UNIT 16 Acute Community-Based Challenges

Case Study

USING EVIDENCE-BASED PRACTICES FOR EFFECTIVE CARE DURING A NOVEL VIRUS OUTBREAK

You are a home health nurse in an urban community. The Centers for Disease Control and Prevention (CDC) has informed

the agency where you work that there is an outbreak within your community of a novel respiratory virus that is implicated in causing pneumonia and acute respiratory failure. You know that when a novel virus begins to circulate among a population that universally has no immunity, some groups will be at greater risk of contracting the virus than others. You are worried about the patients you routinely care for as they have multiple comorbidities, likely placing them at higher risk. How will you find and integrate the best current evidence with clinical expertise, while also respecting patient and family preferences and values for delivery of optimal health care during a novel virus outbreak?

QSEN Competency Focus: **Evidence-Based Practice**

The complexities inherent in today's health care system challenge nurses to demonstrate integration of specific interdisciplinary core competencies. These competencies are aimed at ensuring the delivery of safe, quality patient care (Institute of Medicine, 2003). The Quality and Safety Education for Nurses project (Cronenwett, Sherwood, Barnsteiner, et al., 2007; QSEN, 2020) provides a framework for the knowledge, skills, and attitudes (KSAs) required for nurses to demonstrate competency in these key areas, which include ***patient-centered care***, ***interdisciplinary teamwork and collaboration***, ***evidence-based practice***, ***quality improvement***, ***safety***, and ***informatics.***

Evidence-Based Practice Definition: Integrate best current evidence with clinical expertise and patient/family preferences and values for delivery of optimal health care.

SELECT PRE-LICENSURE KSAs	APPLICATION AND REFLECTION
Knowledge	
Explain the role of evidence in determining best clinical practice Describe how the strength and relevance of available evidence influences the choice of interventions in provision of patient-centered care	Which federal, state, and local sources will you use to identify an evolving evidence base around an outbreak of a novel virus? How will you judge the strength and the relevance of the evidence you locate? Describe how utilizing evidence-based education will help to increase the knowledge that a given patient will have regarding care during a pandemic.
Skills	
Read original research and evidence reports related to area of practice Locate evidence reports related to clinical practice topics and guidelines	Discuss what evidence you would use to guide your practice during an outbreak of a novel virus. According to the evidence-based literature, what are effective infection control techniques for patients of different ages and with various comorbidities during a novel viral outbreak?
Attitudes	
Acknowledge own limitations in knowledge and clinical expertise before determining when to deviate from evidence-based best practices	Reflect on how it would feel to have a novel viral outbreak impose restrictions on your life. How does a novel viral outbreak have the potential to impact the daily lives of patients with comorbidities?

Cronenwett, L., Sherwood, G., Barnsteiner, J., et al. (2007). Quality and safety education for nurses. *Nursing Outlook, 55*(3), 122–131; Institute of Medicine. (2003). *Health professions education: A bridge to quality*. Washington, DC: National Academies Press; QSEN Institute. (2020). *QSEN Competencies: Definitions and pre-licensure KSAs; Evidence-based practice*. Retrieved on 8/15/2020 at: qsen.org/competencies/pre-licensure-ksas/#evidence-based_practice

66 Management of Patients with Infectious Diseases

LEARNING OUTCOMES

On completion of this chapter, the learner will be able to:

1. Differentiate between the concepts of colonization, infection, and disease.
2. Identify federal, state, and local resources available to the nurse seeking information about infectious diseases and discuss the benefits of recommended vaccines for health care workers and patients.
3. Compare and contrast standard and transmission-based precautions and discuss the elements of each of these prevention methods.
4. Describe the concept and the nursing management of patients with emerging infectious diseases.
5. Use the nursing process as a framework for care of the patient with a sexually transmitted infection or with an infectious disease.

NURSING CONCEPTS

Cellular Regulation
Family
Fluids and Electrolytes
Infection
Patient Education
Safety
Sexuality
Thermoregulation

GLOSSARY

bacteremia: laboratory-confirmed presence of bacteria in the bloodstream

carrier: person who has a pathogen without apparent signs and symptoms; one who is able to transmit an infection to others

colonization: the presence of microorganisms in or on a host, without host interference or interaction and without eliciting symptoms in the host

coronavirus disease 2019 (COVID-19): a disease caused by the virus SARS-CoV-2

emerging infectious diseases: human infectious diseases with an increased incidence within the past two decades, or with a potential to increase in the near future

epidemic: a widespread outbreak of a specific infectious disease from a single source within a community or population that exceeds anticipated levels of impact

health care–associated infection (HAI): an infection not present or incubating at the time of admission to the health care setting; this term has replaced the term *nosocomial infection*

host: an organism that provides living conditions to support a microorganism

immune: person with protection from a previous infection or vaccination who resists reinfection when re-exposed to the same agent

incubation period: time between contact and onset of signs and symptoms

infection: condition in which the host interacts physiologically and immunologically with a microorganism

infectious disease: any disease caused by the growth of pathogenic microbes in the body that may or may not be communicable

latency: time interval after primary infection when a microorganism lives within the host without producing clinical evidence of disease

methicillin-resistant *Staphylococcus aureus* (MRSA): *Staphylococcus aureus* bacterium that is not susceptible to extended-penicillin antibiotic formulas, such as methicillin, oxacillin, or nafcillin; MRSA may occur in a health care or community setting

