiety disorders can be treated with supportive therapy and **anxiolytic** (antianxiety) medications. Supportive therapies include individual therapy, education about relaxation techniques, and stress management. Patients who are anxious need much reassurance, and a nurse who is nonjudgmental will be a good listener. Evidence-based practice indicates that for older adults with GAD, cognitive-behavioral therapy (CBT) is the first-line psychotherapy (Box 45-1).

Clinical Cues

Your patient may need referral to a stress management class; however, there are a few basic suggestions that you can make to help your patient cope with stress. These suggestions include talking to a friend, listening to music, taking a warm bath or shower, doing a large-muscle activity such as walking or throwing ice cubes against the back fence.

Box 45-1

Advanced Practice Psychotherapeutic Interventions

- *Psychodynamic therapy*: Therapist helps the patient to link a past event to current feelings. This insight is believed to help patients modify feelings and behavior.
- *Cognitive-behavioral therapy*: Therapist helps the patient to identify unhealthy thoughts or undesirable responses that occur because of a situation or event, and then the patient is assisted to change ways of thinking about an event and therefore to change emotional response and

behavior.

- *Motivational interviewing:* Therapist enhances motivation for change by matching the patient's ability to problem solve with specific strategies. Principles include expressing empathy, developing discrepancy, supporting self-efficacy, and working with resistance.
- *Interpersonal therapy:* Therapist helps the patient to identify the problem, then selects a strategy to address the problem. The goal is to eliminate symptoms by improving social relationships.
- *Group therapy:* Therapist leads group sessions of 5 to 10 patients who have similar needs or problems. Patients share feelings, thoughts, ideas, and experiences; they realize, "I am not alone in my experience."
- *Behavioral therapy:* Therapist assists the patient to change behavior by using rewards, punishment, repetition, imitation, or exposure to stimuli—but understanding of the underlying cause is not essential. There are four types of behavioral therapy: modeling, operant conditioning, systematic desensitization, and aversion therapy.

Benzodiazepines are commonly prescribed for anxiety disorders. Drugs from this category are alprazolam (Xanax), chlordiazepoxide (Librium), oxazepam (Serax), lorazepam (Ativan), and diazepam (Valium). Patients taking these drugs must be advised to use medications with caution because **tolerance** (the need for an increased dosage to achieve the desired effect) and physical and psychological dependency can occur.

Safety Alert

Sensitivity to Benzodiazepines

Older adults are very sensitive to benzodiazepines, and use is generally restricted during alcohol or sedative withdrawal. Ativan and Xanax can cause confusion, oversedation, or disinhibition (Lyons et al, 2009).

Buspirone (BuSpar), in a class by itself, takes 3 to 4 weeks to reach therapeutic efficacy. The advantage of BuSpar is less sedation with a decreased risk of dependency. Another class of drugs, the selective serotonin reuptake inhibitors (SSRIs), are becoming first-line drugs for anxiety because they have fewer adverse effects. Examples from the SSRI category include citalopram (Celexa) and sertraline (Zoloft). **Table 45-2** presents a list of common medications used to treat anxiety.

Safety Alert

Even short-term use of SSRIs tends to pose a significant risk for upper gastrointestinal (GI) bleeding. Observe for signs of such bleeding and check other medications the patient is receiving for similar risk.

 **Table 45-2**

Drugs Commonly Used to Treat Anxiety

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT EDUCATION
Benzodiazepines			
Alprazolam (Xanax)	Has depressant action on the CNS and inhibits stimulation of the brain	Watch for signs of orthostatic hypotension.	Warn to not take any other CNS depressants, including alcohol.
Chlordiazepoxide (Librium)	Used for anxiety disorders and insomnia	Watch for side effects: drowsiness, confusion, palpitations, dry mouth, nausea and vomiting, and occasional nightmares. Older adults have significantly increased risk for falls.	Potentially addictive; use only as prescribed. Can cause drowsiness and lethargy. Advise not to stop taking these medications abruptly.
Diazepam (Valium)	Depresses the CNS		
Lorazepam (Ativan)			
Oxazepam (Serax)			
Clorazepate (Tranxene)			
Nonbenzodiazepines			
Buspirone (BuSpar)	Interacts with serotonin receptors Used for anxiety and sleep disorders	Always a scheduled medication, never PRN. May cause headaches, dizziness, or drowsiness, but much less so compared with the benzodiazepines.	Takes 7-10 days for symptoms to subside and several weeks for optimal results. No evidence of tolerance or physical dependence. Advise not to stop taking this medication abruptly.
Dual-Action Reuptake Inhibitors (Serotonin and Norepinephrine) (SNRIs)			
Duloxetine	Increases activity of	Most common side effects are nausea, dry mouth, sleepiness, and	Advise that driving or operating machinery could be

(Cymbalta) approved for GAD	serotonin and norepinephrine	constipation.	dangerous initially.
Venlafaxine (Effexor)	Inhibits reuptake of serotonin and norepinephrine	Side effects include nausea, drowsiness, headache, dry mouth, constipation, anorexia.	Teach to take with food and not to stop drug abruptly. Advise to avoid tasks requiring motor skills and alertness until response to drug is known.
SSRIs (see Table 45-4)			

CNS, Central nervous system; GAD, generalized anxiety disorder; PRN, as needed; SSRIs, selective serotonin reuptake inhibitors.

❖ Nursing Management

■ Assessment (Data Collection)

Anxiety-prone patients should be assessed for subjective feelings of fear, apprehension, isolation, or the need for increased space. The patient's ability to concentrate and make rational judgments should be assessed and the sources of preoccupation and worries explored. Physical symptoms may include trembling, feeling shaky, increased muscle tension, muscle soreness, easy fatigability, and restlessness. Patients may be hypervigilant, have difficulty sleeping, and be very irritable. In addition, an autonomic nervous system response can cause an increase in blood pressure, dyspnea, palpitations, dry mouth, dizziness, and nausea.

▣ Cultural Considerations

Hispanic and Latino Patients

A Hispanic or Latino patient may have a cultural belief that an emotional trauma will result in a fright sickness called *susto*. Symptoms of *susto* include crying, insomnia, restlessness, nightmares, diarrhea, and fever. Treatment is brushing the body with a rough object. The patient might also believe in *brujeria*, which is a magical or supernatural illness. Symptoms include paranoia, delusions, hallucinations, and being controlled by others. The patient may reject the provider in favor of a *brujo* (witch) for reversal of the spell or hex.

Evidence-based guidelines suggest that screening tools can be used by **any** health care worker if an older adult is showing signs of an anxiety disorder. These assessment tools include the Mini-Mental State Examination, Geriatric Anxiety Inventory, Short Anxiety Screening Test, Hospital Anxiety and Depression Scale, and Rating Anxiety in Dementia Scale ([Smith and Brighton, 2009](#)). After initial screening, the provider is notified to determine the diagnosis. 

▣ Clinical Cues

When a short-acting anxiolytic is prescribed, observe the patient for signs of anxiety, such as pacing, restlessness, and facial expressions of fear or concern. Assess for feelings of apprehension and the patient's ability to concentrate. For example, "Mrs. Smith, you seem a little restless. Let's sit for a while and you can tell me what is going on." If therapeutic communication is not successful, and the patient shows progressively escalating signs of hostility, trembling, agitation, irritability, or inability to relax and converse, it would be appropriate to offer the medication.

▣ Older Adult Care Points

Older adults often have strong spiritual beliefs that assist in coping with stress and illness. Friendships, social contacts, and activities associated with religious organizations also play a large part in positive mental health. Evidence suggests that older adults will benefit from tactful assessment and individualized interventions that incorporate personal spiritual beliefs ([Ehrlich, 2011](#)). 

■ Nursing Diagnosis

Problem statements for anxiety include:

- Anxiety due to threat to self-concept
- Fear due to environmental threat
- Potential social isolation due to extreme anxiety in social situations

- Altered ability to cope due to panic attack
 - Altered role performance due to inability to carry out work responsibilities
 - Powerlessness due to inability to cope when facing a specific phobic object (e.g., a spider)
 - Grief due to multiple loss of colleagues (i.e., war trauma)
 - Post-trauma distress due to an overwhelming life-threatening event (e.g., rape)
- Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning

Expected outcomes are written for each problem. For the problems mentioned, expected outcomes might include:

- Patient will demonstrate decreased symptoms of anxiety (e.g., pacing, crying) within 3 days.
- Patient will verbalize feelings of safety before discharge.
- Patient will attend group meeting today accompanied by primary nurse.
- Patient will practice three coping strategies to use during a panic attack before discharge.
- Patient will identify three tasks at which she excels at work, during this shift.
- Patient will verbalize increased feelings of control when encountering phobic object within 1 month.
- Patient will express grief and loss related to multiple losses before discharge.
- Patient will experience fewer nightmares related to traumatic event within 3 months.

Planning care for a patient with an anxiety disorder involves promoting a physically and psychologically safe environment⁸. For example, a quiet, clean, and noncluttered environment and verbal reassurance should be provided ("Mrs. Smith, you are safe here. The staff is here to help you."). Methods to reduce the symptoms of anxiety include therapeutic communication, such as active listening, being physically present, offering emotional reassurance, giving clear and concise instructions, and using pharmacologic methods.

■ Complementary and Alternative Therapies

Essential Oils

Essential oils that have a calming and soothing effect include basil, bergamot, chamomile, jasmine, rose, and lavender. These oils can be used in an aromatic bath or as massage oil.

■ Complementary and Alternative Therapies

Reduce Stress to Decrease Anxiety

Research has demonstrated that massage reduces cortisol levels with "stress alleviating" effects and increases serotonin and dopamine with "activating" effects. Yoga, exercise, and amino acid therapy also can potentially reduce stress, anxiety, and depression (Smith and Segal, 2014).

■ Nutrition Considerations

Promoting Relaxation

Advise your patient that stimulants such as coffee and colas should be avoided to help decrease anxiety and nervousness. Consumption of raw nuts and seeds, whole grains, and fresh fruits and vegetables helps to build the body's reserve and strength. Bananas, rice, milk, turkey, and pasta contain tryptophan, which helps to induce relaxation.

As the acute anxiety passes, the focus of care is to help the patient recognize that certain behaviors (such as avoidance) are being overused. The patient is then assisted to develop new methods of coping and to resume participation in family, social, and occupational roles.

Older Adult Care Points

Older adults often express somatic complaints rather than openly verbalizing emotional distress. You may observe an anxious older adult complaining of an upset stomach, inability to sleep, fatigue, or increased need to urinate. Medications (e.g., levothyroxine [Synthroid], theophylline [Slo-Phyllin]) that the older adult is taking may increase feelings of anxiety. Certain medical conditions, such as problems with the thyroid gland, problems with the cardiac system, and altered blood sugar, can also mimic anxiety disorders.

Implementation

When intervening with a patient who is experiencing extreme levels of anxiety, you must maintain a calm and reassuring attitude. You should stay with the patient and attend to physical needs as necessary. The stimulation in the immediate surrounding environment should be decreased, such as dimming the lights, turning off the television or radio, and limiting the number of people in the area. Be sure to use clear, simple statements and repeat them as necessary. When extreme levels of anxiety resolve, additional interventions are used to help the patient learn to control her anxiety (see [Table 45-1](#)).

Clinical Cues

Anxiety is contagious and can spread rapidly from person to person until the entire group is affected; likewise, nurses are not immune to these feelings. Fortunately, you can use therapeutic communication skills to help the patient de-escalate. Use a calm voice and a relaxed body position, and convey confidence in your own ability to maintain control of your own anxiety. Self-control by the nurse helps the patient to mimic calm behavior and control her anxiety.

When the anxiety is under control, you can assist in helping the patient to use problem-solving strategies. The long process of determining root causes of the anxiety can take years of therapy, but you can make referrals as needed and provide support.

Evaluation

Ongoing evaluation of patients with anxiety is necessary. Evaluation includes the status of the patient before discharge from the hospital, clinic, or emergency department. You must carefully document that outcome criteria were met and symptoms were relieved. **If symptoms are not totally resolved, you should clearly document that the patient's level of anxiety is not a threat to self or others at the time of discharge.** Also include a plan for follow-up care and a plan to obtain emergency care if needed.

Mood Disorders

The incidence of mood disorders is very high. Unfortunately, these disorders are often inaccurately diagnosed and treated. **Dysthymia** refers to a disturbance in mood that may manifest in either depression or elation (**mania**). An individual experiencing clinical depression is more than just sad. Depressed or dysthymic individuals feel a sense of hopelessness and despair that cannot be alleviated by usual means. This hopelessness can lead to thoughts of suicide.

Mania is an elevation in mood that includes increased grandiosity or irritability that is present for at least 1 week. A manic person may exhibit **pressured speech**, which is talking that is loud and rapid and difficult to interrupt; or **flight of ideas**, in which the speaker goes from topic to topic with little or no connection. There is an inability to concentrate; a decreased need for sleep or nutrients; and an increase in goal-directed activity, impulsive spending, and hypersexuality. Unstable and frequently changing, or **labile**, behavior is often seen in manic patients; a mood of frivolity and joking can rapidly change to agitation and extreme paranoia. **The agitation and irritability seen in manic patients can lead to aggressive behavior.** Manic individuals may require hospitalization for an inability to eat or sleep for days that leads to complete physical and mental exhaustion and aggressive behavior. Sometimes individuals will rapidly switch from being extremely depressed to being euphoric and manic. This condition is called *bipolar disorder* and occurs equally in men and women. It commonly is initially diagnosed in young adults, but it may be diagnosed at any time during the life span.

Bipolar Disorder

Bipolar disorder is suspected when a patient experiences episodes of extreme sadness, hopelessness, and helplessness interspersed with periods of extreme elation and hyperactivity. According to the DSM-5, four types of bipolar disorder are recognized. Bipolar I disorder is characterized by episodes of major depression with at least one episode of manic or hypomanic behavior. Bipolar II disorder is characterized by one or more depressive episodes with at least one episode of hypomania. Patients with cyclothymia exhibit hypomanic episodes alternating with minor depressive episodes. Bipolar disorder unspecified designates disorders with bipolar features that do not meet the criteria for the other specified disorders. **Hypomania** is a hyperinflated or irritable mood for at least 4 days. Patients may display loud, rapid speech and flight of ideas, decreased need for sleep, distractibility, and an increase in goal-directed activity, but hospitalization is not indicated because it does not involve psychotic behavior.

Treatment

Mood stabilizers are the mainstay of treatment. Lithium carbonate was the drug of choice used to stabilize manic behavior for decades. Lithium has a narrow therapeutic range, so serum lithium levels must be determined 8 to 12 hours after the first dose, then two or three times per week for the first month, and then weekly to monthly. See [Table 45-3](#) for nursing implications for patients taking lithium. Because it may take 2 to 3 weeks for lithium to become effective, currently, anticonvulsant drugs such as divalproex sodium (Depakote) and carbamazepine (Tegretol) are used in the treatment of mania along with quetiapine (Seroquel), an atypical antipsychotic, and BusPar or another antianxiety drug are also used. Lamotrigine (Lamictal) is effective for the depressive episodes. The Food and Drug Administration (FDA) has approved risperidone (Risperdal), aripiprazole (Abilify), and ziprasidone HCl (Geodon) for treatment of bipolar disorder. All of these can be used safely in combination with lithium. In addition to stabilizing the patient with medication, it is sometimes necessary to hospitalize patients with manic symptoms, particularly if they are a danger to themselves or others or are suffering from exhaustion caused by extreme hyperactivity. Two thirds of bipolar patients respond to the rapid antidepressive effects of a small dose of ketamine (Ketalar). A simple blood test can determine whether the drug will be effective ([Grohol, 2014](#)).

Table 45-3

Nursing Implications for Patients Taking Lithium

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Antif manic	Alters the release, synthesis, and reuptake of neurotransmitters in the brain (i.e., dopamine, norepinephrine, serotonin) Does not cure bipolar disorder, but helps to decrease the manic behavior.	Takes 7-14 days to reach therapeutic level (1.0-1.5 mEq/L). Blood levels should be drawn 8-12 hr after the first dose, then two or three times per week for the first month and then weekly to monthly until a maintenance level is reached. Sodium depletion or dehydration could cause toxicity; therefore monitor fluid intake and dietary sodium. Diuretics should be avoided. Monitor renal and thyroid function periodically.	Encourage normal salt intake. Teach to drink 2500-3000 mL of fluids per day. Advise to take with meals to decrease gastric distress and to avoid caffeinated drinks because of diuretic effects. Instruct to immediately report diarrhea, vomiting, tremors, or lack of coordination.

❖Nursing Management

■ Assessment (Data Collection)

Assessing for mood disorders involves observing for mood, affect, and physical signs and symptoms. Mood is assessed by asking the patient questions about feelings and observing facial expressions and verbalizations. **Affect** is a term used to describe a person's external expression of emotion. A person with a flat or blunted affect may report feeling fine, but her facial expression and overall demeanor convey sadness. The sadness described by depressed individuals is intense and creates feelings of worthlessness and hopelessness. Conversely, the mood of a manic patient is one of grandiosity and general well-being. In the midst of a manic episode, the patient may feel invincible and recklessly engage in extremely dangerous behavior.

Many physical signs and symptoms are classic for mood disorders. An initial question concerns sleep. A depressed patient may report sleeping all of the time (**hypersomnia**) or falling asleep easily but then waking up after 2 to 3 hours and being unable to get back to sleep (**insomnia**). Manic patients are unable to sleep, and it is not unusual for them to report that they have not slept for days.

■ Nursing Diagnosis

Typical problem statements for mania may include:

- Altered nutrition due to shortened attention span while trying to eat and weight loss
- Potential for violence toward self or others due to labile emotional state
- Disrupted sleep pattern due to hyperactivity
- Altered communication ability due to flight of ideas and pressured speech
- Altered role performance due to inability to perform child care duties
- Absence of compliance due to refusal to take medications during manic phase

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning

For these problems, expected outcomes include:

- Patient will consume at least 1500 calories during a 24-hour period.
- Patient will refrain from hurting self or others during this shift.
- Patient will sleep and rest at least 6 hours within a 24-hour period.
- Patient will demonstrate a decrease in pressured speech and flight of ideas before discharge.
- Patient and family will identify and use substitutes and resources for child care until the patient is able to resume family responsibilities.
- Patient will identify two methods of ensuring medication compliance before discharge.

Planning care for a patient with mania involves intervention to promote safety, adequate nutrition, and sleep. Patients in a manic state can be a source of danger to others on the unit. Manic patients can quickly escalate in behavior from good-natured humor into active aggression. It is often necessary to assign a nurse or nursing assistant to stay with the patient until the medications have reduced agitation and hyperactivity.

■ Assignment Considerations

Hygienic Care of Manic Patients

On a medical-surgical unit, the nursing assistants (NAs) are likely to assist patients with hygienic needs in the morning. When caring for a manic patient, inform the NA that the patient may have a

shortened attention span and a tendency to be argumentative; therefore the hygienic care may have to be accomplished in small steps over the course of the day, for example, washing hands and face on waking, brushing teeth after breakfast, combing hair midmorning, and taking a shower in the afternoon.

■ Implementation

Nursing interventions for a manic patient include keeping the patient safe, providing a high calorie intake, administering mood stabilizer medications, and providing for a restful sleep. Manic patients may come into the hospital malnourished. Small, frequent, high-calorie meals and finger foods are typically necessary, because the manic patient will not sit down long enough to eat. Close observation and documentation of mood, verbalizations, and behavior are very important. It may be necessary to place a manic patient in a quiet area away from others to decrease environmental stimulation.

When communicating with a manic patient, it is essential to maintain a calm demeanor. **Until the medications are effective, therapeutic communication consists of setting limits.** When setting limits, it is necessary to clearly state the initial expectations of the patient's behavior. For example, you might say, "Mr. Smith, I am talking to Ms. Jones right now, so please stop interrupting us and wait for me in the dayroom. I will be with you as soon as we are finished." The consequences for noncompliance should be stated with the request; consistent follow-through on consequences is essential. "If you interrupt us one more time, I will not help you with your project today and you will have to wait until tomorrow." To avoid being manipulated by the patient, it is important that all staff members be consistent. Sometimes, because of the severity of the mania, the manic patient is unable to comply with simple requests. In these instances, it is necessary to distract or redirect the patient rather than attempt to use reason.

When the patient is stabilized, providing her with information about medications and the rationale for their long-term use is important to increase medication compliance. Compliance is important because it is not unusual for the patient to stop taking medications once the manic symptoms subside ([Nursing Care Plan 45-1](#)).

✳ Nursing Care Plan 45-1

Care of a Patient With Bipolar Disorder (Manic Phase)

Scenario

Bobby Holmes, 25 years old, is diagnosed with bipolar disorder. He is currently euphoric, grandiose, loud, and very talkative. Although he can be charming, he is currently argumentative and intrusive and is verbally aggressive toward other patients. He states, "I'm going to get in your face whenever I feel like it!" He is continuously walking around the unit and has trouble sitting still for meals or conversation. He states, "I haven't slept well or eaten much for the past 3 days."

Problem Statement/Nursing Diagnosis

Potential for violence/*Risk for other-directed violence related to manic state.*

Supporting Assessment Data

Subjective: "I'm going to get in your face whenever I feel like it!"

Objective: Argumentative, intrusive, and verbally aggressive toward others.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient and others on unit will remain free from harm during this shift.	Observe patient's behavior frequently (q15min).	Changes in behavior can signal impending violence toward self or others.	Patient pacing and talking loudly; checked q15min × 3.
	Redirect or distract patient (e.g., walk outside, make bed, talk to nurse).	Helps control impulses and channel excess energy.	Patient easily redirected with verbal suggestions; likes to talk to nursing staff and mental health assistant.
	Move patient away from others as necessary.	Agitated and aggressive behavior is contagious and will escalate in proximity to others.	Patient was verbally directed to go to room. Patient was observed for 1 hr on a 1:1 basis by mental health assistant.
	Administer tranquilizing medications as prescribed and monitor effectiveness.	Chemical restraints may be necessary if patient cannot control his behavior.	Administered PO lorazepam. Patient continues to be hypervigilant and loud, but able to sit for 5-6 min without pacing, 45 min after given lorazepam. Patient and others remain free from harm. Outcome met. Continue plan.

Problem Statement/Nursing Diagnosis

Altered nutrition/*Imbalanced nutrition: less than body requirements, related to inability to sit long enough to eat.*

Supporting Assessment Data

Subjective: "I haven't ... eaten much for the past 3 days."

Objective: Patient observed continuously moving and not eating meals.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will assume regular eating habits within 1 wk.	Weigh daily. Record food intake and calculate calorie counts.	To monitor nutritional status. To determine whether nutritional intake is adequate.	Patient's current weight is 160 lb (normal weight is 170 lb). Patient ate sandwich (300 calories) and glass of milk (120 calories).
Determine food likes and dislikes.	Increases likelihood that he will eat if given favorite food. Offer small, frequent, high-calorie meals and finger foods.	Patient will eat any type of food, but needs constant reminders to finish food.	Patient will eat any type of food, but needs constant reminders to finish food.
	Stay with patient during meals.	Patient will eat any type of food, but needs constant reminders to finish food.	Patient was offered eggs, toast, bacon, and orange juice for breakfast. Patient was able to eat bacon, orange juice, and toast "on the run" but refused eggs.
	Administer vitamin and mineral supplements.	Provides support and encouragement to eat as much as possible. To replace any dietary deficiencies.	Patient able to eat meals, but requires less coaching if given PRN lorazepam 30 min before meals. Patient agrees to take supplements for duration of hospitalization. Patient eating three meals per day, but requires monitoring and lorazepam. Outcome partially met. Continue plan.

Problem Statement/Nursing Diagnosis

Disrupted sleep pattern/*Sleep deprivation related to manic activity.*

Supporting Assessment Data

Subjective: "I haven't slept well ... for the past 3 days."

Objective: Observed continuously walking.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will return to his normal patterns of rest and sleep within 3 days.	Provide a quiet environment with low stimuli.	Quiet environment is conducive to rest and sleep.	Patient placed in private room; however, quiet environment was not helpful last night.
	Monitor and record sleeping patterns.	To determine whether rest is adequate and normal pattern is resuming.	Patient slept 2 hr last night and 6 hr after lunch.
	Before bedtime provide comfort measures such as back rub, warm bath, and relaxing music.	Teaches habits that signal bedtime and helps with relaxation.	Patient having difficulty with sleeping; warm milk offered. Suggested resting in bed even if not sleepy, but patient continued to be restless, rising frequently to come to nurses' station last night.
	Prohibit intake of caffeine-containing foods in the evening hours.	CNS stimulants can cause restlessness.	Patient agrees to stop drinking coffee for duration of hospitalization, "but it won't make any difference."
	Administer sedative medications as prescribed.	Potentiates sedation at the biochemical level.	Temazepam (Restoril) offered for sleep, but refused. Patient is sleeping 2-3 hr at night, but has not been able to reestablish normal cycle. Outcome partially met. Continue plan.

CNS, Central nervous system; PO, oral.

Critical Thinking Questions

- How will you respond to Bobby's intrusiveness and constant need for attention?
- Why is Bobby at risk for injury to himself if he is not hospitalized during the manic phase?

See Evolve for Nursing Care Plans for patients with anxiety, depression, and anorexia nervosa.

■ Evaluation

Ongoing evaluation of patients with bipolar disorder is necessary. You must determine whether the outcome criteria for the patient's physical needs—such as safety, nutrition, and rest—were met. In addition, are the symptoms resolving? Is the patient able to communicate effectively and resume social and occupational roles? Do both the patient and the family have a plan to maintain medication and follow-up appointments?

Major Depressive Disorder

Major depressive disorder is diagnosed when at least five symptoms characteristic of depression have been present for at least 2 weeks. These symptoms include an overwhelming feeling of sadness, inability to feel pleasure or experience interest in daily activities, weight gain or loss not attributed to dieting, sleep disturbances, fatigue or loss of energy, feelings of worthlessness, difficulty in making decisions or concentrating, and suicidal thoughts. Depressed patients may have **psychomotor retardation** in which speech, movements, and thought processes are slowed. However, it is not uncommon to see agitation and irritability in a depressed person. These symptoms may be **subjective** (described by the patient) or **objective** (observable by others).

Clinical Cue

The Centers for Disease Control and Prevention (CDC) reported that there were 41,149 suicides in 2013. That is more than the number of deaths from motor vehicle accidents. The suicide rate for those aged 35 to 64 years increased 28.4% since 1999 ([Centers for Disease Control, 2013](#)).

Before making a diagnosis of depression, the provider must be certain that there are no medical conditions present that could mimic depression, such as hypothyroidism or chronic fatigue syndrome. In addition, a patient who has suffered a stroke or myocardial infarction, has cancer, or is newly diagnosed with a chronic disease such as diabetes needs to be screened for depression, because major illness can lead to depression. Moreover, a pharmacologic type of depression may be induced by many medications, including antihypertensives, sedatives, anxiolytics, antipsychotics, steroids, and hormones. In addition, substance abuse—especially of alcohol—often produces symptoms that mimic those of depression. In other cases, consuming large amounts of alcohol will actually cause a person to feel depressed because alcohol is a central nervous system depressant. A diagnosis of alcohol dependence needs to be considered. When a person has an emotional problem such as depression and abuses a substance such as alcohol, she has a **dual diagnosis**. See [Chapter 46](#) for more on substance abuse.

Think Critically

How would you differentiate symptoms of depression and hypersomnia from the medication side effects of drowsiness or sedation?

There is increasing evidence that major depressive disorder is caused by a biochemical imbalance. However, most scientists agree that the majority of chronic illnesses result from a combination of heredity and environment. What is not understood is how these elements interact to precipitate an episode of major mental illness. Whereas the signs and symptoms of mild depression usually subside, research findings indicate that an attack of major depression is very likely to recur with even greater severity; therefore, regardless of the cause, symptoms of depression need to be addressed and not ignored.

Older Adult Care Points

Although older adults have many risk factors for depression (such as loss of friends and body changes) that increase with age, symptoms of major depression are not a normal part of the aging process. Research shows that most older adults are not depressed most of the time. Older adults want to enjoy good mental health, but cost and access to mental health services are barriers.

Treatment

Patients who are depressed respond best to a combination of antidepressant medication and psychotherapy.

Complementary and Alternative Therapies

St. John's Wort

Herbal remedies such as St. John's wort have been used for mild to moderate depression and anxiety; however, patients should be advised that taking monoamine oxidase inhibitors (MAOIs) or SSRIs with St. John's wort can cause adverse drug-herb interactions. Many medications can interact with St. John's wort.

Complementary and Alternative Therapies

Music Therapy for Depression

Evidence-based practice suggests that people with major depression are receptive to music therapy and show improvement in mood ([Maratos et al, 2008](#)). 

Hospitalization may be necessary if the patient has a high potential for suicide. Since the 1960s, medications have made a great difference in the lives of people who are depressed. The first-line medications used to treat depression are tricyclic antidepressants (TCAs), SSRIs, and selective norepinephrine reuptake inhibitors (SNRIs), as well as atypical antidepressants. Second-line drugs are MAOIs. Drugs are very effective in treating depressive symptoms; however, they can cause some serious side effects ([Table 45-4](#)). There is a risk of GI bleeding when taking an SSRI for even a brief period.

 **Table 45-4**

Drugs Commonly Used to Treat Depression

CLASSIFICATION	ACTION	NURSING IMPLICATIONS	PATIENT TEACHING
Tricyclics			
Amitriptyline (Elavil) Clomipramine (Anafranil) Imipramine (Tofranil) Maprotiline (Ludiomil) Nortriptyline (Pamelor) Desipramine (Norpramin) Doxepin (Sinequan) Protriptyline (Vivactil) Trimipramine (Surmontil) Amoxapine (Asendin)	Inhibit the reuptake of neurotransmitters (serotonin and norepinephrine). Used to treat depression.	Watch for side effects: dry mouth, blurred vision, tachycardia, cardiac dysrhythmias, postural hypotension, constipation, urinary retention, and esophageal reflux. Usually taken at bedtime. Monitor patient for suicidal ideation. An overdose of these medications could be fatal.	Mood elevation may take 7–28 days. Full recovery from major depression may take 6–8 wk. Instruct to avoid alcohol and working around machines and heavy equipment. Drowsiness, dizziness, and hypotension will subside after the first few weeks. Warn not to stop taking these medications abruptly.
MAO Inhibitors (MAOIs)			
Isocarboxazid (Marplan) Phenelzine (Nardil) Tranylcypromine (Parnate) Selegiline (Eldepryl)	Inhibits the MAO enzyme, thereby preventing the breakdown of dopamine, norepinephrine, and serotonin.	Common side effects: weight gain, postural hypotension, edema, change in cardiac rate and rhythm, urinary retention, constipation, insomnia, weakness, and fatigue. Monitor blood pressure very closely during the first few weeks of treatment. Take a medication history to identify use of medications that increase the heart rate, such as ephedrine, stimulants, alcohol, narcotics, TCAs, or antihypertensives; report findings to provider or RN.	Instruct to avoid foods high in tyramine, such as aged cheeses; red wine, sherry, and beer; pickled or smoked fish; fermented meats; and artificial sweeteners, because drug-food interactions can cause a life-threatening hypertensive crisis. If the medication is discontinued for any reason, dietary restrictions should continue for at least 14 days. Advise to go to the ED immediately for headaches.
Selective Serotonin Reuptake Inhibitors (SSRIs)			
Citalopram (Celexa) Escitalopram (Lexapro) Fluoxetine (Prozac) Paroxetine (Paxil) Sertraline (Zoloft) Fluvoxamine (Luvox)	Block the reuptake of serotonin. Used for depression, anxiety disorders, and bulimia.	These medications elevate mood faster than the TCAs or MAOIs. They are not as sedating and do not have the anticholinergic side effects of TCAs or MAOIs. Common side effects include nausea, nervousness, insomnia, anxiety, and sexual dysfunction.	Take with food if GI distress occurs. Take drug in the morning for optimal effects. Full therapeutic effects may take up to 4 wk. Decreased libido or impotence may occur; check with provider rather than stopping medications abruptly.
Atypical Antidepressants			
Trazodone (Desyrel, Oleptro) Bupropion (Wellbutrin) Nefazodone (Serzone) Mirtazapine (Remeron) Venlafaxine (Effexor) Duloxetine (Cymbalta) Desvenlafaxine (Pristiq)	Block the reuptake of norepinephrine, serotonin, and dopamine. — — — — — — —	Side effects are similar to the SSRIs. In doses >450 mg/day, can cause seizures; assess for history of head trauma or seizure disorder. Used to treat depression in patients who are not responding to other antidepressants. Can cause liver failure. Can cause agranulocytosis. In doses >300 mg/day, potentiates risk of sustained hypertension; assess for history of hypertension. Side effects are similar to the SSRIs. Common side effects: dizziness, fatigue, headaches, nausea, dry mouth, diarrhea, constipation, decreased appetite.	Instruct to immediately contact provider if priapism (a painful, prolonged erection of the penis) occurs. Instruct to immediately contact provider if seizures occur. Teach to report yellowing of the skin or sclera, anorexia, or malaise. Warn to immediately report sore throat, fever, or other infection signs. Instruct to continue taking BP medications as prescribed. Monitor for hypoglycemia. Instruct patient and family to report suicidal ideations.

BP, Blood pressure; GI, gastrointestinal; MAO, monoamine oxidase; MAOIs, monoamine oxidase inhibitors; TCAs, tricyclic antidepressants.

Evidence-based practice indicates that medications should be started at the lowest dose and increased gradually; however, it is also important that the patient receives a sufficient dose for an appropriate length of time. If the patient experiences medication failure, compliance is more difficult to achieve ([Substance Abuse & Mental Health Services Administration, 2011](#)).

Safety Alert

Serotonin Syndrome

SSRIs have the potential to cause serotonin syndrome. This is a potentially life-threatening condition that could start 30 minutes to 48 hours after taking the medication. Symptoms include change of mental status, increase in pulse and fluctuation in blood pressure, loss of muscular coordination, and hyperthermia. Treatment includes stopping the medication, administering intravenous (IV) fluids, and decreasing the patient's temperature.

Electroconvulsive therapy (ECT) is the oldest form of brain stimulation therapy used for severe depression. After several regimens of medication are unsuccessful, or if the patient is severely depressed or actively suicidal, ECT is considered. Evidence suggests that ECT is more effective in some patients than pharmacology ([Tokutsu et al, 2013](#)). Basically, ECT consists of an electrical shock delivered to the brain via electrodes applied to the temples. This shock artificially induces a grand mal seizure lasting 30 to 90 seconds. The patient typically receives 8 to 12 treatments spread over several weeks. ECT is typically done on an outpatient basis in the early morning.

The potential risks associated with the procedure include increased intracranial pressure, increased blood pressure (especially for those with essential hypertension), and cardiac dysrhythmias. Short-term memory loss, occasional headaches, and confusion are expected but will resolve in minutes to hours after the procedure, and this should be explained to the patient and family before treatment. The patient should take nothing by mouth for 6 to 8 hours before the procedure. Basic preoperative preparation includes obtaining a signed consent and removing dentures, jewelry, hairpins, contact lenses, and hearing aids. The patient will receive a preoperative medication such as atropine sulfate and a short-acting general anesthetic. After the procedure is completed, vital signs are monitored and the patient is reoriented. Before discharge, the patient is fed, and the family is reminded about the expected short-term memory loss.

Newer forms of brain stimulation therapy have shown promise. Repetitive transcranial magnetic stimulation (rTMS) and magnetic seizure therapy (MST) are noninvasive methods; a magnet is placed on the skull, then areas of the brain are stimulated by pulsations. Vagus nerve stimulation (VNS) and deep brain stimulation (DBS) use a surgically implanted pacemaker to stimulate nerve tissue. MST has been approved by the FDA, but DBS is still undergoing trials ([Pedersen, 2013](#)).

Programs are continuously being developed to improve outcomes for mental health patients. For example, IMPACT (Improving Mood–Promoting Access to Collaborative Treatment) is an evidence-based intervention for older patients who have major depression. A nurse, social worker, or psychologist and the primary care provider use a collaborative team approach that includes assessment, education about treatments, activities, and the patient's preference for depression treatment, such as antidepressant medications and psychotherapy ([SAMHSA's National Registry of Evidence-Based Programs, 2015](#)).

Nursing Management

Assessment (Data Collection)

You should collect information about feelings of sadness, hopelessness, and a loss of interest in usual activities. Nurses are responsible for identifying patients at risk for suicide. Assess the patient for changes in ability to fulfill family, social, or occupational obligations, as well as appetite, recent weight loss or gain, and changes in normal eating pattern. A person who is depressed may also have many somatic complaints, such as headache, stomachache, dizziness, nausea, indigestion, constipation, and change in sexual responsiveness. The inability to concentrate and indecisiveness are also hallmarks of mood disorders.

Nursing Diagnosis

Common problem statements for patients experiencing depression include:

- Altered activity tolerance due to psychomotor retardation
- Diminished hope due to inability to achieve career goals
- Spiritual disconnection due to questioning the meaning of life
- Grief due to loss (e.g., divorce)
- Decreased self-esteem due to past failures
- Altered self-care ability due to lack of motivation
- Potential for violence due to repressed anger and grief

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning

For these problems, expected outcomes might include:

- Patient will participate in at least one unit activity today and gradually increase participation as activity tolerance improves.
- Patient will identify two short-term goals that would contribute to achieving overall long-term career goals by the end of shift.
- Patient will verbalize renewal of faith in a higher power after two or three visits from hospital clergy.
- Patient will express feelings of loss and sadness about divorce within 1 month.
- Patient will relate at least one “success story” about self every day for 1 week.
- Patient will participate with assistance (e.g., verbal coaching) in activities of daily living (ADLs) (e.g., brush own teeth) for 1 week and gradually increase independent completion of ADLs before discharge.
- Patient will refrain from harming self or others during this shift.

Planning care for a patient with depression involves promoting safety, adequate nutrition, and rest. Initially, the patient may require assistance in performing ADLs until the severe depression subsides. Mental energy and concentration to work on complex psychological issues are not available to a person who is still in the depths of depression. However, as the energy level improves, you need to help the patient begin to set some small goals such as meeting her own hygienic needs and gradually work toward the greater goal of reentry into the workforce.

■ Implementation

The priority nursing intervention for a depressed patient is to protect the patient from acting on impulses to harm herself. Medications to treat depression often are indicated, and you must help the patient understand that sometimes pharmacologic intervention is necessary to combat depression at the biochemical level; reversing depression is not merely a matter of thinking happy thoughts. Also, comparing the need for medication to that for a condition such as diabetes or a heart problem may help the patient to feel less stigmatized. **Once the antidepressant medications begin to take effect, the risk for self-harm actually increases, because the patient now has sufficient energy to complete the act.** Genuine caring and concern and close monitoring are very important.

Depressed patients can be difficult to be with because of their self-defeating thoughts and verbalizations. Set limits on the amount of time spent ruminating on negative thoughts and redirect the patient to discussions of the present reality, such as focusing on the small successes that the patient has achieved during the shift, such as combing her own hair or attending a group session.

Clinical Cues

When you spend a lot of time caring for a depressed patient, you may find that you feel very tired, subdued, or even mildly depressed. Share this experience with your clinical instructor or a classmate, and remember that to give excellent patient care, identifying your feelings and protecting your own mental health are essential.

Think Critically

What types of goals would be suitable for a 25-year-old female nursing student who is depressed? She is taking Zoloft, an SSRI, and is feeling better but continues to be overwhelmed.

Most depressed people complain of some type of sleep deprivation. Provide an environment that is conducive to sleep and educate the patient and family about the importance of regular sleep.

■ Evaluation

Daily evaluation of the patient's depression includes determining whether the outcome criteria for the patient's physical needs were met. These include safety and issues related to decreased energy levels, such as helping with ADLs. Also evaluate the patient's ability to participate in social activities and to express feelings. Part of this overall assessment will include determining the effectiveness of medications. Sometimes it takes several different trials of a combination of drugs to achieve the desired effect. In addition, many of the medications take 2 to 4 weeks to become effective, and the initial side effects of drowsiness and nausea may discourage long-term compliance.

Suicidal Patients

❖ Nursing Management

■ Assessment (Data Collection)

Risk factors for suicide include family history of suicide, history of a previous attempt, terminal illness, addiction to drugs or alcohol, diagnosis of major depressive disorder or bipolar disorder, and excessive stress. Suicide assessment includes determining the level of risk (low, moderate, or high) for accomplishing the act of suicide, the presence of a distinct plan, and means of acting on the plan. Be caring in your approach; however, do not be afraid to be direct. You cannot cause the patient to commit suicide with your questions. Moreover, the patient is likely to feel relieved that you are not afraid to hear about suicide and that you are capable of dealing with this painful disclosure.

▣ Clinical Cues

If you are working on a busy medical-surgical unit and you identify a patient with signs of suicidal thoughts or behaviors, first ensure patient safety, and then immediately report these behaviors to the provider or RN. The patient may need a psychiatric consultation, transfer to a medical-psychiatric unit, or initiation of intensive suicide precautions (i.e., one-on-one observation). These measures are beyond the routine care provided on a medical-surgical unit.

The probability of a completed suicide attempt increases with male gender, weapon availability (guns or knives), poor support system, social isolation, and the influence of mood-altering chemicals. However, all suicide threats and gestures should be taken seriously. Patients who are actively suicidal are considered unstable, and if you gather data that support this suspicion, the facts should be immediately reported to the provider or RN.

▣ Focused Assessment

Questions to Ask a Potentially Suicidal Patient

- Are you feeling suicidal?
- Do you have a plan? How do you plan to take your life?
- Can you think of any event that may have caused you to feel this way?
- Do you have a lethal weapon in your possession?
- Who is a part of your support system?
- Do you drink or use drugs on a regular basis?
- Has anyone in your family made a previous suicide attempt?
- Are you currently taking any antidepressants?
- Have you experienced a major loss within the last year?
- What is your history with past close relationships?
- Have you given away any of your possessions recently?
- Have you been having difficulty remembering things lately?

Think Critically

Women are two times more likely to attempt suicide, but men are four times more likely to complete the suicide act. Why might older white men have the highest rate for completed suicide?

■ Nursing Diagnosis

Common problem statements for patients at risk for suicide include:

- Potential for violence due to overwhelming feelings
- Potential for suicide due to history of previous suicide attempt
- Decreased power due to dependency in relationships
- Decreased hope due to viewing the future as bleak and grim
- Spiritual disconnection due to loss of belief in God
- Altered coping ability due to use of avoidance of problems
- Altered self-esteem due to unmet dependency needs

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see back cover).

■ Planning

For the problems mentioned, expected outcomes might include:

- Patient will refrain from injuring self during this shift.
- Patient will refrain from suicide attempts during this shift and will stop verbalizing suicidal thoughts before discharge.
- Patient will identify three examples of dependency in her relationships and describe how this dependency affects her life during group therapy sessions.
- Patient will verbalize one or two future events that she could look forward to and enjoy.
- Patient will demonstrate renewal of her usual spiritual activities (e.g., attending church, meditating) within 2 months.
- Patient will identify at least two additional coping mechanisms by the end of the week.
- Patient will list at least two ways to meet her own needs during this shift.

Planning care for a patient at risk for suicide involves ensuring a safe environment by determining the level of risk and initiating the appropriate suicide precautions.

Legal and Ethical Considerations

Safe Environment for a Suicidal Patient

Although patients have the right to bring and keep personal items, you have the legal responsibility for maintaining a safe environment for a suicidal patient. Belts, shoelaces, and even undergarments such as a bra could be used in a self-strangulation attempt and should be taken away as necessary.

As the risk for suicide decreases, the focus of nursing care shifts to assisting the patient to develop alternative methods to cope and solve problems.

■ Implementation

Protecting a suicidal patient from self-harm is a priority nursing intervention. Suicide precautions for a high level of risk consist of placing the patient in a seclusion room with one-to-one (1 : 1) observation, where one caregiver is assigned to be with the patient continuously. A provider's order is required for 1 : 1 seclusion; however, a 1 : 1 measure can be initiated temporarily by the nursing staff until the provider is notified. The observer may have to remain close enough (arm's length) to immediately intervene if the patient attempts self-harm. As the level of risk decreases, the patient is allowed to have more personal space; for example, 1 : 1 may continue in the dayroom, but visual contact must be maintained at all times. In addition, all items with a potential for self-harm must be removed, such as sharp or pointed objects, glass objects, or pills. Observe the patient for

“cheeking,” which is a ploy to avoid taking medication by holding the pill in the cheek pouch rather than swallowing it. Suicidal patients have been known to hoard medication and then use it in an attempt to overdose.

When assessment indicates that the suicide intent is less lethal, it is sufficient to maintain close observation and a contract with the patient to refrain from taking action. A no-suicide contract—preferably written—should be initiated and renewed as needed. Active listening and a caring attitude are necessary to build a trusting relationship with a severely depressed, suicidal patient. Even if the patient is unwilling to talk, you must indicate to the patient both verbally and nonverbally that you care and are available to listen. Your attention and presence convey respect and help the patient to build self-esteem and a sense of self-worth.

■ Evaluation

Unstable, suicidal patients need to be reassessed and evaluated frequently (i.e., every 15 to 30 minutes), and the plan of care should be adjusted accordingly to ensure safety and prevent self-harm. As the patient stabilizes and the level of risk decreases, evaluate patient outcomes related to gaining new coping skills, renewing hope and a sense of purpose, improving communication skills to get needs met, and preparing to resume life in a community setting. The status of the patient just before discharge should be carefully documented to reflect the absence of suicidal ideations and a follow-up plan with a specific method to access emergency care if suicidal feelings return should be included. According to The Joint Commission's National Quality Core Measures, when patients are discharged from a facility, the plan of care should be communicated to the provider who assumes the care of the patient. This is particularly important for patients who have attempted suicide or expressed suicidal thoughts.

Eating Disorders

Anorexia Nervosa

Anorexia nervosa is characterized by the patient's refusal to maintain minimal body weight or eat adequate quantities of food. There is a disturbance in the perception of body shape and size and an extreme fear of becoming fat. The patient strives for perfection and control by controlling caloric intake. These patients may act immaturely and are socially insecure and exhibit fluctuating moods. Intricate food rituals (e.g., shifting food around the plate, collecting recipes, and making elaborate meals for others) develop, and the patient may have superstitions about food (e.g., ice cream goes straight to your hips). Excessive exercise is commonly used as another means of staying thin. In many cultures, the emphasis on a slim body has influenced young women's body image. Anorexia nervosa occurs in about 1% of females in late adolescence or early adulthood. About 0.3% of males have the disorder. Anorexia nervosa is a dangerous disorder; 6% to 20% of patients with this diagnosis will die of starvation or suicide. Other psychiatric conditions accompany anorexia nervosa.

Diagnostic criteria include:

- Refusal to maintain body weight at or above a minimally normal weight for age and height (body weight less than 85% of that expected)
- Intense fear of gaining weight or becoming fat, even though underweight
- Disturbance in the way in which one's body weight or shape is experienced, or denial of this problem
- Absence of at least three consecutive menstrual cycles after onset of menstruation in women

Think Critically

How does your own culture influence your body image?

Bulimia Nervosa

Patients with **bulimia nervosa** induce vomiting after consuming large quantities of food. It occurs in about 1.5% of women and 0.5% of men. This binge eating occurs in a frenzied state and usually in secrecy; afterward, the patient experiences feelings of shame and self-criticism. Laxatives may be taken to purge the system after the binge. Many athletes suffer from an eating disorder. Bulimia and anorexia nervosa can occur simultaneously in some patients, and both conditions are difficult to cure.

Treatment of Eating Disorders

The goal of treatment in eating disorders is to restore nutritional health and a normal body weight. If there is a rapid weight loss of 30% and the patient is medically unstable, the first step is hospitalization to correct fluid and electrolyte imbalances and severe weight loss. After the medical condition is stabilized, behavior modification is the focus of treatment. Therapy is long term, requiring 1 to 6 years for reversal of the disorder. Both inpatient treatment and outpatient treatment are required with individual, group, and family therapy. Support groups can provide opportunities for growth and sharing of feelings and information. The long-term goal is for the patient to achieve a sense of self-worth and self-acceptance that is not exclusively based on appearance.

Nursing Management

Assessment (Data Collection)

Collect information about compulsive dieting, severe weight loss, excessive exercise, or an unrealistic body image. The patient and the family may be in denial. Amenorrhea and electrolyte imbalances occur, and as the disease progresses, a host of other symptoms appear. Problems related to vitamin and nutrient deficiencies occur, including dry skin, constipation, muscle wasting, and facial puffiness. **Lanugo** (downy hair covering the body) may occur. Cardiac dysrhythmias,

hypotension, and hypothermia can be life threatening.

Individuals with bulimia nervosa may maintain a normal weight. Assess for binge eating, tooth marks on the knuckles from repeated attempts to induce vomiting, and dental caries from exposure to stomach acid. Other signs and symptoms include fluid and electrolyte imbalances, complaints of heartburn, vomiting of blood, or constipation from dehydration.

■ Nursing Diagnosis

Common problem statements for patients with eating disorders include:

- Altered nutrition due to refusal to eat and fear of gaining weight
- Potential for electrolyte imbalance due to self-induced vomiting and limited intake
- Altered body image due to sociocultural and media influence
- Altered self-esteem due to repeated negative feedback from parents
- Altered coping ability due to using maladaptive dietary practices to cope with stress
- Altered family functioning due to the emotional growth and development of the adolescent family member

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

▣ Clinical Cues

A patient with an eating disorder is attempting to gain a sense of control by controlling dietary intake; therefore it is important to avoid power struggles over food. Use a matter-of-fact approach and help the patient to experience control in non-food-related areas. For example, "Jane, go ahead and finish your lunch and then you can show me what CDs you decided to take on your school trip."

■ Planning

For the above problems, expected outcomes might include:

- Patient will take in at least ____ calories per day for 1 week and gradually increase caloric consumption to regain 85% of ideal body weight within ____ months.
- Patient will refrain from self-induced vomiting during this shift.
- Patient will discuss four or five ways in which culture and media are influencing her self-image.
- Patient will identify examples of negative feedback from parents and discuss how that feedback is affecting her during today's group session.
- Patient will identify three alternative coping strategies to replace maladaptive dietary practices before discharge.
- Patient and family will identify three family activities (non-food related and non-exercise related) that provide support to the adolescent (e.g., discussing a homework assignment).

Planning care for a patient with an eating disorder involves ensuring a safe environment[®] and helping to restore weight and correct nutritional deficiencies. As the physical needs are met, the focus of nursing care shifts to assisting the patient to develop a more realistic body image, increase self-esteem, increase feelings of control, and practice new coping skills. *Healthy People 2020* goals include decreasing the proportion of adolescents who use eating behaviors to control weight.

■ Implementation

The initial interventions for eating disorders are targeted toward physical health and safety. Suicide precautions are initiated if necessary, and fluid and electrolyte imbalances are corrected. Nutritional status, weight gain, and behaviors such as excessive exercise or self-induced vomiting are monitored. Use a supportive, nonjudgmental approach to assist the patient in building self-esteem, assertiveness, a realistic body image, and age-appropriate peer relationships. Power struggles and discussions of food should be avoided.

▣ Clinical Cues

Evidence-based practice indicates that patients can learn to interrupt negative thoughts and

substitute positive affirmations (Peden et al, 2005). Teach your patients to use a personal positive affirmation statement that can be said out loud on a regular daily basis. You may even want to use a positive affirmation to build your own confidence while you are in nursing school. Wake up every morning and say to your mirror, "I am a good student and I am going to be a great nurse!"

■ Evaluation

In the acute phase, patients with eating disorders need evaluation of outcome criteria that ensure safety, nutritional, and electrolyte and fluid balance needs. Changing beliefs about food or body image, building self-esteem, learning new coping skills, and restructuring eating habits may take months or even years; therefore even small gains should be carefully documented. Evaluate the patient's readiness to resume life in a community setting with healthier eating habits and the family's ability to support the patient's efforts.

Community Care

As hospital stays become shorter, many patients with anxiety, mood, or eating disorders will be hospitalized only long enough to stabilize their life-threatening symptoms. They will then be seen in outpatient clinics, in long-term care, at home, or in day hospitals. Medication compliance is a major nursing responsibility. Once a patient feels better and the crisis is over, there may be a tendency to stop taking medications. Regular visits to the clinic or provider and a social support system are essential.

Get Ready for the NCLEX® Examination!

Key Points

- The four levels of anxiety are mild, moderate, severe, and panic.
- Examples of anxiety disorders include generalized anxiety disorder, phobic disorder, obsessive-compulsive disorder, and post-traumatic stress disorder.
- Assess for physical symptoms of anxiety: increased blood pressure, pulse, respirations, and urinary output; dry mouth; nausea; diarrhea; trembling; muscular tension; restlessness; hypervigilance; and insomnia.
- Assess for the psychological symptoms of anxiety: feelings of impending doom, fear, guilt, anger, helplessness, irritability, and low self-esteem.
- Interventions for patients with anxiety disorders include remaining calm, decreasing environmental stimuli, teaching relaxation techniques and stress management, medicating with anxiolytics as necessary, and determining root causes of anxiety as indicated.
- PTSD may occur after any extremely traumatic event and occurs both in combat veterans and civilians who have experienced such an event. It often appears within 3 months of the event but may not occur until months or years later.
- Bipolar disorder is characterized by episodes of extreme sadness, hopelessness, and helplessness alternating with periods of extreme elation and hyperactivity.
- Assess for physical indicators of bipolar disorder: hypersomnia or insomnia, change in appetite, and somatic complaints such as headache, stomachache, dizziness, nausea, indigestion, and change in sexual responsiveness.
- Assess for psychological indicators of bipolar disorder: irritability, grandiosity, delusions, labile emotions, flat affect, sadness, indecisiveness, and inability to concentrate.
- Interventions for patients in the acute manic phase include ensuring the safety of the patient and others, providing a high-calorie diet and finger foods, setting limits on behavior, administering and monitoring the effectiveness of antimanic medications, and encouraging rest and sleep.
- Assess for physical indicators of depression: weight loss or weight gain, sleep disturbances, fatigue or loss of energy, and psychomotor retardation.
- Assess for psychological indicators of depression: feelings of sadness, worthlessness, hopelessness, or excessive guilt; inability to feel pleasure or disinterest in daily activities; difficulty in making decisions or concentrating; and recurrent thoughts of death or suicide.
- Interventions for depressed patients include active listening, assessing for suicidal ideations, attending to physical needs, administering and monitoring the effectiveness of antidepressant medications, assisting in setting goals, and educating about medications and ECT.
- Assess for a suicide plan, including lethality level and means to act on the plan.
- Interventions for suicidal patients in the acute phase include developing a trusting relationship, one-on-one observation, removing dangerous objects, and initiating a no-suicide contract.
- Anorexia nervosa is the extreme fear of becoming fat, with a disturbance in perception of body size.
- Bulimia nervosa is characterized by the practice of inducing vomiting after binge eating.
- Assess for physical symptoms of an eating disorder: amenorrhea, electrolyte imbalances, dry skin, constipation, muscle wasting, facial puffiness, lanugo, dysrhythmias, hypotension, hypothermia, and dental caries (related to self-induced vomiting).
- Assess for psychological and behavioral symptoms of an eating disorder: denial of problem, compulsive dieting, preoccupation with food, unrealistic body image, low self-esteem, and shame (related to binge eating).
- Interventions for patients with eating disorders include monitoring nutritional intake and weight gain, monitoring behaviors such as excessive exercise and self-induced vomiting, and assisting to build self-esteem and assertiveness.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• **Online Resources**

- Depression, www.nlm.nih.gov/medlineplus/depression.html
- Mental health, www.webmd.com/mental-health/default.htm
- National Institute of Mental Health, www.nimh.nih.gov/index.shtml
- Substance Abuse and Mental Health Services Administration, www.samhsa.gov

Review Questions for the NCLEX® Examination

1. A patient is irritable, pacing, crying, and becoming increasingly agitated. A nursing intervention that could be helpful is:

1. Initiate a contract stating suicide won't be attempted.
2. Administer ordered antidepressant medication.
3. Stay with the patient and make the surroundings less stimulating.
4. Offer small nourishing meals and finger foods to sustain nutrition.

NCLEX Client Need: Psychosocial Integrity: Implement Measures to Reduce Environmental Stressors

2. A 46-year-old woman is diagnosed with generalized anxiety disorder. Which behavior is more likely to be displayed with this diagnosis?

1. Runs out of the room when she notices a spider in the corner
2. Continuously checks to see if doors are shut and locked
3. Has difficulty concentrating and excessively worries about her family
4. Wakes at night screaming because of recurrent nightmares

NCLEX Client Need: Psychosocial Integrity: Identify Client Symptoms of Acute or Chronic Mental Illness

3. A nurse feels that there may be a need to administer ordered medication to an older adult for anxiety. Which strategy would help the nurse to make this clinical decision?

1. Listen to verbalization of apprehension.
2. Be sensitive to somatic complaints.

3. Initiate therapeutic communication.
4. Observe for escalation of agitation.

NCLEX Client Need: Psychosocial Integrity: Monitor Client Effective Use of Stress Management Techniques

4. A patient is taking lithium. Which are early signs of lithium toxicity?

1. Hypertension and headache
2. Diarrhea and slurred speech
3. Confusion and blurred vision
4. Convulsion and polyuria

NCLEX Client Need: Physiologic Integrity: Pharmacological Therapies

5. A patient demonstrates an overwhelming feeling of worthlessness, difficulty in making decisions or concentrating, and suicidal thoughts. The nurse determines the suicide risk by asking which question(s)? (*Select all that apply.*)

1. "Are you feeling suicidal?"
2. "Do you have a plan? How do you plan to take your life?"
3. "Why do you want to commit suicide?"
4. "What would you accomplish by killing yourself?"
5. "Do you drink or use drugs on a regular basis?"
6. "Have you considered how your family would feel?"
7. "Have you recently given away any of your belongings?"

NCLEX Client Need: Psychosocial Integrity: Therapeutic Communication

6. A patient is disheveled and disinterested in daily activities such as bathing or hygiene. She reports overwhelming feelings of sadness and loss of energy. A problem of altered self-care deficit regarding bathing and hygiene is identified. Which intervention(s) would be appropriate? (*Select all that apply.*)

1. Explain the importance of hygiene to health and appearance.

2. Encourage the patient to "look good and feel good."
3. Plan extra time to help the patient to complete ADLs related to hygiene.
4. Instruct the nursing assistant to do partial hygiene.
5. Encourage some participation and set limits.
6. Do everything for the patient until she feels better.
7. Have the same caregiver assist on a daily basis if possible.

NCLEX Client Need: Physiologic Integrity: Personal Hygiene

7. A patient who is taking an SSRI suddenly develops a rapid pulse, fluctuating blood pressure, fever, loss of muscle coordination, and mental status changes. The nurse anticipates that the provider is most likely to order which medical therapy?

1. Infuse IV fluids and administer an antipyretic.
2. Obtain an electrocardiogram and start oxygen through a nasal cannula.
3. Administer an antidote and encourage oral fluids.
4. Monitor the patient closely and continue the medication.

NCLEX Client Need: Physiologic Integrity: Pharmacologic Therapies/Adverse Effects

8. A nurse is admitting a young adult with a tentative diagnosis of bulimia. Which behavior is most likely to characterize this disorder?

1. Vomiting after eating large quantities of food
2. Being obsessed with exercising constantly
3. Stating suicidal thoughts to others
4. Cutting food on the plate into tiny bites

NCLEX Client Need: Psychosocial Integrity: Identify Client Symptoms of Acute or Chronic Mental Illness

9. A nurse is caring for an 18-year-old patient who is diagnosed with anorexia nervosa. The nurse

identifies altered nutrition as a priority problem. What is an appropriate expected outcome?

1. The patient will be able to eat 35% or more of her meals.
2. The patient will be able to develop improved eating behaviors.
3. The patient will be able to verbalize the importance of eating.
4. The patient will be able to identify barriers to eating.

NCLEX Client Need: Physiologic Care: Basic Care and Comfort—Nutrition and Oral Hydration

10. A patient is hospitalized for dehydration and weight loss. She is very restless and exhibits flight of ideas with easy distractibility. Which intervention is most appropriate for the problem of inadequate nutrition?

1. Give three high-calorie meals on a regular schedule.
2. Offer finger foods, such as a meat and cheese sandwich.
3. Provide a pleasant, odor-free environment.
4. Encourage family meals and socialization while eating.

NCLEX Client Need: Physiologic Integrity: Nutrition and Oral Hydration.

Critical Thinking Questions

Scenario A

You are working in a clinic, and the mother of an adolescent who was recently diagnosed with cancer becomes hysterical. You briefly assess her and find she is at a panic level of anxiety.

1. Explain why closed questions (questions that can be answered with a yes or no, or with very specific answers) and short simple sentences delivered in a firm, kind tone would be effective while she is at a panic level of anxiety.
2. What signs and behaviors would indicate that your interventions are successfully helping this mother to reduce her anxiety?

Scenario B

You are caring for an older adult couple in their home. The husband had a stroke 6 months ago. One day the wife takes you aside and tells you that she is concerned about her husband. She says that he is not sleeping well and that his appetite is poor. On further questioning, you find that he is verbalizing a desire to “end it all.”

1. What questions would you ask the husband? What questions would you ask the wife?
2. What type of community supports might be available for this couple?

Scenario C

Tony Garza, a 42-year-old, comes into the emergency department after a high-speed chase with the police. He is using vulgar, profane language and is unable to sit down even for a few minutes. Tony switches rapidly from being fun-loving and humorous to angry and aggressive. The psychiatrist tells you that Tony has bipolar disorder and orders a calming intramuscular injection.

1. How would the team approach Tony to give him the injection?
2. What are the major safety concerns for this patient while he is in the emergency department?
3. What other nursing interventions are necessary at this time?

Scenario D

You are assigned to care for Jacquie, a 19-year-old who has been admitted for treatment of anorexia nervosa. She tells you she would like to delay breakfast to take a walk around the unit. You kindly, but firmly, tell her that she cannot delay breakfast. Later you walk into her room and she is doing jumping jacks; the breakfast is untouched. She tells you she really cannot eat this morning because she feels so fat.

1. How will you respond to Jacquie?
2. What can you do to help her gain a more realistic body image?

Scenario E

You are caring for Mr. Moreno, an older adult who suffers major depression. Several regimens of medication were tried without success, and the psychiatrist has recommended ECT.

1. Give Mr. Moreno and his family a brief explanation of ECT.
2. What are the most common side effects?
3. What are the risks associated with the procedure?
4. Outline the preprocedural and postprocedural care for a patient undergoing ECT.

CHAPTER 46

Care of Patients With Substance Abuse Disorders

Objectives

Theory

1. Summarize the significance of substance use disorders in the general adult population.
2. Choose the diagnostic criteria included in the medical diagnosis of substance use disorder.
3. Determine the physical, behavioral, and psychological indicators of substance use disorder.
4. Examine the significance of denial and rationalization in substance use disorder.
5. Analyze the effects of substance use disorders on family and friends.
6. Discuss symptoms and complications of withdrawal from alcohol.
7. Construct at least six nursing interventions appropriate for a patient with a substance use disorder.

Clinical Practice

8. Visit a 12-step group and identify the advantages and disadvantages of the program for substance abuse patients.
9. Contribute to a teaching plan for a community presentation on smoking cessation.
10. Create a care plan with at least three problems and five nursing interventions per problem for a patient who is at risk for alcohol withdrawal.
11. Devise a care plan with at least three problems and five nursing interventions per problem for a patient who is taking a central nervous system stimulant (e.g., cocaine).

KEY TERMS

- abuse** (ăb-ūz, p. 1073)
- addiction** (ă-DĬK-shŭn, p. 1079)
- codependency** (KŌ-dĭ-PĚN-dĕn-sē, p. 1075)
- confabulation** (kōn-fāb-ū-LĀ-shŭn, p. 1078)
- denial** (dĕ-Nī-ăl, p. 1074)
- dependency** (dĭ-PĚN-dĕn-sē, p. 1073)
- detoxification** (dĕ-tōk-sĭ-fĭ-KĀ-shŭn, p. 1076)
- dual diagnosis** (p. 1073)
- enabling** (ĕn-Ā-blĭng, p. 1074)
- Korsakoff syndrome** (KŌR-să-kōf SĬN-drōm, p. 1078)
- “meth”** (p. 1080)

psychoactive substances (sī-kō-ĀK-tīv SŪBZ -tān-sěz, p. 1073)
rationalization (ră-shūn-ăl-ī-ZĀ-shūn, p. 1074)
substance abuse (SŪBZ-tānz āb-ŪZ, p. 1072)
substance use disorder (SŪBZ -tānz ūz dīs-ÖR-děr, p. 1073)
tolerance (TŌL-ür-üns, p. 1073)
Wernicke encephalopathy (VĚR-ně-kě ěn-sěf-ă-LÖP-ă-thě, p. 1078)
withdrawal (p. 1075)

Substance and Alcohol Abuse

Substance abuse (excessive use of drugs or alcohol that creates problems) has the potential for causing medical problems and death for the patient and also causes many emotional and physical problems for family, coworkers, and friends. There are many theories about the cause of substance and alcohol abuse. In 1956 alcoholism was recognized by the American Medical Association as a medical disease rather than a moral weakness. However, change in attitude takes time, and there are still many stigmas associated with alcoholism and the abuse of other substances. Research conducted in the mid-1980s identified a genetic predisposition to alcoholism. Neurobiologic theories suggest that some people are born deficient of endorphins (the brain's own morphine-like substances) or that other people have hormonal influences that make them more susceptible to peer pressure and so are more likely to abuse substances. Social and psychological theories suggest that users are trying to avoid adult responsibilities and use substances as a dysfunctional coping method. Ongoing research suggests that a variety of factors and circumstances increase the risk for substance abuse: aging ([Martin, 2012](#)); personality disorders ([Dual Diagnosis.org, 2014](#)); male gender; post-traumatic stress disorder ([Calhoun et al, 2010](#)); and those with lesbian, gay, or bisexual preference who experienced discrimination ([McCabe et al, 2010](#)).

Think Critically

What personal experiences have you or your family had with substance abuse, and how might such experiences affect your care of a patient who has a substance use disorder? Or care of the patient's family?

A **substance use disorder** is diagnosed when individuals have problems with alcoholism or substance abuse. This term implies that there is a recognizable set of signs and symptoms related to the ingestion of a psychoactive substance. **Psychoactive substances** are any mind-altering agents capable of changing a person's mood, behavior, cognition, level of consciousness, or perceptions. **Abuse** of substances is considered maladaptive and nontherapeutic, and manifestation of psychological or physical symptoms implies a **dependency** on substances. **Box 46-1** lists common terms associated with substance use. The *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (DSM-5) outlines diagnostic criteria. The current definition suggests a substance use disorder if, within a 12-month period, the individual repeatedly demonstrates symptoms such as failure to meet usual obligations, creates danger to self or others, has legal problems, or has poor interpersonal relationships because of substance use ([American Psychiatric Association, 2013](#)). Mild substance use disorder requires two to three symptoms. Substance abuse and dependency have been combined into one disorder. **Dual diagnosis** indicates that a patient has been diagnosed with a substance abuse problem and with a mental health disorder.

Box 46-1

Common Terms Used to Describe Substance Use Disorders

- **Abuse:** Use of a psychoactive substance in a nontherapeutic manner or illicit use of prescription drugs.
- **Dependency:** Presence of physical and psychological symptoms of addiction.
- **Psychological dependence:** Craves or feels compelled to take a substance to feel good.
- **Addiction or physical dependence:** Needs the substance to prevent symptoms of withdrawal, not merely to sustain the feeling of euphoria that was present with early use of the drug.
- **Tolerance:** Need for increased amounts of substances to achieve the desired effect.

- **Withdrawal:** Stopping the drug results in a group of symptoms. Withdrawal symptoms are usually the opposite of the symptoms caused by use of the chemical.

This chapter addresses some of the more commonly abused substances: alcohol, narcotic analgesics, opiates (e.g., heroin), cocaine, amphetamines (includes methamphetamines), nicotine, cannabis (marijuana), hallucinogens (e.g., lysergic acid diethylamide [LSD]), and inhalants.

Think Critically

Treating patients with a **dual diagnosis** can be challenging and difficult. For example, your patient has schizophrenia and admits to drinking alcohol and using “lots of drugs all of the time.” What are the additional challenges to think about when this patient is discharged to a community setting?

Signs and Symptoms

Symptoms of substance abuse vary greatly, depending on the substance and on the duration of use and the **tolerance** that has developed. The patient should be observed for physical, behavioral, and psychological signs (Figure 46-1). Problems with fine motor control may be observed when the individual is trying to perform simple tasks such as walking or eating. Observe the skin for needle tracks, bruises, excessive perspiration, excoriation, or poor condition that suggests malnutrition. Behavioral symptoms should be compared with baseline; other conditions such as dementia, delirium, and metabolic or psychiatric disorders must be considered if behavioral changes are noted. For psychological symptoms, **denial** and **rationalization** are the most common defense mechanisms used by substance abusers. A typical example of denial would be: “I drink a few on the weekend.” A classic example of rationalization is, “I just have a few drinks to relax.” To be effective in treating these patients, you must remember that substance abusers usually do not seek help voluntarily. Denial and rationalization become entrenched behaviors and are difficult to eradicate. A review of defense mechanisms is presented in Table 46-1.

Legal and Ethical Considerations

Substance Abuse Among Health Care Workers

Those in the health care field are particularly vulnerable to substance abuse because of the availability of drugs and the tendency to care for others while ignoring personal problems. The American Nurses Association estimates that substance abuse among nurses reflects that of the general population at about 10%. In other words, if you work with 10 nurses, potentially one of them will have a substance abuse problem (Heacock, 2013). Approximately 40 states have established confidential programs to assist health care professionals to get help for the problem rather than immediately forfeiting their professional license. Signs and symptoms to be aware of among health care workers include frequently calling in sick or always working (to have access to drugs), sloppy patient care, frequently leaving for breaks, offering to give pain medications, and patients complaining of no relief after receiving  pain medications.

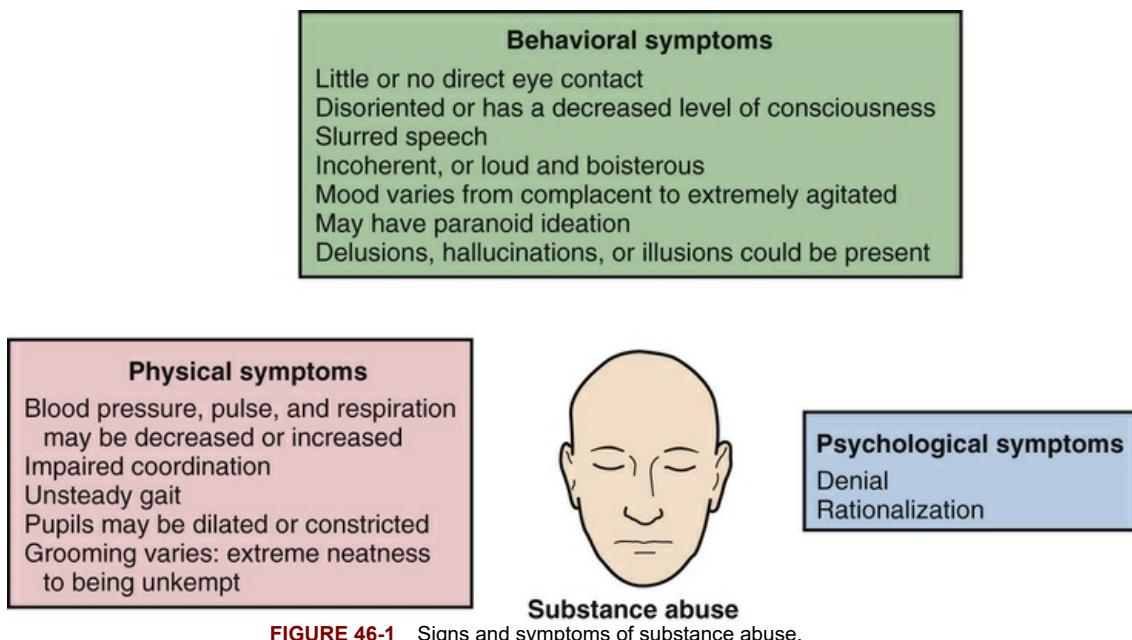


FIGURE 46-1 Signs and symptoms of substance abuse.

Table 46-1
Common Defense Mechanisms

DEFENSE MECHANISMS	CHARACTERISTICS	EXAMPLE
Denial	A simple and primitive defense mechanism. Person ignores reality and absolutely refuses to be swayed by evidence.	A person with alcoholism states, "I do not have a problem with alcohol. I never drink before 5 P.M."
Rationalization	Justifying a behavior or action by making an excuse or an explanation.	A student states, "I failed the class because the teacher didn't like me."
Displacement	Discharging intense feelings for one person onto another object or person who is less threatening.	A woman has an argument with her coworker and goes home and kicks the dog.
Identification	Modeling behavior after someone else.	A student starts dressing and talking like a popular schoolmate.
Intellectualization	Excessive reasoning and logic to counter emotional distress.	A nursing student is upset by the death of a patient, but talks at length about the equipment on the code cart.
Reaction-formation	An intense feeling that is unknowingly acted out in an opposite manner.	A person treats someone whom he unconsciously dislikes in an overly friendly manner.
Regression	Returning to an earlier level of behavior when severely threatened.	A 7-year-old resumes bed-wetting and thumb sucking during the first few days of hospitalization.
Repression	Unconsciously blocking an unwanted thought or memory from open expression.	A student truly does not remember cheating on an important test.
Splitting	Viewing people or situations as all good or all bad.	A patient praises a nurse one day and then hates and scorns her the next day.
Sublimation	Rechanneling an impulse into a more socially desirable acceptable activity.	A student has generalized angry feelings about school so she takes up kickboxing as an after-school sport.

Effects of Substance Abuse on Family and Friends

Anyone living in proximity to a substance-dependent person will be affected. People who are abusing substances are unavailable for emotional intimacy, because life becomes centered on the substance of choice rather than on relationships or responsibilities. **Family members experience a multitude of feelings, including anger, rage, embarrassment, guilt, shame, and hopelessness. The family also uses denial and rationalization to cope.**

Two terms commonly associated with the family and friends of a substance abuser are *enabling* and *codependency*. **Enabling** is “helping” a person so that consequences from unhealthy behavior are less severe; thus enabling “helps” the unhealthy behavior to continue.

In maintaining their own denial about the situation, **enablers** cover up for their troubled loved one and attempt to maintain a status quo. Calling in sick for the abuser is one common example of enabling behavior. Enabling keeps the substance-dependent person from facing consequences, and enabling ultimately supports continued denial. Enablers often have a difficult time understanding that their behavior is counterproductive to the health and well-being of the substance abuser and the abuser's family. Self-righteousness is a typical attitude observed in enablers, and it is difficult to confront.

Think Critically

How might a family enable their loved one? Is enabling ever helpful?

Codependency is another behavior that occurs in circumstances of substance abuse. The **codependent is any family member or friend who overcompensates and tries to “fix the situation” or to control the substance abuser.** For example, a teenage son may repeatedly go to the bar and retrieve his drunk mother when she binges and then assume all household and child care duties until she can function. Because overcompensating does not work, codependents feel powerless and attempt to control even more. A vicious, self-destructive cycle is established that is difficult to break. The overcompensating also keeps the substance abuser from facing reality objectively.

Disorders Associated with Substance Abuse

Alcohol Abuse

Alcohol is a central nervous system (CNS) depressant and is the most commonly abused substance. It is widely available, legally sanctioned, and relatively inexpensive, and abuse of this substance is found at all socioeconomic levels.

Alcoholism is a major health problem and is a factor in many other instances of death and morbidity. Some of the medical conditions include **cirrhosis** (liver damage), cardiomyopathy, **gastrointestinal bleeding**, pancreatitis, hypertension, stroke, sleep disturbances, malnutrition, peripheral neuropathies, cognitive impairment, **leukopenia** (decreased white blood cells), **thrombocytopenia** (decreased platelets), and chronic infection. Alcohol is also frequently associated with traffic accidents, murder, spousal abuse, child abuse, rape, and suicide. Concurrent abuse of other substances (**polysubstance abuse**) is common. Until alcoholism reaches advanced stages, it is often easy to conceal the problem from the general community. Beginning in early 2010, The Joint Commission conducted a pilot phase to develop and refine Core Measures for the assessment and treatment of alcohol abuse (see [Online Resources](#)).

Cultural Considerations

Religion and Alcohol

In a recent study of college students, students who were the least religious were 27 times more likely to be heavy drinkers and nine times more likely to be moderate drinkers compared with students who had strong religious affiliations and beliefs ([Wells, 2010](#)). How does your own cultural and religious background influence your attitudes toward alcohol consumption?

Symptoms of Intoxication and Withdrawal

A 12-oz bottle of beer, a 6-oz glass of wine, and a 1.5-oz single shot of whiskey contain the same amount of alcohol. It takes approximately 1 hour for the body to metabolize one standard drink. A person is intoxicated when the amount of alcohol ingested creates physical or mental impairment. A number of factors can affect intoxication, such as the quantity and speed of alcohol ingestion, food concurrently consumed, the history of alcohol use (e.g., heavy drinker, novice drinker, social drinker), general health status, and concurrent use of other drugs or substances that depress the central nervous system. Familiar early symptoms include drowsiness, slurred speech, loss of coordination, loss of inhibition, euphoria, and mild impairment of judgment. If drinking continues, motor function worsens, confusion progresses, and increasingly stronger stimuli are required to arouse the drinker. The late signs of excessive ingestion include urinary incontinence, coma, low blood pressure, respiratory depression, and possibly death ([Cohen, 2011](#)).

Withdrawal occurs when a person who has a physical dependence on alcohol stops drinking. Early symptoms of withdrawal may manifest within 6 to 12 hours after the last drink; these include anxiety, irritability, and agitation. Progressive symptoms include increased blood pressure and pulse, tremors, nausea and vomiting, diaphoresis, delirium tremens ("DTs"), hallucinations, and seizures. Major withdrawal symptoms can occur 2 to 3 days after the last drink and may last 3 to 5 days.

Older Adult Care Points

Older adults are at great risk for alcohol and substance abuse. Drinking can be an attempt to alleviate depression, pain, or loneliness. The function of vital organs (especially the liver and kidneys) diminishes with age; loss of body mass and decrease in body fluids result in a higher concentration of ingested substances. With decreased liver and kidney function, the by-products of alcohol are not cleared from the body as efficiently. Organ damage or failure and neuropsychiatric effects can occur ([Rehm, 2014](#)).

Diagnosis

To establish a diagnosis of alcohol dependence, the following criteria must be met: presence of withdrawal, significant impairment in family relationships and occupational productivity, **blackouts** (a temporary loss of recent memory that occurs while drinking), drinking despite serious consequences to health or occupation, and evidence of tolerance.

Making the diagnosis of alcohol dependence is not necessarily difficult. The difficulty lies in getting the patient to admit that there is a problem. Unless there is **self-diagnosis** ("I am an alcoholic"), treatment will be for the benefit of the treatment team and the family but will not foster long-term recovery for the patient.

Think Critically

You are caring for a patient with a history of alcohol abuse who has been admitted for surgery. After a visitor leaves, you notice the smell of alcohol on the patient's breath. How would you handle this situation?

Treatment

At one time it was believed that allowing alcoholics to experience a painful withdrawal would frighten them so much they would never drink again. Today we know that **withdrawal can be life threatening**, especially withdrawal from alcohol and certain anxiolytics, such as benzodiazepines. Withdrawal treatment consists of two phases. Initial priorities focus on detoxifying and stabilizing the patient. **Detoxification** refers to the process of ridding the body of the abused substance, without causing harmful ill effects. Treatment decisions may be based on assessment scales such as the Clinical Institute Withdrawal Scale for Alcohol & Revised (CIWA-Ar) ([Clin-eguide, 2009a](#)). CIWA-Ar indicates the severity of the withdrawal and suggests whether admission to the hospital is warranted or outpatient treatment is adequate. Chlordiazepoxide (Librium), diazepam (Valium), or oxazepam (Serax) is given in titrated doses. Phenytoin (Dilantin) and magnesium sulfate (if magnesium levels are low) may be given to prevent seizures. Promethazine (Phenergan), prochlorperazine (Compazine), ibuprofen (Motrin), or dicyclomine (Bentyl) may be given for the symptoms of nausea, vomiting, pain, or cramps. Intravenous (IV) fluids are used to correct dehydration, and a "banana bag," which includes normal saline, magnesium sulfate, folic acid, and multivitamins, may be ordered ([Hoffman and Weinhouse, 2014](#)). **Table 46-2** lists the medications used to treat substance abuse. The RN cares for patients undergoing detoxification.

Table 46-2

Drugs Commonly Used to Treat Substance Abuse

CLASSIFICATION	ACTION	NURSING IMPLICATIONS
Drugs Used to Discourage Relapse		
Naltrexone (ReVia, Vivitrol)	Competitively binds to opiate receptors to prevent narcotic's effects. Used for alcohol rehabilitation.	Advise patient about side effects of naltrexone: dizziness, fatigue, headache, nausea, nervousness, sleeplessness, and vomiting. Screen for history of liver problems. Vivitrol is a once-monthly injection. Caution that concurrent use of heroin can cause withdrawal symptoms or even death.
Acamprosate calcium (Campral)	Similar to naltrexone.	Advise patient about side effects: diarrhea, fatigue, nausea, and flatulence.
Nalmefene (Revex)	Similar to naltrexone.	Must be administered IM or IV. Side effects include nausea, vomiting, tachycardia, hypertension.
Drugs Used to Treat Heroin Abuse or Discourage Relapse		
Opioid Analgesic		
Methadone Buprenorphine (Suboxone, Subutex)	Produces mild euphoria; used as a heroin substitute in rehabilitation programs.	Extreme caution with use in older adults or debilitated patients, or patients with renal or hepatic impairment, hypothyroidism, Addison disease, head injury, urethral stricture, enlarged prostate, or respiratory conditions. Advise patient about side effects of dizziness or drowsiness. Monitor for constipation and encourage fluids and fiber. Methadone tablets should be dissolved in orange juice. Buprenorphine is taken sublingually.
Drug Used to Treat Heroin Overdose		
Narcotic Antagonist		
Naloxone (Narcan)	Competes with opioid receptors and blocks (or reverses) the action of narcotics. Used for patients who have narcotics overdose.	Abrupt reversal of CNS depression may cause nausea, vomiting, increased pulse and blood pressure. Short half-life; watch for recurrent respiratory depression. May have to give repeated doses q2-3min or an IV infusion.
Drugs Used to Treat Nicotine Addiction		
Nicotine polacrilex (Nicorette) Nicotine transdermal (Nicotrol)	Delivers lower doses of nicotine. Used in smoking or tobacco cessation programs.	Apply patch immediately after opening to prevent evaporation. Do not cut or fold patch. Instruct patient to chew gum slowly for about 30 min. Advise patient about gradual withdrawal from gum after 3 mo; not recommended for use longer than 6 mo. Advise patient to suck or lozenge until dissolved; no chewing, biting, or swallowing. Do not eat or drink for 15 min after finishing lozenge. Advise patient that patch should not be used longer than 3 mo. If no benefit within 4 wk, unlikely that continued use will produce desired effects; consult health care provider.
Bupropion (Zyban)	Weakly blocks reuptake of serotonin, epinephrine, and dopamine. At lower doses, used in smoking cessation programs; at higher doses is used as an antidepressant.	Advise patient that drug may cause insomnia; do not take at bedtime. Do not chew, divide, or crush tablets. Treatment usually lasts 7-12 wk. May not notice therapeutic effect for 1 wk. Instruct to avoid alcohol while taking this drug.

Varenicline (Chantix)	Blocks nicotine from binding at the receptor sites.	Teach patient to begin taking Chantix 1 wk before stop date. Side effects include nausea or decreased appetite, headaches, insomnia, or vivid dreams. Use cautiously in renal impairment. May cause suicidal tendency.
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CNS, Central nervous system; IM, intramuscular; IV, intravenous.

See Evolve for drugs to treat alcohol withdrawal that are given by the RN.

Once the patient is stable and able to participate in a treatment program, therapy consists of confronting the patient's denial and encouraging self-diagnosis. Disulfiram (Antabuse) is a drug that causes unpleasant reactions if the patient decides to return to drinking any time after starting the drug and including 14 days after stopping it. Even small quantities of alcohol that might be inhaled from shaving lotion could trigger serious reactions such as chest pain, nausea and vomiting, hypotension, weakness, blurred vision, and confusion. Naltrexone (ReVia) can be used to block the craving for alcohol and to prevent relapse in the recovery phase; nalmefene (Revex) is similar to ReVia but lasts longer and is more potent. An oral form of Revex has been used in research studies, but it is currently only available in parenteral form. Acamprosate (Campral) has been used successfully in Europe and has been approved for use in the United States; patients show significantly higher rates of completing therapy programs on this drug. Vivitrol is a once-monthly injectable form of naltrexone.

Group therapy helps break through denial and gives the patient a new sense of belonging and identity. Behavioral therapy helps with self-discipline and discourages impulsive behavior. Limit setting is one of the hallmarks of behavioral therapy, and it is essential that all members of the behavioral team participate and completely agree about the limits. Brief intervention therapy at 1-year follow-up has been shown to significantly reduce weekly alcohol intake (McQueen et al., 2009). The acronym FRAMES defines the brief approach: Feedback about personal status, Responsibility to change, Advice for change, Menu for options, Empathy in counseling, and Self-efficacy for changes (Miller, 2013). In accordance with *Healthy People 2020* the use of evidence-based screening in level 1 and 2 trauma centers is essential, and brief intervention therapy should be initiated.

Think Critically

A woman brings her 85-year-old father into the clinic and insists that he be admitted to a detox (detoxification) program. The man tells you, "At my age, with my health problems, my fixed income and everything else I have to worry about, having a drink or two is the least of my problems." Discuss your personal reactions and your professional responsibilities in dealing with this family.

Referral to a 12-step program, such as Alcoholics Anonymous (A.A.), is also integral to most treatment plans. A.A. has been in existence for more than 50 years and is the dominant approach to alcoholism rehabilitation in the United States; although there is no "cure" for alcoholism, there is hope for ongoing recovery. Evidence-based practice shows that continued active participation in A.A. results in decreased alcohol consumption. Providers and nurses can assist by helping the patient to make the first call for A.A. information, locating local sites, and asking about the meetings. Box 46-2 lists the 12 steps of A.A.

Box 46-2

The Twelve Steps of Alcoholics Anonymous

1. We admitted we were powerless over alcohol—that our lives had become unmanageable.
2. Came to believe that a Power greater than ourselves could restore us to sanity.
3. Made a decision to turn our will and our lives over to the care of God *as we understood Him*.
4. Made a searching and fearless moral inventory of ourselves.
5. Admitted to God, to ourselves, and to another human being the exact nature of our wrongs.
6. Were entirely ready to have God remove all these defects of character.

7. Humbly asked Him to remove our shortcomings.
 8. Made a list of all persons we had harmed and became willing to make amends to them all.
 9. Made direct amends to such people wherever possible, except when to do so would injure them or others.
10. Continued to take personal inventory and when we were wrong, promptly admitted it.
11. Sought through prayer and meditation to improve our conscious contact with God, *as we understood Him*, praying only for knowledge of His will for us and the power to carry that out.
12. Having had a spiritual awakening as the result of these steps, we tried to carry this message to alcoholics, and to practice these principles in all our affairs.

From Alcoholics Anonymous: *The big book online*, ed. 4, New York, 2005, AA World Services, Inc. The Twelve Steps and Twelve Traditions are reprinted with permission of Alcoholics Anonymous World Services, Inc. ("AAWS") Permission to reprint the Twelve Steps and Twelve Traditions does not mean that AAWS has reviewed or approved the contents of this publication, or that A.A. necessarily agrees with the views expressed herein. A.A. is a program of recovery from alcoholism *only*—use of the Twelve Steps and Twelve Traditions in connection with programs and activities which are patterned after A.A., but which address other problems, or in any other non-A.A. context, does not imply otherwise.

Complications

A serious effect of chronic alcohol abuse is damage to brain cells. A condition that is reversible with treatment is **Wernicke encephalopathy**. This condition precedes **Korsakoff syndrome** (substance-induced persisting dementia), which is often irreversible. If the individual has a history of alcohol abuse and displays the symptoms of confusion, ataxia, and significant memory loss, Wernicke encephalopathy is suspected. Treatment involves large doses of thiamine (vitamin B₁) and abstaining from alcohol. Thiamine acts as a nerve insulator in the body and is absent in the diets of most chronic alcoholics.

Clinical Cues

Thiamine should always be given before glucose to prevent triggering Wernicke encephalopathy ([Schabelman and Kuo, 2012](#)).

An individual with Korsakoff syndrome has grossly impaired memory and gait disturbance. **Confabulation** (making up stories) commonly is seen as an attempt to communicate. A brain scan will show brain atrophy; currently there is no treatment to totally reverse this condition, but long-term administration of thiamine, other vitamins, and magnesium may improve symptoms.

Abuse of Other Central Nervous System Depressants

Other CNS depressants subject to abuse and dependence are barbiturates and anxiolytics, including benzodiazepines. It is not uncommon to see these drugs used in conjunction with alcohol, but this practice can be fatal because of the additive effects. Drugs in this category may be purchased illegally, or initially they may be prescribed by a provider for insomnia or anxiety. There has been an increase in nonmedical use of prescription drugs, and in 2011 emergency department visits for misused prescription or over-the-counter drugs totaled 1,428,145 (SAMHSA, 2013). The increase of abuse of prescription drugs suggests that policy and practice changes are required, such as health provider education, universal use of prescription monitoring programs, routine monitoring of insurance claims information, and increased vigilance for signs of abuse.

Benzodiazepines (e.g., lorazepam [Ativan], oxazepam [Serax], temazepam [Restoril]) have familiar side effects: drowsiness, hypotension, relaxation, and slurred speech. A chronic user may display lack of motivation, memory loss, poor concentration, irritability, aggression, anxiety, and an increased appetite with weight gain. When an individual who has been abusing drugs that depress the CNS goes through withdrawal, symptoms include an elevation in pulse and blood pressure, nervousness, and heightened anxiety. Flunitrazepam (Rohypnol) is classified as a benzodiazepine and may look like a packaged prescription medication because it is produced and used in Europe and Mexico for insomnia; however, it is illegal in the United States. Rohypnol gained notoriety in the 1990s as the date-rape drug. It produces **anterograde amnesia** (inability to remember events that happened while under the influence of a substance), along with muscle relaxation, drowsiness, and slowed motor performance.

Older Adult Care Points

Insomnia is not atypical in the older adult population. Great care must be taken when prescribing sedatives and hypnotics for this group. Decreased liver and renal function can quickly lead to toxicity and dependence. Benzodiazepines, in particular, have a long half-life and are not excreted readily by the body. Therefore patients with poor liver and renal function are subject to a cumulative effect and may experience toxic side effects. Patient education is very important.

Treatment

As with detoxification from alcohol, a person who is addicted to benzodiazepines may be given a drug from a similar category in titrated doses. The amount depends on the severity of the addiction. With the long half-life of benzodiazepines, the initial symptoms of withdrawal may not appear for 3 to 5 days. [Table 46-3](#) presents the symptoms of intoxication with and withdrawal from CNS depressants. Long-term treatment consists of referral to a 12-step program (i.e., Narcotics Anonymous) and perhaps individual and/or group psychotherapy. Patients need to be taught alternative ways to induce sleep and relieve anxiety.

Table 46-3
Characteristics of Commonly Abused Substances

SUBSTANCE	USUAL METHODS OF ADMINISTRATION	SYMPOMTS ASSOCIATED WITH USAGE	EFFECTS OF OVERDOSE	WITHDRAWAL SYNDROME
Alcohol	Oral	Drowsiness, ataxia, initial euphoria and aggressive or belligerent behavior, muscular incoordination. At higher alcohol levels, slurred speech, marked ataxia and muscular incoordination, marked cognitive impairment.	Amnesia, tremors, hypothermia, seizures, respiratory failure, coma, death.	Nausea, vomiting, anorexia, agitation, hallucinations, seizures, increased body temperature, increased blood pressure and heart and respiratory rate, possibly death.
Opiates (narcotic analgesics)	Oral, inhalation, IV	Euphoria, drowsiness, decreased respirations, constricted pupils.	Decreased respirations, shallow breathing, clammy skin, seizures, possibly death.	Watery eyes, runny nose, yawning, anorexia, irritability, tremors, panic, cramps, nausea, chills, sweating.
CNS stimulants (cocaine, amphetamines, "bath salts")	Inhalation, oral, IV, smoked	Increased alertness, excitation, euphoria, increased pulse and blood pressure, insomnia, anorexia.	Agitation, hyperthermia, hallucinations, convulsions, cardiac dysrhythmias, possibly death. Bath salts may cause paranoia, violence, and suicide.	Apathy, long periods of sleep, irritability, depression, disorientation.
CNS depressants (anxiolytics and barbiturates)	Oral	Slurred speech, disorientation, drunken behavior without odor of alcohol.	Shallow respiration, clammy skin, dilated pupils, weak and rapid pulse, coma, possibly death.	Anxiety, insomnia, tremors, delirium, convulsions, possibly death.
Cannabis (marijuana)	Inhaled, oral	Euphoria, relaxed inhibitions, increased appetite, disoriented behavior.	Fatigue, paranoia, psychosis.	None.
Hallucinogens (LSD, PCP)	Oral	Illusions, hallucinations, impaired perception.	Effects are increased and intensified; psychosis, flashbacks, possibly death.	None.

CNS, Central nervous system; IV, intravenous; LSD, lysergic acid diethylamide; PCP, phencyclidine.

Abuse of Opiates

Opiate analgesics can also be obtained both legally and illegally. The process of **addiction** may begin with a prescription drug for severe pain. If these individuals rely totally on narcotics to relieve chronic pain and have a tendency to abuse drugs, addiction may occur. Opiate addiction has become an increasing problem in the United States. Conversely, if narcotics and a variety of measures are used to alleviate the pain, there may be some increased tolerance and physical dependence. However, tolerance and physical dependence can be treated by slowly decreasing dosages of the opiates. For symptoms of use, withdrawal, and overdose see [Table 46-3](#).

Complementary and Alternative Therapies

Pain

Assist patients to explore adjunctive therapies to alleviate pain. These include meditation, visualization, biofeedback, hypnosis, and acupuncture. Aromatherapy with fragrant oils such as jasmine or patchouli can stimulate endorphins (natural pain killers produced by our bodies).

Treatment

The greatest danger with opiates is an overdose, which can result in respiratory depression and death. Treatment for an overdose usually consists of administration of a narcotic antagonist, such as naloxone (Narcan) or naltrexone (Vivitrol).

Clinical Cues

A dose of IV Narcan can produce dramatic and rapid results. A lethargic overdosed patient may arouse very suddenly with nausea, vomiting, tachycardia, and an increased blood pressure. **Do not assume that the danger is over.** The half-life of Narcan is short, and the opiate action will resume and cause respiratory depression; therefore anticipate that a continuous Narcan infusion may be ordered.

Clinical Cues

If activated charcoal is ordered as part of the treatment for an overdose of opiates, make sure that the patient is  fully alert and able to protect his own airway ([EB Medicine, 2013](#)).

Withdrawal from opiates is not life threatening, but patients can experience abdominal cramps, irritability, profuse sweating, yawning, muscle aches, fever and chills, and cravings. Treatment involves helping the individual withdraw from the drug. Methadone maintenance programs are successful in helping patients who have a heroin addiction. Buprenorphine (Suboxone or Subutex) has been approved in the United States for opiate substitute therapy; this drug can be given at a physician's office and comes in a sublingual form. There are restrictions on the number of patients a physician can have. This represents a significant barrier to treatment, considering that current estimates for the United States indicate 1.5 million people use heroin and 2.4 million use prescription drugs nonmedically, and there are far fewer slots for methadone clinics ([Pollack, 2013](#)). See [Table 46-2](#) for nursing implications related to medications to treat opiate overdose and recovery.

For street drugs such as heroin, rehabilitation is difficult unless the environmental and social factors (e.g., breaking off relationships with friends who abuse substances) are also changed. Heroin is less expensive than cocaine now. It is not unusual for an individual addicted to heroin to require up to 2 years in some type of supervised alternative living program. Group, individual, and behavioral therapy and a referral to a 12-step program (i.e., Narcotics Anonymous) are also essential to success. In a systematic review of psychosocial treatments, [Cleary and colleagues \(2009\)](#) found that motivational interviewing combined with cognitive-behavioral therapy reduced substance abuse for the short term and improved mental state (see [Box 46-1](#)). In a 5-year study of providers with substance abuse problems, a zero tolerance approach showed that 72% were successfully abstaining. The program included intensive monitoring and mandatory testing with severe consequences for even a single relapse ([McGovern and Carroll, 2013](#)). Network therapy is an evidence-based program that uses the patient's social network to support abstinence; biweekly meetings and aversive consequences are also part of the therapy ([NREPP, 2013](#)).

Support groups are useful to any individual who is trying to make a major life change or to someone who has experienced a major life-changing event. Substance abusers who are trying to change to a totally different lifestyle can also benefit from this extra support. The purpose of support groups is to help promote healthy relationships, learn and practice new coping skills, and reduce stress and anxiety. Support groups borrow from the principles of group therapy: universality (we have similar experiences), cohesiveness (we have a feeling of belonging), catharsis (expressing feelings makes us feel better), altruism (you help me, I'll help you), information giving (this worked for me, it might help you), improved social skills (you can say this in group, now say it

to your family), and intrapersonal learning (Yalom and Leszcz, 2005). Nurses should refer patients and encourage them to use this valuable resource.

Think Critically

Why might some people feel threatened by the idea of entering a support group? What are your personal feelings about disclosing information in a group?

Abuse of Stimulants

The two common categories of CNS stimulants are cocaine and amphetamines. Both categories of drugs have legitimate medical uses but are also abused. **Amphetamines can cause an increase in pulse rate and blood pressure, general excitation, anorexia, and hyperactive reflexes and can produce life-threatening conditions such as cardiac dysrhythmias, seizures, or hyperthermia.**

Misuse can range from small and infrequent amounts to ingestion of large amounts, which cause prolonged sleeplessness and anorexia. Sleep deprivation of this magnitude can lead to extreme agitation and hostility and a transient psychosis and can be fatal. People who are withdrawing from stimulants experience drowsiness, headache, lethargy, nausea, alterations in eating and sleeping patterns, and sometimes cravings.

Methamphetamine, known as "speed," "**meth**," "crank," or "crystal," is injected or smoked (Figure 46-2). White men ages 20 to 35 years have the highest abuse rate for methamphetamines. They are highly addictive, and users end up taking progressively larger doses. "Meth labs" are unfortunately easy to establish in any average household, garage, trailer, or similar structure; common household chemicals, brake fluid, antifreeze, batteries, matches, ammonia, or over-the-counter medications are "cooked," creating a harmful residue that lingers on the walls and in the air well after the cooking process is finished. Chronic users may develop toxic psychosis and experience paranoia, hallucinations, and delusions. "Meth" use functionally and structurally alters the brain. Weight loss, poor nutrition, skin sores, and serious tooth decay are common effects of methamphetamine addiction.



FIGURE 46-2 Methamphetamine. (Courtesy U.S. Drug Enforcement Administration.)

Cocaine use has become much more expensive, and its users have often switched to cheaper heroin. It is highly addictive and can cause death, even in small doses. Cocaine is a short-acting substance and is more commonly used for binges. It produces euphoria, increased energy, and a sense of well-being. The stimulating effects are very fast acting and energizing. However, the effects after the "high" are equally intense, and individuals are subject to severe emotional lows. The powder is either "snorted" (intranasal administration) or dissolved and taken intravenously. "Crack," a purified form of cocaine, is smoked by placing it in a pipe or smoking it with marijuana or tobacco (Figure 46-3). This "freebasing" of cocaine reduces it to its purest form. This is the most

dangerous type of administration; it produces an immediate rush and accounts for many overdoses and lethal reactions.

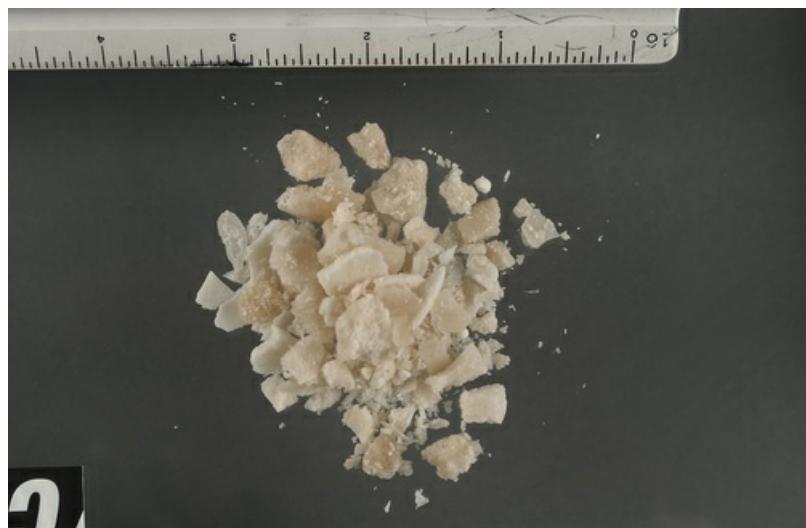


FIGURE 46-3 Crack cocaine. (Courtesy U.S. Drug Enforcement Administration.)

A stimulant newcomer is “bath salts” or “plant food,” a powder that is inhaled, injected, ingested, or smoked to produce an effect close to that of cocaine or amphetamine. It is available over the Internet and is popular among night-club patrons. It is not yet illegal in several states in the United States. These drugs are derived from cathinone, a Schedule I controlled substance. There are many varieties in varying chemical combinations. They are the most addictive drugs to date. High doses bring a risk of violence, paranoid psychoses, and suicide.

Treatment

Treatment for abuse of CNS stimulants is similar to treatment for alcohol abuse. Initially the treatment protocol is symptom specific and managed by medications. Anxiolytics or antipsychotics may be used for agitation or aggressive behavior, and antidepressants may be used for the depressive symptoms. A combination of behavioral and group therapy and referral to a 12-step program have been shown to reduce cocaine use (Carroll, 2014). Contingency or motivational incentives seem effective for initial abstinence from cocaine. Patients who abuse CNS stimulants must also be taught ways to cope with the psychological craving that often leads to relapse. Approaches currently being studied to address cognitive problems in addictive disorders are computer-assisted cognitive rehabilitation and pharmacologic manipulation of neurotransmitters (Pedrero-Perez et al, 2011). Therapeutic communities or residential programs are other options. The recovering addict stays 6 to 12 months while undergoing behavioral therapies.