normal flora: persistent nonpathogenic organisms colonizing a host

outbreak: the occurrence of a disease within a population that exceeds normal expectations

pandemic: an epidemic that spreads across multiple countries or continents

reservoir: any person, plant, animal, substance, or location that provides living conditions for microorganisms and that enables further dispersal of the organism

severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): the virus that causes COVID-19

standard precautions: strategy of assuming all patients may carry infectious agents and using appropriate barrier precautions for all health care worker–patient interactions

susceptible: not possessing immunity to a particular pathogen

transient flora: organisms that have been recently acquired and are likely to be shed in a relatively short period

transmission-based precautions: precautions used in addition to standard precautions when contagious or epidemiologically significant organisms are recognized; the three types of transmission-based precautions are airborne, droplet, and contact precautions

vancomycin-resistant *Enterococcus* (VRE): *Enterococcus* bacterium that is not susceptible to the antibiotic vancomycin

virulence: degree of pathogenicity of an organism

An **infectious disease** is any disease caused by the growth of pathogenic microbes in the body. It may or may not be communicable (i.e., contagious). Although modern science had controlled, eradicated, or decreased the incidence of many infectious diseases, emerging novel pathogens continue to plague the globe, taxing economic and social resources, and proving hazardous to the health and well-being of patients, families, communities, and cultural systems. Examples of such threatening infectious diseases are presented in this chapter. Other infectious diseases are discussed in the appropriate chapters (e.g., see Chapter 19 for information on tuberculosis [TB]). It is important to understand infectious causes and the treatment of contagious, serious, common infections as well as emerging noncommon infections. Table 66-1 presents select infectious diseases, their causative organisms, mode of transmission, and usual **incubation period** (time between contact and development of the first signs and symptoms).

The nurse plays an important role in infection control and prevention. Educating patients may decrease their risk of becoming infected or may decrease the sequelae of infection. Using appropriate barrier precautions, observing prudent hand hygiene, and ensuring aseptic care of intravenous (IV) catheters and other invasive equipment also assists in reducing infections.

The Infectious Process

The Chain of Infection

A complete chain of events is necessary for infection to occur. Six elements are necessary, including a causative organism, a reservoir of available organisms, a portal of exit from the reservoir, a mode of transmission from the reservoir to the **host** (an organism that provides living conditions to support a microorganism) and a mode of entry into a susceptible host.

Nurses must clearly understand the elements of the chain of infection in order to identify points at which they can intervene to interrupt the chain, thus protecting patients, themselves, and others from infectious diseases. Figure 66-1 illustrates these concepts.

Causative Organism

The types of microorganisms that cause infections are bacteria, rickettsiae, viruses, protozoa, fungi, and helminths.

Reservoir

Reservoir is the term used for any person, plant, animal, substance, or location that provides nourishment for microorganisms and enables further dispersal of the organism. Infections may be prevented by eliminating the causative organisms from the reservoir.

Portal of Exit

The organism must have a portal of exit from a reservoir. An infected host must shed organisms to another or to the environment for transmission to occur. Organisms exit through the respiratory tract, the gastrointestinal tract, the genitourinary tract, or the blood.

Route of Transmission

A route of transmission is necessary to connect the infectious source with its new host. Organisms may be transmitted through food intake, sexual contact, skin-to-skin contact, percutaneous injection, or infectious particles carried in the air. A person who carries or transmits a pathogen but does not have apparent signs and symptoms of infection is called a **carrier**.

Specific organisms require specific routes of transmission for infection to occur. For example, *Mycobacterium tuberculosis* is almost always transmitted by the airborne route. Health care providers do not "carry" *M. tuberculosis* bacteria on their hands or clothing. In contrast, bacteria such as *Staphylococcus aureus* are easily transmitted from patient to patient on the hands of health care providers. Some organisms cause infection through several routes. For example, the virus **severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)**, the virus that causes the **coronavirus disease 2019 (COVID-19)**, is highly contagious (see discussion later in this chapter). When appropriate, the nurse explains routes of disease transmission to patients.

Susceptible Host

For infection to occur, the host must be **susceptible** (not possessing immunity to a pathogen). Previous infection or vaccine administration may render the host **immune** (not susceptible) to further infection with an agent. Although exposure to potentially infectious microorganisms occurs essentially on a constant basis, people have complex immune systems that generally prevent infection from occurring. A person who is immunosuppressed has much greater susceptibility to infection than a healthy person.

Portal of Entry

A portal of entry is needed for the organism to gain access to the host. Again, specific organisms may require specific portals of entry for infection to occur. For example, airborne *M. tuberculosis* does not cause disease when it settles on the skin of an exposed host; the only entry route for *M. tuberculosis* is through the respiratory tract. The portal of entry for the SARS-CoV-2 virus is respiratory; however, the virus can remain airborne indoors for hours, accumulate over time, and can travel in airflows over distances greater than 6 feet (Prather, Wang, & Schooley, 2020).