Abuse of Nicotine

Nicotine is highly addictive and causes increased respiration, decreased pulmonary function, and a chronic cough. Use of tobacco is related to more than 400,000 deaths per year and contributes to development of lung cancer and other lung diseases, such as emphysema. Pipe smokers and people who chew tobacco are more prone to oral cancer. Smoking has been implicated in many other health conditions, including heart disease, stroke, many cancers, hypertension, premature wrinkling of the skin, bad breath, and discoloration of the fingernails. In addition, environmental tobacco smoking results in 440,000 deaths each year (Centers for Disease Control and Prevention, 2014). Withdrawal symptoms can begin as soon as 24 hours after the cessation of smoking and include irritability, tension, decreased heart rate, and insomnia. Cigarettes are legal and accessible, and the craving continues long after the patient quits smoking; therefore resumption of the habit is common, and many smokers stay in denial about the effects of nicotine. Electronic cigarettes have been touted as a safe alternative to cigarette smoking, but their health effects are not yet known. Although they do not contain the carcinogenic substances that cigarettes do, they do

contain nicotine. The U.S. Food and Drug Administration is studying their effect. They have been banned in Canada.

Cultural Considerations

New Consumer Markets

There has been a decrease in cigarette smoking in the United States in the past 25 years. In 1966 the U.S. Surgeon General's health warnings were placed on all cigarette packages. Since then, similar warnings have been put on other tobacco products. Television and radio advertising for cigarettes was banned in 1971. Education and an increase in cigarette taxes, along with restrictions on smoking in public places, have also contributed to the decrease. Nevertheless, new potential consumer markets are being targeted around the world. For example, cigarette manufacturers have now identified China as a good alternative consumer market, and as a result, many Chinese men and teenagers have developed this high-risk habit.

Treatment

Nicotine replacement therapy (NRT) is available in patches, lozenges, gum, sublingual tablets, inhalant, and nasal spray. Self-help groups, hypnosis, and acupuncture are among the treatments available for nicotine addiction. Bupropion (Zyban) and varenicline (Chantix) are approved as stop-smoking aids in the United States. Smoking cessation programs support the *Healthy People 2020* goals and emphasize the positive effects of quitting, such as better overall health for the individual and the family, an increased sense of smell and taste, and saving money. Evidence-based practice suggests that nursing intervention for smoking cessation increases the likelihood of quitting and helps patients succeed ([Centers for Disease Control and Prevention, 2014](#)). Multicomponent interventions for smoking cessation that include an on-site visit, follow-up phone calls, enhanced education about NRT, and motivational interviewing are effective. The most useful aspects of counseling are helping the patient develop a plan and identifying barriers to quitting. The plan can include setting a stop date, asking friends and family for help, anticipating how to combat cravings, and removing all tobacco products and accessories from the house, car, and workplace. The combination of counseling and medications is more successful than using one without the other ([AHRQ, 2012](#)).

Clinical Cues

The [AHRQ \(2012\)](#) recommends the “five As” approach for helping patients to quit using tobacco: (1) Ask about tobacco use, (2) Advise to quit, (3) Assess willingness to quit, (4) Assist to quit, and (5) Arrange follow-up.

Legal and Ethical Considerations

Do As I Say, Not As I Do

Studies suggest that nurses who use tobacco are less effective in helping patients with smoking cessation interventions; possibly they have the same misconceptions and difficulties in quitting that patients have. To be more effective in helping patients to quit, health care workers who are using tobacco should actively participate in their own smoking cessation efforts.

Abuse of Cannabis

The leaves and flowering tops of the *Cannabis sativa* (marijuana) plant are dried and loosely rolled in cigarette paper and smoked. It is commonly used as a “gateway substance” (substance that leads the way or opens the gate to more dangerous and serious substance abuse) by teenagers and as a recreational drug by adults. The active ingredient in marijuana is effective in controlling nausea in patients who are receiving chemotherapy and helping relieve some types of chronic pain. Medical marijuana is legally sold in 20 states and Washington, D.C. Two states have passed laws so that

recreational marijuana can be sold legally: Colorado, Washington, Oregon, and Alaska. However, recreational marijuana is still illegal under federal law.

Marijuana is typically smoked, but it can also be ingested. It acts quickly (15 minutes), and the effects last for up to 4 hours. **General effects are a mild euphoria, increased appetite, and increased sensitivity to sound, colors, and other environmental elements. Impaired coordination, decreased mental concentration, and altered judgment are also present.** In large doses, the person may experience psychotic symptoms. Marijuana is believed not to be physically addictive, but it may lead to psychological dependence and a lack of motivation and ambition. There is no particular withdrawal syndrome for cannabis, so treatment must focus on issues related to the general dangers of substance abuse.

❑ Think Critically

Substance abuse crosses all ethnic, gender, age, and socioeconomic backgrounds. You have three patients: a homeless older adult Asian American woman, a well-to-do African American teenager, and a middle-age white man who works as a carpenter. You must assess all three for marijuana (and other substances) use. First, identify your own biases and then describe your approach.

Abuse of Hallucinogens and Inhalants

Two common drugs that cause hallucinations are LSD and phencyclidine hydrochloride (PCP, or angel dust). These hallucinogens are believed to be somewhat less physiologically addictive compared with other psychoactive substances; however, there are extremely unpredictable effects. Hallucinogens cause distortion of the senses, an inability to separate fact from fantasy, impaired sense of time, and severely impaired judgment. Users never know whether they will have a good “trip” or a bad one. Uncontrolled **flashbacks** (feelings and sensations associated with use despite being drug-free) can occur. This group of drugs is very dangerous because use is known to cause panic, paranoia, and death from extremely impaired judgment.

Inhalants are psychologically and physiologically addictive. Commonly abused inhalants include glue, nail polish remover, aerosol-packaged products (e.g., deodorants), and paint thinner and other types of solvents. Symptoms of use are acute confusion, excitability, and sometimes hallucinations. Prolonged use of inhalants causes permanent damage to all body organs and a psychological dependence. Inhalants are most commonly used by teenagers and children because they are inexpensive and easily accessible.

❑ Think Critically

You are caring for a 14-year-old who admits to you that he has been experimenting with glue sniffing. He tells you that he has stopped and he asks you not to share this information with his parents. How will you handle this situation? Who can you consult to clarify your legal and ethical obligations?

Treatment

Medical treatment and intervention for both hallucinogens and inhalants include provision of safety for the individual who may be experiencing a bad “trip.” Emergency measures may be necessary to provide respiratory support for an individual who has impaired gas exchange as a result of inhalants.

❖Nursing Management

■ Assessment for Substance Abuse (Data Collection)

A general physical assessment, including vital signs, is necessary. Any life-threatening physical problems must be quickly identified and treated. For example, patients can and do die of cardiac dysrhythmias associated with stimulant abuse, whereas patients who have overdosed on heroin are at risk for respiratory arrest.

Any patient who enters the health care system should be screened for substance abuse, so that early intervention can prevent the immediate and long-term consequences of substance misuse.

Obtain a substance and alcohol history that includes the type of substance used, the amount taken, and the pattern of use. **For patients scheduled for surgery, a thorough preoperative history is absolutely essential, because a patient who normally drinks a lot of alcohol can return from surgery to a busy surgical unit and develop symptoms of alcohol withdrawal. An event of this type complicates postoperative recovery and can be fatal.**

Focused Assessment

Data Collection for Substance and Alcohol Use

Ask the following questions during history taking to determine past and present substance and/or alcohol use:

- Have you ever had a drinking or substance abuse problem?*
- When did you last drink or use drugs of any kind?*
- What substances (alcohol, tobacco, or illicit substances) are you currently using?
- What other types of drugs (prescription and nonprescription) do you routinely take?
- How much do you drink or how much do you use?
- How often do you drink or use substances?
- Have you ever tried to cut down or control your substance use or drinking?
- Have you noticed that now it takes more of the substance or drink to get the same effect you got several months ago?
- Have you noticed any withdrawal symptoms?
- Have you ever been treated for liver disease, hepatitis, heart disease, anemia, or overdose?
- Have you had any recent falls, accidents, or injuries?
- Have you ever stopped drinking or using drugs for a period of time?
- Have you ever been in treatment for substance abuse?
- Is there a family history of alcoholism or substance abuse?
- What is your marital status? If married, are you happily married?
- Have you ever been in trouble with the law?
- What is your occupation? Are you experiencing any difficulties at work?

*Direct questioning is found to yield highly sensitive responses, despite the common expectation that alcoholics deny or minimize alcohol usage (Tierney, 2009).

A quick and simple assessment tool for alcohol abuse is the CAGE questionnaire, which includes four questions regarding the patient's feelings about his or her drinking and specific habits. A "yes" answer to two or more of the four questions has a 90% correlation with alcohol abuse. Also, obtain information about past and current function in family, social, and occupational roles. Remember that denial is a primary defense mechanism used in these disorders. Therefore it often is necessary to ask the family to describe their perception of the user's problem and the extent of substance use. At the appropriate time, assess the effects of the user's behavior on the family and explore the

presence of codependent or enabling behaviors.

■ Nursing Diagnosis

Problem statements for substance use disorders include:

- Confusion due to excessive or chronic alcohol consumption
- Denial of physical and psychological dependence on a substance
- Altered family dynamics due to substance addiction
- Potential for injury due to impaired judgment
- Altered role performance due to inability to complete assigned work duties
- Absence of compliance with substance abstinence

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

▣ Clinical Cues

Patients enter the health care system with medical complaints or injuries who also have unidentified substance abuse problems. When taking a routine admission history, ask about the use of substances. This information is needed to evaluate drug-drug interactions and any potential toxic effects on the body organs (i.e., heart, kidneys, liver). Use a matter-of-fact tone of voice: "Do you smoke or drink alcohol? What kind of prescription, over-the-counter, or illicit (street) drugs do you use?" In accordance with National Patient Safety Goals, your findings contribute to a complete list of medications. This medication reconciliation list should be communicated to the health care team, sent to other facilities if the patient is transferred, and provided to the patient when discharged.

■ Planning

Expected outcomes are written for the specific individual problems chosen to resolve the patient's problems. For the problems mentioned, expected outcomes might include:

- Patient will demonstrate less confusion after receiving thiamine and abstaining from alcohol before discharge.
- Patient will discuss how reliance on substances is affecting his quality of life during today's group therapy session.
- During weekly sessions with social service counselor, the patient and family will communicate needs and identify sources of support to sustain the family.
- Patient will remain safe from harm or injury during this shift.
- Patient will resume job duties within ____ months.
- Patient will participate in a 12-step program at least three times per week.

▣ Older Adult Care Points

When working with older adults, be on the alert for substance use disorders; this group is at high risk because of loneliness, multiple losses, and limited resources. Health care providers commonly overlook substance abuse in older adults because behaviors may be attributed to aging, depression, or dementia. A predictor model for older women who had a high risk for alcohol abuse has been published (Blow et al, 2013). They found that regular use of over-the-counter drugs, ingestion of large amounts of coffee, and using alcohol to induce sleep were associated with alcohol abuse.

Collaborative goal setting is very important when working with an individual who is addicted to a substance. In addition to working with the patient, it is necessary that you collaborate with the family. Setting goals with the patient and excluding the family or friends often lead to failure or relapse. Planning care for a patient with a substance use disorder includes promoting physical and psychological safety, providing a safe withdrawal from the substance, and ensuring adequate nutrition and sleep. To prevent relapse, education regarding substance abuse becomes a priority goal. The education may be started in a treatment center but needs to be continued after discharge for at least 1 year. People who abuse substances need opportunities to learn and practice new

coping skills in a supportive environment.

Think Critically

Do you have any bad habits such as smoking, drinking a lot of alcohol, or drinking too much coffee? How does your personal behavior affect what you will say to your patients about making changes for a healthier lifestyle?

Implementation

Nursing intervention depends on the severity of the substance abuse disorder. Initial interventions for the patient focus on physical recovery. For example, cardiac monitoring, pulse oximetry, IV access, and other emergency measures may be indicated. Potentially fatal effects of drugs and/or alcohol, such as cardiac dysrhythmias, hypotension, and respiratory depression, must receive priority attention. If the patient is intoxicated, orienting to person, place, and time and providing for physical safety are essential. You may need to insist that the patient remains in a protected environment until judgment and coordination return. Ensuring adequate sleep and a balanced diet high in proteins and multivitamins are also part of early intervention.

If the patient is having symptoms of withdrawal, detoxification must be medically managed by giving antianxiety agents, such as chlordiazepoxide (Librium). Close monitoring of vital signs is important, because signs of alcohol withdrawal include an increase in blood pressure and heart rate. Preventing the patient from experiencing a seizure or delirium tremens is an essential part of the detoxification process.

Clinical Cues

When monitoring and reporting changes in blood pressure, keep several factors in mind: patient's baseline, trends (if available), and medications (last dose and type). Also assess for accompanying subjective symptoms such as dizziness or light-headedness (hypotension), headache, or blurred vision (hypertension).

Assignment Considerations

One-to-One Observation

A CNA or UAP is frequently assigned to sit with a patient who needs one-to-one (1 : 1) observation. Before assigning personnel to this task, clarify with the provider or RN the purpose of 1 : 1 observation and the stability of the patient. For example, recall that opioid withdrawal is not life threatening, but the restless patient may be temporarily placed on 1 : 1 observation to prevent **elopement** (leaving) to seek drugs to satisfy the intense craving. It would be appropriate to assign a CNA or UAP to prevent elopement. In contrast, an agitated patient who is withdrawing from alcohol is not physically stable, and his care should be managed by an RN.

Once the substance is cleared from the body, nursing intervention is directed toward helping the patient lead a drug-free life. This includes alleviating the symptoms and confronting denial. You must also observe for signs of suicide. Addicted patients often feel they cannot live without the euphoria and consolation of the substance experience.

Patients who are in the early recovery process from substance abuse benefit greatly from therapeutic conversations with the nurse, and a caring, concerned attitude is very important. Studies have shown that two 15-minute monthly meetings and two 5-minute follow-up nurse calls have beneficial effects ([Clin-eguide, 2009b](#)). Patients must grieve the loss of the substance, and they also feel guilt and shame for acts that were committed while under the influence. To help the patient "work through" these feelings, you need to be an active listener, offering support and validation as necessary. Mandating a patient to stop is usually not an effective intervention; however, you should support the patient's decision to stop and assist by reminding him that the physical symptoms of withdrawal will not last forever. The craving will last longer than the withdrawal symptoms but is manageable if the patient has a strong motivation to change toward a healthy lifestyle. You can assist these patients to identify ways to cope with the craving, such as

helping him to make a list of activities that he could use to distract his attention from the craving, such as calling a friend, taking a brisk walk, cleaning the house, or eating a nutritious snack. You can help him identify settings, circumstances, or relationships that were part of his substance abuse pattern, then identify alternative settings and relationships that are now part of his new lifestyle. For example, polysubstance use might routinely occur in a bar or lounge with friends after having a few beers, but is less likely to occur in a movie theater with friends who are having popcorn.

If the patient is addicted to heroin, the recovery process will be lengthy because of the lifestyle changes that are necessary. Typically, with heroin addiction, there have been some illegal actions and maladaptive coping. The patient needs to be educated about the disease process and needs to learn new coping methods ([Nursing Care Plan 46-1](#)).

Nursing Care Plan 46-1

Care of the Patient With a Substance Abuse Disorder

Scenario

Charles Hogan is a 46-year-old man brought in by his supervisor for admission to a “detox” unit. The supervisor last saw Mr. Hogan drinking about 10 hours ago. He states that Charles is a good worker but could lose his job. Mr. Hogan jokingly replies, “My boss is a worrier. I’m just a social drinker. My wife and kids know I’m okay.” The supervisor states that the wife frequently makes excuses but seems unaware of the problem. Mr. Hogan seems slightly anxious and irritable. He appears thin and malnourished.

Problem Statement/Nursing Diagnosis

Potential for injury/*Risk for injury related to effects of substance and complications of withdrawal.*

Supporting Assessment Data

Objective: Slightly anxious and irritable; last known drink 10 hours ago.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will remain free from any injury this shift. Patient will withdraw from drugs or alcohol without any dangerous effects.	Assess for early symptoms of withdrawal (e.g., agitation, irritability, anxiety) and notify provider or RN of first signs.	Early detection of withdrawal allows for prompt intervention to prevent life-threatening complications.	Is anxious and irritable.
	Administer medications (e.g., chlordiazepoxide [Librium]) as prescribed by provider.	Decreases neurologic irritability at the biochemical level.	30 min after administration of Librium, patient appears more relaxed.
	Remain with patient during times of confusion and disorientation.	Provides support and decreases agitation.	Currently alert and oriented.
	Restrain and/or place in seclusion as ordered if the patient becomes a danger to self or others.	May temporarily be unable to control aggressive or self-harm impulses. May attempt to leave.	Is verbally hostile and denies substance abuse problems, but shows no signs of physical aggression.
	Ensure safe environment (i.e., call bell within reach, bed in lowest position).	Safety is a priority, and patient judgment and coordination may be temporarily impaired.	Did not sustain any injury during the shift. Outcomes met. Continue plan.

Problem Statement/Nursing Diagnosis

Denial/Ineffective denial related to minimization of the symptoms of addiction.

Supporting Assessment Data

Subjective: States “My boss is a worrier. I’m just a social drinker.”

Objective: Supervisor’s report and Mr. Hogan’s perception of problem are mismatched.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will acknowledge the abuse of substances and the unhealthy effects on his life.	Approach the patient in a nonjudgmental manner.	Helps to build trust and rapport.	Is agreeable to talking but is unable to disclose feelings.
	Gently confront the denial as you gain the trust of the patient.	Breaking through denial is essential to recovery.	Denial continues.
Patient will openly acknowledge the need for substance abuse treatment.	Help the patient see the need for treatment and abstinence.	May be unaware of or is ignoring the long-term consequences.	Denies need for treatment.
	Inform the patient about the negative aspects of addictive processes.	Helps the patient to make an informed decision.	Verbally acknowledges that substances are harmful for others, “but I don’t drink that much.”
	Encourage patient to list the harmful effects that he has experienced.	Increases insight and facilitates self-diagnosis.	Denies that substances are harming him.
Patient will agree to attend 90 12-step meetings in 90 days.	Encourage attendance at a 12-step program to help break through the denial.	Provides support by others who have experienced the same difficulties.	Agrees to go to a 12-step program, but thinks it is unnecessary. Outcomes not met. Continue plan.

Problem Statement/Nursing Diagnosis

Altered family role performance/*Dysfunctional family process: alcoholism related to altered family roles, unexpressed feelings, family history of alcoholism.*

Supporting Assessment Data

Subjective: Per supervisor, wife frequently makes excuses but seems unaware of the problem.

Objective: Wife is absent; supervisor is advocating for treatment.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Family will be able to identify and share feelings.	Invite family to participate.	Family may be unaware, or need assistance to break through their denial.	Wife and children did come in to talk with provider and social worker about Mr. Hogan's condition.
	Assess for presence of denial, shame, or guilt.	Feelings of denial, shame, and guilt are expected, but may be repressed.	Family members expressed support for Mr. Hogan, but are unable to disclose personal feelings.
	Encourage expression of genuine feelings.	Opportunity for expression of feelings helps to build trust and rapport.	Trust and rapport are being established, but communication between family members continues to be ineffective.
	Teach how to recognize feelings and safe ways to express them (e.g., "I love you, but I am not going to stay here while you drink").	New communication methods are needed to help the family break old patterns.	Currently family is not openly acknowledging how Mr. Hogan's behavior affects each member, but they agree to attend group therapy.
	Educate the family about the altered roles present in addictive families (e.g., wife overcompensating for husband).	Family members may be unaware of how the illness is affecting role function.	Family is not identifying dysfunctional roles, but appear open to exploring the family situation.
	Define the term <i>enabling</i> for family members. Encourage family members to state at least one time when they engaged in enabling behavior.	Identifying and defining enabling help family to recognize this behavior. Increases insight into own behavior.	Entire family appears to be in denial at this time; denies enabling behaviors.
	Offer family members alternative choices to enabling behavior (e.g., telling him that he must call in sick for himself).	Family needs new ways to cope with old problems.	Family open to learning more about disease process and how to cope with Mr. Hogan's behavior.
	Have family members practice and role play alternative responses to enabling behavior.	Practice in a safe environment allows family to test new skills.	Family having difficulty with role play.
Family will agree to attend at least six 12-step meetings.	Encourage family members to attend a 12-step support meeting.	Provides support by sharing with others who are experiencing the same problem.	Family agrees to go to a 12-step group this weekend. Outcomes not met. Continue plan.

Problem Statement/Nursing Diagnosis

Altered nutrition/*Imbalanced nutrition: less than body requirements related to poor food intake, inadequate absorption of nutrients, poor appetite.*

Supporting Assessment Data

Objective: Appears thin and malnourished.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will self-select a nutritious diet.	Assess ability to feed self.	May have impairment in fine motor coordination.	Is able to independently feed self; shows some fine tremors in hands.
Patient will gain 5 lb within 1 mo; signs of peripheral neuropathy (numbness and tingling) will disappear.	Watch for nausea, vomiting, diarrhea. Administer antacids, antiemetics, and IV fluids as ordered.	Alcohol can cause gastritis and alterations in absorption.	Currently no nausea or vomiting.
	Document intake and output and food intake. Weigh patient.	To monitor nutritional status and progress toward goal.	Weighs 140 lb (ideal body weight 165 lb). Finishes food trays.
	Collaborate with patient to determine food preferences.	Increases likelihood of consumption.	Eats all types of food.
	Encourage small, frequent meals, high in proteins with 50% carbohydrates.	Small meals are easier to tolerate, and foods rich in nutrition will replace loss due to poor dietary practices.	States that he sometimes forgets to eat but knows he should gain some weight ("Will try harder").
	Administer multivitamins, especially thiamine (vitamin B ₁) and niacin, as ordered.	Patient is at risk for Wernicke encephalopathy.	Agrees that supplements are a good idea and will continue to take them after discharge.
	Consult nutritionist.	Collaboration with specialist ensures best plan.	Consultation with nutritionist deferred because patient agrees to eat everything on food trays. Outcomes partially met. Continue plan.

IV, Intravenous.

Critical Thinking Questions

- What are some questions that would be appropriate to ask Mrs. Hogan (if she is willing to come in and meet with the health care team)?
- Mr. Hogan is currently far from being ready for self-diagnosis. What are some things that might signal that he is breaking through the denial?

Intervening With the Family

A trusting relationship needs to be developed with the family, or they may continue to focus on the

patient rather than focus on their own recovery. Families need to learn in what manner they might have been enabling their loved one, and they need time to practice new behaviors that will require the substance abuser to be responsible for himself. Family members should be encouraged to express how the crisis is affecting them. There may be a need to refer families to legal or social services if the person is abusing illegal drugs or if there was an arrest for driving while intoxicated. The family feels shame and guilt and shares the stigma associated with substance abuse. Encourage them to seek support from groups such as Al-Anon or Alateen. Family members may consider substance abuse a moral weakness, rather than a disease. Educating them about the neurobiologic theories may help them to reconsider their attitudes and relieve some guilt. **To be effective in working with substance abusers, nurses must examine their own attitudes and make certain the patients and families are treated with respect.**

Think Critically

A patient tells you that he drinks socially, but his wife and children tell you that he drinks to the point of intoxication at least three times a week. What would you say to the family? What would you say to the patient?

■ Evaluation

Recovery from a substance use disorder is a lengthy process. Ridding the body of substances can take weeks, particularly if there is coexisting liver damage. Often the patient is malnourished, physically exhausted, and in poor general health. Return to an optimum healthy state may take 6 months to 1 year. Recovery of psychological or emotional health takes even longer. If the patient started abusing drugs at a very young age, emotional development may have been arrested. Coping mechanisms to deal with anxiety or emotional pain were never properly developed; the individual used the drugs instead.

Consequently, nurses working in the hospital may only see early physical recovery. Evaluating overall effectiveness of substance abuse treatment is measured in years rather than weeks. Admitting a patient to a hospital and guiding him safely through detoxification are very necessary, but small, beginning steps in the overall process.

Community Care

Nurses who work in emergency departments and busy outpatient clinics often see individuals who have medical problems related to substance abuse. Often these patients are treated only for their presenting medical problem. In these instances, the medical treatment team is reinforcing the patient's denial system. *Healthy People 2020* goals include a proactive approach to use these incidental contacts to screen for substance abuse and appropriately refer these patients to prevent costly long-term complications.

Inpatient hospital stays for individuals who are addicted are usually short. If the patient has some type of insurance, it is not unusual for the insurance company to pay only for medical detoxification. Any further treatment that is necessary would be performed on an outpatient basis.

Making a decision to become sober and/or substance free typically requires lifestyle changes. Changes of this magnitude are not made overnight. Addicted individuals may need ongoing medical support, as well as support from the recovery community. You should encourage patients who are attempting recovery to seek out help and make the recovery process a number one priority. You can be instrumental in facilitating public awareness and in educating patients about the responsible use, and ultimate hazards, of mood-altering substances. Nurses should also be politically attuned to and advocate for legislation that regulates product availability and marketing of substances such as tobacco and alcohol.

Older Adult Care Points

In dealing with substance abuse issues, older adults are likely to prefer home and community settings. Frame questions and substance problems with a linkage to a medical condition, to decrease feelings of stigma. Older patients are likely to have better adherence to treatment plans and less relapse ([Matthews, 2009](#)).

Get Ready for the NCLEX® Examination!

Key Points

- Substance use disorder is diagnosed when ingestion of psychoactive substances such as alcohol, drugs, or other psychoactive substances results in recognizable signs and symptoms.
- Psychoactive substances are mind-altering agents capable of changing or altering a person's mood, behavior, cognition, arousal level, level of consciousness, and perceptions.
- Abuse implies use of a psychoactive substance in a nontherapeutic manner or the illicit use of prescription drugs.
- Dependence implies the presence of physical or psychological symptoms of addiction; when the substance use is stopped, withdrawal symptoms appear.
- Withdrawal symptoms occur when there is an attempt to stop using a substance. Symptoms of withdrawal from CNS depressants include increased blood pressure and pulse, nervousness, and heightened anxiety.
- Symptoms of withdrawal from CNS stimulants include drowsiness, headache, lethargy, nausea, alterations in eating and sleeping patterns, and cravings.
- Medical conditions related to alcohol abuse include liver damage, cardiomyopathy, hypertension, gastrointestinal bleeding, stroke, sleep disturbances, malnutrition, peripheral neuropathies, chronic infection, cognitive impairment, Wernicke encephalopathy, and Korsakoff syndrome.
- Assess for physical, psychological, and behavioral symptoms of abuse or withdrawal.
- Take a history from the patient and the family to determine type, amount, and pattern of use.
- General nursing interventions include observing for life-threatening conditions, safely managing detoxification, orienting the patient to reality, providing a balanced diet high in protein and multivitamins, setting limits, confronting denial, identifying enabling behaviors and teaching new coping mechanisms, and referring the patient to a 12-step program.
- Denial and rationalization are primary defense mechanisms used by the substance abuser and the family.
- Enabling behaviors ("helping" a person so that the consequences of his unhealthy behavior are less severe) or codependency (family member or friend attempts to control the behaviors of the substance abuser) further inhibit recovery.
- Older adults may drink to alleviate depression and loneliness. Decreased liver and renal function can quickly lead to toxicity and dependence.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

● Online Resources

- Alcoholics Anonymous, www.aa.org
- Joint Commission Core Measures, www.jointcommission.org/performance_measurement.aspx
- National Council on Alcoholism and Drug Dependence, Inc., www.ncadd.org
- National Institute on Drug Abuse, www.nida.nih.gov
- Narcotics Anonymous, www.na.org
- SAMSHA, Get help for substance abuse, www.samhsa.gov/treatment/
- Tobacco Information and Prevention Source (TIPS), www.cdc.gov/tobacco

Review Questions for the NCLEX® Examination

1. A nurse is taking a history on an adult male who needs emergency surgery. He freely admits to using marijuana, alcohol, cocaine, and hallucinogens. What is the most important question that the nurse should ask this patient?

1. "Does your wife know that you are using all these drugs?"
2. "When was the last time you drank or took a substance?"
3. "How frequently are you using these drugs and alcohol?"
4. "Have you ever tried to control your substance use?"

NCLEX Client Need: Physiologic Integrity: Reduction of Risk Potential

2. A patient comes to the clinic with a history of alcohol abuse. The provider makes the medical diagnosis of Wernicke encephalopathy and orders large doses of vitamin B₁. Which response indicates that the treatment is working?

1. No seizure activity
2. Less confusion and improvement of memory
3. Decreased urge to drink alcohol
4. No tremors, nausea, or vomiting

NCLEX Client Need: Physiologic Integrity: Physiological Adaptation

3. Which statement by a patient to the nurse indicates a positive step in the recovery from alcohol dependence?

1. "I do think my job is at the root of my alcohol consumption."
2. "I don't have any power over the effects alcohol has on me."
3. "I don't ever want to use alcohol again."
4. "To stay sober I will increase my exercise and eat healthy foods."

NCLEX Client Need: Psychosocial Integrity: Recognize Change in Client Mental Status

4. The wife of an alcoholic keeps making excuses to their children when he fails to do things with them that he promised he would do. What is the priority problem?

1. Limited coping ability
2. Altered family functioning
3. Absence of compliance

4. Decreased self-esteem

NCLEX Client Need: Psychosocial Integrity: Recognize Client Use of Defense Mechanisms

5. The increased usage of “bath salts” is a societal problem because it: (*Select all that apply.*)

1. is illegal in all states under federal law.
2. is the most addictive of all abused substances.
3. is easily obtained over the Internet and in many stores.
4. potentially causes violence, paranoia, and suicide.
5. causes lung cancer if smoked excessively.

NCLEX Client Need: Health Promotion and Maintenance: Provide Information for Prevention of High Risk Behaviors

6. A postoperative patient who is a self-confessed drinker is given Librium for increased blood pressure, increased pulse, tremors, nausea and vomiting, and diaphoresis. Why did the provider prescribe this medication for the patient?

1. To prevent postoperative clot formation
2. To reduce the symptoms of alcohol withdrawal
3. To control the blood pressure
4. To relieve postoperative nausea and vomiting

NCLEX Client Need: Physiologic Integrity: Pharmacological Therapies

7. A self-confessed alcoholic asks, “What is the purpose of the Antabuse that has been prescribed by my doctor?” What is the best explanation to give to the patient?

1. “It blocks the craving for alcohol.”
2. “The medication causes unpleasant symptoms when you drink.”
3. “The medication keeps you from having seizures.”
4. “It controls symptoms of nausea, vomiting, pain, or cramps.”

NCLEX Client Need: Physiologic Integrity: Pharmacological Therapies

8. A patient's wife indirectly suggests that her husband has a substance abuse problem. Which initial assessment question(s) should the nurse ask the husband? (*Select all that apply.*)

1. "What substances (alcohol, tobacco, or illicit substances) are you currently using?"
2. "How often do you drink or use illicit substances?"
3. "When did you last drink or use drugs of any kind?"
4. "How do you feel about people who abuse substances?"
5. "Why does your wife think you have a substance abuse problem?"
6. "Is there a family history of alcoholism or substance abuse?"

NCLEX Client Need: Psychosocial Integrity: Identify Client Symptoms of Substance Abuse

9. The nurse would consider a dual diagnosis for a patient who states:

1. "I'm so very busy that I rarely get much sleep."
2. "I find it difficult to get up in the morning and face the day."
3. "I need a drink first thing in the morning to calm me down."
4. "Alcohol helps me to function better on a daily basis."

NCLEX Client Need: Psychosocial Integrity: Identify Client Symptoms of Substance Abuse

10. A patient is in the early recovery process and is attempting to lead a drug-free life. Which intervention is the most appropriate to assist the patient?

1. Remind the patient of the discomfort and pain that occurred during detoxification.
2. Tell the patient that there is no need to feel guilty or ashamed.
3. Help the patient to identify relationships that were part of the substance use pattern.
4. Advise the patient that stopping forever is the only choice for a drug-free life.

Critical Thinking Questions

Scenario A

Mr. Jackson, a 74-year-old white man, is recently widowed and misses his wife very much. He comes to the provider's office and he is stumbling. His speech is slurred, and his breath has an alcohol-like odor. He begins to cry and states he has changed his mind. He does not want to see the provider but is going to drive home.

1. How will you ensure his safety?
2. What type of assessment will you perform on this patient?

Scenario B

Ms. Pulido, age 26 years, is an ambulatory postoperative patient. She admits to a past history of illicit substance abuse, but claims to be drug free for several months. You notice that she leaves the unit and when she returns her coordination is slightly impaired and she seems inappropriately euphoric and giddy. Shortly thereafter, you observe her hiding a plastic bag; you suspect that she may be taking an illicit substance.

1. How would you handle this situation?
2. What types of documentation should you perform?

Scenario C

Mr. Hernandez, a 38-year-old construction worker, was admitted for emergency orthopedic surgery yesterday evening after an on-the-job accident. He begins yelling profanity and is irritable and argumentative. He seems to be having trouble concentrating on your questions. His wife says he forgot to tell the provider that he drinks 12 beers every night.

1. What do you suspect is wrong with Mr. Hernandez?
2. What other signs and symptoms would you watch for if you suspect alcohol withdrawal?
3. List the nursing interventions to care for Mr. Hernandez during the initial phase of withdrawal.

Scenario D

Ms. Genavarian's father confides that his daughter has a substance abuse problem. He reports that the family has frequent arguments about the issue. Further assessment reveals that Mr. Genavarian believes that the behavior is "just weakness," whereas the daughter and wife maintain that "it's not that big of a deal."

1. Discuss some of the emotional and psychological responses that are common among patients and families when there is a substance abuse problem.
2. What could you say to Mr. Genavarian to help him understand that substance abuse is a medical problem?
3. How could you help Mrs. Genavarian to understand that she may be enabling her daughter's behavior?

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CHAPTER 47

Care of Patients With Cognitive Disorders

Objectives

Theory

1. Examine the incidence and significance of cognitive disorders in the older adult population.
2. Compare and contrast the etiology and symptoms of **delirium** (acute cognitive disorder) and **dementia** (chronic cognitive disorder).
3. Describe the signs and symptoms of Alzheimer disease (AD) in relation to the three stages: (1) preclinical, (2) mild cognitive impairment (MCI), and (3) dementia.
4. Determine the assessment skills that are necessary to accurately monitor a cognitive disorder.
5. Choose appropriate nursing interventions for the care of patients with Alzheimer disease.
6. Develop nursing interventions that can be used to assist the family and friends of patients who have cognitive disorders.

Clinical Practice

7. Devise a care plan with at least six interventions for a patient who is confused and disoriented.
8. Implement a teaching plan for a family member who is caring for an older adult parent with Alzheimer disease in the family home.

KEY TERMS

Alzheimer disease (ĂWLTZ-hī-mĕr dī-ZĒZ, p. 1092)

biomarker (p. 1095)

cognition (kōg-NĬ-shūn, p. 1092)

confabulation (kōn-făb-u-LĀ-shūn, p. 1093)

delirium (dĕ-LIR-ē-ŭm, p. 1092)

delusion (dĕ-LŪ-shūn, p. 1093)

dementia (dĕ-MĒN-shē-ă, p. 1092)

global amnesia (GLŌ-bāl ām-NĒ-zhē-ă, p. 1104)

hallucinations (hă-lū-sĭ-NĀ-shūnz, p. 1093)

illusions (ĭ-LŪ-shūnz, p. 1093)

sundowning (SŪN-doun-ĭng, p. 1101)

vascular dementia (VĀS-kū-lär dĕ-MĒN-shē-ă, p. 1092)

Overview of Cognitive Disorders

Cognition refers to mental processes of perception, memory, judgment, and reasoning. It includes the ability to perceive and process information. A **cognitive disorder** is diagnosed when there is a significant change in cognition from a previous level of functioning. Cognitive disorders greatly affect the quality of life for affected individuals, families, and friends. Although cognitive disorders do occur across the life span, they are often linked to the neurobiologic changes that accompany aging. Cognitive disorders have become increasingly common with the aging of the population. Disorders of cognition include delirium and dementia.

Delirium (acute confusion) is characterized by a change in overall cognition and level of consciousness over a short time. **Dementia**, on the other hand, is characterized by several cognitive deficits, memory in particular, and tends to be more chronic. Both conditions are classified according to cause or origin of disease. One example of a cause for dementia is multiple small blood clots that cause brain tissue damage (known as **vascular dementia**). **Alzheimer disease** (AD; a degenerative disease of the brain) is another form of dementia, although the exact cause is unknown. The difference between the two conditions is that delirium is an acute condition that requires immediate treatment, and dementia is a chronic condition. Reversing the symptoms of delirium depends on timely diagnosis and treatment. It also is important to note that delirium can coexist with dementia. If delirium is recognized and promptly treated, a patient with preexisting dementia should be restored to a previous level of functioning.

Delirium

Many conditions or physiologic alterations can cause delirium. Some examples are cerebrovascular accident; drug overdose, toxicity, or withdrawal; tumors; systemic infections; anesthesia; fluid and electrolyte imbalances; and malnutrition. The onset of acute delirium is sudden. The patient may be alert or lethargic, depending on the cause of the delirium, or may appear very confused. The attention span changes, and overall awareness of the environment is decreased. Orientation is impaired, as are recent and immediate memory. Speech may be incoherent, and overall thinking can be disorganized and distorted. The patient will not be able to communicate her thoughts in a meaningful way. With delirium, a patient may experience **illusions** (misinterpretations of reality). For example, a pen appears to be a knife, or a shadow on the floor appears to be a menacing monster. If a patient appears to be talking to someone who is not there, it is likely that she is experiencing **hallucinations** (seeing or hearing things that are not there). If she insists that a nurse is an angel of death and destruction, this is an example of a **delusion** (belief in a false idea).

Clinical Cues

Assessment for and treatment of the underlying cause of delirium is essential. Physical restraints should be avoided. Reorientation, a calm environment and reduction of sound, explanations of proceedings, and calm reassurance are first-line interventions. An antipsychotic medication may be used to prevent harm to the patient or others if needed.

Problem-solving ability and judgment may be diminished but not completely absent. Consequently, the patient may not make good decisions, or may become combative or hostile if a nurse or family member attempts to intervene. The general features of delirium are the same for all the causes, and nursing care is basically the same; the main difference is in diagnosis and treatment of the underlying cause.

Older Adult Care Points

In hospitalized older adults with preexisting dementia, it is not unusual to see a patient who has been previously conscious and oriented become drowsy, disoriented, combative, and unable to recognize family and friends. An astute nurse should suspect delirium or acute confusion. An important evaluation is to note the type and response to medications. Anticholinergic medications have potent central nervous system effects and can cause a sudden episode of confusion. Is the

dose too high for age and physiologic functioning? Is there a cumulative effect? Are the medications interacting? Delirium and dementia can coexist, and the acute condition needs to be recognized and treated, not merely dismissed as part of the overall dementia.

Clinical Cues

Does your patient have depression, dementia, or delirium? A patient with depression can have poor personal hygiene, can have difficulty with concentration, and may be very quiet and withdrawn or very agitated (see [Chapter 45](#)). Subtle differences indicate depression, dementia, or delirium. For example, a depressed patient may speak very little, but the speech is generally logical and will contain sad and negative thoughts and feelings of hopelessness. A patient with dementia may confabulate or will have difficulty finding words. A patient with delirium is more likely to be incoherent or loud.

Substance-Induced Delirium

Substance-induced delirium can be caused by withdrawal from a substance, intoxication with a substance, or side effects from a medication (see [Chapter 46](#)). Many classes of medications can produce symptoms of delirium. Some common examples are anesthetics, analgesics, sedative-hypnotics, any products with anticholinergic activity (tricyclic antidepressants, antihistamines, theophylline derivatives, and antipsychotics), and histamine (H_2)-receptor blockers (e.g., famotidine, cimetidine, and ranitidine). Commonly prescribed beta blockers and nonsteroidal anti-inflammatory drugs (NSAIDs) can also cause symptoms of delirium.

Diagnosis and treatment depend on taking a thorough history. If the patient is unable to give a history, the family may be able to help. It is not unusual for a person to be taking large amounts of over-the-counter medications and forget to mention them because the medications were not prescribed by a provider. You should pay attention to drug interactions and incompatibilities, and consult with the pharmacist as needed. Early recognition can facilitate a faster recovery. If the medication accumulates over several days, elimination of the substance from the body takes much longer and places the patient in even greater danger.

Older Adult Care Points

Older adults have a high risk for substance-induced delirium because of overall decreased metabolism and reduction in liver and kidney function. A general principle that providers should use in prescribing medications to older adults is to give the smallest amount possible and increase the amount only as symptoms indicate. Therefore you must carefully observe and report subtle changes in behavior, vital signs, and laboratory results.

Dementia

There are several different types of dementia, and these conditions are also classified according to the underlying cause. Examples include AD, frontotemporal lobe dementia, Huntington disease, Korsakoff syndrome, vascular dementia, AIDS dementia complex, and Parkinson disease. The onset for dementia is slow, and the condition may progress over months to years. The patient is generally alert. Orientation to person, place, and time and recent memory may be impaired. In later stages of dementia, patients lose remote memory as well. Patients with dementia have difficulty with abstracting thoughts and have a poverty of thoughts. **Confabulation** (making up words or experiences to fill conversational gaps) and impaired judgment are common. Often, there is a noticeable change in personality. Hallucinations, delusions, and illusions usually are not present. These patients experience fragmented sleep rather than a reversed cycle.

Complementary and Alternative Therapies

Herbs With Sedative Effects

Herbs that have a sedative effect include chamomile, hops, and valerian. These can be used in a tea

or taken in capsules. A popular method of promoting sleep is to place a few drops of lavender onto the pillowcase. If your patients are using herbs or alternative therapies, advise them to inform their provider because of potential drug-herb interactions or contraindications because of medical conditions.

Alzheimer Disease

Etiology and Pathophysiology

AD is the most common degenerative disease of the brain. More than 5 million Americans have AD ([Alzheimer's Association, 2013](#)), and there is no known cause or cure. It has been determined that there is some link between exposure to pesticides, particularly DDT, a genetic variant, and AD. AD typically affects people older than 65 years but can also strike younger people. The age group of 85 years and older is currently the fastest growing age group in the United States. It is estimated that 50% of this age group have AD.

In AD, there is a loss of neurons in the frontal and temporal lobes. The atrophy in these areas accounts for the patient's inability to process and integrate new information and to retrieve memories. Brain biopsies of patients with AD have revealed nerve cells that are tangled and twisted and an abnormal buildup of proteins. Production of neurotransmitters (e.g., acetylcholine, serotonin) is relatively decreased for these patients. Risk factors for developing AD include advanced age, family history of AD, head trauma, cardiovascular disease, diabetes, high cholesterol, lack of exercise, exposure to toxins such as DDT, and poor diet ([Alzheimer's Association, 2014](#)).

Health Promotion

Diet and Memory

Studies show that fish and omega-3 polyunsaturated fats, fruits and vegetables, curcumin (curry spice), and a traditional Mediterranean diet may lower the risk for loss of cognitive function and/or AD. Moderate consumption (1 to 2 drinks a day) of alcohol, especially wine, is also associated with a reduced risk, but it is not recommended that a nondrinker take up wine  consumption ([Neafsey and Collins, 2011](#)).

Health Promotion

Exercise for the Brain

Longitudinal studies have shown that challenging intellectual activity is associated with a decreased risk for dementia. Reading, writing, debating, learning something new, using the nondominant hand, playing an instrument, and playing memory or puzzle games exercise the brain ( [Polidori et al, 2010](#)). Regular exercise and social interaction also can help maintain a healthy brain.

Signs and Symptoms

AD has a slow onset and variable rate of progression. Eventually, it is fatal. Although the Alzheimer's Association divides behavioral patterns and symptoms into seven stages, other sources prefer a division into three stages: mild cognitive decline, moderate cognitive decline, and severe or late cognitive decline. The early signs and symptoms of beginning mental deterioration include forgetfulness; recent memory loss; difficulty learning and remembering; inability to concentrate; and a decline in personal hygiene, appearance, and inhibitions. Later the patient becomes quite confused and unable to make judgments, has difficulty communicating, suffers losses in motor function, and becomes dependent on others. Behavioral manifestations can also be categorized into three stages ([Box 47-1](#)).

Box 47-1

Behavioral Patterns in Mild, Moderate, and Severe Alzheimer Disease

Mild

- Progressive short-term memory loss
- Slow, progressive loss of intellectual ability
- Difficulty in learning new things
- Small but noticeable changes in ability to perform at work or socially
- Decline in ability to plan ahead
- Decreased ability to perform usual ADLs
- Variable mood; depression is common and worsens symptoms
- Noticeable personality change
- Social withdrawal

Moderate Toward Severe

- Aware of deficits and confabulates to cover memory lapses
- Needs repeated instructions for simple tasks
- Needs day care or constant home care—can be very burdensome for the family
- Wanders away
- May have beginning incontinence
- Outbursts of anger, hostility, paranoia

Severe

- Unable to speak or ambulate
- Profound memory loss; no recognition of family
- Difficulty swallowing
- Weight loss
- Bedridden
- Fetal position
- End-stage consequences of poor nutritional state and bedridden status: pressure sores, respiratory failure, contractures, pneumonia

ADLs, Activities of daily living.

Patients have a progressive loss of common cognitive functions. You observe that an 85-year-old retired attorney has trouble remembering words (**anomia**) or verbally expressing himself (**aphasia**), and he is unable to write down his thoughts (**agraphia**) or understand written language (**alexia**). If he holds a common object such as a spoon, he does not seem to recognize it (**agnosia**), and he

cannot put on his shirt, although he has the strength and motor movement to dress himself (**apraxia**: inability to perform an activity despite motor function). He has difficulty planning ahead and he attends fewer social functions. He also displays some problems with balance and gait. He displays the criteria for dementia according to the *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (DSM-5).

Complementary and Alternative Therapies

Pet Therapy

Pet therapy may help patients to improve memory (e.g., calling the therapy dog's name), coordination (e.g., throwing a ball for the dog), object identification (e.g., directing the dog to get the ball), language (e.g., talking to the dog), and attention (e.g., caring for the dog). Research conducted about pet therapy programs demonstrates consistent positive outcomes for both physical responses, such as improvement in vital signs, and psychological parameters, such as a decrease in anxiety, fatigue, depression, and confusion (Vann, 2010).

Think Critically

It is not uncommon for patients with dementia to act in a sexually inappropriate way because of loss of social reserve. Your older adult male is reaching to fondle your breasts when you turn him to do hygienic care and linen changes. How will you handle this?

Diagnosis

In 2011, new criteria and guidelines for the diagnosis of AD were presented as the result of an international collaboration to incorporate research findings to improve the diagnostic process. The new guidelines propose three stages: (1) preclinical AD, (2) very mild cognitive impairment (MCI) caused by AD, and (3) dementia caused by AD.

Currently there are no criteria for providers to use in making the diagnosis of preclinical AD. Future research on preclinical AD is based on the assumption that there are biologic processes that are occurring before the onset of actual symptoms. Research is under way to predict which cognitively normal older adults will develop AD as early as 7.5 years before symptoms appear. Biomarkers involved are positron emission tomography (PET) scans to detect deposits of beta-amyloid plaque in the brain and cerebrospinal fluid tests for a specific protein, tau, that predict who will develop dementia. (A **biomarker** is an objective measure that indicates the presence of disease.) The drug flutemetamol F 18 (Vizamyl) has been approved by the U.S. Food and Drug Administration for use with PET imaging in adults suspected of having AD. The drug attaches to beta-amyloid, helping to reveal areas of the plaque (Nursing2014, 2014).

In making a diagnosis of AD, the provider uses a detailed medical and family history and conducts a thorough physical, neurologic, and functional assessment. The benefits of early diagnosis include being able to include the patient in the planning for the future, to ensure safety, and to provide the family with understanding of the disease process (Alzheimer's Association, 2014). The patient may undergo magnetic resonance imaging (MRI) to rule out pathologic lesions. Research for new diagnostic tests for AD will continue. The DSM-5 provides behavioral criteria for AD.

Treatment

There are clinical trials under way for a vaccine to prevent AD. Currently medications are used that do not cure AD but may improve intellectual functioning and slow the progression of the disease (Anderson, 2013). The evidence indicates that the benefit of these drugs is modest. Research is being done on immunotherapies that target the protein that contributes to the formation of the neurofiber tangles (FightAging.org, 2013). Table 47-1 describes medications used to treat cognitive disorders and their nursing implications. Behavioral interventions include (1) identifying the behavior, (2) understanding its cause (pain, delirium, thirst, constipation, full bladder, etc.), and (3) adapting the environment to decrease distraction and stimulation and remedy the situation (Alzheimer's Association, 2014). A recent study has found a link between sleep apnea and AD.

(American Thoracic Society, 2013). Treating cognitively normal patients with AD biomarkers with continuous positive airway pressure (CPAP) over an extended period of time will enhance the research.

Table 47-1
Drugs Commonly Used to Treat Cognitive Disorders

MEDICATION	ACTION	PATIENT EDUCATION	NURSING IMPLICATIONS
Donepezil (Aricept) Galantamine (Razadyne) Memantine (Namenda) Rivastigmine (Exelon) Transdermal patch has been recently approved.	Causes elevated acetylcholine levels in the brain and slows progression of Alzheimer disease symptoms.	Take with food to decrease GI distress. Slows progression of symptoms but is not a cure. Take frequent drinks of cool liquids or use sugarless gum or candy for dry mouth. Increase fiber and fluids to prevent constipation. Common side effects (nausea, vomiting, headaches and dizziness, GI bleeding, urinary frequency, anorexia) should be reported to provider.	Be alert for abdominal pain, fatigue, hypotension, and agitation. Monitor CBC, liver, and renal function tests. Signs of overdose include severe nausea and vomiting, bradycardia, hypotension, convulsions, or severe muscle weakness. Rivastigmine patch: first patch should be applied on the day after the last oral dose, then rotate sites; replace every 24 hr.

CBC, Complete blood count; GI, gastrointestinal.

❖ Nursing Management

■ Assessment (Data Collection)

You may be the first health care professional who encounters a patient who is in the early stages of AD. Know and be vigilant for the 10 warning signs of AD (Alzheimer's Association, 2010) (Box 47-2). For example, the family may tell you, "We think Dad is having problems with his memory and in completing daily tasks, and we also think he is attempting to hide his forgetfulness because he keeps misplacing things and can't seem to solve ordinary problems. He insists on driving, but we are beginning to question his judgment. He often acts like he is searching for the right word and often makes up stories [confabulates] to make up for memory loss. We can't seem to teach him how to position a can to use a can opener. He is even confused about times when we have recently visited him, and he is moody and withdrawn during our regular visits." Ask the patient and the family questions about memory, ability to perform activities of daily living (ADLs), and any subtle changes in personality by giving specific common examples (e.g., "Does he forget to turn off the stove or to lock the doors?"). These patients should be referred to the RN or provider, because they need an in-depth assessment and an extensive physical examination. Assessment should include the necessary data to plan measures to protect the patient.

▣ Clinical Cues

Before you begin to assess an older adult patient, consider the changes that normal healthy older adults might be experiencing because of aging. For example, it is normal to have some decline in memory; however, a healthy older adult should be able to create new memories, act purposefully, and accomplish ADLs independently.

Box 47-2

Ten Warning Signs of Alzheimer Disease

1. Memory loss that disrupts daily life
2. Challenges in planning or solving problems
3. Difficulty completing familiar tasks at home, at work, or at leisure
4. Confusion with time or place
5. Trouble understanding visual images and spatial relationships
6. New problems with words in speaking or writing
7. Misplacing things with inability to retrace steps

8. Decreased or poor judgment
9. Withdrawal from work or social activities

10. Changes in mood or personality

From Alzheimer's Association. (2014). *10 warning signs of Alzheimer's*. Retrieved from www.alz.org/alzheimers_disease_10_signs_of_alzheimers.asp?type=more_information.

■ Nursing Diagnosis and Planning

Nursing problems are identified to maximize safety and to minimize complications resulting from loss of cognitive function. For example, Potential for injury, Wandering, Chronic confusion, Altered self-care ability, and Caregiver burden are some of the problem statements used for patients with AD. Planning care for a patient with AD is based on the stage of the disease, and the family should be encouraged from the beginning to participate in developing the long-term goals ([Nursing Care Plan 47-1](#)). As the disease progresses, the patient will sustain losses in every area of function.