TABLE 66-1 Select Infectious Diseases, Causative Organisms, Modes of Transmission, and Usual Incubation Periods

Disease or Condition	Organism	Usual Mode of Transmission	Approximate Incubation Period (Infection to First Symptom)
Acquired immune deficiency syndrome (AIDS)	Human immune deficiency virus (HIV)	Sexual; percutaneous; perinatal	Variable. Median of 10 yrs without effective therapy
Anthrax	*Bacillus anthracis*	Airborne, contact, or ingestion	1–43 days (inhalation) 5–7 days (cutaneous) 1–6 days (gastrointestinal)
Chancroid	*Haemophilus ducreyi*	Sexual	3–5 days
Chickenpox	Varicella zoster	Airborne or contact	10–21 days
Coronavirus disease 2019 (COVID-19)	Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Droplet and contact are principal modes In some situations, may be aerosolized	2–14 days
Cytomegalovirus infection	Cytomegalovirus	Transfusion and transplantation; sexual; perinatal	Highly variable: 3–8 wks after transfusion, 3–12 wks after delivery of newborn
Diarrheal disease (common causes)	*Campylobacter* species	Ingestion of contaminated food	2–5 days
	Clostridioides difficile	Fecal–oral	Variable; over 2 days
	Salmonella species	Ingestion of contaminated food or drink	12–36 h
	Shigella species	Ingestion of contaminated food or drink; direct contact with carrier	1–3 days
	Yersinia species	Ingestion of contaminated food or drink; direct contact with carrier	3–7 days
Ebola	Ebola virus	Contact with blood or body fluids	2–21 days
Gonorrhea	*Neisseria gonorrhoeae*	Sexual; perinatal	1–14 days
Hand, foot, and mouth disease	Coxsackievirus	Direct contact with nose and throat secretions and with	3–5 days

		feces of people who are infected	
Hantavirus pulmonary syndrome	Sin Nombre virus	Contact (direct or indirect) with rodents	2 days to 6 wks
Hepatitis, foodborne	Hepatitis A virus	Ingestion of contaminated food or drink; direct contact with carrier	14–42 days
	Hepatitis E virus	Ingestion of contaminated food or drink; direct contact with carrier	15–65 days
Hepatitis, bloodborne	Hepatitis B virus	Sexual; perinatal; percutaneous	45–180 days
	Hepatitis C virus	Sexual; perinatal; percutaneous	15 days to 6 mo
Herpes simplex	Human herpes viruses 1 and 2	Contact with mucous membrane secretions	2–12 days
Histoplasmosis	*Histoplasma capsulatum*	Inhalation of airborne spores	3–17 days
Hookworm disease	*Necator americanus; Ancylostoma duodenale*	Contact with soil contaminated with human feces	A few weeks to many months
Impetigo	*Staphylococcus aureus, Streptococcus pyogenes*	Contact with carrier or with patient's soiled towels or combs	4–10 days
Influenza	Influenza virus A, B, or C	Droplet spread	24–72 h
Legionnaires disease	*Legionella pneumophila*	Airborne from water source	2–10 days
Lyme disease	*Borrelia burgdorferi*	Tick bite	3–32 days
Lymphogranuloma venereum	*Chlamydia trachomatis*	Sexual	Weeks to years
Malaria	*Plasmodium vivax; Plasmodium malariae; Plasmodium falciparum; Plasmodium ovale*	Bite from *Anopheles* species mosquito	9–40 days
Marburg hemorrhagic fever	Marburg virus	Unknown route of transmission from animals to humans; person-to-person by droplets and direct contact	5–15 days
Meningococcal meningitis or	*Neisseria meningitidis*	Contact with pharyngeal	2–10 days

bacteremia		secretions; perhaps airborne	
Mononucleosis	Epstein–Barr virus	Contact with pharyngeal secretions	4–6 wks
Mycobacterial diseases (nontuberculosis *Mycobacterium* species)	*Mycobacterium avium; Mycobacterium kansasii; Mycobacterium fortuitum; Mycobacterium gordonae;* other *Mycobacterium* species	Variable; probably contact with soil, water, or other environmental source; none is person-to-person transmissible	Variable
Norovirus	Norovirus	Fecal–oral by food or water or by person-to-person spread	10–48 h
Pediculosis	*Pediculus humanus capitis* (head louse); *Pthiriasis pubis* (crab louse)	Direct or indirect contact	1–2 wks
Pertussis (whooping cough)	*Bordetella pertussis*	Contact with respiratory droplets	7–10 days
Pinworm disease	*Enterobius vermicularis*	Direct contact with egg-contaminated articles	1–2-mo life cycle; often takes months of infection before recognition
Pneumocystis jirovecii pneumonia	*Pneumocystis jirovecii*	Unknown; not transmitted person to person	Infants: 1–2 mo; adults: unclear
Pneumococcal pneumonia	*Streptococcus pneumoniae*	Droplet spread	Probably 1–3 days
Rabies	Rabies virus	Bite from rabid animal	3–8 wks
Respiratory syncytial disease	Respiratory syncytial virus	Self-inoculation by mouth or nose after contact with infectious respiratory secretions	1–10 days
Rocky Mountain spotted fever	*Rickettsia rickettsii*	Bite from infected tick	2–21 days
Roseola infantum	Human herpes virus 6	Saliva	10–15 days
Rotavirus gastroenteritis	Rotavirus	Fecal–oral route	24–72 h
Rubella	Rubella virus	Droplet spread; direct contact	14–21 days
Scabies	*Sarcoptes scabiei*	Direct skin contact	2–6 wks
Smallpox	Variola major and minor	Airborne droplets and	7–17 days

(Eradicated since 1980)		contact	
Syphilis	*Treponema pallidum*	Sexual; perinatal	10 days to 12 wks
Tetanus	*Clostridium tetani*	Puncture wound	3–21 days
Tinea (ringworm)	*Microsporum* species; *Trichophyton* species	Direct and indirect contact with lesions	4–10 days
Trichinosis	*Trichinella spiralis*	Ingestion of insufficiently cooked foods, especially pork and beef	8–15 days
Tuberculosis	*Mycobacterium tuberculosis*	Airborne	2–10 wks to the formation of primary lesion
West Nile virus	West Nile virus	Bite of infected mosquitoes; from transfusions and transplants; perinatal	2–14 days
Zika virus	Zika virus	Bite of infected *Aedes* mosquitoes	3–14 days

Adapted from Centers for Disease Control and Prevention. (2015). In Hamborsky, J., Kroger, A., & Wolfe, S. (Eds.). *Epidemiology and prevention of vaccine-preventable diseases* (13th ed.). Washington, DC: Public Health Foundation; Krow-Lucal, E. R., Biggerstaff, B. J., & Staples, J. E. (2017). Estimated incubation period for Zika virus disease. *Emerging Infectious Diseases*, *23*(5), 841–845.

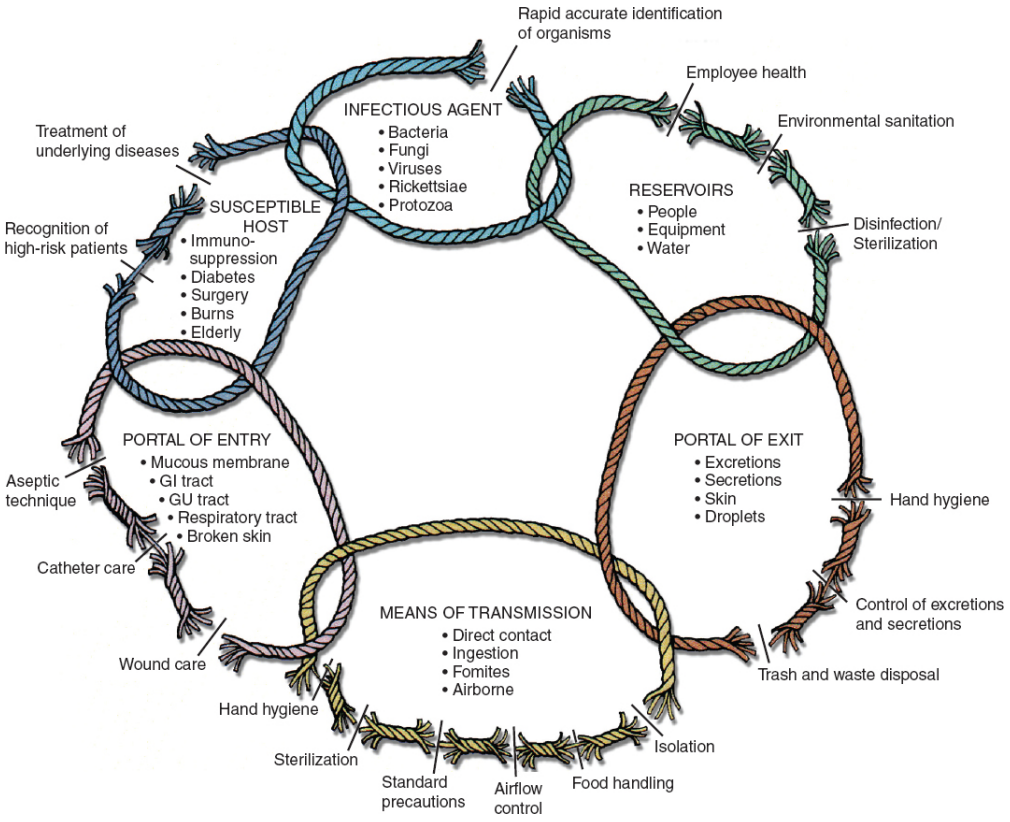


Figure 66-1 • Health care workers' interventions used to break the chain of infection transmission.

Colonization, Infection, and Infectious Disease

Relatively few anatomic sites (e.g., brain, blood, bone, heart, vascular system) are sterile. Bacteria found throughout the body usually provide beneficial **normal flora** (nonpathogenic organisms colonizing a host) to compete with potential pathogens, to facilitate digestion, or to work in other ways symbiotically with the host.

Colonization

The term **colonization** is used to describe the presence of microorganisms without host interference or interaction. Organisms reported in microbiology test results often reflect colonization rather than infection. The patient's health care team must interpret microbiology test results accurately to ensure appropriate treatment.

Infection

Infection indicates a host interaction with an organism. A patient colonized with *S. aureus* may have staphylococci on the skin without any skin interruption or irritation. However, if the patient has an incision, *S. aureus* entering the wound can induce an immune system reaction of local inflammation and migration of white cells to the site. Clinical evidence of redness, heat, and pain and laboratory

evidence of white blood cells in the wound specimen smear suggest infection. In this situation, the host identifies the staphylococci as *foreign.* Infection is recognized by the host reaction (manifested by signs and symptoms) and by laboratory-based evidence of white blood cell reaction and microbiologic organism identification.