▣ Clinical Cues

When caring for confused patients, evidence-based practice supports the need for careful observation and documentation of patterns of behavior. This process, **dementia care mapping**, can be used to improve care ([Downs, 2014](#)). For example, you observe that your confused patient consistently tries to get out of bed on the right side, despite the fact that the safety devices are on the left and that there is more room on the left side. This suggests that the patient has an automatic habit of getting out on the right side; these data can now be used to adapt the room and increase patient safety.

▣ Nursing Care Plan 47-1

Care of a Patient With Alzheimer Disease

Scenario

Mrs. Sarah Hughes, an 83-year-old with Alzheimer disease, has been living with her daughter. The daughter works full time and must take a business trip for 2 weeks. She has had to find respite living arrangements for her mother. "Mom is confused and withdrawn most of the time and needs reminders to eat and coaching to go to the bathroom. I really try my best, but Mom can be difficult." The daughter appears tired but is very patient with her mother. You observe Mrs. Hughes wandering alone and trying to go outside. You have to redirect her several times, and she mistakes you for her daughter.

Problem Statement/Nursing Diagnosis

Confusion/Chronic confusion related to cognitive impairment.

Supporting Assessment Data

Subjective: Per daughter, patient is "confused most of the time."

Objective: Mistakes you for her daughter.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will function at an optimal level for the degree of cognitive losses at this time.	Identify self.	Patient may not recognize people previously introduced.	Patient repeatedly mistakes nurses for her daughter. Does recognize provider.
Patient will follow concrete instructions.	Speak clearly and calmly and use short phrases and repeat as needed. Face the patient directly when talking.	Facilitates communication. Stimulation of two senses (visual and auditory) facilitates understanding.	Speaking slowly and clearly and repeating helps patient to understand.
	Do not approach patient from behind.	Surprises and scares the patient. Pictures are more easily understood than oral words.	Letting the patient see you prevents a fright reaction.
	Use pictures to communicate.		Use of arrows to bathroom also appears helpful.
	Be consistent in approach and assign the same staff and maintain daily structure and routine.	Familiar faces and repetitive patterns decrease confusion.	Patient functions best when A.M. routine is followed and primary nurse helps her.
	Break down all tasks into simple steps and encourage completion of one step at a time.	Single steps are less complex and easier to achieve.	This A.M. patient was able to brush own teeth if instructed, step by step.
	Encourage reminiscing about the past.	Remote memory is more likely to be intact than recent memory.	Appears to enjoy talking about "Maggie's cat."

			Outcomes met. Continue plan.
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Problem Statement/Nursing Diagnosis

Altered self-care ability/*Self-care deficit: Toileting/feeding related to cognitive and perceptual impairment.*

Supporting Assessment Data

Subjective: Per daughter, "needs reminders to eat and coaching to go to the bathroom."

Objective: Needs repetitive verbal prompting.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will perform ADLs independently or with minimal assistance from caregivers.	Assess the patient's ability to perform ADLs independently or with minimal assistance.	Provides baseline for daily planning (abilities may wax and wane).	Is able to physically perform most ADLs, but needs verbal coaching for each step.
	Encourage patient to maintain independence in performing ADLs.	Maintain maximal independence for as long as possible to increase self-esteem and stimulate mental processes.	Daughter reports that "it is really faster just to do everything for her" but acknowledges the benefit of allowing her independence.
	Allow patient to wear own clothes. Use clothing with zippers and Velcro.	Familiar objects decrease confusion. Ease of equipment decreases frustration	Usually recognizes own clothing, but needs coaching for dressing; can manipulate Velcro fasteners.
	Praise for any and all accomplishments.	Reinforces desired behavior.	Appears to enjoy interaction and feedback.
	Use simple, direct explanations when demonstrating the specific behavior patient is to complete.	Verbal and visual cues help to decrease confusion.	Follows instructions, but rarely asks for help.
	Maintain toileting schedule.	Bowel and bladder routine decreases incontinence.	Toileting schedule q4h; patient usually continent.
	Encourage the use of finger foods.	Simplifies eating while maintaining intake.	Eats all food if encouraged. Has difficulty cutting meat with knife and fork. Outcomes met. Continue plan.

Problem Statement/Nursing Diagnosis

Altered socialization/*Social isolation related to anxiety and depression, apathy, and confused state.*

Supporting Assessment Data

Subjective: Per daughter, confused or withdrawn most of the time.

Objective: Walking alone.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will participate in group activities.	Assess preferred patterns of social activity from earlier years.	Ideally, current socialization should mimic past patterns.	Social contact usually limited to family. Occasionally went to church.
Patient will demonstrate socially acceptable behavior.	Provide group activities that are simple, such as singing or simple crafts.	Simple activities decrease frustration and are a vehicle to interaction.	Appears to enjoy movies and musical groups.
	Stay with the patient during social activities as needed.	Provides support and reassurance.	Does not initiate conversation with others, but will respond if spoken to.
	If she becomes agitated do not force her to participate in any social activity.	Socialization can be stressful, and forcing is counterproductive.	Readily agreed to go to all activities today.
	Gradually increase social interaction with other staff and patients.	Gradual exposure increases comfort level and familiarity.	Will sit with others, but does not initiate any interaction. Will speak to other patients if they speak to her. Outcomes met. Continue plan.

Problem Statement/Nursing Diagnosis

Potential for caregiver burden/*Risk for caregiver role strain, related to high emotional and physical demands, safety concerns for the relative, and caregiver isolation.*

Supporting Assessment Data

Subjective: "I really try my best, but Mom can be difficult."

Objective: Daughter works full time and appears tired, but is very patient with her mother.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Caregiver will verbalize ways to perform the caregiver role without becoming exhausted. Caregiver will openly express feelings.	Assess caregiver's ability to meet the needs of the patient.	Baseline for planning.	Daughter expresses willingness to care for her mother, but does work full time.
	Actively listen to caregiver's fears and concerns.	Allowing expression helps to build trust and rapport; also helps speaker and listener to clarify issues.	Fears for mother's safety; is concerned about wandering.
	Educate the caregiver about cognitive disorders and the patient's specific cognitive deficits.	Accurate information allows daughter to have realistic expectations.	Written information given, and discussion of cognitive disorders provided for daughter.
	Help caregivers be realistic about the prognosis for their loved one.	Being realistic about prognosis helps the family to begin the process of anticipatory grieving.	Daughter appears unsure about the future, knows that her mother is going to get worse.
	Make caregiver aware of community	Community supports are available to provide care,	Referred to support group for caregivers

	resources such as respite care.	education, support, and advice.	of patients with Alzheimer disease.
	Encourage participation in support groups.	Sharing with people who are experiencing similar problems decreases feelings of alienation and allows sharing of information.	
	Will try to find an on-line support group. Support caregiver in taking steps to maintain own health.	Daughter must be healthy to continue supporting her mother.	Daughter discussed respite care and plans to take occasional breaks. Continue plan.

Problem Statement/Nursing Diagnosis

Wandering/Wandering related to cognitive impairment and loss of judgment.

Supporting Assessment Data

Subjective: Per daughter, "Mom is confused."

Objective: Wandering by herself and trying to get outside despite repetitive redirection.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will remain within the boundaries of the center (or the family property) unless accompanied by others.	Place in a limited-access unit. Put complex locks on the doors. Allow access to fenced yard.	Securing the environment allows the patient to roam safely, but without restraints.	Patient remained safe in secure unit. Went out to grounds with nursing student in the A.M.
	Use identification bracelets or sew ID labels on clothes.	ID methods facilitate location and return if she does get lost.	Discussed sewing labels into clothes with daughter.
	Label all rooms and doors.	Patient may be wandering because she cannot find the bathroom, cafeteria, etc.	Arrows to bathroom appear especially useful.
	Remove visual cues that trigger wandering (e.g., car keys, coat). Check on patient at frequent designated intervals.	Visual cues such as car keys can trigger a past familiar behavior (e.g., driving to work). Assists to keep patient safe.	Asked for coat, was reassured that it was in the storage closet. Redirected into common area. Has not been wandering.
	Notify police and neighbors to be on the alert.	Police and neighbors can quickly contact caregiver.	Discussed with daughter about notifying neighbors and police. Outcomes met. Continue plan.

Critical Thinking Questions

- How would you react if Mrs. Hughes's daughter complains about the care that Mrs. Hughes is receiving at the respite center at the nursing home?
- What interventions could you initiate to protect patients like Mrs. Hughes from physical injury related to confusion?

ADLs, Activities of daily living; *ID*, identification; *NA*, nursing assistant.

Implementation and Evaluation

Patients with AD need interventions that enhance memory, such as holiday decorations that are appropriate to the season or photos of family and friends to help them reminisce. Reminiscence therapy could also include creating a life-story book that helps the patient to review accomplishments and increase self-esteem. An Irish company is testing an interactive reminiscence software that holds promise in working with patients. Although safety is a primary concern, restraints are rarely appropriate for these patients; creative interventions that are specific to the individual and family can ensure safety while preserving dignity. For example, one family placed a pleasant musical bell on the front door to prevent a confused older adult from leaving the house undetected. Supporting the family will be a priority, particularly if the patient is being cared for at home. Help the family to have realistic expectations and refer them to respite care and support groups. Placing written name tags on commonly used household objects, such as the bathroom door or the patient's room door, seems to help the patient function better within the home setting. Visual cues such as a picture of a toilet on the bathroom door are helpful as the disease progresses.

Clinical Cues

If a patient becomes resistant or agitated when asked to do something or when trying to accomplish a task, redirect the client to something else and return to the desired task later.

Patients with AD may seem to require very infrequent evaluation, because the disease can progress very slowly and obvious changes in behavior or success in meeting goals may seem very gradual. However, vigilant evaluation will help you detect subtle changes in behavior that may

signal delirium or progression of the disease. Also, any small successes can and should be shared with the family (see [Nursing Care Plan 47-1](#)).

Vascular Dementia

Vascular dementia was formerly known as *multi-infarct dementia*. It is the second most common type of chronic cognitive disorder. **Vascular dementia is a broad term used to describe any type of dementia caused by vessel disease.** People who are predisposed to this type of dementia have a history of hypertension, hyperlipidemia, diabetes mellitus, or abuse of nicotine and alcohol.

Any type of vessel disease in the brain will cause brain damage. Lack of oxygen to the brain tissue because of clots or hemorrhage can cause death of brain tissue in a short time. The parts of the brain originally affected by cell death will be permanently damaged. The onset can be gradual or abrupt, and the neurologic impairment is localized rather than global. The progression of symptoms is more rapid than in AD. Neurologic deficits are present in whatever part of the brain has been destroyed. **Prompt treatment of hypertension and vascular disease is necessary to prevent long-term complications.**

Cultural Considerations

Race Factors

African Americans have twice the risk for developing AD, and Hispanic Americans have 1.5 times the risk. African Americans are also at greater risk for developing vascular dementia compared with whites. Patients with risk factors for vascular dementia, such as hypertension and diabetes, should be identified and educated to optimize healthy lifestyle practices ([Alzheimer's Association, 2014](#)).

AIDS Dementia Complex

AIDS dementia complex (ADC) is caused by infection with HIV. The central nervous system can be affected, and the patient may also have **peripheral neuropathy** (disturbance in the function of peripheral nerves that results in numbness or muscle weakness). ADC affects cognition, behavior, mood, and motor ability. There is great variability in the manifestation of symptoms. In the beginning, symptoms can be easily mistaken for depression: apathy, loss of interest, difficulty concentrating and slowed thinking, and irritability. Early symptoms may also include unsteady gait and poor hand coordination for things such as writing. In the later stages, the patient can develop bowel and bladder incontinence, confinement to bed, and psychosis or mania. ADC is diagnosed by computed tomography or MRI, spinal tap, and a mental status examination. Treatment includes anti-HIV drugs, and symptoms are treated with antidepressants, antipsychotics, and anxiolytics.

❖ Nursing Management

■ Assessment (Data Collection)

On admission, an extensive mental status examination should be conducted by the provider and the RN to obtain a baseline for the patient's thought content, intellectual functioning, mood, affect, and judgment. After the baseline is established, the Mini-Mental State Examination (MMSE) can be used for ongoing assessment. The MMSE is a popular shortened version of the mental status examination that was developed by Folstein and colleagues in 1975. It can be used for patients who have cognitive disorders or thought disorders to assess orientation, memory, and ability to follow commands. It consists of 11 easily scored items and should take about 5 to 10 minutes to administer. Examples of items would include "What day is it? What city is this? What am I holding (common objects such as a pen or paper clip)?" Administration should be done without the patient feeling it is a "test."

Differentiating between delirium and dementia is often difficult for nurses, because the patient is not a reliable historian. A mood disorder, such as depression, can further complicate the picture (see [Chapter 45](#)). Accurate recognition of these three conditions requires excellent assessment skills. An effective way to assess whether a patient has delirium or dementia is to note function in the

following five areas: *judgment*, *affect*, *memory*, *cognition*, and *orientation* (JAMCO).

Focused Assessment

Quick Assessment Guide for Delirium and Dementia: JAMCO

Judgment: Does the patient have insight into her behavior? Is the patient aware of danger or safety issues?

Affect: Is affect blunt, flat, inappropriate, suddenly changed, or variable?

Memory: Is memory intact? Does the patient have remote memory, but not recent or immediate? Is memory better during the day?

Cognition: Is the patient able to process abstract thoughts? Are thoughts fragmented or disorganized? Does the patient make up answers to questions (confabulate) to hide deficits?

Orientation: Is the patient oriented to person, place, and time? Does the patient recognize family and friends?

First, what is the status of the patient's **judgment**. Your patient insists on driving, despite the fact that she has had several minor accidents within the past 2 weeks. This connotes poor judgment, and you must work with the patient and the family to seek alternative transportation.

Assessing and documenting **affect** (emotional or feeling tone) are also important. Has there been a sudden change in mood from the previous assessment? The family will often say that they note a difference in mood when they visit the patient. You should pay attention to what family members tell you and elicit their opinions about the changes that they are seeing in their loved one.

Clinical Cues

Mood and affect are typically assessed simultaneously. **Mood** is the current state of emotion that a person is experiencing. **Affect** is the demonstration of emotion, usually by facial expression and body position. Ordinarily, affect and mood match, so those in a "good mood" would display a cheerful affect. Likewise, depressed people often display a flat or sad affect. In a flat affect, the face is devoid of expression, and the patient may appear to have little or no energy for interaction. A sad affect is usually apparent, and the patient may cry, frown, or have a worried, preoccupied expression.

When assessing **memory**, it is important to note recent and remote memory. In some types of dementia, a patient may not be able to remember what was on the breakfast tray, but may be able to talk at great length about events in her younger years. With delirium, both recent memory (a few hours before) and immediate memory (a few minutes before) may be absent.

Think Critically

Think of one or two ways you can assess immediate, recent, and remote memory. How would you know whether the patient's memory is accurate?

Cognition is the ability to abstract and process information. Obviously, there are links and overlaps to memory and perception when assessing cognition. The family should also be consulted whenever possible for valuable baseline information about the patient's past performance. For example, a patient's son tells you, "My mother was a former math teacher; now she cannot seem to balance her checkbook, and that was something that she could easily do in the past."

Finally, is the patient **oriented** to person, place, and time? Are there times when the patient is disoriented? It is not unusual for a patient to be completely oriented during the daytime hours and become confused and disoriented at night. This phenomenon is known as **sundowning** and needs to be documented. A dose of trazodone (Desyrel) in the afternoon or evening may be ordered to

reduce the symptoms associated with sundowning, because it helps reduce anxiety and causes sleepiness.

Complementary and Alternative Therapies

Agitated Patient

Music, recordings of soft ocean sounds, light touch or hand massage (avoid touching if the patient is violent or angry), or aromatherapy may help to calm an agitated patient with sundown syndrome. Having your patient sit by a light box in the early morning may also help, particularly if the patient has depression. These adjunct therapies may decrease the need for drug therapy ([Khachiyants et al, 2011](#)).

Think Critically

What implications does sundowning have for planning care and activities for the patient?

An assessment of mental status needs to be completed at least once per shift so any change can be detected promptly and appropriate interventions taken. This assessment should include orientation to person, place, and time and the other elements of JAMCO. The MMSE can be used at the nurse's discretion to validate mental status changes or according to the agency's policy for long-term care patients. When abrupt changes are noted, the RN and the provider should be notified to perform more detailed assessments.

Clinical Cues

In cases of delirium or acute confusion, you must assess the patient's medication history, look for any signs of infection, and assess current fluid and electrolyte status. Also, if you have reason to suspect that the patient may have sustained a fall, assess for head trauma.

Think Critically

How would you approach a pain assessment for a patient with dementia?

Nursing Diagnosis

Nursing problem statements for patients with cognitive disorders include:

- Acute confusion due to delirium induced by infection
 - Chronic confusion due to slow, progressive memory loss
 - Social isolation due to inability to recognize friends and family
 - Altered self-care ability due to decreased psychomotor abilities
 - Potential for injury due to faulty judgment
 - Disrupted sleep pattern due to age-related changes
 - Altered sensory perception due to hallucinations
 - Wandering due to disorientation to time and place
 - Potential for caregiver burden due to prolonged 24-hour responsibility of caregiving
- Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Planning

Expected outcomes are written for the problems identified from assessment data. For these problems, they might include:

- Patient will demonstrate orientation to person, place, and time within 24 to 48 hours after starting antibiotic therapy.
- Patient will recognize self and primary caregiver (e.g., daughter) during hospital stay.
- Patient will interact with family and friends during weekly visits.

- Patient will perform ADLs with assistance as needed during this shift.
- Patient will be safe and free from harm during this shift.
- Patient will rest and sleep for at least 6 hours every 24-hour period.
- Patient will decrease behaviors that suggest hallucinations (e.g., listening to voices) within 1 week.
- Patient will remain on unit or within fenced grounds during this shift.
- Family will identify signs and symptoms of caregiver burden during counseling session at the end of the week.

Clinical Cues

When assisting older adults and confused patients to eat, slowly give one bite of an item, allow adequate time for chewing and swallowing, and then give another bite of a different food item. This varies the taste and texture and enhances the enjoyment of eating. Limit distractions. Also remember to include some time for socialization during the meal. Sit with the patient during the meal.

In accordance with National Patient Safety Goals, nurses must identify patients who have safety risks; this includes patients with cognitive disorders. Planning care for a patient with delirium involves accurately assessing the acute condition, stabilizing the patient, reducing environmental stimuli, providing reality orientation, and assisting the provider in determining the cause. Planning care for a patient with dementia frequently involves the caregivers and should be done with long-term goals in mind. Patients in the early stages of AD may be experiencing difficulties with ADLs; however, they may attempt to hide their condition. Forgetting to turn off the stove or to lock the doors is not uncommon. Regardless of the cause, the loss of cognition is devastating, and it is important to maintain the patient's dignity, provide for safety and optimal level of functioning, and promote quality of life.

■ Implementation

Interventions to provide safety and minimize anxiety for patients with dementia and delirium are similar. **However, when caring for a patient whose sudden change in behavior may be caused by delirium, time is of the essence.** Assess the patient frequently, document your findings, and be certain the provider is notified. Because the level of consciousness may be clouded, reduce distractions in the environment; for example, having the television on can create background noise that increases confusion ([Alzheimer's Association, 2015](#)). It may be necessary to medicate patients with anxiolytics for severe anxiety, or with antipsychotics if the misinterpretation of the environment causes them to be aggressive.

Safety Alert

Antipsychotic Drugs

Nurses should be aware that atypical antipsychotics such as olanzapine (Zyprexa), quetiapine (Seroquel), and risperidone (Risperdal) are approved for use in schizophrenia but are not approved for use with older patients who display behavioral changes related to dementia. Clinical trials showed an increased risk of death in this population with use of these drugs ([PsychCentral.com, 2011](#)).

Patients may be able to remember their own name but be confused about place and time. A patient who is experiencing acute confusion or delirium will benefit from repeated orientation to person, place, and time. It is not adequate to repeat this information once or twice. It must be repeated frequently and in a calm, soothing manner. Your calm attitude is very important in reducing the anxiety that is inevitably present for the patient. [Box 47-3](#) lists guidelines to conduct reality orientation for confused patients.

Assignment Considerations

Reality Orientation

Nursing assistants (CNAs) can be instrumental in the ongoing orientation of confused patients. First, identify those patients who would benefit from reality orientation. Then give the CNA specific instructions about how to orient to person, place, and time (e.g., "Hi, Mrs. Collins. I am Judy, the nursing assistant at Sunshine Care Center. It is 8 A.M. on Tuesday, June 28, 2010. It's a nice, warm summer day today."). Teach the CNA how to use visual cues to orient patients (e.g., "Mrs. Collins, this calendar will help you remember the day, month, and year.").

Box 47-3

Guidelines for Reality Orientation

What is Reality Orientation?

- Reality orientation is a therapeutic program consistently implemented by all nursing staff to orient a patient to person, place, and time. This method includes the use of verbal communication techniques, as well as written signs indicating the current date, month, or room identification. Clocks with large numbers are included to help the patient know the correct time ([Manepalli et al, 2009](#)).
- Special group sessions are also used to orient patients. These sessions focus on person, place, and time as well as certain holiday events. These groups improve orientation and provide opportunities for social interaction.

When to Use Reality Orientation

- The use of reality orientation is appropriate when a patient is experiencing acute confusion or delirium. A sudden episode of confusion is very frightening, and orienting the patient is a way to allay fear and anxiety.
- Patients experiencing global amnesia do not benefit from repeated verbal reality orientation.
- For patients with dementia, gentle reminders of the day or time need to be repeated often and without the expectation that the patient will remember something that was said 5 minutes ago.
- All aspects of reality orientation are helpful for all patients with cognitive disorders. However, in patients experiencing acute confusion, the ultimate expectation is that the patient will become completely oriented and return to a previous level of functioning. With chronic confusion, the goal is to preserve dignity and maintain optimum function.

Examples of Ways to Implement Reality Orientation and Reduce Confusion

- Under no circumstances should nurses ever chastise or become frustrated when a patient cannot remember. This has no therapeutic value.
- Verbalize to patients in a consistent and caring manner who you are, where they are, and the date and time: "Hi, Mr. Jones. I am your nurse, Betty, at the Davis Nursing Care Center. It is 8 A.M. on Wednesday, October 25, and it is time for breakfast."
- Look directly at the patient when you are speaking.
- Ask only one simple question at a time.
- Ask questions that can be answered with a "yes" or "no": "Would you like to eat in the dining room?"
- Eliminate environmental distractions when talking to a patient.
- Break down tasks such as dressing into simple one-step tasks.

- Ask the patient to do only one task at a time.
- Gently touch the patient to convey acceptance.
- If possible, provide caregivers who are familiar to the patient.
- Provide general orientation to the calendar year by using holiday decorations.
- Decrease the noise level in the environment by not using paging systems or call lights that ring or buzz.
- Label photos of people familiar to the patient with the names of the people who are in the photos.
- Limit visitors to one or two at a time.
- Place the patient's name in large block letters in his room and on clothing.
- Use symbols rather than words on signs indicating the location of the dining room or bathroom.
- When misperceptions are present, clarify them for the patient: "No, Mr. Jones, I am not your daughter; I am your nurse, Betty. Your daughter will be here after you eat your lunch."
- When special low-stimulus units designed for patients with chronic confusion are not available, use yellow tape to mark specific boundaries for the patient.
- Give frequent reassurances.
- Keep the patient's room well lit.
- Encourage the use of hearing aids and prescription glasses.
- Have clocks, calendars, and personal items in clear view of the patient.
- Encourage reminiscing about happy times in life.

A patient experiencing acute confusion may become combative or may attempt to crawl out of bed or remove therapeutic equipment. If restraints are used as a last resort, the patient may be at risk for physical problems such as immobility, strangulation, or asphyxiation or for psychological issues such as anger, humiliation, loss of autonomy, and decreased functioning.

Legal and Ethical Considerations

Use of Restraints

Remember, having to restrain a patient for behavior problems is considered an unusual circumstance that requires clear documentation and adequate elaboration as to the events leading to the need for restraints, **all alternatives tried before restraint**, the type of restraint, strict accounting for time in and out of restraints, and the assessment and care given to the patient while in restraints (Nadler-Moodie, 2009). (Do **not** forget to offer and document bathroom breaks, fluid and food, and skin care with each 1- to 2-hour check.) The total number of hours in restraints or seclusion must be noted with supporting documentation. **Box 47-4** presents guidelines on the use of restraints and alternatives to restraints.

Box 47-4

Alternatives to and Guidelines for the Use of Restraints

Alternatives to Restraints

Acute Care Settings

- Encourage family members and friends to stay with the patient.
- Assign a nurse or nursing assistant for one-on-one observation.
- Encourage oral feedings instead of intravenous or nasogastric feedings. (Avoid inserting tubes that can be pulled out.)
- Remove catheters and drains as soon as possible.
- Decrease glaring lighting, reduce noise, and minimize stimulation.
- Keep the patient close to the nurse's station.
- Be certain the call button is within easy reach.
- Place the bed in the lowest setting, and use three side rails to keep the patient from rolling out.
- Check on the patient frequently to offer nutrition, fluids, pain relief, and toileting assistance as appropriate.

Long-Term Care Facilities

- Place the mattress on the floor to prevent the patient from falling out of bed.
- Talk to the patient, even when the patient is not responding to you or is responding in an inappropriate way.
- Incorporate relaxation techniques into the care plan, such as back massage and hydrotherapy.
- Use therapeutic communication techniques to encourage the patient to verbalize feelings.
- Encourage ambulation whenever feasible.
- Encourage participation in recreational, physical, and occupational therapy.
- Encourage participation in as many ADLs as possible.
- Initiate diversional activities, such as listening to radio, television, and music.
- Maintain a schedule for toileting.

Guidelines for the Safe Use of Restraints

- Document all efforts to assist the patient without physical restraints and the outcomes.
- Use the least restrictive type of restraint that will accomplish the objective.
- Obtain informed consent from the patient or the patient's relatives before using restraints.
- Have an institutional policy on restraints written and available for the patient and family.
- Make certain that all staff have adequate in-service training on the use of restraints.
- Use hand mitts for patients who are receiving IV therapy or have catheters or nasogastric tubes.
- If hand mitts do not work, consider wrist restraints.
- All restraints must have a provider's order.
- Restraints must not be used to punish or control the patient.
- Apply restraints snugly, but ensure that circulation is not impeded.

- Check the area distal to the restraint every 2 hours (or according to the agency policy) for circulation and function.
- Remove the restraints and change the patient's position at least every 2 hours.
- Apply active or passive ROM to the affected joints and muscles.
- Secure restraints to the bed frames, not the side rails.
- Tie restraints with knots that can be quickly released.
- Consider restraints as a temporary solution.
- Clearly document in the patient record the reason for the restraint, the type selected, and the time frame for use.
- Document care given to the patient while in restraints.

ADLs, Activities of daily living; *IV*, intravenous; *ROM*, range of motion.

An individual with chronic confusion in the late stages of dementia will not benefit from repetitive information. If **global amnesia** (generalized loss of memory) is present, the patient will not be able to remember family, friends, or events, regardless of how many times you repeat the information. Moreover, expecting the patient to remember leads to frustration for you and the patient. Use of pictures or symbols, such as arrows pointing to the bathroom, can facilitate daily tasks and clarify communication. In addition, creative therapies such as video histories, use of familiar songs, pet therapy, and aromatherapy may enrich the quality of life for these individuals.

Complementary and Alternative Therapies

Smell

The limbic or “old brain” is associated with the sense of smell. Use of familiar smells reinforces remote memories. For example, the smell of pine or fir can trigger past memories of happy Christmas times spent with family and friends. Rosemary and clary sage have been found to be helpful. Aromatherapy can be administered by inhalation, bathing, massage, or topically ([Keville, 2014](#)).

Complementary and Alternative Therapies

Massage

Massage has been used to reduce agitation in patients with AD ([Valleti, 2011](#)). Additional benefits include meeting the human need for nurturing touch, decreasing mild depression, reducing mental stress, improving circulation, and relieving muscle tension and stiffness.

Think Critically

Is it always necessary to encourage a patient to see and acknowledge reality? What about older adult patients who have severe dementia and believe they are living in their own homes, even though they are in a nursing home?

Nurses who care for patients with dementia need to be aware of the importance of maintaining the dignity of the patient and family. In the later stages of dementia, there are numerous deficits in self-care, such as grooming and toileting. It is very important to treat both patients and families with respect. **Call the patient by name, provide for privacy, and individualize your care for this patient based on culture and history.** It is well documented in the nursing literature that when

patients are seen as people or human beings, nurses are likely to be more compassionate and caring.

Clinical Cues

Pull the curtain or close the door and drape the patient appropriately to provide privacy and protect dignity for toileting or when performing procedures whether or not the patient is cognizant.

Older Adult Care Points

When working with older adults, do not confuse clear and supportive communication with "elderspeak." Elderspeak is a style of speech that includes baby talk, exaggerated tones and slow speed, elevated pitch and volume, and simplified vocabulary. Being overly nurturing ("Come on, sweetie, let's eat now.") or overly controlling ("Sit down and finish your food!") is perceived as patronizing and demeaning, without improving communication.

Assessment of and Interventions for the Family

The family should also be assessed for their knowledge and ability to relate to the illness and care of a family member with dementia. The goal of treatment is preservation of function, and this should be clarified when working with the family. For example, if the patient lives at home, the family will need to realize that **a person with dementia responds much better if there are daily routines and a structured environment**. Assist the family to develop a schedule that includes adequate time for hygiene care, meals, medications, and activities such as walking. Home care nurses are in an excellent position to make suggestions to help the family create a safe environment. For example, potentially hazardous areas can be evaluated and then suggestions made for gates across stairwells or better lighting in dark hallways.

Clinical Cues

"Simple Pleasures" benefit patients and families. In this intervention, patients handle fleece-covered items, are shown photos of familiar people or places, or handle other familiar "activity" items such as cooking implements for women, or safe tool items for men. Handling the item reduces agitation in a patient with dementia ([New York Department of Health, 2014](#)).

If a patient has a tendency to wander or get lost, the family will live in a constant state of hypervigilance to ensure the safety of their loved one. Help family members to recognize potential wandering behaviors: looking for keys, preparing to go to "work," restlessness and pacing, getting lost going to the bathroom or to the bedroom, or performing a task without actually accomplishing anything (e.g., moving dirty dishes from place to place without actually washing them). Nurses can make practical suggestions such as sewing identification labels into clothing, using a bell that signals when an exit door is opened, or wearing a bracelet with a GPS chip. [Box 47-5](#) presents additional tips for families.

Box 47-5

Suggestions for Families Caring for a Person With Alzheimer Disease

- Make and keep a copy of the daily schedule, and stick to the schedule as closely as possible.
- Establish bedtime rituals.
- Orient the person as necessary to maintain safety and promote maximum functioning.
- Minimize the number of caregivers.
- Simplify the environment to minimize illusions and confusion; keep decorative items to a

minimum.

- Keep the environment as quiet as possible.
- Schedule rest breaks throughout the day for yourself and your loved one.
- Change your expectations; forcing thought and interaction causes frustration.
- Offer the person help when needed, and distraction as necessary.
- Always supervise the use of medications.
- Use sense of touch; there is an increased need for touch.
- Always approach the person from the front before touching.
- Use distraction if agitated. Walking, gardening, rocking in a rocking chair, sanding wood, and folding laundry are good examples of distraction.
- Use many of the safeguards for young children, such as storing all cleaning solutions, pesticides, medications, and nonedible items in locked cabinets.
- Put protective caps on all unused electrical outlets.
- Remove all sharp objects.
- Remove all throw rugs, and keep hallways and stairs free of clutter.
- Keep the house well lit.
- Allow smoking only under very close supervision.
- Attach safety grab bars in the bathroom.
- Protect windows and doors with Plexiglas.
- Rather than restrict the person from wandering, provide a safe area in which to wander.

Families should also be assessed for signs of caregiver role strain. Observe and assist family members to recognize when they themselves experience denial, irritability, anxiety, sleeplessness, and anger—and note that these signs suggest the illness of the older adult is taking its toll on the caregivers. Family members often are exhausted from the daily requirements of round-the-clock care. Evidence suggests that families who receive intensive support and counseling are able to manage the care of a patient with AD in the home for longer periods of time ([Messecar, 2012](#)).

Encourage caregivers to consider day care or respite care. These options give the family members a much-needed psychological and physical rest. In addition, families should be encouraged to use support groups, such as the Alzheimer's Association (see [Online Resources](#)). One of the *Healthy People 2020* objectives is to help family caregivers to access caregiver support [@services](#).

Think Critically

How would you help a family member to recognize and acknowledge the need for respite care?

Families also need to be encouraged to talk openly and frankly about quality of life, and about end-of-life issues such as advance directives. Preferably these talks should be completed before the diagnosis of dementia, when the patient still has cognitive functioning. If not, the family caregiver becomes the spokesperson and needs to be encouraged to get a power of attorney and a living will for the patient. Families need considerable support in these matters. Refer to [Nursing Care Plan 47-1](#) for additional nursing management information.

■ Evaluation

Because confusion is present in all cognitive disorders, keeping the patient free of injury is of primary importance. Is the patient returning to or moving toward a previous level of cognitive and psychomotor functioning? Has the cause of acute delirium been determined or eliminated? An additional expected outcome, particularly with patients with dementia, is that the family will be able to verbalize the stages of illness and maintain realistic expectations for their loved one.

Community Care

If patients with dementia or delirium are hospitalized, the inpatient stay will typically be for a short time and not for dementia alone. Patients with AD are not placed in psychiatric hospitals, because antipsychotic medications or psychotherapy does not work for these patients. For a variety of reasons, financial and personal, many families are choosing to keep their older adults at home. Nurses who make home visits will often encounter families attempting to care for a relative who is experiencing one of these conditions. Teaching must be done about the causes and stages of these illnesses. In addition, families are eager for practical knowledge that will make the living arrangement more acceptable (see [Box 47-5](#)).

In the later stage of dementia, nursing home placement sometimes is necessary. Many nursing homes have special units set aside for patients with AD. In these units, safety precautions are a primary concern. Entrance and exit doors have special codes so that patients cannot wander off the unit. "Wandering pathways" are created using corridors, walkways, or outdoor spaces that allow for walking and roaming with security and safety. Nurses in these units spend considerable time educating families about the stages of AD and helping families with the inevitable grieving process.

In addition to observing patients with delirium in the acute hospital setting, nurses often interact with these patients in outpatient clinics, emergency departments, or providers' offices. Excellent assessment skills are necessary to prevent any further decline.

Get Ready for the NCLEX® Examination!

Key Points

- Cognition includes the mental processes of perception, memory, judgment, and reasoning.
- Delirium is acute confusion; signs and symptoms may include a shortened attention span; disorientation; impairment in recent and remote memory; incoherent speech; disorganized thinking; and possible presence of delusions, hallucinations, and illusions.
- Dementia is chronic confusion that has slow onset (months to years); signs and symptoms include impairments in memory, poverty of thoughts, difficulties with abstract thoughts and judgments, confabulation, and changes in personality.
- Assess judgment, affect, memory, cognition, and orientation (JAMCO).
- AD is the most common degenerative disease of the brain and usually affects people older than 65 years; it has three or more stages.
- Vascular dementia describes any type of dementia caused by vessel disease, which causes brain damage. Onset is usually more abrupt, and neurologic impairment is localized rather than global.
- Goals of treatment for cognitive disorders include achieving an optimal level of functioning, ensuring safety, educating caregivers, and preserving the dignity of the patient and family.
- Nursing interventions for AD depend on the stage of illness. General interventions include maintaining a calm and soothing manner, ensuring environmental safety, using appropriate reality orientation, and monitoring the effects of medications.
- Families commonly elect to care for older adults at home; teach the family about cognitive disorders and provide practical knowledge about living arrangements.
- Observation for caregiver strain of the family caring for a cognitively impaired patient at home is needed.

Additional Learning Resources

SG Go to your Study Guide for additional learning activities to help you master this chapter content.

• Online Resources

- Alzheimer's Association, www.alz.org
- Caring for a patient with AD, www.gmhfonline.org/gmhf/consumer/factsheets/caring_alzheimer_disease.html
- Choosing resources for patients with AD, www.nia.nih.gov/alzheimers/choosing-services-and-long-term-care-people-alzheimers-disease-resource-list
- Paying for care and services resources, www.alzheimers.gov/paying.html

Review Questions for the NCLEX® Examination

1. Alzheimer disease has a greater impact on society than delirium because: (*Select all that apply.*)

1. memory deficits become progressive.
2. it often improves with correction of the underlying cause.
3. it continues to cause mental decline and the need for more and more care.
4. the expense of care for dementia patients is a drain on society and families.

5. a family member may have to leave the workforce to care for the patient.

NCLEX Client Need: Psychologic Integrity

2. The nurse should recognize the following signs and symptoms in a patient as those of delirium:
 1. fading short-term memory, withdrawn behavior, and depression.
 2. inattention to hygiene, sad countenance, little verbal expression.
 3. confusion, incoherent speech, and sudden onset of symptoms.
 4. inability to recognize familiar objects, angry outbursts, confusion.

NCLEX Client Need: Psychosocial Integrity: Sensory/Perceptual Alterations

3. The nurse recognizes that a patient is in the early stage (mild) of Alzheimer disease when noting that the patient:
 1. has difficulty swallowing during meals.
 2. needs repeated instructions for simple tasks.
 3. has difficulty learning new things.
 4. cannot recognize familiar people.

NCLEX Client Need: Psychosocial Integrity: Sensory/Perceptual Alterations

4. A confused older adult man is hospitalized for a recent fall. He is accompanied by a daughter, who cries and says, "I can't take care of him any longer!" Initial assessment confirms a problem of caregiver burden. Which nursing intervention(s) would be appropriate? (*Select all that apply.*)

1. Encourage verbalization of feelings.
2. Refer to respite care or day care programs.
3. Tell the daughter to calm down and maintain composure.
4. Reassure the daughter that everything will be okay.
5. Encourage admission to a nursing home.
6. Assess for alternative family support and resources.

7. Tell the daughter to focus on past happy times with the father.

NCLEX Client Need: Psychosocial Integrity: Stress Management

5. A nurse is caring for a patient who has confusion resulting from Alzheimer disease. Which action requires more instruction about Alzheimer disease and confusion?

1. Uses season-appropriate holiday decorations and a calendar with large numbers
2. Labels family photos with names of family members and discusses photos with patient
3. Encourages the patient to acknowledge that he is not living in his own home
4. Helps the patient to perform one task at a time, giving step-by-step instructions

NCLEX Client Need: Psychosocial Integrity: Behavioral Management

6. The nurse is working in a long-term care facility and notices that one of the residents with chronic dementia is uncharacteristically drowsy and lethargic. What is the most appropriate nursing intervention?

1. Monitor the patient, but allow her to sleep.
2. Stimulate her by inviting her to join a social group.
3. Call the provider to report a change of mental status.
4. Perform a mental status examination and obtain vital signs.

NCLEX Client Need: Physiologic Integrity: Physiological Adaptation

7. To assist a family in caring for a member with Alzheimer disease, the nurse can teach the family to: (*Select all that apply.*)

1. place door locks up high on the doors.
2. redirect to another place or activity when the patient becomes obstinate.
3. keep lights low in the evening to decrease stimulation.

4. present finger foods to increase caloric intake when restless.
5. provide lively activity in the late afternoon to prevent sundowning.
6. provide clothing with Velcro or other easy fasteners.

NCLEX Client Need: Psychosocial Integrity: Behavioral Management

8. A nurse in an acute medical-surgical unit is caring for a confused, older adult patient who is trying to get out of bed. Which alternative to restraints would be appropriate for the patient and the setting?

1. Put the patient's mattress on the floor.
2. Keep the patient in a wheelchair close to the nurses' station.
3. Put four side rails up instead of tying the patient down.
4. Use hand mitts and a soft vest with Velcro fasteners.

NCLEX Client Need: Safe and Effective Care Environment: Least Restrictive Restraints and Safety Devices

9. The caregiver of a male patient with Alzheimer disease is given instructions regarding donepezil (Aricept). Which caregiver statement indicates a need for further instructions?

1. "I should always give Aricept with food to minimize gastric distress."
2. "I thought Aricept was rarely used because of liver problems."
3. "I must increase fiber and fluid in his diet."
4. "I need to provide frequent sips of cool liquids."

NCLEX Client Need: Physiological Integrity: Pharmacological Therapies

10. The nurse observes that a patient with dementia cannot put on his shirt, although he has the strength and motor movement to dress himself. Which intervention would be appropriate to accomplish dressing while maximizing the patient's dignity?

1. Verbally coach the patient using simple directions.
2. Leave the patient alone and give extra time and privacy.

3. Have the wife help the patient get dressed.
4. Give the patient a shirt with Velcro fasteners.

NCLEX Client Need: Psychosocial Integrity: Behavioral Management

Critical Thinking Questions

Scenario A

Margarita Munoz, 81 years old, has AD. Her daughter tells you that Mrs. Munoz has “good days and bad days,” but seems to be more forgetful and more withdrawn. “Do you have any suggestions for me? I know Mom is going to get worse, but I’d like to care for her at home as long as possible.”

1. What are some questions you should ask the daughter?
2. What can you do to help the daughter with the practical issues of caring for Mrs. Munoz at home?

Scenario B

You are caring for Mr. Abdul, who is a 77-year-old patient residing in a nursing home for the past 6 months. Today he becomes uncharacteristically combative when the nurse’s aide attempts to give him a bath. You have never observed Mr. Abdul exhibit this type of behavior before.

1. What would your initial nursing interventions be?
2. How might you explain Mr. Abdul’s sudden change in behavior?

Scenario C

Jill Capelli, a 42-year-old schoolteacher, accompanies her father, Arturo Capezzi, to the provider’s office where you are working. Mr. Capezzi, currently 67 years old, was diagnosed with vascular dementia 2 years ago. His condition is progressively deteriorating, and Ms. Capelli tells you that she is fearful that this type of dementia could happen to her.

1. How would you respond to Ms. Capelli?
2. What type of preventive education might be helpful for Ms. Capelli?

Scenario D

The night shift nurse recommends that you call the provider and obtain an order to restrain Mr. Jackson, who is an older adult patient with dementia. The patient currently has a feeding tube and an intravenous line, which he keeps trying to pull out. He is easily agitated and strikes out at caregivers. In addition, he is physically strong enough to get out of bed and has a history of falls.

1. What assessments would you make before calling the provider for the restraint order?
2. What interventions could you try before using restraints?
3. If restraints are ordered, describe what you must document.

CHAPTER 48

Care of Patients With Thought and Personality Disorders

Objectives

Theory

1. Examine the incidence of thought disorders in the general population.
2. Determine the signs and symptoms of schizophrenia.
3. Establish at least four nursing problems and the major nursing interventions that would be appropriate for a patient with a thought disorder.
4. Compare and contrast behaviors for each of the various personality disorders.
5. Choose at least four nursing problems and the major nursing interventions that would be appropriate for a patient with borderline personality disorder.
6. Illustrate how a nurse can identify and modify personal feelings that can occur when caring for a patient with borderline personality disorder.
7. Analyze your personal feelings related to caring for patients with manipulative behaviors.

Clinical Practice

8. Watch the movie *A Beautiful Mind* and develop a teaching plan to help the wife understand the husband's bizarre and erratic behavior.
9. Develop a care plan with at least six nursing interventions for a patient who is paranoid and suspicious.
10. Write a care plan with at least six nursing interventions for a patient who is manipulative.

KEY TERMS

- akathisia** (ă-kă-THĒ-zhă, p. 1112)
- alogia** (ă-LŌ-jyă, p. 1111)
- anhedonia** (än-hē-DŌ-nyă, p. 1111)
- atypical antipsychotics** (ă-tī-pi-kăl än-tē-sī-KÖT-iks, p. 1113)
- avolition** (ă-vō-LĬ-shūn, p. 1111)
- borderline personality disorder (BPD)** (BŎR-dĕr-lĭn pĕr-sō-NĀL-i-tē dīs-ŎR-dĕr, p. 1121)
- command hallucinations** (KÖM-mănd hă-lū-sī-NĀ-shūns, p. 1115)
- conventional antipsychotics** (kōn-VĒN-shūn-ăl än-tē-sī-KÖT-iks, p. 1112)
- delusions** (dĕ-LŪ-zhūn, p. 1109)
- dystonic reaction** (dīs-TŌN-ik rē-ĂK-shūn, p. 1112)
- hallucinations** (hă-lū-sī-NĀ-shūn, p. 1109)
- illusion** (ĭ-LŪ-zhūn, p. 1110)

loose associations (p. 1116)
milieu therapy (mēl-yū THĒR-ă-pē, p. 1121)
negative symptoms (NĒG-ă-tīv, p. 1111)
neologisms (NĒ-ō-lō-jīzm, p. 1116)
oculogyric crisis (ók-ū-lō-Jī-rīk KRĪ-sís, p. 1112)
personality disorders (pěr-sō-NĀL-ĭ-tē dīs-ÖR-děrz, p. 1120)
positive symptoms (p. 1110)
psychotherapy (sī-kō-THĒR-ă-pē, p. 1121)
psychotic features (sī-KŌ-tīk, p. 1109)
schizophrenia (skīt-sō-FRĒ-nē-ă, p. 1109)
splitting (p. 1121)
tardive dyskinesia (TĀR-dīv dīs-kī-NĒ-zhē-ă, p. 1112)
therapeutic alliance (p. 1117)
thought disorders (p. 1109)
word salad (p. 1116)

Overview of Thought Disorders

The *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (DSM-5) defines **thought disorders** by the presence of psychotic symptoms. **Schizophrenia** is the most common thought disorder. Examples of **psychotic features** are **hallucinations** (hearing, seeing, smelling, tasting, or feeling something that is not really there), **delusions** (false fixed ideas), and disorganized speech and/or behavior.

The incidence of thought disorders is not as high as that of mood disorders, but thought disorders tend to be more chronic and debilitating. It is estimated that 1.1% of the general population is affected with schizophrenia, and in the United States this represents 3,432,000 Americans (Schizlife, 2014).

Schizophrenia

Etiology and Pathophysiology

The exact cause of schizophrenia is unknown, but several types of theories are considered: genetic, neurobiologic, brain structure abnormalities, and influences from psychological and environmental factors. Genetically, it is believed that several genes on several different chromosomes play a role. Neurobiologically, abnormality of the amount of the neurotransmitter dopamine is believed to exist. Neurotransmitters are chemical messengers that are produced and stored in the nerve terminal (**axon**) (Figure 48-1). Low dopamine activity in the cortex of the cingulate gyrus leads to the negative symptoms of schizophrenia, and higher than usual dopamine activity in the limbic system leads to the positive symptoms. Other neurotransmitters such as serotonin, norepinephrine, and gamma-aminobutyric acid (GABA) also interact in the disease. Glutamate is being researched as another factor. Brain structure abnormalities in individuals with schizophrenia have been identified and include enlargement of the lateral cerebral ventricles; reduced cortical, frontal lobe, and hippocampus volume; and increased fissure size on the surface of the brain.

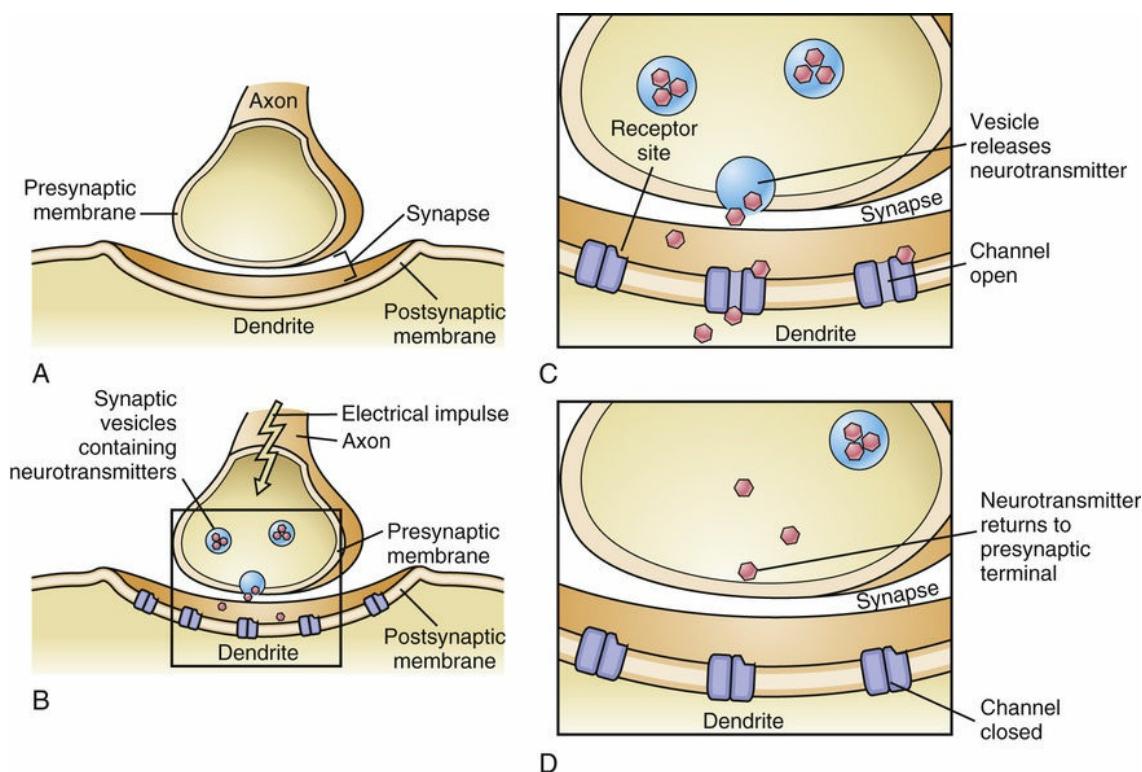


FIGURE 48-1 Neurotransmitters. **A**, Axon with stored neurotransmitters and dendrite with receptor sites.

B and **C**, Electrical impulse causes release of neurotransmitter. **D**, Receptor sites close and neurotransmitter returns to storage.

Prenatal stressors such as birth complications, prenatal viral infection, poor maternal nutrition, and exposure to toxins contribute to the potential for schizophrenia. Psychological stress appears to precipitate the disease when other factors are present in susceptible people. Environmental factors such as exposure to chronic poverty or a high-crime environment also have an effect on susceptible persons. Schizophrenia usually develops in late adolescence or the early 20s.

Complementary and Alternative Therapies

Omega-3 Fatty Acids

A study by Mossaheb and associates (2013) found that omega-3 fatty acids were effective at preventing progression to psychosis in young people and improved both negative and positive symptoms.

Signs and Symptoms

The signs and symptoms are divided into positive (present) and negative (absent) symptoms (Figure 48-2). **Positive symptoms** are those symptoms present in patients with schizophrenia that should **not** be there. These include the presence of hallucinations, delusions, and disordered thinking or loose associations between thoughts. Voices (**auditory hallucinations**) will tell the person what to do, and delusions develop as the disorder progresses.