Infectious Disease

Infectious disease is the state in which the infected host displays a decline in wellness due to the infection. When the host interacts immunologically with an organism but remains symptom free, the definition of infectious disease has not been met. For example, most people who are infected with *M. tuberculosis* have no symptoms. This is considered **latency,** or the time interval after primary infection when a microorganism lives within the host without producing clinical evidence of disease. The severity of an infectious disease ranges from mild to life-threatening (Norris, 2019). Figure 66-2 depicts the range of response to bacterial infection at the cellular and host level.

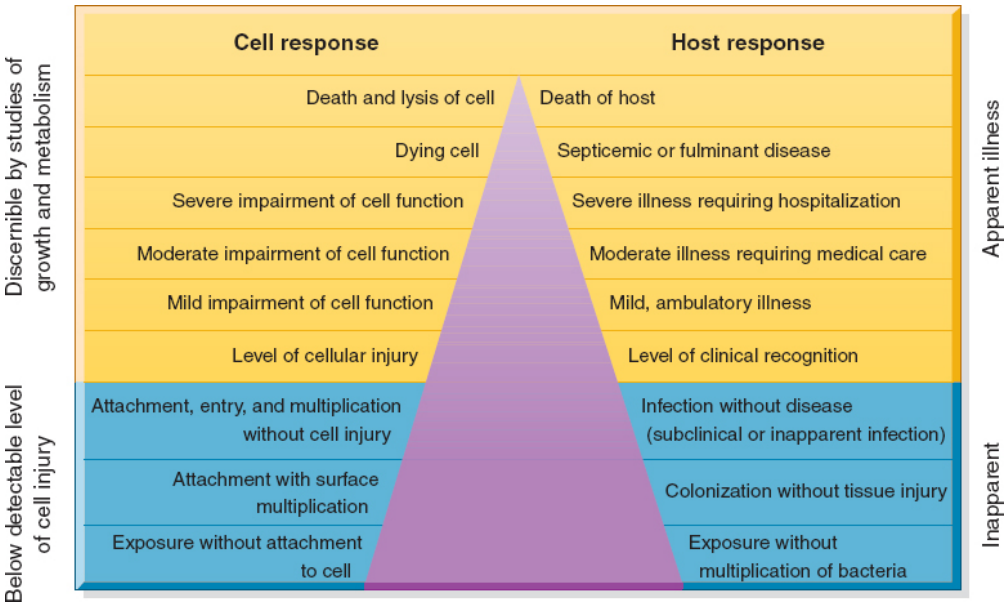


Figure 66-2 • Biologic spectrum of response to bacterial infection at the cellular level (*left*) and of the intact host (*right*). Redrawn from Evans, A. S., & Brachman, P. S. (1998). *Bacterial infections in humans: Epidemiology and control* (3rd ed., p. 40). New York: Plenum.

The primary source of information about most bacterial infections is the microbiology laboratory report, which should be viewed as a tool to be used along with clinical indicators to determine if a patient is colonized or infected. Microbiology reports from clinical specimens usually show three components: the smear and stain, the culture and organism identification, and the antimicrobial susceptibility (i.e., sensitivity). As a marker for the likelihood of infection, the smear and stain generally provide the most helpful information because they

describe the mix of cells present at the anatomic site at the time of specimen collection. Culture and sensitivity results specify which organisms are recognized and which antibiotic agents actively affect the bacteria.

Infection Control and Prevention

The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) are the principal agencies involved in setting guidelines about infection prevention. The impact of infectious diseases changes over time as microorganisms mutate, as human behavior patterns shift, or as therapeutic options change. The CDC provides timely recommendations about many of the situations that a nurse may face when caring for or educating a patient with an infectious disease and routinely publishes recommendations, guidelines, and summaries. Through its Internet site and its weekly journal, the *Morbidity and Mortality Weekly Report (MMWR),* the CDC reports significant cases, **outbreak**s (the occurrence of a disease within a population that exceeds normal expectations), environmental hazards, or other public health problems. Examples of important CDC guidelines and summaries include *Immunization Schedule*s (CDC, 2020b) and *Interim Infection Prevention and Control Recommendations for Healthcare Personnel During the COVID-19 Pandemic* (CDC, 2020c).

Nurses serve important roles in preventing the transfer of organisms given their frequent encounters with patients and families. It is essential for the nurse to model appropriate and effective hand hygiene practices in all aspects of patient care. Nurses can also help reduce hand-to-hand spread of organisms by serving as patient advocates. The nurse should observe the hand hygiene activities of other professionals and alert them to lapses in technique that are observed. Nurses need to educate patients and their families to feel comfortable in reminding health care workers to perform hand hygiene before patient contact.

This chapter summarizes several aspects of infectious diseases. However, the field of infection control and prevention changes rapidly. The COVID-19 **pandemic** provides a striking example of how a new infectious agent can place new expectations and responsibilities on health care workers, including nurses. A pandemic is an **epidemic** (an outbreak of infectious disease within a population that exceeds anticipated levels of impact) that spreads across multiple countries or continents. The COVID-19 crisis created unprecedented challenges with health care systems modifying everyday practices, and making administrative system wide changes. Nurses carried out complex care, simultaneously adapting to frequent changes in protocols, therapies, and other day-to-day routines, while also providing direction and support for stressed patients and family members. See Chapter 68 for discussion of moral distress during the COVID-19 pandemic.

Preventing Infection in Health Care Settings

The prevention of infection in the health care setting focuses upon following the appropriate standard and transmission-based precautions as well as reducing the risk of a **health care–associated infection (HAI)**. HAIs, formerly called *nosocomial infections,* are infections that were not present or incubating at the time of the patient's admission to the health care setting.

There are many types of HAIs. The most widely used system for tracking HAIs is the CDC National Healthcare Safety Network (NHSN) (CDC, 2020d). The system can be used by individual facilities to analyze risk-adjusted outcomes. Centers for Medicare and Medicaid Services (CMS) uses this standardized source to post outcomes on their Web site, Hospital Compare, so that the public can view the data (see Resources section). CMS also uses these data for imposing financial penalties for facilities who have less favorable HAI rates.

The NHSN has reporting systems for several health care facility types. These include acute care facilities, ambulatory care centers, long-term care facilities, outpatient dialysis centers, inpatient rehabilitation facilities, inpatient psychiatric facilities, and home dialysis facilities (CDC, 2020d).

Isolation Precautions

Isolation precautions are guidelines created to prevent transmission of microorganisms in health care facilities. The Healthcare Infection Control Practices Advisory Committee (HICPAC) of the CDC recommends two tiers of isolation precautions. The first tier, called **standard precautions**, is designed for the care of *all* patients and is the primary strategy for preventing HAIs. The second tier, called **transmission-based precautions**, is designed for care of patients with known or suspected infectious diseases spread by airborne, droplet, or contact routes. In addition, Occupational Safety and Health Administration (OSHA) regulations are followed to prevent exposure to bloodborne pathogens and hazardous substances (Occupational Safety and Health Administration [OSHA], 2012).

Standard Precautions

The basis of standard precautions is that all patients are colonized or infected with microorganisms, whether or not there are signs or symptoms, and that a uniform level of caution should be used in the care of all patients. The health care worker should use additional barriers in the form of personal protective equipment (PPE), including gloves, masks, eye protection, and cover gowns, depending on the expected degree of exposure to patient excretions or secretions. The elements of standard precautions include appropriate hand hygiene, the use of PPE, proper handling of patient care equipment and linen, environmental control, prevention of injury from sharps devices, and patient room assignments within health care facilities. Hand hygiene, glove use, needlestick prevention, and avoidance of splash or spray of body fluids are discussed in the following sections. See Chapter 32, Chart 32-5 for a description of standard precautions.

Hand Hygiene

The most frequent cause of bacterial transmission in health care institutions is spread of microorganisms by the hands of health care workers. Health care workers should perform hand hygiene frequently during patient care. Chart 66-1 describes the indications for different hand hygiene methods (CDC, 2002).

Chart 66-1

Hand Hygiene Methods

Hand Decontamination with Alcohol-Based Product

- After contact with body fluids, excretions, mucous membranes, nonintact skin, or wound dressings; as long as hands are not visibly soiled
- After contact with a patient's intact skin (e.g., after taking pulse or blood pressure or lifting a patient)
- In patient care, when moving from a contaminated body site to a clean body site
- After contact with inanimate objects in the patient's immediate vicinity
- Before caring for patients with severe neutropenia or other forms of severe immune suppression
- Before donning sterile gloves when inserting central catheters
- Before inserting urinary catheters or other devices that do not require a surgical procedure
- After removing gloves

Handwashing

- When hands are visibly dirty or contaminated with biologic material from patient care
- When health care workers do not tolerate waterless alcohol product

Adapted from Centers for Disease Control and Prevention (CDC). (2002). Guideline for hand hygiene in health care settings. *MMWR. Morbidity and Mortality Weekly Report, 51*(RR 16), 1–56.

When hands are visibly dirty or contaminated with biologic material from patient care, the worker should wash hands with soap and water. In intensive care units and other locations in which virulent or resistant organisms are likely to be present, antimicrobial agents (e.g., chlorhexidine gluconate, iodophor, chloroxylenol) may be used. Effective handwashing requires at least *20 seconds of vigorous scrubbing,* with special attention to the area around nail beds and between fingers, where there is a high bacterial load. Hands should be thoroughly rinsed after washing (CDC, 2002).

If hands are not visibly soiled, health care providers are encouraged to use alcohol-based, waterless antiseptic agents for routine hand decontamination. These solutions are superior to soap or antimicrobial handwashing agents in their speed of action and effectiveness against most microorganisms. Because they are formulated with emollients, they are usually better tolerated than other agents, and

because they can be used without sinks and towels, health care workers may be more adherent with their use. Nurses working in home health care or other settings where they are relatively mobile should carry pocket-sized containers of alcohol-based solutions. The spore form of the bacterium *Clostridioides difficile* is resistant to alcohol and other hand disinfectants; therefore, the use of gloves and handwashing (soap and water for physical removal) are required when *C. difficile* has been identified (CDC, 2019c).

Normal skin flora usually include relatively benign coagulase-negative staphylococci or diphtheroids. Health care workers may temporarily carry more potentially pathogenic bacteria such as *S. aureus* or *Pseudomonas aeruginosa*. This temporary carriage is considered **transient flora** which will likely be shed with hand hygiene and natural skin degeneration over time.