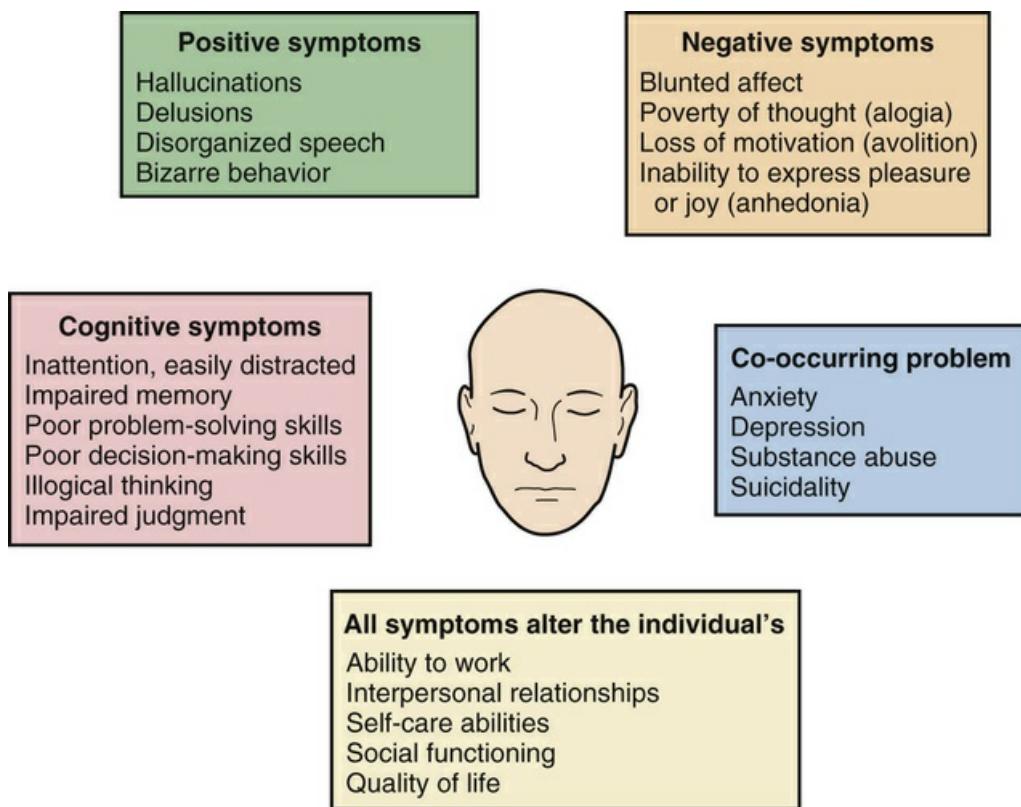


FIGURE 48-2 Signs and symptoms of schizophrenia.

Delusions can be either grandiose or persecutory. An individual who believes he is a king is having **delusions of grandeur**. Individuals with **delusions of persecution** believe that they are being persecuted by agencies, by other people, or by supernatural beings. An **illusion** is a misinterpretation of something that really exists. For example, an electrical cord appears to be a snake, or a pencil is misinterpreted to be a knife blade. When **ideas of reference** occur, the individual believes that events or situations are occurring because of—or specifically for—him. A common idea of reference is to believe that people on the television are sending special telepathic

messages. **Positive symptoms** are much more responsive to medication therapy compared with the **negative symptoms**; however, some patients will tell you that “the voices are always there, but if I take my medications the voices are less intrusive.”

Negative symptoms are abilities or personal characteristics that are **absent** or lost to the patient (negative symptoms are those that **should** be present).

For example, think of elements of personality that make people motivated, socially outgoing, happy, and active in daily life, and then take away those elements. The results are **negative symptoms**: apathy, social withdrawal, psychomotor retardation, flat affect (obvious absence of emotional expression), poverty of thoughts (**alogia**), lack of motivation (**avolition**), and inability to experience pleasure or joy (**anhedonia**). These symptoms are notoriously more difficult to treat because the symptoms, in and of themselves, inhibit the individual from seeking help. Negative symptoms are also linked to acquisition of important social skills and prognosis (Csernansky, 2013). For example, if a teenage patient withdraws because of feelings of persecution, he will miss the important socialization tasks that occur during adolescence, such as exploring identity and preparing to live independently away from his parents.

In addition, these patients have cognitive impairments that manifest as difficulty with memory, judgment, problem solving, and decision making. Concurrent mental health problems such as anxiety and depression can also occur. Overall the individual's quality of life is affected, and some will have great difficulty functioning in society.

Think Critically

Why might friends and family fail to recognize that there is a problem when schizophrenia first develops in a teenager or young adult? Describe how you might feel, and how it would change your life, if someone you loved developed schizophrenia in early adulthood.

Safety Alert

Be Cautious, Not Fearful

Nursing students are often afraid to enter a psychiatric unit because patients with schizophrenia can exhibit bizarre and unpredictable behavior; however, these patients are usually not overly prone to violence. Those with a dual diagnosis of substance abuse and schizophrenia are more likely to become violent (Volavka et al, 2010). To protect yourself and others, ask the charge nurse for advice about potentially violent patients.

Diagnosis

Diagnosis is not easy, and symptoms also resemble those of bipolar disease and brain tumor. Methamphetamine and phencyclidine (PCP) use can mimic the symptoms. Evaluating symptoms over the course of 6 months helps with diagnosis. An immunoassay blood test, VeriPsych, has been developed and is being refined before further testing. There are different types of schizophrenia (paranoid, catatonic, disorganized, undifferentiated, and residual), and diagnosis is based on guidelines in the DSM-5. Table 48-1 provides a description of the different types of schizophrenia. Note that many patients with schizophrenia have other mental illness problems and may have a dual diagnosis.

Table 48-1
Types of Schizophrenia and Associated Behaviors

TYPE	BEHAVIORS
Paranoid	Exhibits extreme suspiciousness, delusions of grandeur, and delusions of persecution. Can be hostile and aggressive. Auditory hallucinations are common.
Catatonic	Exhibits a stuporous condition associated with rigidity, unusual posturing, and waxy flexibility (maintains a limb in one position for a long time). Also demonstrates echopraxia (imitating the motions of others) and echolalia (involuntary repetition of words spoken by others). Exhibits unpredictable behavior because behavior is controlled by delusions and hallucinations.
Disorganized	Exhibits flat affect, silliness, and incoherence. Has gross thought disturbances, including word salad and neologisms. Delusions and hallucinations are common.
Undifferentiated	Exhibits symptoms found in more than one type, but does not meet adequate criteria for paranoid, catatonic, or disorganized types.
Residual	Exhibits negative symptoms (i.e., apathy, social isolation, psychomotor retardation, blunted affect, poverty of thoughts, and lack of motivation) of schizophrenia, with no evidence of hallucinations, delusions, or disorganized thoughts.

Treatment

There is evidence that early treatment for schizophrenia improves long-term prognosis. Patients who are treated for first episodes generally respond to the therapeutic effects and require lower doses of antipsychotic medications. After starting a medication, the patient should be monitored for 3 to 6 weeks for therapeutic response (Frankenburg, 2014). Antipsychotic medications (neuroleptics) **treat the positive symptoms of schizophrenia** (Box 48-1). The **conventional antipsychotics** are very effective in stopping the auditory hallucinations, enabling the patient to connect thoughts in a logical manner, and eliminating the delusional system. They do cause serious and unpleasant side effects and are becoming less commonly prescribed. However, some patients respond well to these drugs and, particularly for older patients who have taken them for a long time, it is likely that a successful drug regimen will continue.

Box 48-1

Drugs Used to Treat Schizophrenia

CONVENTIONAL DRUGS	ATYPICAL DRUGS*
Chlorpromazine (Thorazine)	Clozapine (Clozaril) [†]
Fluphenazine (Prolixin)	Aripiprazole (Abilify)
Haloperidol (Haldol)	Olanzapine (Zyprexa)
Loxapine (Loxitane)	Quetiapine (Seroquel)
Molindone (Molar)	Risperidone (Risperdal)
Perphenazine (Trilafon)	Ziprasidone (Geodon)
Thioridazine (Mellaril)	Paliperidone (Invega)
Thiothixene (Navane)	Iloperidone (Fanapt)
Trifluoperazine (Stelazine)	Asenapine (Saphris)

*These drugs have fewer side effects than the conventional medications.

[†]First atypical antipsychotic, now rarely prescribed because of potential agranulocytosis. Frequent monitoring of white blood cell count is necessary.

The side effects for these medications include the familiar anticholinergic effects (i.e., dry mouth, flushing, urinary retention, and constipation). In addition, these drugs have **extrapyramidal side effects** (EPSs): dystonia, pseudoparkinsonism, and akathisia (Figure 48-3). Dystonia or **dystonic reaction** is an acute muscle contraction, especially of the tongue, face, neck, and back. **Oculogyric crisis**, a fixed upward gaze or muscle spasm of the eye, can occur. **Pseudoparkinsonism**, or drug-induced parkinsonism, consists of poor balance, flat affect, slowed movements, tremors, and drooling. **Akathisia** manifests as motor restlessness (e.g., tapping a foot, rocking, pacing) or apprehension and irritability. Treatment for akathisia, dystonia, or pseudoparkinsonism is to lower the dosage or change the medication and to give benzotropine (Cogentin) or diphenhydramine (Benadryl).



FIGURE 48-3 Characteristics of pseudoparkinsonism, acute dystonia, akathisia, and tardive dyskinesia.

Tardive dyskinesia is a primary concern because **symptoms are irreversible once they have developed if not caught early**. Symptoms include tongue protrusion; lip smacking; sucking; chewing; blinking; lateral jaw movements; grimacing; shoulder shrugging; pelvic thrusting; wrist and ankle flexion or rotation; foot tapping and toe movements; and rapid, purposeless, and irregular movements. Movements are often described as writhing and wormlike. **Monitor for signs of tardive dyskinesia, particularly in patients who have been taking a conventional antipsychotic medication for longer than 6 to 12 months.**

Other adverse effects associated with the use of antipsychotic medications include blurred vision; bone marrow suppression; cardiac dysrhythmias; endocrine changes such as elevation of blood sugar, weight gain, and breast enlargement; and **hepatotoxicity** (liver injury and jaundice).

Neuroleptic malignant syndrome is a rare reaction; however, it is life threatening, and the patient typically will be transferred to the intensive care unit. Symptoms include high fever, increased pulse, muscle rigidity, stupor, incontinence, elevated white blood cell count, hyperkalemia, and renal failure.

Older Adult Care Points

Older adults who are taking antipsychotic medications are at a higher than usual risk for developing serious side effects. Baseline cardiac, renal, hepatic, and hematologic studies need to be done before initiating psychotropic drugs. The beginning dosages should be one half to one third of the normal adult dosage. Older adults need to be watched very closely for difficulty swallowing, constipation and fecal impaction, weight gain, memory impairment, and orthostatic hypotension.

Examples of newer medications—sometimes referred to as **atypical antipsychotics** (see Box 48-1)—have the advantages of fewer side effects, particularly tardive dyskinesia, and offer some success with treating the negative symptoms. Olanzapine comes in a quickly dissolving oral form that is a potential alternative to an injection. This form is more expensive; however, it eliminates the risk of needle-stick injury if the patient is combative, and it discourages “cheeking” (attempts to avoid swallowing by holding the pill in the cheek pouch). Aripiprazole (Abilify) is the first in a new class of antipsychotics, the dopamine system stabilizers. The most recently approved medications for schizophrenia include paliperidone (Invega), iloperidone (Fanapt), and asenapine (Saphris). Table 48-2 presents medication side effects and nursing implications for drugs used to treat thought disorders.

Table 48-2

Nursing Implications for Antipsychotic Drugs Used to Treat Thought Disorders

COMMON SIDE EFFECTS	NURSING IMPLICATIONS
Anticholinergic Side Effects	
Dry mouth	Provide adequate fluids. Suggest sugarless hard candy or gum and good oral care.
Urinary retention and hesitancy	Monitor voiding and elimination patterns.
Constipation	Administer stool softener. Encourage fluids and high fiber foods.
Blurred vision	Remind patient that blurred vision will cease once the body becomes accustomed to the drug.
Photophobia	Remind patient to wear sunglasses and a hat when in the sun.
Sexual dysfunction	Remind patient to alert treatment team for sexual difficulties.
Common Extrapyramidal Side Effects	
Pseudoparkinsonism: Masklike facies, stiff and stooped posture, shuffling gait, drooling, fine tremors, and pill-rolling movement.	May need to switch to a different antipsychotic. Administer anticholinergic medications such as trihexyphenidyl (Artane) or benztropine (Cogentin).
Akathisia: Characterized by pacing and motor restlessness.	Notify provider. Antipsychotic may need to be changed or an anticholinergic added to the drug regimen. Symptoms disappear when the drug is discontinued.
Other Adverse Neuromuscular Effects	
Tardive dyskinesia: Typically manifests after 6–12 mo or more of medication therapy. It is characterized by tongue protrusion, lip smacking, sucking, chewing, blinking, lateral jaw movements, grimacing, shoulder shrugging, pelvic thrusting, wrist and ankle flexion or rotation, foot tapping and toe movements, and rapid, purposeless, and irregular movements.	Prevention by assessment; encourage checkups every 3 mo. Discontinuing the drug does not always relieve the symptoms. No specific treatment other than discontinuing the drug. Give soft foods. Have patient wear soft shoes or slippers.
Neuroleptic malignant syndrome: A rare but potentially fatal reaction to antipsychotic medications. It is characterized by high fever, increased pulse,	Early detection increases survival rate.

muscle rigidity, stupor, diaphoresis, hyperkalemia, incontinence, elevated white blood cell count, and renal failure.		Stop all medications. Give supportive, symptomatic care. Decrease body temperature. Hydrate (oral and IV). Correct electrolyte imbalance. Medicate for dysrhythmias as ordered. Renal dialysis for renal failure.
Cardiovascular Side Effects		
Orthostatic hypotension Tachycardia Paliperidone (Invega) can cause cardiac dysrhythmias (i.e., QT prolongation)		Check blood pressure and pulse before giving medications. Inform patient to dangle feet before getting out of bed to prevent falls. Inform patient that tolerance will develop in several weeks. Report to provider or RN any history of cardiac disease before starting the medication. Increase fluid intake to expand vascular volume as ordered.
Miscellaneous Side Effects		
Sleepiness and fatigue		Inform patient that tolerance to the dosage will develop in 1-2 wk.
Photosensitivity		Administer medication at bedtime. Avoid direct sunlight. Wear protective clothing and sunscreen when outside.
Weight gain Hives and contact dermatitis		Monitor food intake. Notify provider if there is a rash; may need to discontinue or change the drug.

IV, Intravenous.

For patients with positive symptoms that do not respond to medication, repetitive transcranial magnetic stimulation (rTMS) may be an alternative (Frankenburg, 2014).

Clinical Cues

Clozapine (Clozaril) is significantly more effective than the other atypical antipsychotics but is less frequently prescribed because 1% of patients develop **agranulocytosis** (decreased white blood cells). Patients on this drug must have frequent blood tests (NAMI, 2014). The Joint Commission's National Quality Core Measures require that documentation reflects appropriate justification when patients are discharged with prescriptions of multiple antipsychotic medications.

Negative symptoms are treated with a therapeutic environment, including a therapeutic relationship with the nurse, and education regarding basic living skills. Historically, individuals with schizophrenia were shunned and stigmatized because of unusual and bizarre behavior. Evidence-based practice indicates that with early intervention these individuals can cope with symptoms and maintain independent and productive lives outside of an institution. Community mental health teams decrease likelihood of relapse (Frankenburg, 2014). Programs such as the Program for Assertive Community Treatment (PACT), Assertive Community Treatment (ACT), and Functional Adaptation Skills Training (FAST) include elements of patient and family support, education about disease management, and skills training (NAMI, 2014). If left untreated, individuals with schizophrenia are particularly vulnerable to poverty, homelessness, drug abuse, and suicide.

Cognitive-behavioral therapy (CBT), once believed to be helpful, has been shown by a team of international researchers to have little effect on schizophrenia symptoms (University of Hertfordshire, 2014).

Legal and Ethical Considerations

Rights of Psychiatric Patients

Psychiatric patients have the right to refuse medication and other therapies. Denial, paranoia, stigmatization, and lack of insight into illness contribute to the decision to refuse. In emergency situations, such as potential harm to self or others, the provider can order administration of involuntary medications. For routine ongoing treatment, the patient must be deemed incompetent and a court order must be obtained if the staff are to override the patient's right to refuse therapy.

Clinical Cues

Nursing students often have difficulty applying therapeutic communication skills with schizophrenic patients because these patients have trouble answering questions, conversing coherently, or expressing feelings. Remember to offer yourself ("Mr. Elliott, if you would like to

talk or walk around the unit, I can spend some time with you today.”) and attempt to understand (“Mr. Elliott, I am having a little difficulty understanding what you are saying, but I can tell you are trying to say something important.”). Spending even a few seconds with a paranoid schizophrenic patient is therapeutic because your attention builds trust and rapport and allows the patient to practice social skills. Also remember that the purpose of therapeutic communication is to meet the patient's needs, not to have your questions answered.

❖Nursing Management

■ Assessment (Data Collection)

When collecting information from patients who have thought disorders, the interview must be brief. Because there is a problem with logical thought processing, it is difficult for the individual to remain focused for very long. Mental status assessment tools, such as the Mini-Mental State Examination (MMSE) (see Chapter 47), are useful in evaluating thinking processes and the ability to abstract information. Assessment of a thought disorder involves observing the person's ability to think in a logical manner and the presence of psychotic features. Assessing the content and themes of hallucinations and delusions is important to ensure safety. For example, the patient may be receiving **command hallucinations** in which the voices are directing him to harm himself or others. Your patient may be experiencing delusions of persecution and be suspicious of staff and therefore refuse to eat. In addition, you should observe for stressors that seem to trigger or exacerbate disorganized behavior.

Patients with thought disorders may have difficulty verbalizing physical symptoms, and routine physical assessment should be performed to identify or monitor potential health problems. In addition, an initial and ongoing assessment of functionality, including activities of daily living (ADLs) and social skills, should be conducted. For example, the patient may have a disheveled appearance and dress in a bizarre fashion. Clothes may be worn in layers, backward, or inside out and be inappropriate to the season, or the patient may disrobe and stride about naked. One of the nursing goals would be to help the patient recognize and adopt socially appropriate attire.

■ Nursing Diagnosis

Typical problem statements for thought disorders may include:

- Confusion due to extreme anxiety and delusional thoughts
- Altered sensory perception (hallucinations) due to biochemical imbalance
- Limited coping ability in work or social situations
- Altered communication ability due to disorganized thoughts and loose associations
- Social isolation due to extreme distrust
- Altered self-care ability due to cognitive deficits
- Absence of compliance due to medication regimen
- Potential for violence due to command hallucinations

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

■ Planning

Sample outcomes for these problem statements might include:

- Patient will verbally acknowledge that delusional thinking and beliefs (e.g., accuses others of being FBI agents) increase during times of intense anxiety.
- Patient will spend decreased time attending to hallucinations (e.g., less time talking to self, less time listening for voices) before discharge.
- Patient will develop skills to adapt to a small social group within 6 months.
- Patient will communicate basic needs more clearly within 1 week.
- Patient will attend the community meeting for ____ minutes today.
- Patient will wash his face and hands with supervision this morning.
- Patient will identify three methods that will help him to continue medications (after discharge) at first follow-up appointment.
- Patient will refrain from hurting self or others during this shift.

Clinical Cues

Monitor your own appearance and clothing when you are working with patients who have thought disorders. First, be a role model for clear, matching, and appropriate clothing. Second, avoid flashy and dangling jewelry because patients are easily distracted by such objects. Third, watch what you put around your neck. An agitated patient can grab a long necklace, a scarf, a tie, or a stethoscope when out of control and in need of restraint.

Planning care for a patient with a thought disorder involves promoting safety, monitoring medications intended to relieve agitation or psychosis, observing for signs of medication side effects, promoting social skills, and ensuring adequate nutrition and sleep. **Care for these disorders will be long term, with intermittent treatment for acute episodes.** Patients need to be educated about the medications and coping skills necessary to function outside of a hospital setting. It is not unusual for a patient to stop taking medications because the voices returned and told him that all medications are unnecessary or harmful. For patients who are noncompliant with medications, a long-acting injectable form may be prescribed to prevent relapse ([American Psychiatric Association, 2004](#)). 

Think Critically

Can you think of some ways that nurses could devise to help individuals with thought disorders comply with the medication regimen?

Implementation

A priority intervention in working with schizophrenic patients is to administer antipsychotic medications. As with any medication, nursing responsibility includes not only giving the medication, but also monitoring the effectiveness and for any adverse effects. Antipsychotics have many serious side effects, some of which can be life threatening.

Patient Teaching

Antipsychotic Medications

Patients taking antipsychotic medications should be advised not to use alcohol. Combining alcohol and antipsychotic medications may impair judgment, thinking, and coordination because of the additional central nervous system depression.

Clinical Cues

In accordance with National Patient Safety Goals, there should be at least two identifiers before giving medication or blood products or taking blood samples. When patients are not able to state their correct legal name (because of confusion or psychosis), an alternative method would be to have two health care providers verify the patient's identity.

When dealing with an actively psychotic patient, use a calm and caring approach. Do not touch the patient without warning or permission, especially if he is agitated or paranoid. During active hallucinations, state reality and help the patient return to reality. "Mr. Elliott, you seem to be listening to something. I am not hearing any voices. Come and talk to me." Strategies for helping patients to manage persistent auditory hallucinations include monitoring what triggers the hallucinations, talking with someone, listening to music, watching TV, saying "stop," using earplugs, doing deep breathing or relaxation exercises, and doing a favorite activity.

You may have great difficulty understanding the patient because of **neologisms** (making up new words), **word salad** (disorganized mix of words, phrases, and fragments), or **loose associations** (expression of ideas that do not logically connect).

Cultural Considerations

Language

During times of stress, it is natural to revert to your first language. If your patient speaks English as a second language, obtain the assistance of a translator to determine whether the patient is having disturbances in communication (e.g., the patient's verbalizations might sound like word salad, but are actually a mixture of English and another language). Also, you can be charged with giving substandard care if you fail to call for a translator when the patient is unable to speak or understand English.

Use therapeutic communication and be attentive, respond to the underlying feelings, and gently verbalize concern. "Mr. Elliott, you seem really anxious to tell me something. I am trying to understand."

? Think Critically

You are caring for a patient who does not trust you. How does his distrust affect medication compliance? How will you establish trust and rapport with this patient?

General nursing interventions for the negative symptoms include establishing trust and teaching the patient and family how to manage the signs and symptoms. An attitude of acceptance is necessary to promote trust. Begin by offering yourself and being available to the patient even if he initially rejects your overtures to establish a therapeutic relationship: "I'm here if you want to spend some time talking today." You should model conventional social behaviors such as greeting the patient by name—"Good morning, Mr. Elliott"—and making friendly eye contact.

Cultural Considerations

Eye Contact

Lack of direct eye contact does not necessarily signal disinterest or an unwillingness to communicate. Direct eye contact may be considered a sign of disrespect by people from different cultural backgrounds (i.e., Asian, Hispanic/Latino).

Give patients positive feedback for making attempts to overcome negative symptoms: "You seemed very interested in the group discussion topic today." Do not make promises that you cannot keep, and if you make a promise, be sure to follow through.

Consistently invite the patient to join groups even if he rejects the initial invitations: "Mr. Elliott, we are going to play cards. Would you like to join us?" Acknowledge and thank the patient for his efforts to interact, even if he spends only a few seconds with you: "Thank you for talking to me today." Leave the door open for future interactions: "I understand if you don't want to talk today; maybe we can try tomorrow." Although these patients may have difficulty sustaining an interaction for even 1 or 2 minutes, persistent effort builds the **therapeutic alliance** (relationship between the patient and nurse) and increases the patient's self-esteem.

Complementary and Alternative Therapies

Music Therapy

Music therapy can be used with selected patients to treat positive and negative symptoms of schizophrenia. Participation in music groups increases socialization and stimulates interest. Encourage participants to express how the music makes them feel and to discuss their favorite kinds of music. Focused projects such as a performance event help patients to meet individual goals and experience success.

Administering medications and teaching the patient and family about antipsychotic medications are two additional nursing interventions. In addition, the side effects of the medications must be

monitored. **Nursing Care Plan 48-1** lists specific problem statements/nursing diagnoses, expected outcomes, and nursing interventions for individuals with thought disorders. **Box 48-2** lists additional interventions for patients who are angry, hostile, aggressive, manipulative, or paranoid.

*** Nursing Care Plan 48-1**

Care of the Patient With Schizophrenia

Scenario

George Coss is a 26-year-old man who was diagnosed with schizophrenia 7 years ago. He was taken to the emergency department yesterday after he destroyed his trailer home. George states, "There were demons in the walls." He is disheveled and unkempt and appears paranoid and reluctant to interact with the staff or other patients. He appears to be hearing voices and tells you, "I am Jesus, saving you, saving you; hear the demons. You, all of you are demons, yourselves are demons."

Problem Statement/Nursing Diagnosis

Confusion/Acute confusion related to delusional thinking, loosening of associations, or neurobiochemical imbalances.

Supporting Assessment Data

Subjective: States "You, all of you are demons, yourselves are demons."

Objective: Believes he is Jesus and believes others are demons.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will be able to talk for 5 min without discussion of delusions. Patient will be able to distinguish between reality and nonreality before discharge.	Assess the themes of delusions. Assess for situations that trigger anxiety and stress.	Delusional themes suggest fears and safety issues. Anxiety and stress are theorized to increase delusions and disorganized behavior.	Has a belief that he is being persecuted by demons. Currently very anxious and actively delusional; assessment for associated triggers continues. Patient is making continuous reference to demons.
	Reflect the underlying feelings ("It's frightening if you feel someone is trying to hurt you.")	Acknowledging feelings validates the patient's experience without agreeing with the delusional content.	Appears suspicious and fearful.
	State reality as you perceive it ("I believe that the hospital is a safe place.")	Corrects misperceptions without directly arguing against patient's perspective.	Reassured that the hospital is a safe place, but he continues to be fearful.
	Avoid arguing about the patient's delusional system.	Arguing causes patient to verbally defend own beliefs and potentially strengthens the delusional system.	Occasionally, patient appears to recognize certain staff members, but overall is highly delusional.
	Redirect discussions to real people and events.	Helps patient to stay focused on reality.	Continues unwavering in his beliefs in demons. Does respond when called by name (George); however, continues to verbalize the belief that he is Jesus.
	Administer antipsychotic medications as ordered and monitor for effectiveness and side effects.	Counteracts psychosis at the biochemical level.	Agrees to take risperidone (Risperdal) if administered by certain nurses. Outcomes not met. Continue plan.

Problem Statement/Nursing Diagnosis

Altered self-care ability/Self-care deficit related to cognitive impairment.

Supporting Assessment Data

Objective: Disheveled and unkempt.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will independently perform self-care within 1 wk.	Encourage the patient to independently perform ADLs according to current level of ability.	Performing ADLs helps the patient to focus on real tasks and decreases time spent in delusional thinking.	Is not initiating ADLs, but will perform brief tasks (e.g., washing face) with coaching.
Patient will dress appropriately and maintain appropriate hygiene before discharge.	Make available only the clothes the patient is to wear. Intervene as necessary if patient is unable to complete daily care.	Limiting choices decreases confusion and indirectly suggests appropriate attire. Initially the patient may not be able to complete ADLs because of impaired thought processes.	Is continuously changing clothes unless locked out of room. Mental health assistant verbally directed patient to shower. Patient became hostile; therefore shower deferred for today. Will try to have his brother assist him tomorrow.
	Offer positive reinforcement for any completed portion of ADLs.	Increase likelihood that desired behavior will be repeated.	Acknowledges feedback by looking up when spoken to.
	Assist the patient to make a structured plan if necessary.	Having a plan provides structure, goals, and ways to achieve goals, which helps the patient to complete tasks.	Verbally advised that shower is deferred for today, but that brother will help tomorrow. Agrees to wash hands and face today. Outcomes not met. Continue plan.

Problem Statement/Nursing Diagnosis

Altered sensory perception/Disturbed sensory perception related to neurobiochemical imbalance and anxiety.

Supporting Assessment Data

Subjective: States, "hear the demons."

Objective: Appears to be hearing voices.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will verbalize three ways to cope with hallucinations this week. Patient will verbalize a decrease in hallucinations before discharge.	Observe behavior that suggests that hallucination is occurring (e.g., talking to self, listening intently).	Staff can interrupt the hallucination in progress.	Observed in listening position and talking to self. Is actively hallucinating today (more than yesterday), appears upset; reason unclear.
	Assess for theme of hallucinations, especially command hallucinations (e.g., voices that say, "Kill others").	Knowing themes helps to anticipate violent or unexpected behavior.	Hearing command hallucinations ("I have the word, the word to save you").
	Redirect when hallucinations occur (e.g., "Talk with me.").	Interrupts hallucination in progress.	Patient does attend to nurse when spoken to; although he appears fearful, he will stay for 10-15 sec if he is given adequate space (e.g., 5 ft).
	Help patient recognize the feelings that are present before the hallucination.	Anxiety, fear, and stress are theorized to exacerbate hallucinations.	Unclear why patient is so agitated today; he is unable to verbalize specific feelings.
	State reality (e.g., "I understand that you hear voices. I do not hear those voices").	Helps patient to recognize and stay focused on reality.	Patient is actively hallucinating; only able to attend to nurse's voice for a few seconds.
	Teach patient to identify and use strategies to interrupt the hallucinations (e.g., seek out nursing staff, sing, listen to music).	Allows patient to cope with hallucinations. (For some patients, hallucinations never completely resolve.)	Unable to identify or teach alternative coping methods. Appears less agitated if not approached by other patients.
	Administer antipsychotic medications and monitor effectiveness and side effects.	Counteracts psychosis at the biochemical level.	Agrees to take risperidone (Risperdal) if administered by certain nurses. Outcomes not met. Continue plan.

Problem Statement/Nursing Diagnosis

Social isolation/Social isolation related to mistrust, bizarre behavior, or cognitive impairment.

Supporting Assessment Data

Subjective: "...all of you are demons."

Objective: Reluctant to interact with the staff or other patients.

Goals/Expected Outcomes	Nursing Interventions	Selected Rationale	Evaluation
Patient will engage in social interaction with others on the psychiatric unit (meals, outings, groups) within 2 wk.	Convey a warm, accepting attitude. Spend some structured time with the patient every day.	Builds therapeutic relationship. Encourages social interaction with a set time and purpose.	Has some trust toward selected nurses. Able to tolerate 10-15 sec of contact with nurses. Responds to his own name.
	Determine patient's interests.	Patient more likely to engage if interested in activities.	Family states that George is interested in baseball. Does show some interest in watching sports on television.
	Model social interaction and conversation. Create opportunities for socialization (e.g., card games).	Patient may be unaware of how to converse with others. Patient may not know how to independently engage others.	Is not initiating any conversations. Is able to attend group meeting for less than 1 min.
	Acknowledge and thank patient for any efforts to interact and participate in groups.	More likely to repeat behavior if encouraged and acknowledged.	Unable to participate in any group interaction today.
	Encourage the patient to interact with others, even if only briefly.	Brief contacts allow for gradual trust and familiarity to decrease suspiciousness.	Declined going to group music class this afternoon. Appears more restless and suspicious compared with yesterday. Patient unable to verbalize source of distress, no known event or trigger identified. Will continue to observe. Outcomes not met. Continue plan.

Critical Thinking Questions

1. Why is it important for a patient like George to have consistent social support after he is discharged from the hospital?
2. What can nurses do to help decrease the social stigma of chronic mental illnesses such as schizophrenia?

ADLs, Activities of daily living.

Box 48-2

Specific Nursing Interventions for Patients Who Are

Angry, Hostile, Aggressive, Manipulative, or Paranoid

Angry, Hostile, and Aggressive Behavior

- Continuously assess for nonverbal cues (pacing, fidgeting, and increase in verbalizations) and intervene early.
- Maintain a calm, self-assured attitude, even if you are frightened.
- Listen and acknowledge that you care and want to help.
- Be culturally aware of how your patient is interpreting eye contact.
- Allow the patient to have adequate personal space.
- Encourage the patient to find a quiet, safe place.
- Maintain your own safety—have adequate staff visually present in the background. However, only one person should attempt verbal de-escalation.
- Stand to the side or sideways to present yourself as a smaller target. Your hands should be relaxed at your sides or with the palms turned upward.
- Be aware of the exits and position yourself so that the patient is not blocking the exit.
- Ask for permission before touching. Defer therapeutic touching if the patient is highly agitated.
- Honestly verbalize the patient's options. For example, say, "You can stay in the dayroom if you can remain calm; otherwise it will be necessary for you to go to the quiet (seclusion) room."
- Set a time frame for verbal de-escalation. If progress is made within the time limit, continue. If not, remind the patient of the initial time limit.
- Offer appropriate PRN medications as ordered. If the patient continues to escalate and the behavior becomes aggressive, physical restraints may be necessary.
- Application of physical restraints requires a team approach by trained staff.
- Inform the patient of the staff's intentions and actions. Accurately document the entire episode, including all efforts to use the less restrictive measures before resorting to physical restraints.

Manipulative Behavior

- Set clear and realistic limits on specific behaviors.
- Establish realistic and enforceable consequences.
- Make certain that all staff are informed of the limits and are in agreement.
- Specific limits need to be documented in the plan of care/nurses' notes.
- The decision to discontinue limits should be made by the entire staff and should be made only when the patient has demonstrated consistent behavior.
- Be self-aware and establish clear boundaries.

Paranoid Behavior

- Assign only one or two staff members to the patient.
- Initially make brief contact with the patient, and do not make unnecessary demands.

- Increase credibility by being honest, adhering to a stated schedule, and following through on commitments.
- Do not touch a patient who is paranoid.
- Do not mix medications with food.
- Supply food in commercially wrapped packages if the patient is refusing to eat.

PRN, As needed.

■ Evaluation

To evaluate the effectiveness of nursing interventions, it is necessary to monitor the patient's progress toward expected outcomes. **Compliance with antipsychotic medications will decrease hallucinations and delusions (positive symptoms) and improve sleep.** It takes longer to achieve expected outcomes for the negative symptoms of schizophrenia than for the positive symptoms. Progress toward outcomes for the negative symptoms would include a decrease in psychomotor retardation, increase in self-care, improved affect, and an increase in motivation. In addition, the patient would exhibit a trusting attitude toward others and a decrease in social withdrawal.

Overview of Personality Disorders

Ordinarily, personality traits are flexible and adaptive. **Personality disorders** are enduring patterns of behavior in which there is no loss of contact with reality or impaired cognition. The patient with a personality disorder demonstrates an ongoing, inflexible pattern of behavior that is **very** different from others within the individual's culture.

Symptoms of personality disorders are usually first observed in late adolescence and early adulthood. Four characteristics of personality disorders are:

1. Inflexible and maladaptive response to life events
2. Serious difficulty in areas of personal and work relationships
3. Tendency to evoke interpersonal conflict
4. Tendency to evoke a negative empathic response from others

An actual diagnosis may not be made until the person reaches the late 20s or 30s; by then the entrenched behaviors are quite evident. It is not uncommon to note failed marriages, poor work histories, and considerable difficulty with interpersonal relationships.

The DSM-5 describes 10 different personality disorder types. Depending on the descriptive characteristics, these disorders are clustered into three separate categories. Cluster A includes behaviors that are considered **odd** or **eccentric** (schizotypal, schizoid, and paranoid). Cluster B describes behaviors that are considered **dramatic, emotional, and erratic** (antisocial, borderline, histrionic, and narcissistic). Individuals with Cluster C behaviors appear **anxious** and **fearful** (avoidant, dependent, and obsessive-compulsive). A final type of personality disorder is personality disorder NOS (not otherwise specified). **Box 48-3** provides a brief description of each of these personality disorders. Many psychiatrists feel a personality disorder cannot be diagnosed until a person is 18 years old. This chapter discusses borderline personality disorder because it is more commonly diagnosed and caring for patients with a borderline personality presents many challenges.

Box 48-3

Description of Personality Disorders

Cluster A (Odd and Eccentric)

- *Schizotypal*: Exhibits difficulty with close relationships, distortions in thinking and feeling, and odd or eccentric behavior.
- *Schizoid*: Exhibits withdrawal from social relationships and a restricted affect.
- *Paranoid*: Exhibits distrust and suspiciousness of others and feels that others wish him harm or evil.

Cluster B (Dramatic, Emotional, and Erratic)

- *Antisocial*: Exhibits disregard for, and violation of, the rights of others; lacks empathy.
- *Borderline*: Exhibits instability in interpersonal relationships and self-concept, labile emotions, and marked impulsivity.
- *Histrionic*: Exhibits pattern of extreme emotionality and attention-seeking behavior.
- *Narcissistic*: Exhibits grandiose behavior, intense need for admiration, and lack of empathy.

Cluster C (Anxious and Fearful)

- *Avoidant*: Exhibits social inhibition, feelings of inadequacy, and fear of rejection.
- *Dependent*: Exhibits behavior that is submissive and clinging; needy.
- *Obsessive-compulsive*: Exhibits behavior that is concerned with excessive orderliness, perfectionism, and need for control.

Borderline Personality Disorder

The main feature of **borderline personality disorder (BPD)** is “a pervasive pattern of instability in interpersonal relationships, self-image and emotions” (Grohol, 2014). Individuals with this disorder tend to be very impulsive, attach quickly and easily to others, and fear **real or imagined abandonment**. Emotions and relationships are very intense. In response to potential abandonment from caregivers or significant others, it is not unusual to see **self-mutilating behavior** (e.g., cutting on hands and wrists, cigarette burns) or **suicidal gestures**. Evidence-based practice suggests that the therapeutic goals for patients who self-mutilate include acquiring new coping methods, better impulse and emotional control, and increasing self-awareness (Warner and Spander, 2012).

Think Critically

You are assigned to escort a young patient to the smoking area. As she is finishing her cigarette, she touches the hot ash to her wrist and sustains a burn before you can stop her. She publicly announces to the staff and the other patients that you were negligent in watching her. How would you handle this?

Splitting, a primitive defense mechanism, involves the initial idealization of a caregiver or friend, followed by a hasty devaluing of that same person. A patient with BPD also may idealize one or two team members and devalue others. For example, the patient may say, “You are the best nurse I have ever had. No one else understands me like you do.” When the nurse returns after 2 days off, the patient would say, “I can't believe you didn't call me when you were off. I felt horrible and began cutting on my wrists, and it is your fault.” It is very important that the staff decide on an approach to use with a particular patient. To implement the plan properly, all team members must be consistent with the approach.

Impulsivity in at least two of the following areas also is characteristic of BPD: gambling, overeating, spending impulsively, abusing substances, engaging in unsafe sex, binge eating, or driving recklessly. Engaging in one or more of these impulsive behaviors is often the reason for admission to a hospital.

Treatment

Treatment for people with this disorder involves long-term psychotherapy, such as individual counseling and group or family therapy. The purpose of **psychotherapy** is to help the participants identify problem areas and work to change behavior and attitudes or modify feelings. The American Psychiatric Association recommends dialectical behavior therapy (DBT) for patients with BPD. This therapy includes individual counseling, telephone support, and skills training and has been shown to reduce self-destructive and impulsive episodes, anxiety, and hospitalization. In addition, DBT could be used to help the family members of patients. Patients with personality disorders can also benefit from milieu therapy. **Milieu therapy** uses the structured environment of a hospital or group home setting to help patients participate as active members of the milieu community and practice social behaviors. Medications are not indicated for personality disorders, although they are sometimes prescribed when there is a concurrent mood disorder.

Nursing Management

Assessment (Data Collection)

Collect information about how the individual views himself and others. Obtain a history of former relationships and identify how the individual typically expresses feelings. It is important not to make a hasty judgment and label a person with a personality disorder. For example, adolescents

may impulsively act out with substances and have identity problems, but these traits often disappear with maturity. In addition, when a patient is labeled as “borderline,” nurses may view the patient as “hopeless.” **Box 48-4** lists examples of behaviors nurses might observe when assessing a personality disorder.

Box 48-4

Guide for Assessing Patients With Personality Disorders

Observe and assess for the following:

- Acting without thinking; impulsivity
- Anger and possible rage when others do not share the same point of view
- Consistent poor judgment in making decisions
- Constant seeking of praise and admiration
- Evidence of self-destructive behavior
- Excessive use of manipulation to get needs met
- Expression of a need to control others
- Extreme envy of others
- Low self-esteem
- Self-centeredness
- Treatment of others as objects, not people
- Unreliability

Nursing Diagnosis

Typical problem statements for BPD may include:

- Social isolation due to immature and manipulative behavior
- Decreased self-esteem due to childhood abuse and neglect
- Limited coping ability due to emotional state outbursts
- Anxiety due to perceived threats of abandonment
- Potential for injury related to feelings of guilt and rejection

Specific NANDA-I diagnoses can be chosen from the NANDA-I list (see inside back cover).

Planning

Sample outcomes for the above problem statements include:

- Patient will discuss one example of how his behavior alienates others by the end of the week.
- Patient will share two things that he likes about himself in today's group meeting.
- Patient will identify three methods to cope with intense emotions (e.g., anger at staff or significant others) within 1 week.
- Patient will identify situations that provoke feelings of abandonment (e.g., favorite nurse is on vacation) and state two methods to reduce accompanying anxiety during this shift.
- Patient will substitute a safe behavior (e.g., talking to nurse, counting to 100) for self-mutilating behavior when experiencing feelings of guilt or rejection during hospitalization.

Planning for the care of a patient with BPD requires involvement of the entire team to define goals and to prevent the patient's inevitable attempts at staff manipulation. If possible, some staff debriefing time will help everyone to maintain a professional and optimistic focus when working

with patients who have this disorder.

Assignment Considerations

Interpersonal Skills

When planning care for your patients, incorporate the strengths and interpersonal skills of your team members and make assignments appropriately. For example, your patient is a 23-year-old woman who needs an escort to attend a group therapy class outside of the unit. She is known for her attempts to manipulate male staff members; therefore assign a mature female nursing assistant who is familiar with the patient's manipulative behavior.

Implementation

For individuals with BPD, setting limits is a priority intervention. Individuals must be taught healthy and nonmanipulative ways to have their needs met. To work with patients who have BPD, the staff needs to maintain good boundaries without being controlling, rigid, and inflexible. Patients with this disorder often ask you to “bend the rules” or grant special privileges. **The staff needs to consistently set limits with caring and empathy, offer a rationale, and decline negotiation.** If the patient views the limit setting as punitive, the behavior is certain to recur at a later time. This does not mean that the patient will always gladly accept the limit setting and be grateful for your concern. It does mean that you are assisting the patient in developing some internal sense of boundaries and subsequent changes in behavior.

It is also necessary to maintain a safe environment for patients with BPD, because they can be impulsive and do not have internal control. It may be necessary to initiate suicide precautions or help the patient who is self-mutilating to stop this behavior. See [Chapter 45](#) for information on suicide precautions.

Patients with personality disorders have an ability to “get under the skin” of caregivers. If you note a particularly intense reaction to a patient (excessive sympathy, empathy, anger, or frustration), it is important to talk about these feelings with a more experienced nurse or a trusted peer. Identify and express the feelings that the patient’s behavior evokes. Awareness of your own feelings will help you modify your reactions and focus on the therapeutic aspects of your relationship with the patient. Evidence suggests that the strength of the therapeutic alliance is related to overall outcomes of treatment ([Horvath et al, 2011](#)). In addition, the nurse’s skills and attitudes are just as important as any  prescribed medical intervention ([Fisher, 2011](#)). See the Evolve website for a Nursing Care Plan on personality disorders.

Evaluation

Achievement of long-term outcomes is demonstrated by new coping strategies for handling stressors, verbalizing anger without acting out, increasing independent decision making, and decreasing manipulative behaviors to have needs met. It is expected that in times of stress, the patient will revert to previously learned behaviors. When the stress has passed, you should encourage the patient to continue implementing new behaviors.

Community Care

At one time individuals with thought disorders were hospitalized indefinitely. With the introduction of antipsychotic medications, hospitalization is reserved for medication stabilization; then patients are released to a less restrictive type of care. In fact, community mental health teams are shown to increase patients' acceptance of treatment and reduce the need for hospitalization ([Malone et al, 2009](#)).

Older Adult Care Points

Because of the negative symptoms of social withdrawal, apathy, and sometimes paranoia, older adults with schizophrenia are not as likely to seek out nurses for help. They may ignore physical problems and often will not seek help for pain associated with physical disabilities.

Although there are fewer older adults with schizophrenia, they can present unique challenges for nurses who work in long-term care.

Safety Alert

Be Alert for Suicidal Ideations

Approximately 50% of patients who have schizophrenia think about suicide sometime during their lifetime. Community health nurses are in a position to make regular contact with these patients, assess for suicide even if the patient does not raise the issue, clearly communicate the intention to see the patient again, and help the patient to make a crisis response plan that includes hospitalization as needed ([Meerwijk et al, 2010](#)) (see [Chapter 45](#)).

Patients with personality disorders are not hospitalized unless they present an imminent danger to themselves via self-mutilation or suicidal gestures. Again, nurses come into contact with personality disorders in a variety of settings outside a psychiatric hospital. Setting limits and appropriate boundaries continues to be an effective intervention, regardless of the setting.

Patients with chronic mental illness are at high risk for social problems and may have limited encounters with health care professionals. For example, patients with schizophrenia are at a high risk for homelessness, and patients with personality disorders, particularly antisocial personality disorder, are more likely to be incarcerated. In accordance with *Healthy People 2020* goals, a greater percentage of people who are homeless and those who are in prison need mental health screening and access to treatment.

Get Ready for the NCLEX® Examination!

Key Points

- Thought disorders are characterized by disorganized thoughts and behavior and hallucinations. Mood and interpersonal relationships are altered.
- Schizophrenia is the most commonly diagnosed thought disorder and usually develops in late adolescence or the early 20s.
- The positive symptoms of schizophrenia (hallucinations, delusions, and disordered thinking) can be treated with antipsychotic medications.
- The negative symptoms of schizophrenia (apathy, social isolation, psychomotor retardation, blunted affect, poverty of thoughts, and lack of motivation) are responsive to some of the newer atypical medications but are more difficult to treat. Long-term social skills training and ongoing family and community support are essential.
- Older adults who are taking antipsychotics are at a greater risk for developing extrapyramidal symptoms, tardive dyskinesia, and neuroleptic malignant syndrome. Beginning doses should be one half to one third of the normal adult dose.
- General nursing management includes establishing trust and rapport, encouraging social skills, administering medications and monitoring effects, and educating the patient and family about the illness and the therapeutic regimen.
- Personality disorders are characterized by enduring traits.
- Borderline personality disorder is the most prevalent personality disorder. The hallmarks of personality disorders are inflexible and maladaptive response to life events, serious difficulty in personal and work relationships, a tendency to evoke interpersonal conflict, a tendency to evoke a negative empathic response from others, and impulsivity.
- For a patient with a personality disorder, assess the patient's view of self and others, expression of feelings, and behaviors that are interfering with life and relationships.
- General nursing management of patients with personality disorders includes building trust, setting limits, teaching coping skills, preventing self-harm, and encouraging insight into behavior.

Additional Learning Resources

 Go to your Study Guide for additional learning activities to help you master this chapter content.

Online Resources

- Mayo Clinic, www.mayoclinic.com/health/borderline-personality-disorder/DS00442
- National Alliance on Mental Illness, www.nami.org
- National Education Alliance Borderline Personality Disorder, www.borderlinepersonalitydisorder.com/
- National Institute of Mental Health, www.nimh.nih.gov/health/topics/schizophrenia/index.shtml
- Schizophrenia support and resources, www.schizophrenia.com/coping.html
- Schizophrenia treatment and recovery, www.helpguide.org/mental/schizophrenia_treatment_support.htm

Review Questions for the NCLEX® Examination

1. An older adult male patient on antipsychotic medications develops a flat affect with drooling and a shuffling gait. He has slowed movements, tremors, motor restlessness, apprehension, and irritability. The nurse would look for an order from the physician for which medication?

1. Benztropine (Cogentin)
2. Haloperidol (Haldol)

3. Chlorpromazine (Thorazine)
4. Perphenazine (Trilafon)

NCLEX Client Need: Physiological Integrity: Pharmacological Therapies

2. The nurse is administering medication to a familiar patient, who has been on the unit for several weeks. When asked to state his name, the patient replies, "I am Jesus Christ, the son of God." What is the best nursing action?

1. Give the medication, because the nurse knows he is confused.
2. Document that the patient cannot state his name and hold the medication.
3. Hold the medication until the family can bring in a picture identification.
4. Have a second nurse verify his identity and document accordingly.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

3. The nurse discusses the effects of a patient's antipsychotic medication with him. Which patient statement indicates a need for further teaching?

1. "The medication helps me to think more logically."
2. "The medication makes my mouth dry."
3. "The medication improves my mood."
4. "The medication helps to stop the voices."

NCLEX Client Need: Integrated Processes: Teaching/Learning

4. A patient reports to the nurse that he has been taking chlorpromazine (Thorazine) for 4 months. Which symptom is the cause for greatest concern?

1. Muscle rigidity
2. Tongue protrusion
3. Photophobia

4. Dry eyes

NCLEX Client Need: Physiological Integrity: Pharmacological Therapies

5. When the nurse is talking with a patient who is having active hallucinations, what is the priority action?

1. Assess the content and themes of hallucinations.
2. Give an antipsychotic medication.
3. Take the patient to a secluded area.
4. Set boundaries and explain rationale.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

6. A patient is suspicious and believes that he is surrounded by terrorists. He tells the nurse, "They put anthrax in the food and there is a bomb in the bathroom." What is the most therapeutic response?

1. "Who do you think is doing all these things?"
2. "Let's go together and check the bathroom."
3. "Tell me why you believe these things are happening."
4. "I believe that the hospital is a safe place."

NCLEX Client Need: Psychosocial Integrity: Therapeutic Communication

7. A patient demonstrates negative symptoms of apathy, social isolation, and lack of motivation. To establish trust, what should the nurse do? (*Select all that apply.*)

1. Offer self and be available.
2. Reorient to person, place, and time.
3. Keep all promises.
4. Invite the patient to join groups.
5. Leave the door open for future interactions.
6. Encourage independence in ADLs.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

8. A patient is readmitted for an acute psychotic episode. He appears to be having command hallucinations. What is the priority problem on his care plan?

1. Altered sensory perception
2. Potential for violence
3. Anxiety
4. Altered coping ability

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

9. A nurse is caring for a patient with a personality disorder. Which statement by the nurse indicates a need for additional training and education on setting boundaries?

1. "I can spend 20 minutes talking with you and then I have to pass medications."
2. "I understand that you are bored, but you have to complete the task."
3. "If you promise not to cause trouble, I'll give you the magazine."
4. "When someone is speaking in group, it is polite to listen while they speak."

NCLEX Client Need: Integrated Processes: Teaching/Learning

10. A patient is becoming progressively louder and more aggressive about getting a personal item (belt) that was taken from him for safety precautions. What intervention(s) should the nurse use? (*Select all that apply.*)

1. Continuously assess for pacing, fidgeting, and increase in verbalizations.
2. Maintain a calm, self-assured attitude, even if frightened.
3. Listen and state, "I care and want to help."
4. Move in close to the patient to reassure him.
5. Give the patient the belt and set strict limits on his behavior.

6. Stand to the side or sideways to present yourself as a smaller target.
7. Explain the hospital policy and offer him a copy.

NCLEX Client Need: Integrated Processes: Clinical Problem-Solving Process

Critical Thinking Questions

Scenario A

You are caring for Mrs. Jackson, a 62-year-old who has a fixed delusional system with many religious overtones. You notice that she is pacing and becoming increasingly agitated. She begins to yell in a loud voice about God and salvation and not being saved.

1. How might you approach Mrs. Jackson and help her to de-escalate?
2. What behaviors would cause you to consider physically restraining Mrs. Jackson?

Scenario B

Mr. Philip Munoz, 38 years old, was recently discharged from a psychiatric facility after an extended stay. He comes to the clinic for a renewal of his antipsychotic medications, accompanied by his father, who reports that his son is noncompliant with medications and has limited social interaction.

1. What nursing interventions could increase Mr. Munoz's compliance with therapy?
2. What type of community referrals would be appropriate for this patient and his family?

Scenario C

Mr. Abdul is admitted to the psychiatric unit for chronic schizophrenia. It is very difficult to understand Mr. Abdul, because he has thought disorders and manifests word salad, neologisms, and loose associations. He has not demonstrated any aggressive behaviors toward anyone, but he is unable to sustain interaction for more than a few seconds at a time.

1. What interventions could be used for the problem of altered communication ability?
2. Write a communication goal that would be appropriate for Mr. Abdul.
3. Identify an activity that would be appropriate for this patient.

Scenario D

A 28-year-old patient, Cindy Stalling, arrives at the clinic with a superficial scratch on the wrist. She begins to cry, "You are the best nurse here. You're always so kind and understanding. Would you call my boyfriend and tell him that I am here? I cut myself because we just broke up." You know Ms. Stalling because she has been in the clinic many times with similar minor injuries. In the past, she has been manipulative and verbally abusive toward the staff.

1. What behaviors suggest that Ms. Stalling may have a personality disorder?
2. How would you respond to her request to call her boyfriend?

APPENDIX A

Most Common Laboratory Test Values

Table A-1
Reference Intervals for Hematology

TEST	CONVENTIONAL UNITS	SI UNITS
Acid hemolysis (Ham test)	No hemolysis	No hemolysis
Alkaline phosphatase, leukocyte	Total score, 14-100	Total score, 14-100
Cell Counts		
Erythrocytes		
Males	4.6-6.2 million/mm ³	4.6-6.2 × 10 ¹² /L
Females	4.2-5.4 million/mm ³	4.2-5.4 × 10 ¹² /L
Children (varies with age)	4.5-5.1 million/mm ³	4.5-5.1 × 10 ¹² /L
Leukocytes, total	4,500-11,000/mm ³	4.5-1.0 × 10 ⁹ /L
Leukocytes, differential counts*		
Myelocytes	0%	0/L
Band neutrophils	3%-5%	150-400 × 10 ⁶ /L
Segmented neutrophils	54%-62%	3000-5800 × 10 ⁶ /L
Lymphocytes	25%-33%	1500-3000 × 10 ⁶ /L
Monocytes	3%-7%	300-500 × 10 ⁶ /L
Eosinophils	1%-3%	50-250 × 10 ⁶ /L
Basophils	0%-1%	15-50 × 10 ⁶ /L
Platelets	150,000-400,000/mm ³	150-400 × 10 ⁹ /L
Reticulocytes	25,000-5,000/mm ³ (0.5%-1.5% of erythrocytes)	25-75 × 10 ⁹ /L
Coagulation Tests		
Bleeding time (template)	2.75-8.00 min	2.75-8.00 min
Coagulation time (glass tube)	5-15 min	5-15 min
D-Dimer	<0.5 mcg/mL	<0.5 mg/L
Factor VIII and other coagulation factors	50%-150% of normal	0.5-1.5 of normal
Fibrin split products (Thrombo-Welco test)	<10 mcg/mL	<10 mg/L
Fibrinogen	200-400 mg/dL	2.0-4.0 g/L
Partial thromboplastin time, activated (aPTT)	20-25 sec	20-35 sec
Prothrombin time (PT)	12.0-14.0 sec	12.0-14.0 sec
Coombs test		
Direct	Negative	Negative
Indirect	Negative	Negative
Corpuscular Values of Erythrocytes		
Mean corpuscular hemoglobin (MCH)	26.34 pg/cell	26.34 pg/cell
Mean corpuscular volume (MCV)	80.96 μm ³	80.96 fL
Mean corpuscular hemoglobin concentration (MCHC)	32.36 g/dL	320-360 g/L
Haptoglobin	20-165 mg/dL	0.20-1.65 g/L
Hematocrit		
Males	40-54 mL/dL	0.40-0.54 g/L
Females	37-47 mL/dL	0.37-0.47 g/L
Newborns	49-54 mL/dL	0.49-0.54 g/L
Children (varies with age)	35-49 mL/dL	0.35-0.49 g/L
Hemoglobin		
Males	13.0-18.0 g/dL	8.1-11.2 mmol/L
Females	12.0-16.0 g/dL	7.4-9.9 mmol/L
Newborns	16.5-19.5 g/dL	10.2-12.1 mmol/L
Children (varies with age)	11.2-16.5 g/dL	7.0-10.2 mmol/L
Hemoglobin, fetal	<1.0% of total	<0.01 of total
Hemoglobin A1C	3%-5% of total	0.03-0.05 of total
Hemoglobin A2	1.5%-3.0% of total	0.015-0.03 of total
Hemoglobin, plasma	0.0-5.0 mg/dL	0.0-3.2 μmol/L
Methemoglobin	30-130 mg/dL	19-80 μmol/L
Erythrocyte Sedimentation Rate (ESR)		
Wintrobe		
Males	0-5 mm/hr	0-5 mm/hr
Females	0-15 mm/hr	0-15 mm/hr
Westergren		
Males	0-15 mm/hr	0-15 mm/hr
Females	0-20 mm/hr	0-20 mm/hr

*Conventional units are percentages; SI units are absolute cell counts.

From McCloskey LJ: Reference intervals for interpretation of laboratory test values. In Bope ET, Rakel RE, Kellerman R (Eds), *Conn's current therapy 2010*, Philadelphia, 2010, Saunders.

Table A-2
Reference Intervals* for Clinical Chemistry (Blood, Serum, and Plasma)

ANALYTE	CONVENTIONAL UNITS	SI UNITS
Acetoacetate plus acetone		
Qualitative	Negative	Negative
Quantitative	0.3-2.0 mg/dL	30-200 μmol/L
Acid phosphatase, serum (thymolphthalein monophosphate substrate)	0.1-0.6 U/L	0.1-0.6 U/L
ACTH (see Corticotropin)		
Alanine aminotransferase (ALT), serum (SGPT)	1-45 U/L	1-45 U/L
Albumin, serum	3.3-5.2 g/dL	33-52 g/L
Aldolase, serum	0.0-7.0 U/L	0.0-7.0 U/L
Aldosterone, plasma		
Standing	5-30 ng/dL	140-830 pmol/L
Recumbent	3-10 ng/dL	80-275 pmol/L

Alkaline phosphatase (ALP), serum		
Adult	35-150 U/L	35-150 U/L
Adolescent	100-500 U/L	100-500 U/L
Child	100-350 U/L	100-350 U/L
Ammonia nitrogen, plasma	10-50 µmol/L	10-50 µmol/L
Amylase, serum	25-125 U/L	25-125 U/L
Anion gap, serum calculated	8-16 mEq/L	8-16 mmol/L
Ascorbic acid, blood	0.4-1.5 mg/dL	23-85 µmol/L
Aspartate aminotransferase (AST), serum (SGOT)	1-36 U/L	1-36 U/L
Base excess, arterial blood, calculated	0 ± 2 mEq/L	0 ± 2 mmol/L
Beta-carotene, serum	60-260 mcg/dL	1.1-8.6 µmol/L
Bicarbonate		
Venous plasma	23-29 mEq/L	23-29 mmol/L
Arterial blood	21-27 mEq/L	21-27 mmol/L
Bile acids, serum	0.3-3.0 mg/dL	0.8-7.6 mmol/L
Bilirubin, serum		
Conjugated	0.1-0.4 mg/dL	1.7-6.8 µmol/L
Total	0.3-1.1 mg/dL	5.1-19.0 µmol/L
Calcium, serum	8.4-10.6 mg/dL	2.10-2.65 mmol/L
Calcium, ionized, serum	4.25-5.25 mg/dL	1.05-1.30 mmol/L
Carbon dioxide, total, serum or plasma	24-31 mEq/L	24-31 mmol/L
Carbon dioxide tension (PCO ₂), blood	35-45 mm Hg	35-45 mm Hg
Ceruloplasmin, serum	23-44 mg/dL	230-440 mg/L
Chloride, serum or plasma	96-106 mEq/L	96-106 mmol/L
Cholesterol, serum or EDTA plasma		
Desirable range	<200 mg/dL	<52.0 mmol/L
Low-density lipoprotein (LDL) cholesterol	60-180 mg/dL	1.55-4.65 mmol/L
High-density lipoprotein (HDL) cholesterol	30-80 mg/dL	0.80-2.05 mmol/L
Copper	70-140 mcg/dL	11-22 µmol/L
Corticotropin (ACTH), plasma, 8 A.M.	10-80 pg/mL	2-18 pmol/L
Cortisol, plasma		
8 A.M.	6-23 mcg/dL	170-630 µmol/L
4 P.M.	3-15 mcg/dL	80-410 µmol/L
10 P.M.	<50% of 8 A.M. value	<50% of 8 A.M. value
Creatinine, serum		
Males	0.2-0.5 mg/dL	15-40 µmol/L
Females	0.3-0.9 mg/dL	25-70 µmol/L
Creatine kinase (CK), serum		
Males	55-170 U/L	55-170 U/L
Females	30-135 U/L	30-135 U/L
Creatinin kinase MB isoenzyme, serum	<5% of total CK activity <5% of ng/mL by immunoassay	<5% of total CK activity <5% of ng/mL by immunoassay
Creatinine, serum	0.6-1.2 mg/dL	50-110 µmol/L
Estradiol-17-beta, adult		
Males	10-65 pg/mL	35-240 pmol/L
Females		
Follicular	30-100 pg/mL	110-370 pmol/L
Ovulatory	200-400 pg/mL	730-1470 pmol/L
Luteal	50-140 pg/mL	180-510 pmol/L
Ferritin, serum	20-200 ng/mL	20-200 mcg/L
Fibrinogen, plasma	200-400 mg/dL	2.0-4.0 g/L
Folate, serum	3-18 ng/mL	6.8-41 nmol/L
Erythrocytes	145-540 ng/mL	330-1420 nmol/L
Follicle-stimulating hormone (FSH), plasma		
Males	4-25 mU/mL	4-25 U/L
Females, premenopausal	4-30 mU/mL	4-30 U/L
Females, postmenopausal	40-250 mU/mL	40-250 U/L
Gamma-glutamyltransferase (GGT), serum	5-40 U/L	5-40 U/L
Gastrin, fasting, serum	0-100 pg/mL	0-100 ng/L
Glucose, fasting, plasma or serum	70-100 mg/dL	3.9-5.55 nmol/L
Growth hormone (hGH), plasma, adult, fasting	0-6 ng/mL	0-6 mcg/L
Haptoglobin, serum	20-165 mg/dL	0.20-1.65 g/L
Beta-hydroxybutyrate	0.3-2.8 mg/dL	20-280 µmol/L
Immunoglobulins, serum (see Table A-8)		
Iron, serum	75-175 mcg/dL	13-31 µmol/L
Iron-binding capacity, serum		
Total	250-410 mcg/dL	45-73 µmol/L
Saturation	20%-55%	0.20-0.55
Lactate		
Venous whole blood	5.0-20.0 mg/dL	0.6-2.2 mmol/L
Arterial whole blood	5.0-15.0 mg/dL	0.6-1.7 mmol/L
Lactate dehydrogenase (LD), serum	110-220 U/L	110-220 U/L
Lipase, serum	10-140 U/L	10-140 U/L
Lutropin (LH), serum		
Males	1-9 U/L	1-9 U/L
Females		
Follicular phase	2-10 U/L	2-10 U/L
Midcycle peak	15-65 U/L	15-65 U/L
Luteal phase	1-12 U/L	1-12 U/L
Postmenopausal	12-65 U/L	12-65 U/L
Magnesium, serum	1.3-2.1 mg/dL	0.65-1.05 mmol/L
Osmolality	275-295 mOsm/kg water	275-295 mOsm/kg water
Oxygen, blood, arterial, room air		
Partial pressure (PaO ₂)	80-100 mm Hg	80-100 mm Hg
Saturation (SaO ₂)	95%-98%	95%-98%
pH, arterial blood	7.35-7.45	7.35-7.45
Phosphate, inorganic, serum		
Adult	3.0-4.5 mg/dL	1.0-1.5 mmol/L
Child	4.0-7.0 mg/dL	1.3-2.3 mmol/L
Potassium		
Serum	3.5-5.0 mEq/L	3.5-5.0 mmol/L
Plasma	3.5-4.5 mEq/L	3.5-4.5 mmol/L
Progesterone, serum, adult		
Males	0.0-0.4 ng/mL	0.0-1.3 mmol/L
Females		
Follicular phase	0.1-1.5 ng/mL	0.3-4.8 mmol/L
Luteal phase	2.5-28.0 ng/mL	8.0-89.0 mmol/L
Prolactin, serum		
Males	1.0-15.0 ng/mL	1.0-15.0 mcg/L
Females	1.0-20.0 ng/mL	1.0-20.0 mcg/L
Protein, serum, electrophoresis		
Total	6.0-8.0 g/dL	60-80 g/L
Albumin	3.5-5.5 g/dL	35-55 g/L
Globulins		
Alpha ₁	0.2-0.4 g/dL	2.0-4.0 g/L

Alpha ₂	0.5-0.9 g/dL	5.0-9.0 g/L
Beta	0.6-1.1 g/dL	6.0-11.0 g/L
Gamma	0.7-1.7 g/dL	7.0-17.0 g/L
Pyruvate, blood	0.3-0.9 mg/dL	0.03-0.10 mmol/L
Rheumatoid factor	0.0-30.0 U/mL	0.0-30.0 kU/L
Sodium, serum or plasma	135-145 mEq/L	135-145 mmol/L
Testosterone, plasma		
Males, adult	300-1200 ng/dL	10.4-41.6 nmol/L
Females, adult	20-75 ng/dL	0.7-2.6 nmol/L
Pregnant females	40-200 ng/dL	1.4-6.9 nmol/L
Thyroglobulin	3-42 ng/mL	3-42 mcg/L
Thyrotropin (hTSH), serum	0.4-4.8 mIU/mL	0.4-4.8 mU/L
Thyrotropin-releasing hormone (TRH)	5-60 pg/mL	5-60 ng/L
Thyroxine (FT ₄), free, serum	0.9-2.1 ng/dL	12-27 pmol/L
Thyroxine (T ₄), serum	4.5-12.0 mcg/mL	58-154 nmol/L
Thyroxine-binding globulin (TBG)	15.0-34.0 mcg/mL	15.0-34.0 mg/L
Transferrin	250-430 mg/dL	2.5-4.3 g/L
Triglycerides, serum, after 12-hr fast	40-150 mg/dL	0.4-1.5 g/L
Triiodothyronine (T ₃), serum	70-190 ng/dL	1.1-2.9 nmol/L
Triiodothyronine uptake, resin (T ₃ RU)	25%-38%	0.25-0.38
Tropponin I	0.05-0.50 ng/mL	0.05-0.50 ng/mL
Ururate		
Males	2.5-8.0 mg/dL	150-480 μmol/L
Females	2.2-7.0 mg/dL	130-420 μmol/L
Urea, serum or plasma	24-49 mg/dL	4.0-8.2 mmol/L
Urea, nitrogen, serum or plasma	11-23 mg/dL	8.0-16.4 nmol/L
Viscosity, serum	1.1-1.8 × water	1.1-1.8 × water
Vitamin A, serum	20-80 mcg/dL	0.70-2.80 μmol/L
Vitamin B ₁₂ , serum	180-900 pg/mL	133-664 pmol/L

*Reference values may vary, depending on the method and sample source used.

ACTH, Adrenocorticotrophic hormone; EDTA, ethylenediaminetetraacetic acid; mU, milliunit; mIU, microunit; kIU, killiunit; SGPT, serum glutamic pyruvic transaminase.

Table A-3

Reference Intervals* for Therapeutic Drug Monitoring (Serum or Plasma)

ANALYTE	THERAPEUTIC RANGE	TOXIC CONCENTRATIONS	PROPRIETARY NAME(s)
Analgesics			
Acetaminophen	10-40 mcg/mL	>150 mcg/mL	Tylenol, Datril
Salicylate	100-250 mcg/mL	>300 mcg/mL	Aspirin, Bufferin
Antibiotics			
Amikacin	20-30 mcg/mL	Peak >35 mcg/mL Trough <10 mcg/mL	Amkin
Gentamicin	5-10 mcg/mL	Peak >10 mcg/mL Trough >2 mcg/mL	Garamycin
Tobramycin	5-10 mcg/mL	Peak >10 mcg/mL Trough >2 mcg/mL	Nebcin
Vancomycin	5-35 mcg/mL	Peak >40 mcg/mL Trough >10 mcg/mL	Vancocin
Anticonvulsants			
Carbamazepine	5-12 mcg/mL	>15 mcg/mL	Tegretol
Ethosuximide	40-100 mcg/mL	>250 mcg/mL	Zarontin
Phenobarbital	15-40 mcg/mL	40-100 ng/mL (varies widely)	Luminal
Phenytoin	10-20 mcg/mL	>20 mcg/mL	Dilantin
Primidone	5-12 mcg/mL	>15 mcg/mL	Mysoline
Valproic acid	50-100 mcg/mL	>100 mcg/mL	Depakene
Antineoplastics and Immunosuppressives			
Cyclosporine	100-300 ng/mL	>400 ng/mL	Sandimmune
Methotrexate, high-dose, 48 hr	Variable	>1 μmol/L, 48 hr after dose	
Tacrolimus (FK-506), whole blood	3-20 mcg/L	>15 mcg/L	Prograf
Bronchodilators and Respiratory Stimulants			
Caffeine	3-15 ng/mL	>30 ng/mL	Elixophyllin
Theophylline (aminophylline)	10-20 mcg/mL	>30 mcg/mL	Quibron
Cardiovascular Drugs			
Amiodarone (obtain specimen more than 8 hr after last dose)	1.0-2.0 mcg/mL	>2.0 mcg/mL	Cordarone
Digoxin (obtain specimen more than 6 hr after last dose)	0.8-2.0 ng/mL	>2.4 ng/mL	Lanoxin
Disopyramide	2-5 mcg/mL	>7 mcg/mL	Norpace
Flecainide	0.2-1.0 mcg/mL	>1 mcg/mL	Tambocor
Lidocaine	1.5-5.0 mcg/mL	>6 mcg/mL	Xylocaine
Mexitilene	0.7-2.0 mcg/mL	>2 mcg/mL	Mexitil
Procainamide	4-10 mcg/mL	>12 mcg/mL	Pronestyl
Procainamide plus NAPA (N-acetyl procainamide)	8-30 mcg/mL	>30 mcg/mL	
Propranolol	50-100 ng/mL	Variable	Inderal
Quinidine	2-5 mcg/mL	>6 mcg/mL	Cardioquin, Quinaglute
Tocainide	4-10 ng/mL	>10 ng/mL	Tonocard
Psychopharmacologic Drugs			
Amitriptyline	120-150 ng/mL	>500 ng/mL	Elavil, Triavil
Bupropion	25-100 ng/mL	Not applicable	Wellbutrin
Desipramine	150-300 ng/mL	>500 ng/mL	Norpramin
Imipramine	125-250 ng/mL	>400 ng/mL	Tofranil
Lithium (obtain specimen 12 hr after last dose)	0.6-1.5 mEq/L	>1.5 mEq/L	Lithobid
Nortriptyline	50-150 ng/mL	>500 ng/mL	Aventyl, Pamelor

*Values may vary depending on the method and sample collection device used. Always consult the reference values provided by the laboratory performing the analysis.

Table A-4

Reference Intervals* for Clinical Chemistry (Urine)

ANALYTE	CONVENTIONAL UNITS	SI UNITS
Acetone and acetoacetate, qualitative	Negative	Negative

Albumin		
Qualitative	Negative	Negative
Quantitative	10-100 mg/24 hr	0.15-1.5 µmol/day
Aldosterone	3-20 mcg/24 hr	8.3-55 nmol/day
Delta-aminolevulinic acid (δ-ALA)	1.3-7.0 mg/24 hr	10-53 µmol/day
Amylase	<17 U/hr	<17 U/hr
Amylase/creatinine clearance ratio	0.01-0.04	0.01-0.04
Bilirubin, qualitative	Negative	Negative
Calcium (regular diet)	>250 mg/24 hr	<6.3 nmol/day
Catecholamines		
Epinephrine	<10 mcg/24 hr	<55 nmol/day
Norepinephrine	<100 mcg/24 hr	<590 nmol/day
Total free catecholamines	4-126 mcg/24 hr	24-745 nmol/day
Total metanephrines	0.1-1.6 mg/24 hr	0.5-8.1 µmol/day
Chloride (varies with intake)	110-250 mEq/24 hr	110-250 mmol/day
Copper	0-50 mcg/24 hr	0.0-0.80 µmol/day
Cortisol, free	10-100 mcg/24 hr	27.6-276 nmol/day
Creatine		
Males	0.40 mg/24 hr	0.0-0.30 mmol/day
Females	0.80 mg/24 hr	0.0-0.60 mmol/day
Creatinine	15-25 mg/kg/24 hr	0.13-0.22 mmol/kg/day
Creatinine clearance (endogenous)		
Males	110-150 mL/min/1.73 m ²	110-150 mL/min/1.73 m ²
Females	105-132 mL/min/1.73 m ²	105-132 mL/min/1.73 m ²
Cystine or cysteine	Negative	Negative
Dehydroepiandrosterone		
Males	0.2-2.0 mg/24 hr	0.7-6.9 µmol/day
Females	0.2-1.8 mg/24 hr	0.7-6.2 µmol/day
Estrogens, total		
Males	4-25 mcg/24 hr	14-90 nmol/day
Females	5-100 mcg/24 hr	18-360 nmol/day
Glucose (as reducing substance)	>250 mg/24 hr	>250 mg/day
Hemoglobin and myoglobin, qualitative	Negative	Negative
Homogentisic acid, qualitative	Negative	Negative
17-Hydroxycorticosteroids		
Males	3-9 mg/24 hr	8.3-25 µmol/day
Females	2-8 mg/24 hr	5.5-22 µmol/day
5-Hydroxyindoleacetic acid		
Qualitative	Negative	Negative
Quantitative	2-6 mg/24 hr	10-31 µmol/day
17-Ketogenic steroids		
Males	5-23 mg/24 hr	17-80 µmol/day
Females	3-15 mg/24 hr	10-52 µmol/day
17-Ketosteroids		
Males	8-22 mg/24 hr	28-76 µmol/day
Females	6-15 mg/24 hr	21-52 µmol/day
Magnesium	6-10 mEq/24 hr	3-5 mmol/day
Metanephrides	0.05-12.00 ng/mg creatinine	0.03-0.70 mmol/mmol creatinine
Osmolality	38-1400 mOsm/kg water	38-1400 mOsm/kg water
pH	4.6-8.0	4.6-8.0
Phenylpyruvic acid, qualitative	Negative	Negative
Phosphate	0.4-1.3 g/24 hr	13-42 mmol/day
Porphobilinogen		
Qualitative	Negative	Negative
Quantitative	<2 mg/24 hr	<9 µmol/day
Porphyryns		
Coproporphyrin	50-250 mcg/24 hr	77-380 nmol/day
Uroporphyrin	10-30 mcg/24 hr	12-36 nmol/day
Potassium	25-125 mEq/24 hr	25-125 mmol/day
Pregnanediol		
Males	0.0-1.9 mg/24 hr	0.0-6.0 µmol/day
Females		
Proliferative phase	0.0-2.6 mg/24 hr	0.0-8.0 µmol/day
Luteal phase	2.6-10.6 mg/24 hr	8-33 µmol/day
Postmenopausal	0.2-1.0 mg/24 hr	0.6-3.1 µmol/day
Pregnanetriol	0.0-2.5 mg/24 hr	0.0-7.4 µmol/day
Protein, total		
Qualitative	Negative	Negative
Quantitative	10-150 mg/24 hr	10-150 mg/day
Protein/creatinine ratio	<0.2	<0.2
Sodium (regular diet)	60-260 mEq/24 hr	60-260 mmol/day
Specific gravity		
Random specimen	1.003-1.030	1.003-1.030
24-hr collection	1.015-1.025	1.015-1.025
Urate (regular diet)	250-750 mg/24 hr	1.5-4.4 mmol/day
Urobilinogen	0.5-4.0 mg/24 hr	0.6-6.8 µmol/day
Vanillylmandelic acid (VMA)	1.0-8.0 mg/24 hr	5-40 µmol/day

*Values may vary, depending on the method used.

Table A-5
Reference Intervals for Toxic Substances

ANALYTE	CONVENTIONAL UNITS	SI UNITS
Arsenic, urine	<130 mcg/24 hr	<1.7 µmol/day
Bromides, serum, inorganic	<100 mg/dL	<10 mmol/L
Toxic symptoms	140-1000 mg/dL	14-100 mmol/L
Carboxyhemoglobin, blood	Saturation, percent	
Urban environment	<5%	<0.05
Smokers	<12%	<0.12
Symptoms		
Headache	>15%	>0.15
Nausea and vomiting	>25%	>0.25
Potentially lethal	>50%	>0.50
Ethanol, blood	<0.05 mg/dL <0.005%	<1.0 mmol/L
Intoxication	>100 mg/dL >0.1%	>22 mmol/L
Marked intoxication	300-400 mg/dL 0.3%-0.4%	65-87 mmol/L

Alcoholic stupor	400-500 mg/dL 0.4%-0.5% >500 mg/dL	87-109 mmol/L
Coma	0.5%	>109 mmol/L
Lead, blood		
Adults	<20 mcg/dL	<1.0 μmol/L
Children	<10 mcg/dL	<0.5 μmol/L
Lead, urine	<80 mcg/24 hr	<0.4 μmol/day
Mercury, urine	<10 mcg/24 hr	<150 nmol/day

Table A-6
Reference Intervals for Tests Performed on Cerebrospinal Fluid

TEST	CONVENTIONAL UNITS	SI UNITS
Cells	<5 mm ³ , all mononuclear	<5 × 10 ⁶ /L, all mononuclear
Protein electrophoresis	Albumin predominant	Albumin predominant
Glucose	50-75 mg/dL (20 mg/dL less than in serum)	2.8-4.2 mmol/L (1.1 mmol/L less than in serum)
Immunoglobulin G (IgG)		
Children <14 yr	<8% of total protein	<0.08 of total protein
Adults	<14% of total protein	<0.14 of total protein
IgG index	0.3-0.6	0.3-0.6
Oligoclonal banding on electrophoresis	Absent	Absent
Pressure, opening	70-180 mm H ₂ O	70-180 mm H ₂ O
Protein, total	15-45 mg/dL	150-450 mg/L

Table A-7
Reference Intervals for Tests of Gastrointestinal Function

TEST	CONVENTIONAL UNITS
Bentrimide	6-hr urinary arylamine excretion >57% excludes pancreatic insufficiency
Beta-carotene, serum	60-250 ng/dL
Fecal fat estimation	
Qualitative	No fat globules seen by high-power microscope
Quantitative	<6 g/24 hr (>95% coefficient of fat absorption)
Gastric acid output	
Basal	
Males	0.0-10.5 mmol/hr
Females	0.0-5.6 mmol/hr
Maximum (after histamine or pentagastrin)	
Males	9.0-48.0 mmol/hr
Females	6.0-31.0 mmol/hr
Ratio: basal/maximum	
Males	0.0-0.31
Females	0.0-0.29
Secretin test, pancreatic fluid	
Volume	>1.8 mL/kg/hr
Bicarbonate	>80 mEq/L
D-Xylose absorption test, urine	>20% of ingested dose excreted in 5 hr

Table A-8
Reference Intervals for Tests of Immunologic Function

TEST	CONVENTIONAL UNITS	SI UNITS
Complement, serum		
C3	85-175 mg/dL	0.85-1.75 g/L
C4	15-45 mg/dL	150-450 mg/L
Total hemolytic (CH ₅₀)	150-250 U/mL	150-250 U/mL
Immunoglobulins, serum, adult		
IgG	640-1350 mg/dL	6.4-13.5 g/L
IgA	70-310 mg/dL	0.70-3.1 g/L
IgM	90-350 mg/dL	0.90-3.5 g/L
IgD	0.0-6.0 mg/dL	0.0-60 mg/L
IgE	0.0-430 ng/dL	0.0-430 mg/L
Autoantibodies, serum, adult		
Antinuclear antibody	<1 : 40	—
Anti-dsDNA antibody	0-40 U	0-40 U/mL
Anti-CCP	0-19 units	—
Rheumatoid factor	0-30 mg/dL	—

Table A-9
Lymphocyte Subsets, Whole Blood, Heparinized

ANTIGEN(s) EXPRESSED	CELL TYPE	PERCENTAGE	ABSOLUTE CELL COUNT
CD3	Total T cells	56-77	860-1880
CD19	Total B cells	7-17	140-370
CD3 and CD4	Helper-inducer cells	32-54	550-1190
CD3 and CD8	Suppressor-cytotoxic cells	24-37	430-1060
CD3 and DR	Activated T cells	5-14	70-310
CD2	E rosette T cells	73-87	1040-2160
CD16 and CD56	Natural killer (NK) cells	8-22	130-500
Helper/suppressor ratio: 0.8-1.8	—	—	—

Table A-10
Reference Values for Semen Analysis

TEST	CONVENTIONAL UNITS	SI UNITS
Volume	2-5 mL	2-5 mL
Liquefaction	Complete in 15 min	Complete in 15 min
pH	7.2-8.0	7.2-8.0
Leukocytes	Occasional or absent	Occasional or absent
Spermatozoa		
Count	60-150 × 10 ⁶ mL	60-150 × 10 ⁶ mL
Motility	>80% motile	>0.80 motile
Morphology	80%-90% normal forms	>0.80-0.90 normal forms
Fructose	>150 mg/dL	>8.33 mmol/L

APPENDIX B

Standard Precautions*

Assume that every person is potentially infected or colonized with an organism that could be transmitted in the health care setting and apply the following infection control practices during the delivery of health care. *Category 1B/1C*

A. Hand Hygiene

1. During the delivery of health care, avoid unnecessary touching of surfaces in close proximity to the patient to prevent (1) contamination of clean hands from environmental surfaces and (2) transmission of pathogens from contaminated hands to surfaces.
2. When your hands are visibly dirty, contaminated with proteinaceous material, or visibly soiled with blood or body fluids, wash your hands with either a non-antimicrobial soap and water or an antimicrobial soap and water. *Category 1A*
3. If your hands are not visibly soiled, or after removing visible material with non-antimicrobial soap and water, decontaminate your hands. The preferred method of hand decontamination is with an alcohol-based hand rub. Alternatively, hands may be washed with an antimicrobial soap and water. Frequent use of alcohol-based hand rub immediately after handwashing with non-antimicrobial soap may increase the frequency of dermatitis. *Category 1B*

Perform hand hygiene:

- Before having direct contact with patients
 - After contact with blood, body fluids or excretions, mucous membranes, nonintact skin, or wound dressings
 - After contact with a patient's intact skin (e.g., when taking a pulse or blood pressure or lifting a patient)
 - If your hands will be moving from a contaminated body site to a clean body site during patient care
 - After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient
 - After removing gloves
4. Wash your hands with non-antimicrobial soap and water or with antimicrobial soap and water if contact with spores (e.g., *Clostridium difficile* or *Bacillus anthracis*) is likely to have occurred. The physical action of washing and rinsing your hands under such circumstances is recommended because alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores. *Category 2*
 5. Do not wear artificial fingernails or extenders if duties include direct contact with patients who are at high risk for infection and associated adverse outcomes (e.g., those in intensive care units [ICUs] or operating rooms). *Category 1A*
- Develop an organizational policy on the wearing of non-natural nails by health care personnel who have direct contact with patients outside of the groups specified above.

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B. Personal Protective Equipment (PPE)

Observe the following principles of use:

- Wear PPE when the nature of anticipated patient interaction indicates that contact with blood or body fluids may occur. *Category 1B/1C*
- Prevent contamination of clothing and skin during the process of removing PPE. *Category 2*
- Before leaving the patient's room or cubicle, remove and discard PPE. *Category 1B/1C*

Gloves

Wear gloves when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, nonintact skin, or potentially contaminated intact skin (e.g., of a patient incontinent of stool or urine) could occur. Wear gloves with fit and durability appropriate to the task. Wear disposable medical examination gloves for providing direct patient care. Wear disposable medical examination gloves or reusable utility gloves for cleaning the environment or medical equipment. Remove gloves after contact with a patient and/or the surrounding environment (including medical equipment) using proper technique to prevent hand contamination. Do not wear the same pair of gloves for the care of more than one patient. Do not wash gloves for the purpose of reuse, because this practice has been associated with transmission of pathogens. Change gloves during patient care if your hands will move from a contaminated body site (e.g., perineal area) to a clean body site (e.g., face).

Gowns

Wear a gown that is appropriate to the task to protect skin and prevent soiling or contamination of clothing during procedures and patient care activities when contact with blood, body fluids, secretions, or excretions is anticipated. Wear a gown for direct patient contact if the patient has uncontained secretions or excretions. Remove gown and perform hand hygiene before leaving the patient's environment. Do not reuse gowns, even for repeated contacts with the same patient. Routine donning of gowns on entrance into a high-risk unit (e.g., ICU, neonatal ICU [NICU]) is not indicated.

Mouth, Nose, and Eye Protection

Use PPE to protect the mucous membranes of your eyes, nose, and mouth during procedures and patient care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions. Select masks, goggles, face shields, and combinations of each according to the need anticipated by the task performed. During aerosol-generating procedures (e.g., bronchoscopy, suctioning of the respiratory tract [if not using in-line suction catheters], endotracheal intubation) in patients who are not suspected of being infected with an agent for which respiratory protection is otherwise recommended (e.g., *Mycobacterium tuberculosis*, SARS, or hemorrhagic fever viruses), wear one of the following: a face shield that fully covers the front and sides of the face, a mask with attached shield, or a mask and goggles (in addition to gloves and gown).

Patient Care Equipment and Instruments/Devices

Establish policies and procedures for containing, transporting, and handling patient care equipment and instruments/devices that may be contaminated with blood or body fluids. Remove organic material from critical and semicritical instruments/devices, using recommended cleaning agents before high-level disinfection and sterilization to enable effective disinfection and sterilization processes. Wear PPE (e.g., gloves, gown), according to the level of anticipated contamination when handling patient care equipment and instruments/devices that are visibly soiled or may have been in contact with blood or body fluids.

Care of the Environment

Establish policies and procedures for routine and targeted cleaning of environmental surfaces as indicated by the level of patient contact and degree of soiling. Clean and disinfect surfaces that are likely to be contaminated with pathogens, including those that are in close proximity to the patient (e.g., bed rails, overbed tables) and frequently touched surfaces in the patient care environment (i.e., door knobs, surfaces in and surrounding toilets in patients' rooms) on a more frequent schedule compared with that for other surfaces (e.g., horizontal surfaces in waiting rooms). Use Environmental Protection Agency (EPA)-registered disinfectants that have microbiocidal (i.e., killing) activity against the pathogens most likely to contaminate the patient care environment. Use in accordance with manufacturer's instructions. Review the efficacy of in-use disinfectants when evidence of continuing transmission of an infectious agent (e.g., rotavirus, *C. difficile*, norovirus) may indicate resistance to the in-use product and change to a more effective disinfectant as indicated.

Textiles and Laundry

Handle used textiles and fabrics with minimum agitation to prevent contamination of air, surfaces, and persons. If laundry chutes are used, ensure that they are properly designed, maintained, and used in a manner to minimize dispersion of aerosols from contaminated laundry.

Safe Injection Practices

The following recommendations apply to the use of needles, cannulas that replace needles, and, where applicable, intravenous delivery systems. Use aseptic technique to prevent contamination of sterile injection equipment. Do not administer medications from a syringe to multiple patients even if the needle or cannula of the syringe is changed. Needles, cannulas, and syringes are sterile, single-use items; they should not be reused for another patient nor to access a medication or solution that might be used for a subsequent patient. Use fluid infusion and administration sets (i.e., intravenous bags, tubing, and connectors) for one patient only and dispose of appropriately after use. Consider a syringe or needle/cannula contaminated once it has been used to enter or connect to a patient's intravenous infusion bag or administration set. Use single-dose vials for parenteral medications whenever possible. Do not administer medications from single-dose vials or ampules to multiple patients or combine leftover contents for later use. If multidose vials must be used, both the needle or cannula and syringe used to access the multidose vial must be sterile. Do not keep multidose vials in the immediate patient treatment area, and store them in accordance with the manufacturer's recommendations; discard if sterility is compromised or questionable. Do not use bags or bottles of intravenous solution as a common source of supply for multiple patients.

Infection control practices for special lumbar puncture procedures indicate wearing a surgical mask when placing a catheter or injecting material into the spinal canal or subdural space (i.e., during myelograms, lumbar puncture, and spinal or epidural anesthesia).

Worker Safety

Adhere to federal and state requirements for protection of health care personnel from exposure to blood-borne pathogens.

*Sections pertinent to adult health care nursing extracted from Siegel JD, Rhinehart E, Jackson M, et al: *Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings 2007*, Atlanta, 2007, Centers for Disease Control and Prevention.

APPENDIX C

Standard Steps for All Nursing Procedures

At the Beginning of the Procedure

Step A: Perform Task According to Protocol

- Mentally review the steps of the task beforehand. If you are uncertain how to do a task, ask your team leader, resource nurse, instructor, or charge nurse.
- Plan for efficiency of time and effort while delivering safe care.

Step B: Check Orders, Collect Equipment and Supplies, and Perform Hand Hygiene

- Verify that the procedure is to be done for the patient.
- Check the agency's policies and procedures manual for the accepted method of performing the procedure.
- Process equipment and supply charges.
- Take all equipment and supplies to the patient's room.

Step C: Identify and Prepare Patient

- Greet the patient, introduce yourself, and check the patient's identification band. Use two identifiers during the identification process.
- Explain what you are going to do in terms the patient can understand.
- Elicit questions and answer clearly.
- Provide necessary teaching related to the procedure to be performed.

Step D: Provide Privacy, Institute Safety Precautions, Arrange Supplies and Equipment

- Close the door or curtains and drape the patient before beginning the procedure or discussing information the person might want kept confidential.
- Check equipment for breaks or wear and for safety.
- Set up the equipment and supplies in an orderly, methodical fashion.
- Raise the bed to an appropriate working height.
- Raise the side rail before turning the patient and be certain that the wheels are locked.
- Perform hand hygiene to prevent contaminating the patient with organisms from the chart, the nurses' station, and the supply room.

During the Procedure

Step E: Use Standard Precautions and Aseptic Technique as Appropriate

- Protect yourself from blood and body fluids by wearing gloves.
- If there is a danger of splashing blood or body fluids, wear protective glasses or goggles and an impermeable cover gown or apron.
- Be very careful with sharp instruments and needles so as not to nick your skin. (See Appendix B.)

At the End of the Procedure

Step X: Remove Gloves and Other Protective Equipment

- After making certain the patient is clean and dry, dispose of used supplies, remove goggles and other protective equipment, and discard or store appropriately.
- To remove gloves without contaminating yourself, begin by pulling one glove off without touching your skin; hold the removed glove in the palm of the remaining gloved hand and then reach to the inside of the other glove and roll it down the hand.
- Dispose of the gloves in the trash.
- Perform hand hygiene immediately.

Step Y: Restore Unit

- Collect the used equipment; dispose of, clean, or store items in the proper places.
- Make the person comfortable, tidy the bed and unit, place the call light and personal items within reach, and provide for safety by lowering the bed.
- Remove used equipment.
- Place soiled linens in a soiled-linen hamper.
- Clean reusable items and return them to the storage or processing area (central supply). Discontinue use of the equipment on the computer so no further charges will be made.
- Remove unsightly, odorous, or potentially infectious trash from the room.
- Inquire if anything else is needed.
- Perform hand hygiene before leaving the room.

Step Z: Record and Report Procedure

- Document assessment findings and the details of the procedure performed, or care given, in the chart. Include any problems encountered and the patient's response to the care or treatment. The recording should be accurate, specific, concise, and appropriate and should include the specific time the procedure was performed and how it was done.
- Report abnormalities encountered to the charge nurse or physician.

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Glossary

A

abduction Movement away from the midline of the body.

ablation The removal of a part, as by incision; eradication.

ablation therapy A treatment for hyperthyroidism using radioactive iodine (¹³¹I).

abrasion A wound caused by rubbing or scraping the skin or mucous membrane.

absorption The passage of liquids or other substances through a body surface and into its tissues and fluids, as in absorption of the end products of digestion into the intestinal villi.

abuse Misuse; excessive or improper use.

acceptance Admission of reality, as in the reality of death; the final stage in the process of dealing with dying and death.

accommodation Adjustment, especially of the ocular lens for seeing objects at varying distances.

achlorhydria The absence of hydrochloric acid from maximally stimulated gastric secretions.

acid A substance that yields hydrogen ions in solution.

acid-base balance A normal condition in which the narrow range of normal pH and the normal ratio of carbonic acid to bicarbonate ions are maintained.

acidosis A condition in which the pH of body fluids is below normal range because of either a loss of base bicarbonate or an accumulation of acid.

acquired Occurring from factors outside the organism, as in response to the environment.

acquired immunity Immunity involving the functioning of the immune system acquired by natural infection or vaccination (active immunity), or transfer of antibody from an immune donor (passive immunity).

acquired immunodeficiency syndrome (AIDS) A group of symptoms believed to be caused by a virus (HIV) that infects and destroys T lymphocytes.

acromegaly A chronic disease of adults caused by hypersecretion of the pituitary growth hormone and characterized by enlargement of many parts of the skeleton.

active immunity Immunity acquired by producing one's own antibody.

active transport Movement of substances from an area of lower concentration to an area of higher concentration.

acuity The degree of seriousness of illness or injury.

acupressure The application of digital pressure on a part of the body to relieve pain or produce anesthesia.

acupuncture A technique for treating certain painful conditions and for producing regional anesthesia by passing long, thin needles through the skin to specific points.

acute myocardial infarction Ischemic necrosis of an area of the heart muscle resulting from sudden occlusion of blood flow through one or more branches of the coronary arteries.

acute pain Sharp, severe pain.

addiction A psychological craving for alcohol or drugs with the presence of withdrawal symptoms if the substance cannot be obtained.

Addisonian crisis Sudden insufficiencies of the mineralocorticoids and the glucocorticoids that can lead to shock.

adduction Movement toward the midline of the body.

adenohypophysis The anterior lobe of the pituitary gland.

adhesion A fibrous band that binds together two parts that are normally separated; often occurs after surgery in the abdomen.

adjvant That which assists, such as a drug added to a prescription that enhances the action of the principal ingredient.

adrenergic Having action that mimics that of the sympathetic nervous system.

adrenocortical Indicating the cortex of the adrenal gland.

adrenocorticotropic hormone (ACTH) A “tropic” hormone of the anterior pituitary gland that acts on the adrenal cortex.

adulthood A stage of life at which an individual has reached biologic maturity, usually at age 20 in humans.

advance directive A document prepared while an individual is alive and competent that contains instructions for future health care.

adventitious Acquired; arising sporadically.

aerobe A microorganism that requires oxygen for survival.

aerobic Requiring oxygen to live.

aerosol A suspension of a drug or other substance that is dispensed in a cloud or mist.

affect The external expression; mood.

ageism Prejudice against aging and elderly people.

agent A party authorized to act on behalf of another.

agglutination One type of antigen-antibody reaction in which a solid antigen clumps together with a soluble antibody.

agnosia The loss of the power to recognize the significance of sensory stimuli.

agranulocytosis A condition of deficiency, or absolute lack, of granulocytic white blood cells.

airway The passage by which air enters and leaves the lungs; also, a device used to secure unobstructed respiration.

akathisia A condition of motor restlessness; a common extrapyramidal side effect of neuroleptic drugs.

albumin, serum A plasma protein formed principally in the liver and constituting about 60% of the protein concentration in the plasma.

aldosterone A mineralocorticoid steroid hormone produced by the adrenal cortex. Works in the

renal tubules To retain sodium and conserve water by reabsorption; increases urinary potassium excretion.

alkalosis A condition in which the pH of body fluids is above normal because of either a loss of acid or an accumulation of base bicarbonate.

allergen(s) Any substance capable of triggering an exaggerated immune response.

allergy (allergies) An abnormal and individual hypersensitivity to a particular allergen; acquired by exposure to the allergen and manifested after reexposure.

alleviate To relieve; to make easier to bear.

alliance An agreement to cooperate made between a free-standing independent facility and a hospital.

allogeneic Having a different genetic constitution but belonging to the same species.

allograft Transplant tissue obtained from the same species.

alogia A psychiatric term meaning poverty of thoughts.

alopecia Baldness or loss of hair.

Alzheimer disease (AD) The most common degenerative disease of the brain, with no known cause or cure. The disease causes loss of neurons in the frontal and temporal lobes and primarily affects people older than 65 years but can also occur in younger people.

amenorrhea The absence of menstruation.

anabolic Constructive in nature; the opposite of catabolic.

anabolism The building up of the body substance; the constructive phase of metabolism.

anaerobe An organism that lives in an oxygen-free environment.

anaerobic Able to live in an oxygen-free environment.

analgesia The absence of normal sense of pain.

analgesic(s) A pain reliever.

anaphylaxis An unusual or exaggerated allergic reaction.

anasarca Generalized massive edema resulting from severe depletion of albumin.

anastomosis A communication between two tubular organs; also surgical, traumatic, or pathologic formation of a connection between two normally distinct structures.

androgen(s) Any steroid hormone that promotes male characteristics.

anemia(s) A condition in which there are too few functioning red blood cells to meet the oxygen needs of tissues.

anesthesia The loss of feeling or sensation.

aneurysm A sac formed by localized dilation of the wall of a blood vessel or the heart.

anger A feeling of hostility and bitterness against a situation or person; the second stage in acceptance of death.

angina pectoris Exertional chest pain caused by ischemia of the heart muscle and increased demand for oxygen.

angioedema A vascular reaction representing localized edema caused by dilation and characterized by development of giant wheals.

angiography Radiographic studies of the arteries, veins, or lymph vessels of the body.

animate Alive.

anion A negatively charged atomic particle.

ankylosis Abnormal immobility and consolidation and obliteration of a joint.

anorexia A lack or loss of appetite for food.

anorexia nervosa An eating disorder in which there is an aberration of eating patterns, severe weight loss, and malnutrition.

anosmia The absence of the sense of smell; also called *anospresia* and *olfactory anesthesia*.

anovulation Failure of the ovary to produce or release mature eggs.

antibiotic An agent that is capable of either killing or inhibiting the growth of microorganisms.

antibody (antibodies) An immune globulin molecule that is capable of adhering to and interacting only with the antigen that induced its synthesis.

anticoagulants Substances that suppress, delay, or nullify the coagulation of blood.

antidiuretic hormone A hormone that decreases the production of urine by increasing the reabsorption of water by the renal tubules. It is secreted by the hypothalamus and stored in the posterior lobe of the pituitary gland.

antidysrhythmic agents Substances that help return the heart rate and rhythm to more normal values and restore the origin of the heart's electrical activity to its natural pacemaker.

antiemetic An agent that prevents or relieves nausea and vomiting.

antifungal(s) An agent that is destructive to or inhibitive of the growth of fungi.

antigen(s) Any substance that can produce an antagonist.

antigen-antibody reaction An immune response that occurs when an antibody comes into contact with the specific antigen for which it was formed. In a transfusion reaction, the response is a clumping together, or agglutination, of the red blood cells carrying the antigens.

antihistamine An agent that counteracts the effects of histamine; used to relieve the symptoms of an allergic reaction.

antihypertensive A medication to prevent or control high blood pressure.

antimicrobial agent A substance capable of either killing or suppressing the multiplication and growth of microorganisms.

antineoplastic agent A substance that inhibits the maturation and proliferation of malignant cells.

antiseptic(s) Any substance that inhibits the growth of bacteria outside the body; in contrast, a germicide kills the bacteria outright.

antitoxin A specific kind of antibody produced in response to the presence of a toxin.

antitussive An agent that inhibits the cough reflex in the cough center in the brain.

antivenin A substance used to neutralize the venom of a poisonous animal.

anuria Diminished or absent production of urine by the kidney.

apathetic thyrotoxicosis Milder hyperthyroidism signs and symptoms seen in older adult patients compared with symptoms seen in the typical adult patient.

aphakic eye An eye without a lens, as after a cataract extraction.

aphasia A defect in or loss of the power of expression by speech, writing, or signs or in the comprehension of spoken or written language.

aphonia The loss of the voice.

apical Pertaining to the apex of a structure; particularly the heart.

aplastic Having deficient or arrested development.

aplastic anemia Deficient red cell production caused by a bone marrow disorder.

apnea Temporary cessation of breathing.

apraxia The loss or impairment of acquired motor skills.

arrhythmia (also dysrhythmia) Variation from the normal rhythm, especially of the heartbeat.

arteriosclerosis A group of diseases characterized by thickening and loss of elasticity of the arterial walls.

arthritis Inflammation of a joint.

arthrocentesis The surgical puncture of a joint cavity for aspiration of synovial fluid.

arthroplasty Surgery performed on a joint to increase mobility or decrease pain.

arthroscopy Endoscopic examination of the interior of a joint.

ascites The accumulation of edematous fluid within the peritoneal cavity.

asepsis, medical The destruction and containment of infectious agents after they leave the body of a patient with an infectious disease.

assessment, nursing Data-gathering activities for the purpose of collecting a complete, relevant database from which a nursing diagnosis can be made.

asterixos A motor disturbance marked by intermittent lapse of an assumed posture; a characteristic of hepatic coma. Also called "flapping tremor."

asthma A condition marked by recurrent attacks of paroxysmal dyspnea, with wheezing from spasmodic contraction of the bronchi.

astigmatism An error of refraction in which light rays are not sharply focused on the retina because of abnormal curvature of the cornea or lens.

ataxia Uncoordinated motor movements.

atelectasis The collapsed or airless state of the lung.

atherosclerosis A disease process in which fibrinous plaques are laid down on the inner walls of the arteries, thus narrowing the lumens of the vessels and predisposing them to the development of intravascular clots.

atopy The tendency to develop allergies.

atrial fibrillation Rapid, irregular, and ineffective contractions of the atria.

atrial natriuretic peptide A hormone involved in the regulation of renal and cardiovascular homeostasis. It is produced in the atrium and helps to normalize blood pressure and volume.

atrophy Wasting, or a decrease in size, from lack of use.

atypical antipsychotics Newer medications used for treating schizophrenia with fewer side effects.

audiometry The measurement of sound perception.

audit An official examination of the record of all aspects of patient care.

aura A peculiar sensation preceding the appearance of more definite symptoms, especially a sensation, that occurs immediately before an epileptic seizure.

aural Pertaining to the ear.

auscultation Listening for sounds produced within the body, usually with a stethoscope.

autograft A graft transferred from one part of a patient's body to another.

autoimmune A defective cellular immune response in which antibodies are produced against normal parts of the person's body.

autoimmune disease A disease caused by the body's failure to recognize its own cells, thus rejecting them as it would a foreign substance.

autoimmune thyroiditis (Hashimoto thyroiditis) A condition in which the body produces antibodies against the thyroid, which in turn destroy the gland.

autoinoculation Inoculation with microorganisms from one's own body.

autologous Indicating something that has its origin within an individual, as in transfusion with one's own blood.

automated external defibrillator (AED) A defibrillator found in many public places that is used to treat cardiac arrest.

automatisms Repetitive, automatic actions such as lip smacking.

autonomic dysreflexia Hyperreflexia, an uninhibited and exaggerated reflex response of the autonomic nervous system to some type of stimulation.

avolition A lack of motivation.

avulsion The tearing away of part or all of an organ or structure.

axon The projection, or process, of a neuron that transmits impulses away from the cell body.

azotemia Retention in the blood of urea, creatinine, and other nitrogenous protein metabolites that are normally eliminated in the urine.