Hand hygiene decreases bacterial transmission to patients by reducing bacterial load on health care workers' hands. The Joint Commission includes hand hygiene as one of the National Patient Safety Goals and focuses on this behavior in surveys of health care facilities (The Joint Commission, 2021). All health care settings should have mechanisms to measure and improve adherence with hand hygiene by all personnel who care for patients (Schierhorn, 2019).

Artificial fingernails or nail extenders have been epidemiologically linked to several significant infection outbreaks and therefore should not be worn when providing patient care. Natural nails should be kept less than 0.6 cm (0.25 inch) long, and nail polish should be removed when chipped because it can support increased bacterial growth (CDC, 2002).

Glove Use

Gloves provide an effective barrier for hands from the microflora associated with patient care. Gloves should be worn when a health care worker has contact with any patient secretions or excretions and must be discarded after each patient care contact. Because microbial organisms colonizing health care workers' hands can proliferate in the warm, moist environment provided by gloves, hands must be washed or disinfected after gloves are removed. As patient advocates, nurses have an important role in promoting hand hygiene and glove use by other hospital workers, such as laboratory personnel, technicians, physicians, and others who have contact with patients.

Compared with vinyl gloves, latex or nitrile gloves are preferred because they resist puncture better and provide greater comfort and fit. Improvements in latex gloves have reduced the incidence of latex hypersensitivity, but some workers continue to experience local skin irritation or more severe reactions, including generalized dermatitis, conjunctivitis, asthma, angioedema, and anaphylaxis (see Chapter 33). The nurse who experiences irritation or an allergic reaction associated with exposure to latex should report symptoms to an occupational health specialist or a primary provider and avoid latex-based products.

Needlestick Prevention

The most important aspect of reducing the risk of bloodborne infection is avoidance of percutaneous injury. Extreme care is essential in all situations in

which needles, scalpels, and other sharp objects are handled. Used needles should not be recapped. Instead, they are placed directly into puncture-resistant containers close to where they are used. If a situation dictates that a needle must be recapped, the nurse must use a mechanical device to hold the cap or use a one-handed approach to decrease the likelihood of skin puncture. OSHA requires use of needleless devices and other instruments designed to prevent injury from sharps when appropriate (OSHA, 2012).

Avoidance of Splash and Spray

When the health care professional is involved in an activity in which body fluids may be sprayed or splashed, appropriate barriers must be used. If a splash to the face may occur, goggles and a facemask are warranted. If the health care worker is involved in a procedure in which clothing may be contaminated with biologic material, a cover gown should be worn (CDC, 2007).

Transmission-Based Precautions

Reducing the risk of HAIs requires specific preventive activities in addition to implementing standard precautions. Some microbes are so contagious or epidemiologically important that, in addition to standard precautions, a second tier of precautions—transmission-based precautions—should be used when such organisms have been identified. Transmission-based categories are airborne, droplet, and contact precautions (CDC, 2007). As the term implies, the precautions are based on the routes of transmission. Diseases spread by very small respiratory particles that are suspended as aerosol require airborne precautions, those spread by larger respiratory droplets require droplet precautions, and those spread by touch require contact precautions.

Airborne precautions are required for patients with presumed or proven pulmonary TB, varicella, or other airborne pathogens such as COVID-19. When hospitalized, patients should be in airborne infection isolation rooms, engineered to provide negative air pressure, rapid turnover of air, and air either highly filtered or exhausted directly to the outside. If a facility does not have negative pressure rooms available, portable high-efficiency particular air (HEPA) filters may be used. Health care providers should wear an N95 respirator (i.e., protective mask) (see Chapter 68, Fig. 68-1) at all times while in the patient's room. The nurse should be able to validate room negative pressure by reading a pressure manometer placed outside the room or by witnessing that a tissue held at the gap between the door and the floor will be pulled toward the room.

Droplet precautions are used for organisms such as influenza or meningococcus that can be transmitted by close contact with respiratory or pharyngeal secretions. When caring for a patient requiring droplet precautions, the nurse should wear a facemask within 3 to 6 feet of the patient; however, because the risk of transmission is limited to close contact, the door may remain open.

Contact precautions are used for organisms that are spread by skin-to-skin contact, such as antibiotic-resistant organisms or *C. difficile.* Contact precautions are designed to emphasize cautious technique and the use of barriers. When possible, the patient requiring contact isolation is placed in a private room to

facilitate hand hygiene and decreased environmental contamination. Masks are not needed, and doors do not need to be closed (see Chart 66-2).

COVID-19 Considerations

Guidelines for preventing transmission of COVID-19 in health care facilities include using a combination of all the transmission-based precautions and adding other prevention elements, such as increased use of PPE, enhanced cleaning, and adjusted visitor policies (CDC, 2020c). The SARS-CoV-2 virus is primarily transmitted by close contact to droplets and aerosol and by touching contaminated surfaces, with subsequent self-infection when touching the face. In most social interactions, the virus appears to be spread from droplets from the infected person to another. In the health care setting, airborne transmission can occur when aerosol-generating procedures are conducted. Procedures such as intubation, extubation, suctioning, and administering nebulized medication can mechanically aerosolize droplets so that infective particles can be inhaled. Similar transmission may be possible with other close contact, such as may be required in the care of a patient infected with COVID-19. Due to COVID-19's **virulence** (degree of pathogenicity of an organism), contagiousness, and lack of treatment, guidelines advise facilities to use a combination of droplet, airborne, and contact precautions (CDC, 2020c). See discussion later in this chapter.