B

Babinski reflex A reflex action elicited by stimulating the sole of the foot and characterized by dorsiflexion of the great toe and flaring of the smaller toes. A positive Babinski reflex indicates an abnormality in the motor control pathways of the nervous system.

bacteria Microscopically small organisms belonging to the plant kingdom, some of which are capable of producing disease in humans.

bacterial vaginosis A bacterial disease of the vagina.

bactericidal Able to kill bacteria.

bacteriophage A virus that destroys bacteria by lysis. The virus is usually of a type specific for the particular kind of bacteria it attacks.

bacteriostatic Able to slow duplication of bacteria.

bargaining An attempt to make an arrangement whereby one gives something to gain something in

return; the third stage in acceptance of death.

bariatrics The field of medicine that focuses on the treatment and control of obesity and diseases associated with obesity.

basal insulin Amount of insulin that would normally be produced by the pancreas.

base A substance that combines with acids to form salts.

basement membrane The noncellular layer that secures the overlying epithelium to the underlying tissue.

behavior The manner in which one conducts oneself in response to social stimuli, an inner need, or a combination of the two.

belief A currently held idea or value derived from culture and experience.

benign Not very harmful; nonmalignant.

benign pituitary adenoma A benign tumor of the pituitary gland that secretes growth hormone (GH), leading to continued growth. It can also antagonize the effect of the hormone insulin, resulting in increased blood glucose.

bereaved Experiencing the reaction of grief and sadness on learning of the loss of a loved one.

biliary Pertaining to bile, the bile ducts, or the gallbladder.

biliary colic Acute pain resulting from obstruction of a bile duct, usually caused by cholelithiasis.

binder A broad bandage most commonly used as an encircling support of the abdomen or chest.

biofeedback A training program designed to develop one's ability to control the autonomic (involuntary) nervous system.

biologic dressing Materials obtained from a patient's intact skin, cadavers, or animals that is used to treat burn victims.

biologic response modifier (BRM) An agent that manipulates the immune system in hopes of controlling or curing a malignancy.

biomedicine Biologic medicine; focuses on the biologic aspects of medicine.

biopsy Removal of living cells for the purpose of examining them microscopically.

biosynthetic A biologic substance created by chemical processes. A term used for artificial skin that can be used as a temporary measure for grafting in burn victims.

bioterrorism An attack that involves the deliberate release of microorganisms or toxins derived from living organisms that cause disease or death to humans, animals, or plants on which we depend for food.

bipolar disorder A mood disorder in which manic and depressive episodes occur.

bisexual An individual who is sexually attracted to others of either sex.

bivalve Split through all layers of the material.

bladder, cord A dysfunction of the urinary bladder caused by damage to the spinal cord.

bladder, neurogenic A dysfunction of the urinary bladder caused by a lesion of the central or peripheral nervous system and characterized by lack of awareness of the need to void.

blepharitis An infection of the glands and lash follicles along the margin of the eyelid.

blood gases, arterial (ABGs) The partial pressure exerted by oxygen and carbon dioxide in the

arterial blood. ABGs reflect the ability of the lungs to exchange these gases, the effectiveness of the kidneys to retain and eliminate bicarbonate, and the efficiency of the heart as a pump.

B-lymphocyte A sensitized lymphocyte that is responsible for antibody formation and the development of humoral immunity.

bolus dose A dose of short- or rapid-acting insulin that is used to manage elevations in blood glucose and bring the next blood glucose measurement into range.

borborygmi Gurgling, splashing sounds normally heard over the large intestine; rumbling in the bowels.

borderline personality disorder A mental disorder defined by the DSM-5 as “a pattern of instability in interpersonal relationships, self-image and affect, and marked impulsivity.”

botulism Food poisoning caused by a neurotoxin produced by *Clostridium botulinum*, sometimes found in improperly canned or preserved foods.

bradycardia An abnormally slow heart rate, usually fewer than 60 beats per minute.

bradykinesia Slow movement; a symptom seen with Parkinson disease.

bradypnea Abnormally slow breathing.

bronchiectasis Chronic dilation of the bronchi marked by fetid breath and paroxysmal coughing, with the expectoration of mucopurulent matter.

bronchodilator A drug that acts directly on the smooth muscles of the bronchi to relax them and relieve bronchospasm.

bronchogram A radiograph of the bronchial tree using a radiopaque substance that is introduced into the trachea.

bronchoscopy Insertion of an endoscope for diagnosis and treatment of disorders of the bronchi.

bruit An abnormal sound of venous or arterial origin heard on auscultation.

bulimia nervosa A mental disorder that occurs predominantly in females characterized by episodes of binge eating that continue until terminated by abdominal pain, sleep, or self-induced vomiting.

bulla (bullae) A blister; a round, fluid-filled lesion of the skin, usually more than 5 mm in diameter.

burns, full-thickness Burns in which all of the epithelializing elements of the skin and those tissues lining the sweat glands, hair follicles, and sebaceous glands are destroyed.

burns, partial-thickness Burns in which the epithelializing elements remain intact.

C

cachexia A profound state of general ill health and malnutrition.

calculus (calculi) An abnormal concretion, usually of mineral salts, occurring mainly in hollow organs or their passages (e.g., renal calculus, or kidney stone).

callus A thickened area of the epidermis caused by pressure or friction.

caloric testing Testing to check the oculovestibular reflex. A patient's eye movements are observed while the external ear canal is irrigated with cold water. Absence of eye movement indicates a brainstem lesion.

candidiasis An infection with a fungus of the genus *Candida*, especially *C. albicans*. It is usually a superficial infection of the moist cutaneous areas of the body, although it becomes more severe

in immunocompromised patients.

capitation A payment method wherein the health care provider is paid a monthly contracted rate for each member patient assigned regardless of the type or number of services provided.

capnography Measurement of inhaled and exhaled carbon dioxide as recorded on a capnogram.

caput medusa Dilated cutaneous veins around the umbilicus in patients who have cirrhosis of the liver.

carbuncles A collection of infected hair follicles. They most often occur on the back of the neck, the upper back, and the lateral thighs.

carcinogen Any substance or agent that produces or increases the risk of developing cancer in humans or lower animals.

carcinoma(s) A malignant growth made up of epithelial cells.

cardiac glycosides A group of compounds containing a carbohydrate molecule (e.g., digitalis) that affect the contractile force of the heart muscle.

cardiac tamponade Compression of the heart caused by collection of fluid in the pericardial sac.

cardiogenic shock A shock state caused by pump failure of the heart.

cardiomyopathy Disease of the myocardium, especially from primary disease of the heart muscle.

cardiomyoplasty A procedure in which the latissimus dorsi muscle is detached from its natural position, brought around to the front of the body, and wrapped around the heart. A pacemaker, connected to the heart and back muscle, helps boost the heart's pumping action.

cardiopulmonary resuscitation The reestablishment of heart and lung action after they have suddenly stopped.

cardiotonic(s) An agent that strengthens the contractions of the heart muscle.

cardioversion A mild electrical shock delivered to the heart at a specific time in the cardiac cycle to interrupt an abnormal rhythm and begin a new, normal rhythm of electrical impulse and contraction.

carpopedal spasm A spasm of the hand, thumbs, foot, or toes that accompanies tetany.

carriers People who harbor infectious organisms within their bodies without manifesting any outward symptoms of the infection.

cartilage A type of connective tissue in which fibers and cells are embedded in a semisolid gel material.

catabolic Destructive in nature; the opposite of anabolic.

catabolism The phase of metabolism in which larger molecules are broken down and energy is released; the destructive phase of metabolism.

cataract(s) An opacity of the lens of the eye.

catecholamines One of a group of biogenic amines that have a sympathomimetic action; examples are dopamine, norepinephrine, and epinephrine.

category-specific precautions A system of precautionary measures organized according to types of diseases (e.g., respiratory or enteric) and initiated to prevent the spread of disease.

cations Positively charged atomic particles.

cauterize To burn with a cautery, or to apply one.

CD lymphocyte A type of lymphocyte that is the master regulator of the human immune system. It is the primary site of replication for HIV.

cell(s) The basic structural unit of living organisms.

cell-mediated immunity Immunity resulting from activation of sensitized lymphocytes.

cellulitis Inflammation of cellular or connective tissue.

central hearing loss Impaired perception of sound caused by pathology above the junction of the eighth cranial nerve and the brainstem (in the brain).

cerumen Earwax.

chalazion An infection of the meibomian gland of the eye; an internal stye.

chancre A primary syphilis skin lesion that begins as a papule and develops into a red, bloodless, painless ulcer with a scooped-out appearance.

chemonucleolysis Treatment of a herniated intervertebral disk by dissolution of a portion of the nucleus pulposus by injection of a chemolytic agent.

chemotherapy Use of chemicals, especially drugs, in the treatment of such diseases as cancer, infection, and some mental illnesses.

cholecystectomy The removal of the gallbladder.

cholecystitis An inflammation of the gallbladder.

choledocholithiasis A condition in which gallstones lodge in the common bile duct.

cholelithiasis The presence of stones within the gallbladder or biliary tract.

cholinergic An agent that produces the effect of acetylcholine.

chorea Involuntary muscle twitching.

chronic pain Pain of long duration showing little change or slowly progressive pain.

chronologic Occurring in a natural time sequence.

Chvostek sign Low calcium level that manifests as muscle irritability when the facial nerve is gently tapped.

chyme The mixture of partly digested food and digestive secretions found in the stomach and small intestine during digestion of a meal.

cirrhosis A liver disease characterized by diffuse interlacing bands of fibrous tissue dividing the hepatic parenchyma into micronodular or macronodular areas.

cirrhosis of the liver A condition characterized by destruction of normal hepatic structures and their replacement with necrotic tissue and scarring.

claudication, intermittent A syndrome characterized by intensification of limb pain as exercise is increased; related to occlusion of arteries in the legs.

climacteric Endocrine, somatic, and psychic changes that occur at the end of the female reproductive period (menopause); also, normal diminution of testicular activity in the male.

clinical pathway A tool used to track patient progress along a set path in a managed care system.

clonic Alternating contraction and relaxation of muscles.

clonus Abnormal neuromuscular activity, characterized by rapidly alternating involuntary contraction and relaxation of skeletal muscle; occurs with epileptic seizure.

coarctation Narrowing (of the aorta).

code of ethics A set of rules governing one's conduct.

codependency A behavior pattern in which a family member or friend of a substance abuser attempts to control the behavior of the dependent person.

cognition The mental processes of perception, memory, judgment, and reasoning.

coinsurance Insurance in which both the insurer and the patient pay the medical bill.

coitus Sexual intercourse.

colectomy The removal of part of the colon.

colic A spasm causing pain; may be biliary, renal, intestinal, or uterine.

collaboration The act of working or cooperating with another.

collaborator One who works cooperatively with another.

collagen A fibrous protein found in skin, bone, cartilage, and ligaments.

colonization The process in which a group of organisms, especially bacteria, live together and multiply.

colostomy (colostomies) The surgical creation of an opening in the colon to allow fecal material to pass outside.

colporrhaphy The operation of suturing the vagina.

colposcopy The visual examination of the vagina and cervix with a specially designed endoscope that allows the detection of malignant growths in their early stages.

comedo (comedones) A plug of keratin and sebum in an enlarged pore; a blackhead.

communicable disease A disease that may be transmitted directly or indirectly from one individual to another.

compartment syndrome External or internal pressure that seriously restricts circulation to the area.

complementary and alternative medicine (CAM) Types of treatments for medical disorders that do not rely on traditional medicine, but frequently are combined with traditional medical treatment for a disorder.

complement system A complex series of enzymatic proteins that interact to combine with the antigen-antibody complex, producing lysis of intact antigen cells.

complement system of proteins A series of protective proteins that are activated in the inflammatory response.

complete blood count (CBC) The number of each kind of cell in a sample of blood.

compliance An expression of the ability of lung tissue to distend when filled with air.

computed tomography (CT) scan A computer-aided technique in which small sections of tissue within an organ can be visualized by radiograph.

concept(s) An idea, thought, or notion derived from experiences and information acquired from one's external environment.

concussion A closed head injury in which the brain is compressed by a portion of the skull at the time of the blow and temporary ischemia of the brain tissue results.

conductive hearing loss Impaired perception of sound caused by a dysfunction of either the

external or the middle ear.

confabulation A behavioral reaction to memory loss in which the patient fills in memory gaps with made-up facts and experiences.

confusion The state of not being aware of or oriented to time, place, or self.

congenital Present at birth.

congestive heart failure The exhaustion of the heart muscle and a resultant engorgement of the heart's chambers and the blood vessels. Eventually, sluggish blood flow leads to retention of fluid and edema in the lungs and elsewhere in the body.

conjugate Working in union; equally coupled.

conjunctivitis An inflammation of the membrane covering the eyeball and lining the eyelids.

consciousness Responsiveness of the mind to impressions made by the senses.

contactant A substance that produces an allergic or sensitivity response when in direct contact with the skin.

contamination The presence of a noxious agent, such as bacteria or radiation, in a place where it is not wanted.

contracture An adaptive shortening of skeletal muscle tissue that is not subjected to normal stretching and contraction.

contralateral On or affecting the opposite side of the body.

contusion A bruise; an injury of a part without a break in the skin.

conventional antipsychotics Neuroleptics used to treat the positive symptoms of schizophrenia. Cause serious and unpleasant side effects and are becoming less commonly prescribed.

convulsion A state of involuntary muscle contractions and relaxations.

copayment The amount a member of an HMO has to pay for each visit to the health care provider.

COPD Chronic obstructive pulmonary disease.

coronary artery bypass graft (CABG) Surgery in which a blood vessel is grafted onto the coronary artery to improve blood flow.

coronary insufficiency Decreased or insufficient blood flow in the coronary arteries.

coronary occlusion The closing off of a coronary artery and interruption of its blood flow.

cor pulmonale Heart disease characterized by hypertrophy of the right ventricle because of pulmonary hypertension.

corrosive Containing a destructive agent that produces disintegration or wearing away.

cost containment The need to hold costs to within fixed limits.

counter-regulatory hormones Growth hormone, glucagon, and epinephrine that are released during the night that cause an increase in blood glucose. They act "counter" to insulin.

coup-contrecoup injury An injury that occurs when the head is moving rapidly and hits a stationary object. The contents within the cranium hit the inside of the skull (coup) and then bounce back and hit the opposite side, causing a second injury (contrecoup).

crackles An abnormal respiratory sound heard on auscultation during inspiration; can be a bubbling noise or a popping sound. Crackles do not clear with coughing.

creatinine A nonprotein substance that is formed in muscle in relatively small and constant amounts, passes into the bloodstream, and is eliminated by the kidneys. Urine creatinine levels are diminished when glomerular filtration is impaired.

Credé technique Exerting downward pressure with the open hand over the suprapubic area to facilitate emptying of the urinary bladder.

cremasteric reflex The retraction of the testicles when the inner thigh is stroked. This reflex is absent with testicular torsion.

crepitition A sound like that of hair rubbed between the fingers; occurs when bone fragments rub together.

cretinism A congenital condition caused by lack of thyroid secretion characterized by arrested physical and mental development, dystrophy of the bones and soft parts, and lowered basal metabolism.

criterion A standard for judging a condition or establishing a diagnosis.

critical thinking Purposeful, considered, organized cognitive processing used to examine a problem or situation or evaluate the thinking of others.

crust An outer layer of solid matter formed by dried exudate or secretion.

cryoprecipitate Any precipitate that forms as a result of cooling.

cryosurgery The destruction of tissue by application of extreme cold, as in removal of cataracts.

cryotherapy The therapeutic use of cold or freezing.

cryptorchidism (cryptorchism) The failure of one or both of the testes to descend into the scrotum during fetal life.

culdoscopy The direct inspection of the female viscera through an endoscope introduced into the pelvic cavity through the posterior vaginal fornix.

culture The propagation of microorganisms or living tissue cells in media conducive to their growth.

curettage Cleansing of a surface of an organ with a spoon-shaped instrument (curet).

Curling ulcer A type of ulcer caused by decreased perfusion to other organs, which causes changes in the gastric mucosa.

cyanosis A bluish tinge to the skin caused by lack of oxygen and accumulation of carbon dioxide in the blood.

cystitis An inflammation of the urinary bladder.

cystocele A protrusion or herniation of the bladder through the wall of the vagina.

cystogram A radiograph of the urinary bladder using a contrast medium.

cystoscopy Endoscopic examination of the interior of the bladder.

cytokine A low-molecular-weight protein secreted by various cell types and involved in cell-to-cell communication. It coordinates antibody and T cell immune interactions and augments immune reactivity.

cytology The study of cells and their origin, structure, function, and pathology.

cytotoxic Destructive to cells.

D

dactylitis An inflammation of a finger or toe.

database A collection of facts and figures for analysis from which conclusions may be drawn.

data collection The systematic collection of physical and psychosocial data for a patient who is having a problem. Part of assessment within the nursing process.

dawn phenomenon A condition sometimes encountered in type 1 diabetes characterized by increased blood glucose in the morning caused by release of hormones during the night.

deaf Partially or completely lacking the sense of hearing.

death(s) The cessation of all physical and chemical processes that invariably occurs in all living organisms. *See also* Dying.

débride Peel away dead tissue.

débridement The removal of all foreign material and dead tissues from or adjacent to a traumatic or infected lesion until healthy tissue is exposed.

debriefing Questioning of personnel involved and obtaining knowledge about event and problems that occurred (during a disaster).

decerebrate posturing Extensor posturing; the arms are stiffly extended and held close to the body and the wrists are flexed outward. Indicates damage to the midbrain or brainstem.

decontamination The freeing of a person or an object of some contaminating substance such as radioactive material.

decorticate posturing Flexor posturing; extension of the legs and internal rotation and adduction of the arms with the elbows bent upward. Indicates damage to the cortex.

decubitus ulcer(s) A breakdown in the skin and underlying tissues caused by long-standing pressure, ischemia, and damage to the underlying tissue.

deductible The yearly amount an insured person must spend out-of-pocket before a medical insurance plan begins to pay its share.

defecate To evacuate the bowels; to have a bowel movement.

defibrillation Stopping fibrillation of the heart with electrical current.

dehiscence The separation of all layers of a surgical wound.

dehydration Excessive loss of water from tissues of the body.

delegate To authorize and send another as one's representative (to carry out a task).

delegation Allocation of patient care activities to team members.

delirium An altered state of consciousness that is usually acute and of short duration.

delusion A false, fixed belief that cannot be changed with rational explanation.

dementia A broad impairment of intellectual function that usually is progressive.

demyelination Destruction of the myelin sheath of nerve tissue.

demyelinization Demyelination.

dendrite Any of the thread-like extensions of the cytoplasm of a neuron.

denial A defense mechanism in which the existence of intolerable conditions is unconsciously

rejected; the first stage in the acceptance of death.

denuded When the protective layer or covering is removed through surgery, trauma, or pathologic change.

deoxyribonucleic acid (DNA) The primary genetic material of all cellular organisms.

dependency The state of reliance on a substance; implies that there are physical and psychological symptoms of addiction. Term used to describe substance use disorder.

dependent (nursing action) Requiring an order from a health care provider.

dependent rubor A dusky-red color dangling feet may take on after elevating the feet and legs above the heart for 1 to 2 minutes that indicates arterial insufficiency.

depression A morbid sadness, dejection, or melancholy; a stage in the acceptance of death.

depression (of immune function) The decreased ability of the immune system to function normally.

dermabrasion Planing of the skin done by mechanical means to smooth the skin and remove scars.

dermatitis An inflammation of the skin.

dermatology The medical specialty concerned with diagnosing and treating skin disorders.

dermatome A nerve tract.

dermatophytosis Any superficial fungal infection caused by a dermatophyte and involving the stratum corneum of the skin, hair, and nails.

detoxification The process of ridding the body of a drug without causing harmful ill effects.

developmental task(s) A task that should be completed during a specific life period to ensure continuing psychosocial growth and maturity.

deviation Departure from normal.

diabetes insipidus (DI) Occurs as a result of decreased production of the antidiuretic hormone (ADH) and is characterized by the production of copious amounts of dilute urine.

diabetic nephropathy Kidney disease secondary to chronic high blood glucose levels.

diabetic neuropathy A disorder of the peripheral nerves that is associated with diabetes mellitus and is characterized by sexual impotence in the male, neurogenic bladder, and pain or loss of feeling in the lower extremities.

diabetogenic Causing diabetes.

diagnosis, nursing A concise statement of a patient's actual or potential health problems that nurses, because of their education and experience, are able and licensed to treat.

diagnosis-related groups (DRGs) The classifications used to determine Medicare payments for patient care based on medical diagnoses.

dialysis The diffusion of solute molecules through a semipermeable membrane with the molecules passing from the more concentrated solution to the less concentrated one.

dialysis, peritoneal The use of the peritoneum as a dialyzing membrane to remove waste products that have accumulated in the body as a result of renal failure.

diaphoresis Excessive perspiration.

diastole The phase of the cardiac cycle in which the heart muscle relaxes between contractions; during this phase the two ventricles are dilated by blood flowing through them.

diastolic blood pressure Arterial pressure during diastole, recorded as the bottom number in the pressure measurement.

diffusion The spontaneous mixing of the molecules or ions of two or more substances; the result of random thermal motion.

digital Pertaining to or resembling a finger or toe.

digitalization The initial administration of digitalis to build up a therapeutic blood level of the drug.

diplopia Double vision; seeing two images.

disability Difficulty in performing certain tasks because of impairment.

disaster A natural or human-caused (bioterrorism or nuclear) event that overwhelms the community's existing emergency resources.

disease One possible outcome of an infection.

disease-specific precautions A system of precautionary measures organized according to the specific infectious disease presented by the patient.

disinfectant(s) An agent that destroys infection-producing organisms.

dislocation Stretching or tearing of ligaments around a joint with complete displacement of a bone.

disseminated Widespread.

disseminated intravascular coagulation (DIC) A disorder in which tissue damage causes widespread, excessive blood clotting in the microcirculation; subsequently, the body's clotting factors are depleted and hemorrhage occurs.

distal In a position farthest from the point of reference.

distraction Diversion of attention from present experience (e.g., pain).

diuresis The excretion of excess fluid in the urine.

diuretic(s) An agent that promotes secretion of urine.

diurnal Happening during daylight hours.

diverticulitis The inflammation of the diverticula.

diverticulosis The presence of diverticula, in the absence of diverticulitis.

diverticulum (diverticula) A small blind pouch resulting from a protrusion of the mucosa of a hollow organ through weakened areas in the organ's muscle wall.

documentation The recording of significant information on a patient's chart.

dowager's hump An abnormal backward curve of the cervical spine as a result of osteoporosis and/or Cushing syndrome.

Down syndrome A congenital disorder characterized by physical malformations and some degree of mental retardation; also called *trisomy 21 syndrome* because it involves an extra copy of chromosome 21.

DRGs See Diagnosis-related groups.

drusen Yellow exudates found beneath the retinal pigment epithelium, representing extracellular debris.

dual diagnosis The diagnosis of a patient with a substance abuse problem and a mental health

disorder.

dumping syndrome A group of symptoms caused by too-rapid passage of food through the upper gastrointestinal tract.

dying A stage of life; a process that, from a medical point of view, begins when a person has a disease that is untreatable and inevitably ends in death; or the final stages of a fatal disease. *See also* Death(s).

dynamic Having vital force or inherent power.

dysarthria Slurring or indistinct speech articulation; difficulty speaking.

dyscrasia An imbalance of formed elements, as in blood dyscrasia.

dysfunctional uterine bleeding Uterine bleeding at times other than during normal menstruation.

dysmenorrhea Painful or difficult menstruation.

dyspareunia Difficult or painful coitus in women.

dyspepsia Impairment of the power or function of digestion; usually referring to epigastric discomfort after meals.

dysphagia Difficulty in swallowing.

dysphasia Difficulty speaking; usually caused by a brain lesion.

dyspnea Labored or difficult breathing.

dysrhythmia A variation from the normal rhythm, especially of the heartbeat.

dysthymia A disturbance in mood that may manifest in either depression or elation.

dystonic reactions Acute contractures of the tongue, face, neck, and back.

dysuria Painful urination.

E

eccentric Departing from conventional custom or practice; differing conspicuously in behavior, appearance, or opinions.

echymosis (ecchymoses) An irregularly shaped, blue-black skin discoloration caused by bleeding beneath the skin.

ECG (also EKG) *See* Electrocardiogram.

ectopic Located away from normal position, as in ectopic pregnancy.

ectropion An outward turning of the eyelid.

edema An accumulation of fluid surrounding the cell.

edematous Pertaining to, or affected with, edema (abnormal fluid in the tissue).

EEG *See* Electroencephalogram.

effleurage A massage technique with long, light, or firm strokes over the spine and back. May be circular strokes done with the fingertips.

effluent A discharge or outflow (e.g., the contents flowing out of an ileostomy or colostomy).

effusion An escape of fluid into a part or tissue, as an exudation or transudation.

ejaculation Ejection of the seminal fluid from the male urethra.

elastance The extent to which the lungs are able to return to their original position after being barely distended.

electrocardiogram The record produced by amplification of the electrical impulses normally generated by the heart.

electroconvulsive therapy (ECT) The oldest form of brain stimulation therapy used for severe depression. Considered after several unsuccessful regimens of medication. Consists of electric shock to the brain via electrodes applied to the temples. This shock artificially induces a grand mal seizure lasting 30 to 90 seconds.

electroencephalogram A recording of changes in electric potentials in various areas of the brain.

electrolyte(s) A chemical substance that, when dissolved in water, dissociates into ions and thus is capable of conducting an electric current.

electromyography The recording and study of intrinsic electrical properties of skeletal muscle; useful in diagnosing neuromuscular disorders.

elimination Discharge from the body of indigestible materials and waste products of metabolism.

embolism A sudden obstruction of arterial blood flow by a blood clot or a mass that has been brought to the site in the bloodstream.

embolus A clot or plug of material (usually from a thrombus) carried by blood flow that lodges in a vessel and obstructs blood flow.

emesis Substance produced by vomiting.

empathy The ability to recognize and share the emotions and states of mind of another; understanding another's behavior.

emphysema A chronic pulmonary disease characterized by increase beyond normal in the size of air spaces distal to the terminal bronchiole with destructive changes in their walls.

empyema The presence of infected and purulent exudate within the pleural cavity.

enabling Doing something for a substance-dependent person that keeps the person from facing consequences. Term used with substance abuse.

encapsulated Surrounded by a fibrous capsule.

encephalopathy Any dysfunction of the brain.

endarterectomy The surgical removal of thickened atheromatous areas of the innermost layer of an artery.

endemic Present in a community at all times.

endocarditis An inflammation of the membrane lining the cavities of the heart and of the connective tissue bed on which it lies.

endocrine Secreting internally; refers to glandular function.

endogenous Coming from within.

endometriosis The presence of endometrial tissue in locations outside the uterus.

endorphin(s) Any of a group of opiate-like peptides naturally produced by the body.

endoscopy Examination with an endoscope that allows for direct visual inspection of the interior of hollow organs and body cavities.

endotoxin(s) A heat-stable toxin that is present in the intact bacterial cell wall, is pyrogenic, and is capable of increasing capillary permeability.

endotracheal intubation Airway management with a catheter or tube inserted through the mouth or nose into the trachea.

engraftment Successful establishment of the graft in bone marrow transplantation.

enteral feeding Feeding a patient by means of a tube passed into the stomach from the nasal passage.

enterocele A hernia containing intestines.

enterostomal Related to an abdominal stoma, or artificial opening of the intestine onto the surface of the body.

entropion Inversion of the eyelid margin.

enucleation Removal of an organ or other mass intact (e.g., the eyeball from the orbit).

environment All the physical and psychological factors that influence or affect the life or survival of an individual.

enzyme Any protein that acts as a catalyst, increasing the rate at which chemical reaction occurs.

epidemic(s) A disease that simultaneously attacks many people in a geographic area, is widely diffused, and spreads rapidly.

epidermophytosis A fungal infection that most often affects the feet, especially between the toes; also called *athlete's foot* or *dermophytosis*.

epididymis A small oblong body resting on and beside the posterior surface of the testes that constitutes the first part of the excretory duct of each testis.

epidural Situated on or outside the dura mater.

epidural hematoma A hematoma caused by rapid leakage of blood from the middle meningeal artery, which quickly elevates intracranial pressure.

epigastric Pertaining to the region over the pit of the stomach.

epilepsy A group of neurologic disorders characterized by recurrent episodes of convulsive seizures, sensory disturbances, abnormal behaviors, loss of consciousness, or all of these.

epistaxis Nosebleed.

equilibrium Balance.

erection The state of swelling, hardness, and stiffness observed in the penis of the male and to a lesser extent in the clitoris of the female.

erythema Redness of the skin.

erythrasma A chronic bacterial infection of the major skinfolds, marked by red or brownish patches on the skin.

erythrocyte sedimentation rate The rate at which red blood cells settle out of unclotted blood in 1 hour.

erythropoiesis Formation of red blood cells, or erythrocytes.

eschar A castoff of dead tissue, as from a burn, corrosive application, or gangrene.

escharotomy Surgical incision of a constricting eschar in a burn victim to permit the cut edges to separate and restore blood flow to unburned tissue.

esophageal varices Varicosities of branches of the azygous vein that connects with the portal vein in the lower esophagus; related to portal hypertension and cirrhosis of the liver.

estrogens The female sex hormones, including estradiol, estriol, and estrone.

etiology Study of the cause of disease; origin.

euthanasia An easy or painless death; active euthanasia, or mercy killing, is the deliberate ending of the life of a person who is incurably and terminally ill; passive euthanasia is the withholding of "heroic" measures and allowing the person to die.

euthymia A normal mood or feeling state.

evaluation, of outcome Appraisal of the patient's progress toward achievement of the goals and objectives stated in the nursing care plan.

evaluation, of process Appraisal of nursing activities and what has been done to assess, plan, and implement nursing care.

evaluation, of structure Appraisal of the physical facilities, equipment, staffing, and other characteristics of an agency that affect the quality of nursing care.

evagination (1) extrusion of internal organs; (2) removal of the contents of the eyeball, leaving the sclera intact.

excess An amount beyond what is usual or necessary.

excoriation Any superficial loss of substance, such as that produced by scratching the skin.

excursion Range of movement (of the lungs).

exercises, isometric Active exercises performed against stable resistance, without change in the length of the muscle.

exfoliate To separate or peel off in scales, layers, or flakes.

exocrine Secreting externally via a duct.

exogenous Coming from outside.

exophthalmos Abnormal protrusion of the eyeball.

exotoxin A potent toxin formed and excreted by the bacterial cell.

Expanded Precautions Use of Standard Precaution techniques with additional protective actions specific to the organism and location involved.

expected outcomes Results expected to be achieved by the patient from health care provided and personal contributions.

expectorate To spit out saliva or cough up materials from the air passageways leading to the lungs.

extension A movement that brings a limb into or toward a straight position by increasing the angle between the bones forming a joint; opposite of flexion.

extracellular Outside of the cell.

extracellular fluids Body fluids outside the cell walls that constitute the environment of each cell.

extracorporeal Outside the body.

exudate Fluid that contains dead cells, serum, phagocytes, bacteria, or pus.

F

fasciotomy Linear incisions in the fascia down the extremity.

fecal impaction The accumulation of putty-like or hardened feces in the rectum or sigmoid colon.

feedback The process of providing a system with information about its output.

feedback, negative A corrective action in which a system is informed that its output is not satisfactory and a change is needed.

feedback, positive Information that tells a system its output is satisfactory.

fee-for-service Fee paid for services provided; a type of medical practice.

fetor hepaticus Foul-smelling breath associated with severe liver disease.

fibroid A thickened vascular mass in the uterus.

fibroma A fibrous, encapsulated connective tissue tumor.

fibrosis Fibrous tissue formation.

filtration Passage of a gas or liquid through a filter to separate out unwanted matter.

fistula(s) Any abnormal, tubelike passage within the body between two internal organs or leading from an internal organ to the body surface.

flaccid Limp, weak, or relaxed.

flatulence Gas in the digestive tract.

flexion A movement that brings a limb into or toward a bent position by decreasing the angle between the bones forming a joint; opposite of extension.

flight of ideas Going from topic to topic in conversation with little or no connection.

flora Plant life, as distinguished from animal life.

fluid(s) The water and substances dissolved in it that form the internal environment.

fluid balance Equilibrium between the amount of fluid taken into the body and that lost through urine, feces, the lungs, skin, and possibly vomiting and fistulas.

fluid deficit(s) A fluid imbalance in which there is not enough fluid in one or more of the body's fluid compartments as a result of either inadequate intake or excessive loss.

fluid excess A fluid imbalance in which too much fluid accumulates in one or more of the body's fluid compartments as a result of either excessive intake or inadequate loss. *See also Edema.*

fluids, transcellular Body fluids that pass through cellular structures and eventually are eliminated from the body.

follicular pharyngitis An inflammation of the pharynx accompanied by purulent infection.

fracture(s) Interruption in the continuity of a bone.

friction rub A high-pitched, scratchy sound heard with the diaphragm of the stethoscope placed at the lower left sternal border of the chest; a symptom of pericarditis.

fructosamine assay A test that may be used to monitor control of glucose over a period of 2 to 3 weeks.

fulguration Destruction by electric cautery.

functional disorder A disorder that affects the function but not the structure of the body or body part.

fungus (fungi) A member of a group of organisms (mushrooms, yeasts, molds, etc.) that thrive in a warm, moist climate. Can cause infections that are difficult to eradicate because fungi tend to reproduce by means of spores that are resistant to ordinary disinfectants and antiseptics.

furuncles Inflammations of hair follicles. Also called *boils*.

G

galactosemia A genetic disorder in which there is a lack of the enzyme necessary for proper metabolism of galactose.

gangrene A necrosis, or death, of tissue, usually caused by deficient or absent blood supply.

gastritis An inflammation of the mucous membrane lining the stomach.

gastrojejunostomy The surgical creation of an anastomosis between the stomach and jejunum.

gastroparesis Delayed gastric emptying.

gastrostomy The surgical creation of an opening into the stomach to administer food and liquids.

gate control theory The proposal that synapses in the dorsal horn of the spinal cord act as gates and that pain signals compete with signals of other kinds of stimuli for passage through the gate and transmission to the brain.

gene One of the self-reproducing biologic units of heredity that make up segments of the DNA molecule that controls cellular reproduction and function.

generalized anxiety disorder A persistent, unrealistic, or excessive worry about two or more life circumstances.

genital Pertaining to the reproductive organs.

geriatrics The medical treatment of diseases commonly associated with aging and elderly persons.

gerontology The study of the problems of aging in all its aspects.

gigantism Excessive size. Seen in children with excessive secretion of growth hormone.

gingivitis An inflammation of the gingivae.

glaucoma A group of diseases of the eye characterized by increased intraocular pressure that can produce blindness if not managed successfully.

global amnesia Irretrievable total loss of memory.

globulin(s) A general term for proteins; separated into five fractions by serum protein electrophoresis and classified in order of decreasing electrophoretic mobility. The fractions are alpha₁, alpha₂, beta₁, beta₂, and gamma globulins.

glucagon(s) A polypeptide hormone secreted by the alpha cells of the islets of Langerhans.

glucocorticoid Any hormone released from the adrenal cortex that increases glucogenesis and thus raises the level of liver glycogen and blood glucose.

glucogenesis The formation of glucose from glycogen.

glucometer Blood glucose-monitoring machine.

glucose intolerance The inability to properly metabolize glucose.

glucose tolerance test A test to detect abnormal glucose metabolism; assists in diagnosis of diabetes mellitus.

glycemic Referring to the amount of glucose present in a substance.

glycemic control Control of glucose in the blood.

glycosuria Glucose in the urine.

glycosylated hemoglobin (Hb A_{1c}; A1C) Hemoglobin with glucose attached to it; periodic measurements of hemoglobin A1C can help determine a diabetic patient's average blood glucose level over a period of 3 to 4 months.

goal(s) A broad statement describing what is to be accomplished over a specified period.

goiter An enlargement of the thyroid gland.

gonads Gamete-producing glands; the ovaries and testicles.

goniometry The measurement of range of motion in a joint.

graft An implant or transplant of tissue or an organ.

gram negative Having the pink color of the counterstain used in the Gram method of staining microorganisms.

gram positive Retaining the violet color of the stain used in the Gram method of staining microorganisms.

granulocyte A leukocyte containing abundant granules in its cytoplasm; granulocytes include neutrophils, eosinophils, and basophils.

Graves disease An immune disorder that causes overproduction of thyroid hormones. Also called toxic goiter.

gynecomastia The development of abnormally large mammary glands in the male.

H

hallucination A sensory perception (touching, tasting, feeling, hearing, seeing) that occurs without external stimulation.

hand hygiene The primary intervention any health care provider can use to control the spread of infection; performed with soap and water, if the hands are visibly soiled, or with an alcohol-based hand-sanitizing solution.

handicap A social disadvantage that exists because of a disability.

"Hands-Only CPR" Intended only for lay rescuers and only chest compressions are delivered; rescue breathing or mouth-to-mouth resuscitation are not included.

Haversian system A canal system that runs through the bones and contains the blood and lymph vessels.

health The ability to function well physically and mentally and to express the full range of one's potential.

health care-associated infection Formerly known as a *nosocomial infection*. Can occur when a patient is cared for in any kind of health care setting.

health care-associated pneumonia (HCAP) Pneumonia that results from conditions related to being in a health care facility or receiving health care.

health maintenance organization (HMO) A type of group health care practice that provides basic and supplemental health maintenance and treatment services to enrollees who prepay a fixed periodic fee that is set without regard to the amount or kind of services received.

Healthy People 2020 A federal government mandate with goals for improving the health of the American people, with particular attention to health concerns of people in minority groups.

hearing loss Impaired perception of sound.

heat exhaustion A disorder resulting from overexposure to heat or to the sun; also called *heat prostration*. It is caused by excessive perspiration and loss of body water and salt.

heatstroke A life-threatening condition resulting from prolonged exposure to environmental heat; also called *sunstroke*.

Helicobacter pylori A species of gram-negative, microaerophilic bacteria of the family Spirillaceae that causes gastritis and pyloric ulcers in humans.

helping relationship A relationship in which at least one of the parties intends to promote growth, development, maturity, improved functioning, and improved coping in the life of the other.

hemarthrosis A collection of blood in the joint space.

hematemesis Vomiting of blood.

hematocrit The volume percentage of red blood cells in whole blood.

hematoma(s) A localized collection of blood, usually clotted, that has leaked from adjacent blood vessels into an organ, space, or tissue.

hematuria Blood in the urine.

hemianopsia Blindness for half the field of vision in one or both eyes.

hemicolecotomy Removal of part of the colon.

hemiparesis Weakness affecting only one side of the body.

hemiparesthesia Abnormal sensation on one side of the body.

hemiplegia Paralysis of one half, or one side, of the body.

hemodialysis The removal of nitrogenous wastes from the blood by circulating arterial blood through a dialysate and returning it to the venous circulation.

hemodynamics The study of the movements of blood and the pressures being exerted in the blood vessels and the chambers of the heart.

hemoglobin The protein found in red blood cells that transports molecular oxygen in the blood; oxygenated hemoglobin (oxyhemoglobin) is bright red; unoxygenated hemoglobin is darker.

hemoglobinuria The presence of free hemoglobin in the urine.

hemolysis The rupture of red blood cells with release of hemoglobin into the plasma.

hemolytic Pertaining to the breakdown of red blood cells.

hemophilia An inherited disorder in which there is deficiency of one or more specific clotting factors in the blood.

hemoptysis Coughing and spitting of blood that can originate in the lungs, larynx, or trachea.

hemorrhoid A varicosity of a vein of the rectum. It may be internal (inside the sphincter muscles of the anus) or external (outside the sphincter muscles).

hemorrhoidectomy The removal of hemorrhoids.

hemothorax A collection of blood in the pleural cavity.

hepatic encephalopathy Degenerative changes in the brain associated with liver failure.

hepatitis An inflammation of the liver.

hernia The protrusion or projection of an organ or a part of an organ through the wall of the cavity that normally contains it.

hernioplasty The repair of a hernia.

herniorrhaphy The surgical repair of a hernia.

herpesvirus Any of a large group of DNA viruses found in many animal species. Type 1 herpes simplex virus (HSV) produces lesions that are primarily nongenital. Type 2 HSV lesions most often are genital.

heterosexual A person who is sexually attracted to people of the opposite sex.

hiatal hernia Protrusion of a portion of the stomach through the opening in the diaphragm through which the esophagus passes.

hierarchy The arrangement of objects, elements, or values in a graduated series.

hirsutism The excessive growth of hair on the body.

HIV The causative agent for AIDS; *see* Human immunodeficiency virus.

HLA Human leukocyte antigen.

HMO *See* Health maintenance organization.

holism The belief that each person is a unified whole.

holistic health care Attention to the mental, social, spiritual, and physical aspects of health and illness.

Homans sign Pain on passive dorsiflexion of the foot; a sign of thrombosis of deep calf veins.

homeopathy A practice based on the theory that a substance that produces symptoms of a disease when given in large doses to a healthy individual will cure the same symptoms when administered in small amounts.

homeostasis A tendency of biologic systems to maintain stability in the internal environment while continually adjusting to changes necessary for survival.

homonymous hemianopia Blindness or defective vision in the right or left halves of the visual fields of both eyes.

homosexual A person who is sexually attracted to people of the same sex.

homozygous Having inherited a genetic trait from both parents.

hordeolum An external stye.

hormone A chemical produced by the cells of the body and transported by the bloodstream to target cells and organs on which it has a regulatory effect.

hospice A program that provides a continuum of home and inpatient care for terminally ill individuals and their families.

hospital-acquired pneumonia (HAP) Pneumonia symptoms that occur more than 48 hours after admission.

host An organism in which another, parasitic organism is nourished and harbored.

human immunodeficiency virus (HIV) A retrovirus that integrates itself into the genetic material

of the cell it infects, changing the DNA of the host cell.

human needs Basic needs for survival and personal growth shared by all humans.

human needs theory The proposal that basic human needs act as stimuli to human behavior; Maslow postulated five levels of human needs: physiologic, safety and security, love and belonging, esteem, and self-actualization.

humoral Pertaining to body fluids or substances contained in them.

humoral immunity Antibody-mediated immunity, the result of B-cell action and the production of antibodies.

hydrocephalus Increased cerebrospinal fluid in the ventricles of the brain.

hydronephrosis Distention of the renal pelvis and calices with urine that cannot flow through obstructed ureters.

hydrostatic pressure The pressure or force caused by the presence of a fluid.

hyperalimentation Total parenteral nutrition.

hypercalcemia An excessive amount of calcium in the blood (i.e., more than 5.5 mEq/L or 11 mg/dL).

hypercapnia An excessive amount of carbon dioxide in the blood.

hyperchloremia An excessive amount of chloride in the blood.

hyperesthesia Abnormal sensitivity to stimuli.

hyperglycemia An above-normal level of blood sugar, as in diabetes.

hyperkalemia An excessive amount of potassium in the blood.

hyperlipidemia An excessive amount of lipids in the blood.

hypermagnesemia An excessive amount of magnesium in blood plasma.

hypernatremia An excessive amount of sodium in the blood.

hyperopia A visual defect in which parallel light rays reaching the eye focus behind the retina; farsightedness.

hyperphosphatemia An excessive amount of phosphates in the blood.

hyperplasia An increase in the number of cells of an organ; extra cell growth.

hyperpyrexia An extremely elevated temperature.

hypersecretion Oversecretion.

hypersensitivity An exaggerated immune response to an agent perceived by the body to be foreign. *See also* Allergy (allergies).

hypersomnia Sleeping for long periods.

hypertension Persistently high blood pressure; in adults, a systolic pressure equal to or greater than 140 mm Hg and a diastolic pressure equal to or greater than 90 mm Hg.

hyperthermia Unusually high fever.

hypertonic Of greater concentration.

hypertonic solution A solution in which the osmotic pressure (concentration) is greater than that of body fluids.

hypertrophy An increase in size of a structure or organ.

hyperuricemia An excessive amount of uric acid in the urine.

hyperventilation An abnormal breathing pattern in which an above-normal amount of air is inhaled into the lungs.

hypervolemia An abnormal increase in the volume of circulating blood.

hypesthesia A dysesthesia consisting of abnormally decreased sensitivity, particularly to touch.
Also called *hypoesthesia*.

hypnosis A subconscious condition, usually artificially induced, in which there is a response to suggestions and commands made by the hypnotist.

hypoalbuminemia An abnormally low level of albumin in the blood.

hypocalcemia An abnormally low level of calcium in the blood (i.e., less than 4.5 mEq/L or 8.5 mg/dL).

hypocapnia An abnormally low level of carbon dioxide in the blood, resulting from hyperventilation.

hypochloremia An abnormally low level of chloride in the blood.

hypochromic Pertaining to a condition of the blood in which the red blood cells have a reduced hemoglobin content.

hypodermoclysis Injection of fluid into subcutaneous tissue via continuous infusion.

hypoesthesia See Hypesthesia.

hypogammaglobulinemia An immune deficiency characterized by abnormally low levels of generally all classes of serum gamma globulins with increased susceptibility to infectious diseases.

hypoglycemia An abnormally low level of blood sugar.

hypoglycemic agents Agents that lower the blood sugar level (i.e., oral medications that are used to treat some forms of diabetes mellitus).

hypokalemia An abnormally low level of potassium in the blood.

hypomagnesemia An abnormally low level of magnesium in the blood plasma.

hypomania Inflated or irritable mood for at least 4 days.

hyponatremia An abnormally low level of sodium in the blood.

hypophosphatemia An abnormally low level of phosphates in the blood.

hypophysectomy Excision of the hypophysis cerebri.

hyposecretion Undersecretion.

hyposensitization A treatment used in managing hypersensitivity to a known allergen; the program involves regular injections of minute quantities of selected antigens over an extended period.

hypothalamus That portion of the diencephalon that lies beneath the thalamus at the base of the cerebrum; it activates, controls, and integrates many of the body's vital functions (e.g., regulation of metabolism, volume of body fluids, electrolyte content, and release of hormones).

hypothermia A serious loss of body heat caused by prolonged exposure to cold.

hypothyroidism Deficient activity of the thyroid gland.

hypotonic Of lesser concentration.

hypotonic solution One in which the osmotic pressure (concentration) is less than that of body fluids.

hypotonic state Pertaining to abnormally decreased muscular tone or tension.

hypoventilation An abnormal breathing pattern in which insufficient amounts of air are inhaled into the lungs.

hypovolemia Diminished blood volume.

hypoxemia Insufficient oxygenation of the blood.

hypoxia Deficiency of oxygen.

hysterectomy Surgical removal of the uterus.

I

iatrogenic Caused by medical treatment or diagnostic procedure.

iatrogenic disorder An adverse condition induced by effects of treatment by a physician or surgeon.

icterus Bile pigmentation of the tissues, membranes, and secretions.

idiopathic Of unknown cause.

idiosyncrasy A special characteristic by which a person differs from others.

ileal conduit A surgically created passageway that uses a portion of the ileum to direct the flow of urine from the ureters to the outside of the body.

ileostomy (ileostomies) An artificial opening in the ileum, created surgically, to drain fecal material from the small intestine.

ileus Intestinal obstruction, especially failure of peristalsis.

illusion A misperception of an actual sensory perception; misinterpretation of reality.

imagery Imagination; the calling up of mental pictures or events.

immune deficiency A lack of immune bodies and resultant impairment of the immune response to foreign agents.

immunity Resistance to a specific disease.

immunity, active Immunity acquired by producing one's own antibody.

immunity, passive Immunity acquired from a source other than one's own body, such as by transfer of antibody or lymphocytes from an immune donor.

immunization The process of rendering an individual immune by passive immunity or of becoming immune by active immunity.

immunocompetence The capacity to develop an immune response after exposure to an antigen.

immunoglobulin(s) A protein of animal origin with known antibody activity and a major component of humoral immunity. *See also* Antibody (antibodies).

immunoscintigraphy A radioactive scan of the immune structures.

immunosuppression The deliberate inhibition of antibody formation; used in transplantation to prevent rejection of the donor organ.

immunotherapy Development of passive immunity in a person by administration of preformed antibody; also, the administration of immunopotentiators and immunocompetent lymphoid tissue for cancer treatment.

impairment Dysfunction of a specific organ or body system.

impetigo An infection of the skin, usually by streptococci or staphylococci.

implementation A deliberate action performed to achieve a goal; carrying out of nursing interventions.

impotence Inability of the male to achieve or maintain an erection.

impulsive Acting in response to an impulse because the action brings emotional release or pleasure even though the action may be harmful to oneself or socially unacceptable.

inanimate Not alive; dull, lifeless.

incidence The rate at which certain events occur.

incontinence An alteration in the control of bowel or urinary elimination, or both.

incubation The interval between exposure to infection and the appearance of the first symptom.

index of suspicion Keen observation to detect problems that are not initially obvious, but suspected because of history or circumstances that underlie the patient's decision to seek care.

induration An abnormally hard spot or place.

infarct A localized area of necrosis produced by ischemia caused by obstructed arterial supply or inadequate venous drainage.

infarction Occurrence of a localized area of dead tissue produced by inadequate blood flow.

infection The invasion and multiplication of pathogenic microorganisms in body tissue.

inference A deduction or conclusion.

infertility The condition of inability to produce offspring.

inflammation An immediate cellular response to any kind of injury to the cells and tissues.

ingestants Any substances taken orally, such as food or drink.

ingestion The taking of any substance, such as food, drugs, water, or chemicals, by mouth or through the digestive system.

inhalants Medication or compounds suitable for inhaling.

initial The beginning of a thing or process; the first.

injectables Fluids capable of being injected.

innate Belonging to the essential nature of something; existing in or belonging at birth.

innate immunity A person's natural (inborn) immunity to certain diseases.

inotropic Pertaining to the force or energy of muscular contractions, particularly of the heart.

insensible Unconscious; without feeling or consciousness.

inspection The process of visual examination.

insomnia A sleep disorder; an inability to sleep.

insufficiency The condition of being inadequate for a given purpose.

insulin A naturally occurring hormone secreted by the beta cells of the islets of Langerhans in the pancreas in response to increased levels of glucose in the blood.

insulin-dependent diabetes mellitus Type 1 diabetes; a form of the disease that requires replacement of endogenous insulin with regular injections of exogenous insulin.

insulin resistance A situation in which insulin interaction with glucose becomes less efficient and fat metabolism is abnormal.

intention tremor A tremor that occurs on attempt at voluntary movement.

interdisciplinary (collaborative) care plan A care plan composed through collaboration of all of the health care team members caring for a patient.

intermittent claudication Cramping pain in the muscles of the lower extremities brought on by exercise and relieved by rest. A common symptom of arterial insufficiency; pain usually occurs in the calves of the legs but can also affect the muscles of the thighs and buttocks.

interstitial Placed or lying between.

interstitial fluids Body fluids that are located in the tissue spaces around the cells. *See also* Edema.

intervention Nursing activities performed by the nurse to meet the specified goals of a nursing care plan.

intracellular Within cells.

intracellular fluids Body fluids that are within cell walls.

intractable pain Hard-to-manage pain; pain not relieved by ordinary methods.

intraocular Within the eye.

intrathecal Injected into the subarachnoid space of the spinal cord via lumbar puncture.

intrathoracic Within the thoracic cavity.

intravascular fluids Body fluids within the blood vessels composed of plasma and the substances it transports.

intravenous therapy The administration of fluids through a vein.

intussusception Telescoping of one part of the bowel into another.

inuria Abnormal presence of protein in the urine.

ions Atoms or groups of atoms that have an electrical charge through the gain or loss of an electron.

ipsilateral On or affecting the same side of the body.

iridectomy Excision of part of the iris.

ischemia A deficiency of blood supply to a part as a result of functional constriction of a blood vessel or of actual obstruction, as by a clot.

islets of Langerhans Pancreatic cells. Beta cells, which secrete insulin, are found in these cells.

isolation technique Special precautionary procedures used to set apart a patient with a communicable disease; the purpose is to prevent the spread of infectious agents from the patient to others.

isometric Having equal dimensions; maintaining the same length.

isometric exercises Exercises that involve generating tension between two opposing sets of muscles.

isotonic Of equal solute concentration.

isotonic contraction A contraction that occurs when tension is developed in a muscle.

isotonic solution A solution in which the osmotic pressure is the same as that of intracellular fluid (e.g., normal saline [0.9% concentration]).

isotope One of a series of chemical elements that have nearly identical chemical properties but differ in their atomic weight and electrical charge. Many isotopes are radioactive.

J

jaundice A yellowing of the skin and mucous membranes that reflects excessively high blood levels of bilirubin (bile pigment).

K

keloid Excessive, abnormal scar formation in the skin after trauma or surgical incision.

keratitis An inflammation of the cornea.

keratosis (keratoses) Any horny growth, such as a wart or callosity; usually either actinic keratosis or a seborrheic keratosis.

ketoacidosis The accumulation of ketone bodies in the blood because of incomplete metabolism of fats, resulting in metabolic acidosis.

ketonuria The presence of acetone bodies in the urine.

ketosis The accumulation in the body of the ketone bodies: acetone, beta-hydroxybutyric acid, and acetoacetic acid.

kinetic motion The motion of material bodies and the forces and energy associated with it.

Korsakoff syndrome Substance-induced persisting dementia.

Kupffer cells Large, highly phagocytic cells in the liver; they form part of the reticuloendothelial system.

kypnosis An abnormally increased curvature of the thoracic spine, which gives a "hunchback" appearance.

L

labile Unsteady, not fixed; easily disarranged.

labyrinthitis An inflammation of the internal ear, including the vestibule, cochlea, and semicircular canal.

laparoscopy The examination of the peritoneal cavity with a fiberoptic instrument inserted through a small abdominal incision.

laryngectomy The partial or total removal of the larynx by surgical excision; the person who has had a laryngectomy is called a *laryngectomee*.

laryngitis An inflammation of the larynx.

laryngoscopy Direct or indirect visual examination of the larynx.

laser Stands for *light amplification by stimulated emission of radiation*; converts light wavelengths into one small, intense, unified beam of single-wavelength radiation; used for diagnosis and surgery.

latent Not obvious; hidden.

latent TB infection (LTBI) An infection with *Mycobacterium tuberculosis* without current active disease.

lesions A circumscribed area of pathologically altered tissue.

leukapheresis A process by which blood is withdrawn from a vein, white blood cells are removed, and the remaining blood is reinfused in the patient.

leukemia A malignant disease of the blood-forming organs, marked by abnormal proliferation and development of leukocytes and their precursors in the blood and bone marrow.

leukocyte A colorless blood cell whose chief function is to protect the body against pathogenic

microorganisms.

leukocytosis An increase in the number of white blood cells, or leukocytes, in the blood.

leukopenia A reduction in the number of leukocytes in the blood to 5000 or less.

leukoplakia Patches of thickened, white tissue on mucous membrane; considered a precursor to cancer.

leukotrienes A class of biologically active compounds that occur naturally in leukocytes and produce allergic and inflammatory reactions similar to those of histamine.

level of consciousness (LOC) A standardized system to describe the state of consciousness (i.e., alert wakefulness, drowsiness, stupor, or coma).

Lhermitte sign An electrical shock-like sensation felt along the spine when the neck is flexed.

libido The conscious or unconscious sexual drive.

lifestyle habits Entrenched practices related to work, recreation, diet, exercise, and other activities of daily living.

ligament Connective tissue that joins the bones of a joint together.

ligate To tie or bind.

lipodystrophy A disturbance of or defect in fat metabolism.

lipoma A fatty tumor.

lipoprotein Any of the macromolecular complexes that are transported in the blood.

lithiasis The formation of stones.

lithotripsy The crushing of a calculus in the kidney, bladder, urethra, or gallbladder.

loose associations Disordered thinking with little connection between thoughts.

lordosis An abnormal forward curvature of the spine.

lozenge(s) A medicated tablet or disk.

lucid Clear, especially applied to clarity of the mind.

lymphadenitis An inflammation of the lymph nodes.

lymphadenopathy A disease of the lymph nodes, often producing enlargement.

lymphangiography Radiography of lymphatic vessels after injection of a contrast medium.

lymphangitis An inflammation of the lymph vessels.

lymphatic system An accessory system by which fluids can flow from tissue spaces into the blood.

lymphedema The swelling of tissues drained by the lymphatic system.

lymph nodes Small bundles of lymphatic tissue containing lymphocytes, the functions of which are filtration and phagocytosis.

lymphocyte A mononuclear, nongranular leukocyte that is chiefly a product of lymphoid tissue and is important in the development of immunity.

lymphocyte, sensitized A nongranular lymphocyte that has been processed either by the thymus (T lymphocyte) or an unknown processing area (B lymphocyte) and is responsible for either cellular or humoral immunity.

lymphocyte-transforming factor A protein mediator that causes transformation and clonal expansion of nonsensitized lymphocytes that produce a toxin destructive to antigen.

lymphoma Any neoplastic disorder of lymphoid tissue.

lyse To produce decomposition; to destroy.

lysis The gradual decline of a fever or disease; the opposite of crisis.

M

macrophage(s) A large, mononuclear phagocyte derived from monocytes; macrophages are components of the reticuloendothelial system.

macrophage-activating factor A mediator released by sensitized lymphocytes on contact with an antigen, the function of which is to induce in macrophages an increased content of lysosomal enzymes, more aggressive phagocytosis, and increased mitosis.

macrophage chemotaxis factor A protein mediator released by sensitized lymphocytes on contact with antigen, the function of which is to attract macrophages to the antigen site.

macule (macula) A discolored spot on the skin that is not raised above the surface.

major depressive disorder A mental disorder in which at least five symptoms characteristic of depression have been present for at least 2 weeks. Some of these symptoms include an overwhelming feeling of sadness, inability to feel pleasure or interest in daily activities, weight gain or loss not attributed to dieting, sleep disturbances, fatigue, difficulty concentrating, and suicidal thoughts.

malignancy *See* Carcinoma.

malignant Becoming progressively worse; resisting treatment and resulting in death; having the properties of anaplasia, invasiveness, and metastasis.

mammography The x-ray examination of the soft tissues of the breast.

mammoplasty Plastic surgery of the breast.

managed care Organization of health care delivery that coordinates care delivery by various health team members in a timely, cost-effective manner.

mania An elevation in mood characterized by feelings of elation, excitement, or extreme irritability.

mass casualties Casualties in such numbers that the normal health care system has difficulty providing adequate care.

mastication Chewing.

mean, mathematical An average (e.g., mean corpuscular hemoglobin concentration, which is the concentration of hemoglobin in the average erythrocyte).

measurable The ability to be expressed numerically, or to be described as to the extent or quantity (of a substance, energy, or time).

mechanism of injury Refers to how the injury occurred.

mediastinum The mass of tissues and organs separating the sternum in front and the vertebral column behind.

mediate To accomplish by indirect means; to act between two parties or sides.

Medicaid A federally funded state-operated program that provides medical assistance to eligible people with low incomes.

medical nutrition therapy A registered dietitian (RD) or a certified diabetes educator (CDE) performs an in-depth assessment of type of diabetes, height-to-weight ratio, usual dietary intake, food preferences, exercise level, and daily schedule. A range of interventions are considered when designing a plan that is individualized for the patient.

Medicare A federally funded national health insurance program in the United States for people older than 65 years.

meditation The act of contemplative thinking.

melanoma A malignant, darkly pigmented mole or tumor of the skin.

melena Black, tarry stools.

menarche The onset of menstruation.

Ménière disease A group of symptoms produced by an increase in fluid in the labyrinthine spaces with swelling and congestion of the mucosa of the cochlea.

menopause The span of time during which the menstrual cycle wanes and gradually stops; *see Climacteric.*

menorrhagia Excessive menstruation.

menses The onset of the menstrual cycle.

menstruation The shedding of the uterine lining.

mentate To think.

MET Acronym for "metabolic equivalent of task," a measure of heat production by the body. This term is used with cardiac rehabilitation patients.

metabolic acidosis A condition in which the pH of body fluids is below 7.4 because of either an excessive production of carbonic acid through the oxidation of fats or a loss of bicarbonate.

metabolic alkalosis A condition in which the pH of body fluids is above 7.4 because of either an excessive loss of acid, an above-normal intake or retention of base, or a low level of potassium in the blood.

metabolism The sum of the physical and chemical processes by which living tissue is formed and maintained and by which large molecules are disassembled to provide energy.

metastasis The movement of disease from one organ or body part to a distant location; for example, the migration of microorganisms and of malignant cells.

metrorrhagia Uterine bleeding occurring at irregular intervals and sometimes for prolonged periods.

microalbuminuria Presence of albumin in the urine, which is suggestive of **early** kidney disease.

microcytic Pertaining to a smaller-than-normal cell.

micron A unit of linear measure; equal to 0.001 mm.

micturition The voiding of urine.

milieu therapy Therapy in a structured environment of a hospital or group home setting to help patients participate as active members of the milieu community and practice social behaviors.

milliequivalent One-thousandth of a chemical equivalent, expressed as mEq; the concentration of electrolytes in a certain volume of solution is usually expressed as milliequivalents per liter (mEq/L).

mineralocorticoids A group of hormones produced by the adrenal cortex that have an effect on sodium, chloride, and potassium levels in extracellular fluid.

miotic A drug that constricts the pupil.

mitosis A type of cell division of somatic cells in which each daughter cell contains the same number of chromosomes as the parent cell. It is the process by which the body grows and by which somatic cells are replaced.

mittelschmerz A sharp pain in the right or left lower quadrant, sometimes felt at midcycle around the time of ovulation.

modulation The fourth of four phases associated with nociceptive pain in which the brain sends signals back down the spinal cord by release of neurotransmitters.

monocytes Mononuclear phagocytic leukocytes.

monoparesis Weakness in one limb.

monoplegia Paralysis of one limb.

morphologic Related to the science of structures and forms without regard to function.

mucolytic Dissolving or destroying mucus.

mucorrhea The free discharge of mucus.

mucositis An inflammation of a mucous membrane.

multidrug-resistant organism (MDRO) A pathogen that has mutated as a result of inadequate dosages or delays in administration of antimicrobial medication and is now resistant to many medications.

multisystem organ dysfunction syndrome (MODS) A syndrome in which there is concurrent dysfunction of several organs.

muscle tone The readiness of a muscle to contract and relax normally.

mutation An unusual change in a gene occurring spontaneously or by induction. Mutation can occur in pathogenic organisms.

mycosis (mycoses) Any disease caused by a fungus.

mydriatic Dilating the pupil.

myocardial infarction (MI) Necrosis of the myocardium as a result of interruption of the blood supply to the area.

myocarditis An inflammation of the heart muscle.

myomectomy Surgical removal of a tumor from the uterine wall, accomplished by use of an endoscope.

myopia The error of refraction in which parallel light rays focus in front of the retina; nearsightedness.

myringotomy An incision into the eardrum.

myxedema A condition in an adult in which there are low thyroid levels.

N

nebulizer An atomizer; a device for delivering drugs or water to the respiratory tract by forcing air

or oxygen through a solution.

necrosis The changes that occur as a result of death of cells; caused by enzymatic degradation.

necrotic Pertaining to death of a portion of tissue.

negative feedback In the endocrine system, if the hormonal need of a target tissue is being satisfied, production or secretion of the hormone will be inhibited.

negative symptoms One of the two divisions of signs and symptoms of schizophrenia; include apathy, social isolation, psychomotor retardation, and lack of motivation.

neologism(s) In psychiatry, an invented word whose meaning may be known only to the person using it and may be related to his or her conflicts.

neoplasm A tumor; any new and abnormal growth.

nephron The structural and functional unit of the kidney, which consists of the renal corpuscle, the proximal convoluted tubule, limbs of the loop of Henle, the distal convoluted tubule, and the collecting tubule; thus each nephron is able to form urine independently.

nephrosclerosis Atherosclerotic disease of the small renal arteries related to hypertension and eventual destruction of renal cells.

nephrostomy Formation of an artificial fistula into the renal pelvis of the kidney.

nephrostomy tubes Tubes inserted to drain the renal pelvis.

networking Meeting people, exchanging phone numbers, expressing interest in other people and what they are doing, and establishing a business relationship that might be mutually beneficial.

neuroglycopenia A shortage of glucose in the brain.

neuron Any of the conducting cells of the nervous system; consists of a cell body containing the nucleus and cytoplasm and the axon and dendrites.

neuropathic pain Pain associated with a dysfunction of the nervous system; specifically, an abnormality in the processing of sensations.

neuropathy Any disease of the nerves.

neutropenia An abnormal decrease in the number of neutrophils in the blood.

neutrophilia An increase in the number of neutrophils in the blood.

neutrophils Granular leukocytes; also called *polymorphonuclear leukocytes*.

nociceptive pain Pain associated with pain stimuli from either somatic or visceral structures.

nocturia Excessive urination during the night.

nodules Small masses of tissue that can be detected by touch.

noncommunicable Cannot be carried from one person to another.

non-insulin-dependent diabetes mellitus Type 2 diabetes; a form of diabetes in which levels of endogenous insulin are adequate and control can be managed by diet and exercise and perhaps by an oral hypoglycemic agent.

nonjudgmental Avoiding judgment based on one's personal standards.

normal flora Flora most often found on or in body systems that have some form of contact with the outside environment. This flora prevents most harmful microorganisms from colonizing the body.

normo- A combining form indicating normal or usual.

North American Nursing Diagnosis Association—International (NANDA-I) An organization that formulates and validates nursing diagnoses.

nosocomial Pertaining to or originating in a hospital.

nuchal rigidity Stiffness and pain in the neck from inflammation of the meninges.

nurse practice act A legal statute describing the parameters of nursing practice.

nursing The diagnosis and treatment of human responses to actual or potential health problems.
See also Nursing process.

nursing care plans Written plans of care that serve to communicate to the nursing staff and others the specific nursing diagnoses and prescribed nursing orders for directing and evaluating the effectiveness of the care given.

nursing diagnosis A statement of a health problem or of a potential problem in the patient's health status that a nurse is licensed and competent to treat.

nursing interventions Acts by nurses that implement the nursing care plan.

nursing process A goal-directed series of activities in which the practice of nursing accomplishes its goal of alleviating, minimizing, or preventing real or potential health problems.

nystagmus Involuntary, rapid rhythmic movement of the eyeball.

O

objective data Information obtained through the senses or measured by instruments.

objectives Well-defined steps toward the accomplishment of a goal; they should be realistic, be stated in measurable terms, and include the conditions under which they will be accomplished.

observation The act of watching carefully and attentively.

obsessive Having ideas, thoughts, or impulses that are persistent to an excessive degree.

obsessive-compulsive disorder A mental disorder characterized by recurrent or intrusive thoughts and rituals that can become overwhelming to the point of interfering with normal life.

obturator A device that is placed into a large-bore cannula during insertion to prevent potential blockage by tissues.

occult Obscure; concealed; hidden.

occult blood Hidden blood.

oculogyric crisis A side effect of antipsychotic medication characterized by uncontrolled rolling back of the eyes.

olfaction The act of smelling.

oligomenorrhea Decreased menstruation. Usually refers to menstrual periods that occur at an interval of 45 days or longer.

oliguria A diminished amount of urine formation.

oncogene A gene in a virus that has the ability to induce a cell to become malignant.

oncology The study of tumors.

onychomycosis A fungal infection of the fingernail or toenail.

oophoritis An inflammation of an ovary; ovaritis.

open access plan An insurance plan in which the patient can see any health care provider.

ophthalmologist A physician who specializes in treating eye disorders.

ophthalmoscope An instrument for examining the eye. The direct ophthalmoscope is used to inspect the back portion of the interior of the eyeball; the indirect ophthalmoscope permits stereoscopic inspection of the interior of the eye.

opportunistic infections (OIs) Infections that develop in an individual with a depressed immune system from organisms commonly found in the environment that are usually harmless.

opportunistic pathogen A fungus or bacterium, usually harmless, that causes infection in a person with a depressed immune system.

optic chiasm The part of the hypothalamus formed by the decussation, or crossing, of the fibers of the optic nerve from the medial half of each retina.

optician A specialist in the making of optical apparatus (e.g., eyeglasses).

optometrist A professional person trained to examine the eyes and prescribe eyeglasses or contact lenses to correct irregularities of vision.

orchectomy The excision of one or both testes.

orchitis An inflammation of the testes.

orthopedic Referring to the correction of deformities of the musculoskeletal system.

orthopnea The ability to breathe easily only in the upright position.

orthopneic position Sitting up in bed with two or three pillows behind the back.

orthostatic hypotension A fall in blood pressure that occurs when standing up from a sitting or lying position or when standing in a fixed position; it is characterized by dizziness, syncope, and blurred vision.

oscilloscope An instrument that makes visible on a screen the nature of an electrical current.

osmolality The osmotic pressure of a solution, expressed in osmoles or milliosmoles (mOsm) per kilogram of water.

osmosis The passage of solvent from a solution of lesser concentration to one of greater concentration through a selectively permeable membrane.

osmotic pressure Pressure that develops when two solutions of different concentrations are separated by a semipermeable membrane.

ossification Formation of or conversion into bone or a bony substance.

osteomyelitis A bacterial infection of the bone.

osteoporosis A porous condition of bone caused by demineralization associated with aging or steroid medication.

otalgia Pain in the ear.

OTC Over the counter; available without a prescription.

otitis media An inflammation of the middle ear.

otorrhea An inflammation of the ear with purulent discharge.

otoscope An instrument for examining the ear canal and eardrum.

outcome The result of an action.

ovulation The periodic ripening and rupture of the mature graafian follicle and the discharge of the ovum from the cortex of the ovary.

oxidation The process by which a substance combines with oxygen.

P

pacemaker A mechanical device that provides electrical stimulation when an anatomic pacemaker fails; a cardiac pacemaker provides electrical stimulation when there is heart block.

pain A feeling of distress or suffering caused by stimulation of specialized nerve cells; considered to occur whenever a person says it is present.

pain threshold The point at which pain is perceived.

pain tolerance The length of time or intensity at which a person will endure pain before outwardly responding to it.

palliative Designed to relieve symptoms when a disease cannot be cured.

palliative care Comfort care.

palliative surgery Surgery performed to make a patient more comfortable.

palmar erythema A persistent redness of the palms that may be seen in liver disease.

palpation A physical examination technique in which the texture, size, consistency, and location of body parts are felt with the hands.

palpitation A rapid, violent, or throbbing pulsation, as an abnormally rapid throbbing or fluttering of the heart.

pancreatitis An inflamed condition of the pancreas.

pandemic An international outbreak of disease.

panhysterectomy The surgical removal of the entire uterus.

papule A small, round, solid, elevated lesion of the skin.

paracentesis The surgical puncture of a cavity to aspirate fluid.

paradoxical respirations Respirations in which, on inhalation, the traumatized portion of the chest wall moves inward rather than outward.

paralytic ileus The absence of peristalsis; paralysis of the intestines.

paranoia A mental disorder in which a person exhibits delusions of persecution or of grandeur or a combination of both.

paraplegia Paralysis of the lower extremities.

parathormone A hormone produced and secreted by the parathyroid gland.

parenteral Administered by a route other than the digestive tract.

paresthesia A feeling of tingling or numbness.

passive immunity Immunity acquired by transfer of antibody or lymphocytes from an immune donor.

patent Wide open.

pathogen A microorganism or substance capable of producing a disease.

pathologic Caused by a disease.

patient advocate A person who will advocate on the patient's behalf with the hospital, insurance company, or health care personnel.

PCA Patient-controlled analgesia.

pediculosis An infestation with lice.

pelvic inflammatory disease Any inflammation in the pelvis that occurs outside the uterus, uterine tubes, and ovaries.

peptic ulcer The loss of tissue lining the esophagus, stomach, or duodenum.

perception The recognition and interpretation of sensory stimuli that serve as a basis for comprehending, learning, and knowing or for motivating a particular action or reaction. Also, the third of four phases associated with nociceptive pain, during which impulses reach the brain and pain is recognized.

percussion The physical examination technique of tapping the body surface with the fingertips or fist to evaluate the size, borders, and consistency of some of the internal organs or to detect the presence of fluid in a body cavity.

percutaneous Through the skin.

perforation A hole or break in the retaining walls or membranes of an organ, as in perforated ulcer and perforated eardrum.

perfusion Supplying tissues and organs with nutrients and oxygen by blood flow through the arteries.

pericardial effusion A collection of serous or purulent exudate in the pericardial cavity.

pericardiocentesis The surgical puncture of the pericardial cavity for aspiration of fluid.

pericardiotomy The surgical incision of the pericardium.

pericarditis An inflammation of the sac that encloses the heart and the roots of the great vessels.

periodontal Located around a tooth.

perioperative Pertaining to the period extending from the time of hospitalization for surgery to the time of discharge.

periorbital Surrounding the socket of the eye.

peripheral Pertaining to the area outside the central region or structure.

peristalsis Involuntary wavelike contraction of organs with both longitudinal and circular muscle fibers that passes along the organ and propels its contents, as in peristalsis of the digestive tract.

peristomal Pertaining to the area around a stoma.

peritonitis An inflammation of the serous sac that lines the abdominal cavity and encloses the abdominal organs.

permeable Permitting passage of a substance.

personality disorder A mental disorder characterized by inflexible and maladaptive responses to life events, serious difficulty in personal and work relationships, a tendency to evoke interpersonal conflict, and a tendency to evoke a negative empathic response from others.

personal protective equipment (PPE) Equipment that forms some type of barrier to protect a

person from exposure to blood-borne pathogens, body fluids, or other potentially infectious materials (e.g., gloves, covering gowns, and face masks).

pessary A hard rubber ring inserted in the vagina to help keep the abdominal organs in place.

petechiae Very small, nonraised, round, purplish spots, caused by intradermal or submucosal bleeding, that later turn blue or yellow.

pH The concentration of hydrogen (H) in a solution; the higher the concentration of hydrogen ions, the lower the pH of the solution.

phacoemulsification A technique of cataract extraction in which high-frequency vibrations are used to fragment the lens.

phagocytosis The engulfing of microorganisms and other foreign matter by phagocytes.

phantom pain A sensation of discomfort occurring where an extremity has been amputated.

pharyngitis An inflammation or infection of the pharynx that usually produces a sore throat.

phenylketonuria A genetic disorder in which there is a defect in the metabolism of phenylalanine resulting in the presence of this amino acid in the urine.

pheochromocytoma A rare tumor of the adrenal medulla that secretes catecholamines (epinephrine and norepinephrine).

phlebitis An inflammation of a vein.

phlebotomy The surgical opening of a vein to draw blood, often done with a needle.

phobic disorder Excessive fear of a situation or object.

photocoagulation The alteration of proteins in tissue by the use of light energy in the form of ordinary light rays or a laser beam.

photodynamic therapy A type of chemotherapy in which the action of the drug is enhanced by exposure to light.

photophobia Difficulty tolerating light.

pilonidal Pertaining to, characterized by, or having a tuft of hairs.

pilonidal sinus A lesion located at the cleft of the buttocks in the sacrococcygeal region; also called *pilonidal cyst*.

placebo(s) A supposedly inactive substance or procedure that can have either positive or negative effects on the relief of symptoms and that is usually given under the guise of effective treatment or in clinical trials of new drugs.

planning A phase of the nursing process in which a plan is developed with the patient, family, or significant other to provide a blueprint for nursing intervention to achieve specified goals. *See also* Nursing care plans.

plaque A patch or flat area.

plasma The liquid portion of blood in which formed elements are suspended; it contains plasma proteins, inorganic salts, nutrients, gases, wastes from the cells, and various hormones and enzymes.

plasma cell A spherical or ellipsoidal cell involved in the synthesis, storage, and release of antibody.

plasmapheresis The separation of the cells and components of the blood.

platelets The smallest formed elements in the blood; important in coagulation and blood clotting.

plethora A general term denoting a red, florid complexion or an excess of blood.

pleurisy An inflammation of the pleura.

Pneumocystis jiroveci An opportunistic pathogen that produces infection of the lung associated with acquired immunodeficiency syndrome (AIDS); formerly *Pneumocystis carinii*.

pneumonectomy The excision of lung tissue, especially of an entire lung.

pneumonia An inflammation of the lungs with consolidation.

pneumothorax The accumulation of air or gas in the pleural cavity, resulting in collapse of the lung on the affected side.

point-of-service (POS) option An option offered by some managed care plans in which a member pays an extra fee to see a desired physician outside of the care plan.

polyarteritis Multiple sites of inflammatory and destructive lesions in the arterial system.

polycystic ovarian syndrome An endocrine disturbance characterized by anovulation, amenorrhea, hirsutism, and infertility.

polycythemia An elevation in the total number of blood cells.

polydipsia Excessive thirst that results in drinking large quantities of water.

polymorphonuclear leukocytes The fully developed cells of the granulocyte series, especially neutrophils, the nuclei of which contain three or more lobes.

polyphagia Increased hunger.

polyuria The production of an excessive amount of urine.

positive symptoms One of the two divisions of signs and symptoms seen with schizophrenia; includes hallucinations, delusions, and disordered thinking.

postictal state The condition of a person right after a seizure.

post-traumatic stress disorder A mental disorder characterized by recurrent symptoms of anxiety that some individuals may experience after encountering an extreme, life-threatening event. Nightmares or flashbacks may be part of the symptoms.

PPO See Preferred provider organization.

precancerous Term used to refer to a growth that is not yet, but probably will become, cancerous.

precipitate A deposit separated from a suspension or solution by precipitation; the reaction of a reagent that causes the deposit to fall to the bottom or float near the top.

preferred provider organization (PPO) An organization of physicians, hospitals, and pharmacists whose members discount their services to subscriber patients.

premenstrual syndrome A group of symptoms experienced by some women for several days before the onset of the menstrual period.

prepuce The foreskin or fold of skin over the glans penis in the male.

presbycusis Impairment of hearing in old age.

presbyopia Farsightedness that occurs normally with aging.

pressor A substance that causes a rise in blood pressure. Norepinephrine is an example of a "pressor" hormone. Norepinephrine maintains blood pressure.

pressure ulcer A sore caused by pressure from a splint or other appliance or from the body itself

when it has remained immobile in bed for extended periods.

preventive Hindering the occurrence of something, especially disease.

priapism A prolonged penile erection resulting in a large, hard, and painful penis unrelated to sexual desire or activity.

primary union The joining of two edges of a wound that are close together, resulting in a thin scar after healing; also called *healing by first intention*.

priority Preference established on the basis of emergency or need.

priority setting Setting the sequence of actions according to importance or priority.

problem-oriented medical record (POMR) A system of documentation in which the information is arranged according to specific problems presented by the patient at the time of seeking health care. The four components are database, problem list, initial plan, and follow-up. *See also* Progress notes.

process A series of actions that move from one point to another on the way to completing a goal.

prodromal stage The early or very beginning stage of an illness.

prodrome An early sign of a developing condition or disease.

prognosis The predicted outcome of the course of a disease.

progress notes Entries in the medical record describing what has been done in the care of the patient and his or her response to the intervention.

prolapse The falling down or displacement of a part or all of an organ, as in prolapse of a stoma or prolapse of the uterus.

promoter(s) A type of epigenetic carcinogen that promotes neoplastic growth only after initiation by another substance; a cocarcinogen.

prophylactic Something done or used to prevent infection or disease.

prospective payment system A payment system for reimbursing hospitals for inpatient health care services in which a predetermined rate is set for treatment of specific illnesses.

prostaglandins A group of naturally occurring fatty acids that stimulate contraction of the uterine and other smooth-muscle tissue.

prostate-specific antigen (PSA) A protein produced by the prostate that is present in elevated levels in patients with cancer or other diseases of the prostate.

prosthesis An artificial substitute for a missing part, such as an eye, limb, or tooth, used for functional or cosmetic reasons, or both.

protease inhibitor A drug that works at the last stage of viral reproduction.

protective isolation Special precautionary procedures to minimize exposure to infectious agents in a patient who has an immune deficiency or who is otherwise susceptible to infection.

proteinuria An excess of serum proteins in the urine.

protocol The plan for a course of medical treatment.

protozoa A phylum comprising the unicellular organisms; most are free-living, but some lead commensalistic, mutualistic, or parasitic existences.

provider A person or an agency that provides health care services.

proximal Closest to a point of reference.

pruritus Itching.

pseudocyst An abnormal or dilated cavity resembling a true cyst but not lined with epithelium.
Also called *adventitious cyst* or *false cyst*.

psychoactive substances Mind-altering agents capable of changing or altering a person's mood, behavior, cognition, arousal level, level of consciousness, and perceptions.

psychomotor retardation A slowing of speech, movement, and thought process often seen in depressed patients.

psychotic features Hallucinations, delusions, and grossly disorganized behavior.

ptomaines Toxic substances produced by the action of putrefactive bacteria on proteins and amino acids.

ptosis The dropping of an organ below its usual position, for example, lowering of the eyelid so that it partially or completely covers the cornea.

pulmonary edema A diffuse accumulation of fluid in the tissues and air spaces of the lung.

pulmonary embolus A mass of clotted blood or other formed element in the lung.

pulse deficit The difference between the radial and apical pulse rates.

pulsus paradoxus A drop in systolic blood pressure of greater than 10 mm Hg on inspiration.

purpura Purplish areas caused by bleeding into the skin or mucous membranes.

purulence The condition of producing or discharging pus.

purulent Full of pus.

pus A liquid product of inflammation composed of albuminous substances, a thin fluid, and leukocytes; generally yellow.

pustule A small, round, pus-filled lesion of the skin.

pyelogram A radiograph of the kidney and ureters after injection of a contrast medium that may be administered intravenously (IV pyelogram) or by way of the ureters (retrograde pyelogram).

pyelonephritis An inflammation of the kidney and renal pelvis.

pyrogen Any agent that causes fever.

pyuria Pus in the urine.

Q

quadriplegia Paralysis of all four extremities.

quadriplegic A person with paralysis of all four limbs.

R

rad Radiation absorbed dose; the unit used for measuring doses of radiation.

radiation therapy The use of radiant energy from radioactive materials or high-voltage x-rays to treat disease.

radioimmunoassay A laboratory method for measuring minute quantities of specific antibodies or any antigen, such as a hormone or drug, against which antibodies have been produced.

radionuclide A radioactive substance given to the patient before radiography or scanning.

radiopaque Not penetrable by x-rays; appears white on radiograph.

rales Abnormal respiratory sounds heard on auscultation with a stethoscope indicating some pathologic condition.

range of motion The extent, measured in degrees of a circle, through which a joint can be extended and flexed.

rationalization A defense mechanism in which a patient finds logical reasons (justification) for his or her behavior while ignoring the real reasons.

realistic Attainable, based on the patient's condition and desire.

rectocele A protrusion of the rectum and posterior vaginal wall into the vagina.

recurrent Returning at intervals.

referred pain Pain felt in a part away from its point of origin.

reflex (reflexes) The sum of any particular autonomic (automatic) response mediated by the nervous system and not requiring conscious movement.

refraction The determination of refractive errors (inability to focus light rays on the retina) and their correction with eyeglasses.

regeneration The natural renewal of a structure.

regimen A prescribed scheme of diet, exercise, or activity to achieve certain ends.

rehabilitation The processes of treatment and education that help a disabled individual attain maximum function, a sense of well-being, and a personally satisfying level of independence.

remittent Having alternating periods of abating and returning, such as a fever that comes and goes.

replicate To duplicate, reproduce, or copy.

replication The process of duplicating or reproducing.

reservoir A passive host or carrier that harbors pathogenic organisms without harm to itself and is a source from which others can be infected.

residual urine Urine that remains in the bladder immediately after urination.

resorption Taking in or absorbing again.

respiration The taking in of oxygen, its utilization in the tissues, and the giving off of carbon dioxide.

respiratory acidosis A condition in which the pH of body fluids is below 7.4 because of failure of the lungs to remove sufficient amounts of carbon dioxide.

respiratory alkalosis A condition in which the pH of body fluids is above 7.4 because of excessive removal of carbon dioxide by the lungs, as in hyperventilation.

resuscitation Revival after apparent death.

reticuloendothelial system A network of cells and tissues found throughout the body, especially in the blood, connective tissue, spleen, liver, lungs, bone marrow, and lymph vessels; these cells play a role in blood cell formation and destruction and in inflammation and immunity.

retinopathy A pathologic condition of the retina associated with diabetes mellitus.

retrograde Moving backward; degenerating from a better to a worse state.

retrospective Dealing with the past.

retrospective payment system Medicare payment based on actual costs submitted to government; used before 1983.

retrovirus A type of virus that contains RNA.

reverse transcriptase An enzyme that is present in retroviruses.

rhinitis An inflammation of the mucous membrane of the nose.

rhinoplasty A plastic surgical operation on the nose, either reconstructive, restorative, or cosmetic.

rhonchi Coarse rattling sounds in the bronchial tubes caused by a partial obstruction.

rickettsia A genus of small, rod-shaped to round microorganisms found in tissue cells of lice, fleas, ticks, and mites and transmitted to humans by their bites.

rigor mortis The stiffness that occurs in dead bodies.

robotics The science of designing mechanical, computerized instruments for procedures.

Roux-en-Y Any Y-shaped anastomosis in which the small intestine is included.

rubor A dusky-red color seen in patients with arterial insufficiency.

rugae Ridges or folds on a mucous membrane.

S

safer sex Any sexual practice that is performed with the use of a barrier to prevent the exchange of body fluids.

salpingitis An inflammation of a uterine tube.

sarcoidosis A chronic, progressive, systemic granulomatous reticulosis of unknown etiology, involving almost any organ or tissue.

sarcoma A tumor, often highly malignant, composed of cells derived from connective tissue.

scabies An infestation with the mange mite.

scaling The shedding of small, thin, dry layers of skin.

scarring The replacement of damaged tissue with fibrous tissue.

schizophrenia A mental illness that causes unusual, bizarre behavior (hallucinations and delusions).

scleropathy The injection of a solution that causes the vessel to dry up and disintegrate.

scoliosis Lateral curvature of the spine.

scotoma An area of lost vision in the visual field.

sebaceous Containing or pertaining to sebum, an oily, fatty matter secreted by the sebaceous glands.

secondary union The healing of a wound in which the edges are far apart and cannot be brought together; the wound fills with granulation tissue and heals from the edges inward.

sedative(s) An agent that calms nervousness, irritability, and excitement.

seizure(s) An attack of uncontrollable muscular contractions; a convulsion.

self-care The process by which one initiates and carries out certain health practices to maintain life, health, and personal well-being.

semen A thick, opalescent, viscid secretion discharged from the urethra of the male at the climax of sexual excitement (orgasm).

seminal Concerning the semen or seed.

senile lentigines Areas where melanocytes increase in production, producing brown age spots.

senile purpura Dark purplish-red ecchymoses occurring on the forearms and backs of the hands in the elderly.

sensitivity reaction An exaggerated response to agents perceived by the body as foreign.

sensorineural hearing loss Impaired perception of sound caused by a dysfunction in the inner ear or the eighth cranial nerve.

sensory loss Impairment of acuity of sight, hearing, taste, touch, and smell.

sentinel infections Infections that may indicate an underlying immunosuppression.

sentinel node biopsy A biopsy of lymph nodes that receive drainage from the anatomic area of a breast cancer to determine spread of the disease.

sepsis Infection, contamination (refers to infection in the blood).

septicemia Invasion of the bloodstream by infective microorganisms.

sequelae An abnormal condition that follows and is the result of a disease.

seroconversion The point at which antibodies to specific antigens are detectable in the blood.

seroma A collection of serum forming a tumor-like mass.

serosanguineous Containing both serum and blood.

serum (sera) The clear, liquid portion of blood that does not contain fibrinogen or blood cells. Immune serum is blood serum from the bodies of people or animals that have produced antibody; inoculation with such serum produces passive immunity.

serum sickness A hypersensitivity reaction to a foreign serum or other antigen.

sexually transmitted infection An infection that is transmitted by sexual intercourse.

shearing action Superficial layers of tissue are pulled and stretched across deeper layers of tissue.

shedding Losing or casting off by a natural process.

Sheehan syndrome A rare but serious postpartum complication that involves infarction of the pituitary gland secondary to postpartum hemorrhage.

shock Acute peripheral circulatory failure caused by derangement of circulatory control or loss of circulating fluid.

shunting Physiologically bypassing, as when blood flows past the alveoli but the membrane is thickened and gases cannot cross into or out of the blood.

sickle cell disease All those genetic disorders in which sickle hemoglobin is found in the red cells.

slit lamp An instrument for examining the surface of the eye through a biomicroscopic lens.

smear A specimen for microscopic and cytologic study; the material is spread thinly and evenly across a slide with a swab or loop.

SOAP Acronym for Subjective and Objective data, Assessment, and Planning.

solute The substance that is dissolved in a solution.

Somogyi effect A rebound phenomenon caused by overtreatment with insulin.

source-oriented record keeping A system of documentation in which information is arranged according to the person, department, or other source of information.

specific gravity The weight of a substance compared with the weight of an equal amount of another substance taken as a standard; for liquids, the standard usually is water (specific gravity of 1).

spermatozoa The mature male sex or germ cells formed within the seminiferous tubules of the testes.

spider angioma A form of telangiectasis with a central elevated red dot the size of a pinhead from which small blood vessels radiate; often occurs with liver disease.

spirochete Any organism that is a member of the order Spirochaetales.

spirometer An instrument for measuring air taken into and expelled from the lungs.

splenomegaly Enlargement of the spleen.

splitting A personality trait that involves initial idealization of a caregiver or friend, followed by a devaluing of that same person.

spores Reproductive cells, usually unicellular, produced by plants and some protozoa.

sprain The wrenching or twisting of a joint with partial or complete tearing of the ligaments.

sputum A substance expelled by coughing or clearing the throat.

Standard Precautions Precautions designed to prevent the transmission of microorganisms from one patient to another as well as to protect health care workers from unnecessary exposure to infection.

stapedectomy The surgical removal of the stirrup of the middle ear and its replacement with a prosthetic device.

stasis Standing still; stagnation; usually refers to fluid.

status epilepticus A grave condition in which there is a rapid, unrelenting series of convulsive seizures without intervening periods of consciousness and with absence of respiration. Irreversible brain damage may occur if seizures are not controlled.

steatorrhea Stool that is bulky, frothy, and foul smelling and usually floats in the toilet.

stem cells Generalized mother cells, the descendants of which specialize, often in different functions; an example is an undifferentiated mesenchymal cell that is the progenitor of the blood and fixed-tissue cells of the bone marrow.

stenosis The narrowing or contraction of a passageway or opening.

stent A tubular device to give support to the interior of a vessel or tube, preventing its collapse.

stereotaxis A method of precisely locating areas in the brain.

stereotype(s) A simplification used to describe all members of a specific group without exception.

sterilization, microbe The process of rendering an article free of microorganisms and their pathogenic products.

Steri-Strips Small, reinforced, adhesive strips placed over a healing incision to hold it together after

sutures are removed.

STI Sexually transmitted infection.

stoma(s) A mouth-like opening, especially one that is created surgically for the elimination of urine or fecal material.

stomatitis A generalized inflammation of the oral mucosa.

strabismus A deviation of the eye that cannot be controlled voluntarily.

strain The pulling or tearing of either muscle or tendon, or both.

stress incontinence The loss of urine during a sneeze or cough.

stridor A harsh, high-pitched respiratory sound such as the inspiratory sound often heard in acute laryngeal obstruction.

stromal cells Connective tissue cells of the supporting tissue or matrix of an organ.

sty An infected swelling near the margin of the eyelid.

subcutaneous Beneath or to be introduced beneath the skin.

subcutaneous emphysema Interstitial emphysema characterized by the presence of air in the subcutaneous tissue, usually caused by intrathoracic injury.

subdural hematoma The accumulation of blood in the subdural space.

subjective data Data that the patient provides about a symptom that cannot be seen, felt, or heard by an examiner (e.g., pain).

subluxation A partial or incomplete dislocation of a bone from its place in a joint.

substance use disorder A problem with alcoholism or drug abuse.

subsystem A system within a larger system.

“sucking” chest wound A wound in which the pleural cavity has been penetrated, allowing air and gas to enter the cavity and produce pneumothorax.

suicidal gestures Things done or said that indicate a patient is contemplating committing suicide.

sundowning The phenomenon of becoming confused and disoriented at night, although oriented during the day.

suppression Inhibition, such as interfering with immune response.

suprasystem A highly complex system.

surge capacity The maximum services that a facility can offer when every resource is mobilized.

susceptible Being predisposed or sensitive to the effects of an infectious disease, allergen, or other pathogenic agent; lacking immunity or resistance.

sympathectomy A surgical excision or interruption in some portion of the sympathetic nerve pathways.

syncope Fainting.

syndrome A combination of signs and symptoms associated with a pathologic process or disease.

syndrome of inappropriate antidiuretic hormone (SIADH) Excessive amounts of ADH are produced, resulting in fluid retention.

synovial fluid The transparent viscid fluid found in joint cavities, bursae, and tendon sheaths.

synthesis The process or processes involved in the formation of a complex substance from simpler elements or compounds; opposite of decomposition.

synthesize To put together (data) into a logical whole.

system An organized whole composed of interacting parts.

systemic inflammatory response syndrome (SIRS) A condition in which the body's inflammatory response feedback mechanism fails, causing signs and symptoms (tachycardia, tachypnea, hypotension, oliguria, and fever) without a documented source of infection.

systole The phase of the cardiac cycle in which the ventricles contract and force blood into the aorta and pulmonary arteries; the systolic pressure is recorded as the top number in a blood pressure reading.

systolic blood pressure Arterial pressure during systole.

T

tachycardia An abnormally rapid heart rate, usually more than 100 beats per minute.

tachypnea Abnormal rapidity of respiration.

tamponade The stoppage of blood flow to an organ or part of the body by pressure.

tardive dyskinesia A common extrapyramidal side effect seen with antipsychotics; patients may exhibit lip-smacking, tongue protrusion, blinking, sucking, chewing, and lateral jaw movements.

target cells/tissues Cells and tissues that are affected by a specific hormone.

tendons Connective tissue that connects the muscles to the bones.

TENS Transcutaneous electrical nerve stimulation.

tertiary Third in order or stage.

testis The male gonad. One of two reproductive glands located in the scrotum that produce the male reproductive cells and the male hormone, testosterone.

tetany The continuous tonic spasm of a muscle; associated with calcium deficit, vitamin D deficiency, and alkalosis.

tetraplegia Another term for quadriplegia (paralysis of all four extremities).

thalamus Either of two large structures composed of gray matter and situated at the base of the cerebrum that act as a relay station for impulses traveling from the spinal cord and brainstem to the cerebral cortex.

thanatologist One who studies death.

thanatology The medicolegal study of the dying process and death.

theory (theories) A belief, policy, or principle proposed or followed as the basis of action.

therapeutic Having medicinal or healing properties.

therapeutic alliance Relationship between the patient and nurse established for the purpose of helping the patient to build trust and achieve therapeutic goals.

thermal Pertaining to heat.

thoracentesis The surgical puncture and drainage of the thoracic cavity.

thoracotomy The surgical incision of the wall of the chest.

thought disorder A mental disorder characterized by disorganized thought, behavior, and hallucinations. Mood and interpersonal relationships are altered.

thrombectomy The excision of a clot.

thrombocytopenia A decreased number of platelets.

thrombocytopenic purpura A bleeding disorder characterized by a marked decrease in the number of platelets, resulting in multiple bruises, petechiae, and hemorrhage into the tissues.

thrombolytic Dissolving or splitting up a thrombus.

thrombophlebitis An inflammation of a vein related to formation of a blood clot within the vessel.

thrombosis The formation, development, or presence of a blood clot within a blood vessel.

thrombus A blood clot that obstructs a blood vessel or a cavity of the heart.

thymus An endocrine gland that lies in the upper chest beneath the sternum and that, during fetal life, sensitizes certain stem cells that eventually become T lymphocytes.

thyrocalcitonin A hormone secreted by the thyroid gland.

thyroid crisis A sudden increase in the output of thyroxine and resultant extreme elevation of all body processes.

thyroid panel A group of tests performed to evaluate thyroid function.

thyroid storm *See* Thyroid crisis.

thyrotoxicosis A toxic condition that results from hyperactivity of the thyroid gland.

thyroxine (T₄) A hormone secreted by the thyroid gland.

time-referenced Measured by an educated guess as to how long it will take to attain the outcome.

tinea Ringworm; a name applied to many different kinds of fungal infections of the skin. The specific type usually is designated by a modifying term (e.g., tinea capitis, or ringworm of the scalp).

tinea pedis A fungal infection of the foot; also called *athlete's foot*.

tinnitus A ringing, buzzing, or other continuous noise in the ear.

T lymphocytes White cells destined to provide cellular immunity that have passed through the thymus and migrated to the lymph nodes.

tolerance Increased resistance to a drug or substance that occurs when there is a need for increased amounts of substances to achieve the desired effect. Term used with substance use disorder.

tonic A state of rigid contraction of the muscles.

tonometer An instrument for measuring tension or pressure, especially intraocular pressure.

tophus (tophi) A deposit of sodium biurate in tissues near a joint, in the ear, or in bone, as occurs in gout.

topical Pertaining to the surface of a part of the body, as in topical medications applied to an area of the skin.

torsion The act of twisting or condition of being twisted.

total parenteral nutrition Intravenous feeding to provide all nutritional needs over time.

tourniquet A device for compressing an artery or vein; its use as an emergency measure to relieve

hemorrhage is generally recommended only if the victim's life is threatened and other measures fail to stop massive blood loss.

toxin A poisonous substance.

tracheostomy A surgical incision into the trachea to insert a tube through which the patient can breathe.

traction The exertion of a pulling force, as that applied to a fractured bone or dislocated joint, to maintain proper positioning.

tranquilizers A group of agents that provide calm and relief from anxiety.

transcellular Between cells, but within an epithelial membrane.

transcellular fluid Secretions and excretions that move through cell membranes and eventually leave the body.

transduction The first of four phases associated with nociceptive pain. Tissue damage stimulates the nociceptors and initiates pain sensation.

transfer factor A factor occurring in sensitized lymphocytes that recruits additional lymphocytes and transfers to them the ability to confer cell-mediated immunity.

transformation A change to another form.

transfusion The administration of whole blood or blood components directly into the bloodstream.

transmission The second of four phases associated with nociceptive pain. Involves movement of sensation to the spinal cord.

triage The classification of casualties in an emergency room or location of a disaster by the gravity of the injury, urgency of treatment, and place for treatment.

triiodothyronine (T₃) A hormone secreted by the thyroid gland.

Trousseau sign Low calcium level manifested as a carpal spasm elicited by inflating a blood pressure cuff above the systolic blood pressure.

tuberculin test An evaluation of sensitivity to the tubercle bacillus; the most common method is intradermal injection of a purified protein derivative of tuberculin (the Mantoux test); a positive reaction indicates the need for further diagnostic procedures.

tuberculosis Any of the infectious diseases caused by species of *Mycobacterium* and characterized by the formation of tubercles and caseous necrosis in the tissues.

tumor marker A blood test to detect biochemical substances synthesized and released into the bloodstream by tumor cells; used mainly to confirm a diagnosis of cancer or response to cancer therapy.

tumor-node-metastasis (TNM) staging system A system for classifying cancers according to the extent to which the malignancy has spread.

turgor The normal tension of a cell; swelling, distention.

tympanoplasty An operative procedure on the eardrum or ossicles of the middle ear to restore or improve hearing in patients with a conductive hearing loss.

U

ultrasonography An imaging technique in which deep anatomic structures are recorded by depicting the echoes of ultrasonic waves that have been directed into the tissues; the echoes (reflections) returning from the structures are converted into electrical impulses that are

displayed on a screen, thus presenting a "picture" of the tissues being examined.

unlicensed assistive personnel (UAP) Nursing assistants, technicians, unit secretaries, and aides who do not hold a professional license to perform some aspects of health care delivery and are hired to perform specific repetitive tasks.

urea nitrogen A major protein metabolite that is not recycled by the body but is excreted in the urine; blood urea nitrogen levels indicate the ability of the kidney to filter and excrete waste products.

uremia Retention in the blood of urea, creatinine, and other nitrogenous wastes normally eliminated in the urine; more correctly called *azotemia*.

ureterostomy (ureterostomies) Surgical creation of a stoma to divert urine to the outside.

urinalysis Analysis of a sample of urine, most often done to detect protein, glucose, acetone, blood, pus, and casts.

uroflowmetry Pressure flow studies of the bladder.

urticaria Hives.

V

vaccination The injection of a vaccine into the body to produce immunity to a specific disease.

vaccines Suspensions of attenuated or killed microorganisms administered by injection to provide active immunity to infectious disease.

vagotomy The interruption of impulses carried by the vagus nerve or nerves; may be done to reduce the production of gastric secretions and to inhibit gastric motility, as part of the treatment for peptic ulcer.

Valsalva maneuver An increase of thoracic pressure by forcible exhalation against the closed glottis, as in straining at stool.

value A personal belief about the worth of something that is cherished or held dear.

valvuloplasty A procedure in which a balloon catheter is threaded via the circulatory system through the heart and into the valve. The balloon is inflated to break open a stenosed valve.

varices Twisted and swollen veins.

varicose veins Enlarged and tortuous veins in which the distorted shape is the result of accumulations of pooled blood.

vascular dementia A broad term used to describe any type of dementia caused by vessel disease.

vascular disorders An abnormal functioning of blood vessels, either arterial or venous. Peripheral arterial disorders are most commonly caused by atherosclerosis. Peripheral venous problems are caused by defective valvular function.

vasectomy Excision of the vas (ductus) deferens, or a portion of it; bilateral vasectomy results in sterility.

vasoactive Tending to cause vasodilation or vasoconstriction.

vector(s) A carrier, usually one that transmits disease.

venereal Pertaining to or resulting from sexual intercourse.

ventilation The movement of air from the external environment to the gas exchange units of the lung.

ventilator-associated pneumonia (VAP) Pneumonia that occurs 48 to 72 hours after endotracheal intubation.

vertigo A sensation of movement of one's self or of one's surroundings.

vesicant Blistering; causing or forming blisters.

vesicle A small sac containing a serous liquid; a small blister.

vesicostomy The formation of an opening into the urinary bladder.

viable Capable of living.

virulence The degree of ability of an organism to cause disease.

viscera The internal organs contained within a cavity.

viscous Sticky, gummy, gelatinous; thicker than usual.

vitrectomy The removal of the contents of the vitreous chamber and replacement with a sterile physiologic saline solution.

volvulus A twisting of the bowel upon itself, causing obstruction.

vulvectomy The excision of the vulva.

W

wart An epidermal growth of viral origin.

Wernicke encephalopathy Damage to brain cells caused by chronic alcohol abuse.

wheal A localized area of edema on the body surface.

wheeze A form of rhonchus characterized by a high-pitched or low-pitched musical quality caused by airflow through a narrowed airway.

withdrawal Symptoms that are the opposite of the symptoms caused by the ingestion of chemicals or drugs.

word salad A meaningless mixture of words and phrases characteristic of advanced schizophrenia.

X

xanthelasma A planar xanthoma involving the eyelid(s).

xanthoma A lipid deposit in the skin.

xenograft A surgical graft of tissue from an individual of one species to an individual of a different species.

xerostomia The lack of saliva; dry mouth.

Y

yeast A term for fungi that reproduce by budding.

Z

zygomatic Pertaining to the zygomatic bone.

1999

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