Chart 66-2

Summary of Types of Precautions and Patients Requiring the Precautions

Standard Precautions

Use standard precautions for the care of all patients.

Airborne Precautions

In addition to standard precautions, use airborne precautions for patients known or suspected to have serious illnesses transmitted by airborne droplet nuclei. Examples of such illnesses include:

- Measles
- Varicella (including disseminated zoster)[a]
- Tuberculosis

Airborne precautions are also used when performing aerosol-generating procedures for patients with coronavirus disease 2019 (COVID-19) (along with a focus on droplet and contact precautions).

Droplet Precautions

In addition to standard precautions, use droplet precautions for patients known or suspected to have serious illnesses transmitted by large particle droplets. Examples of such illnesses include:

- Invasive *Haemophilus influenzae* type b disease, including meningitis, pneumonia, epiglottitis, and sepsis
- Invasive *Neisseria meningitidis* disease, including meningitis, pneumonia, and sepsis
- Other serious bacterial respiratory infections spread by droplet transmission, including:
  - Diphtheria (pharyngeal)
  - Primary atypical pneumonia (*Mycoplasma pneumoniae*)
  - Pertussis
  - Pneumonic plague
  - Streptococcal (group A) pharyngitis, pneumonia, or scarlet fever in infants and young children
- Serious viral infections spread by droplet transmission, including:
  - COVID-19 (along with contact precautions; and airborne precautions during aerosol-generating procedures)
  - Adenovirus[a]
  - Influenza
  - Mumps
  - Parvovirus B19
  - Rubella

Contact Precautions

In addition to standard precautions, use contact precautions for patients known or suspected to have serious illnesses easily transmitted by direct patient contact

or by contact with items in the patient's environment. Examples of such illnesses include:

- Gastrointestinal, respiratory, skin, or wound infections or colonization with multidrug-resistant bacteria judged by the infection control program, based on current state, regional, or national recommendations, to be of special clinical and epidemiologic significance
- Enteric infections with a low infectious dose or prolonged environmental survival, including:
  - *Clostridioides difficile*
  - For patients who are diapered or incontinent: enterohemorrhagic *Escherichia coli* O157:H7, *Shigella* species, hepatitis A, or rotavirus
- Respiratory syncytial virus, parainfluenza virus, or enteroviral infections in infants and young children
- Skin infections that are highly contagious or that may occur on dry skin, including:
  - Diphtheria (cutaneous)
  - Herpes simplex virus (neonatal or mucocutaneous)
  - Impetigo
  - Major (noncontained) abscesses, cellulitis, or pressure injuries
  - Pediculosis
  - Scabies
  - Staphylococcal furunculosis in infants and young children
- Zoster (disseminated or in the immunocompromised host)[a]
- Viral and hemorrhagic conjunctivitis
- Viral hemorrhagic infections (Ebola, Lassa, or Marburg)

[a]Certain infections require more than one type of precaution.

Adapted from Centers for Disease Control and Prevention (CDC). (2007). 2007 *Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings*. Retrieved on 3/13/2020 at: www.cdc.gov/hicpac/2007ip/2007ip_part1.html; Centers for Disease Control and Prevention (CDC). (2020c). Interim infection prevention and control recommendations for healthcare personnel during the coronavirus disease 2019 (COVID-19) pandemic. Retrieved on 7/17/2020 at: www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html

To protect against potential airborne transmission, health care workers in close contact with patients infected with COVID-19 were advised to use N95 respirators or powered air-purified respirators (PAPRs) (CDC, 2020c). When there is not an adequate supply of such devices to use for all patients with confirmed or suspected COVID-19 infection, a system should be designed to prioritize their use for aerosol-generating procedures. Some health care facilities have been able to reprocess N95s to expand their availability (CDC, 2020e). See Chapter 56 for recommendations for preventing and treating occupationally induced dermatologic conditions during the COVID-19 pandemic (American Academy of Dermatology [AAD], 2020).

Gowns and gloves are worn to prevent transmission by contact. Health care workers must carefully put on, use, and safely take off PPE. Using the correct sequence for putting on and taking off PPE is especially important with SARS-CoV-2 as well as other highly contagious or virulent pathogens. The recommended sequence for putting on and safely removing PPE is outlined in Chart 66-3.

Specific Organisms with HAI Potential

Prior to the COVID-19 crisis, the WHO and CDC had focused increased attention on HAIs, which have also received increased focus from The Joint Commission, the Institute for Healthcare Improvement (IHI), and Medicare. HAI rates for each hospital are posted on the Hospital Compare Web site (see the Resources section). The Hospital Compare site also reports on some infections where the actual acquisition location is difficult to determine. For example, Hospital Compare shows rates for *C. difficile*, considering any case first diagnosed after the third day of hospitalization as a hospital onset case.

Chart 66-3

Use of Personal Protective Equipment (PPE) When Caring for the Patient with Suspected or Confirmed COVID-19

Donning (Putting on the Gear)

More than one donning method may be acceptable. Training and practice using your health care facility's procedure is critical. Below is one example of donning.

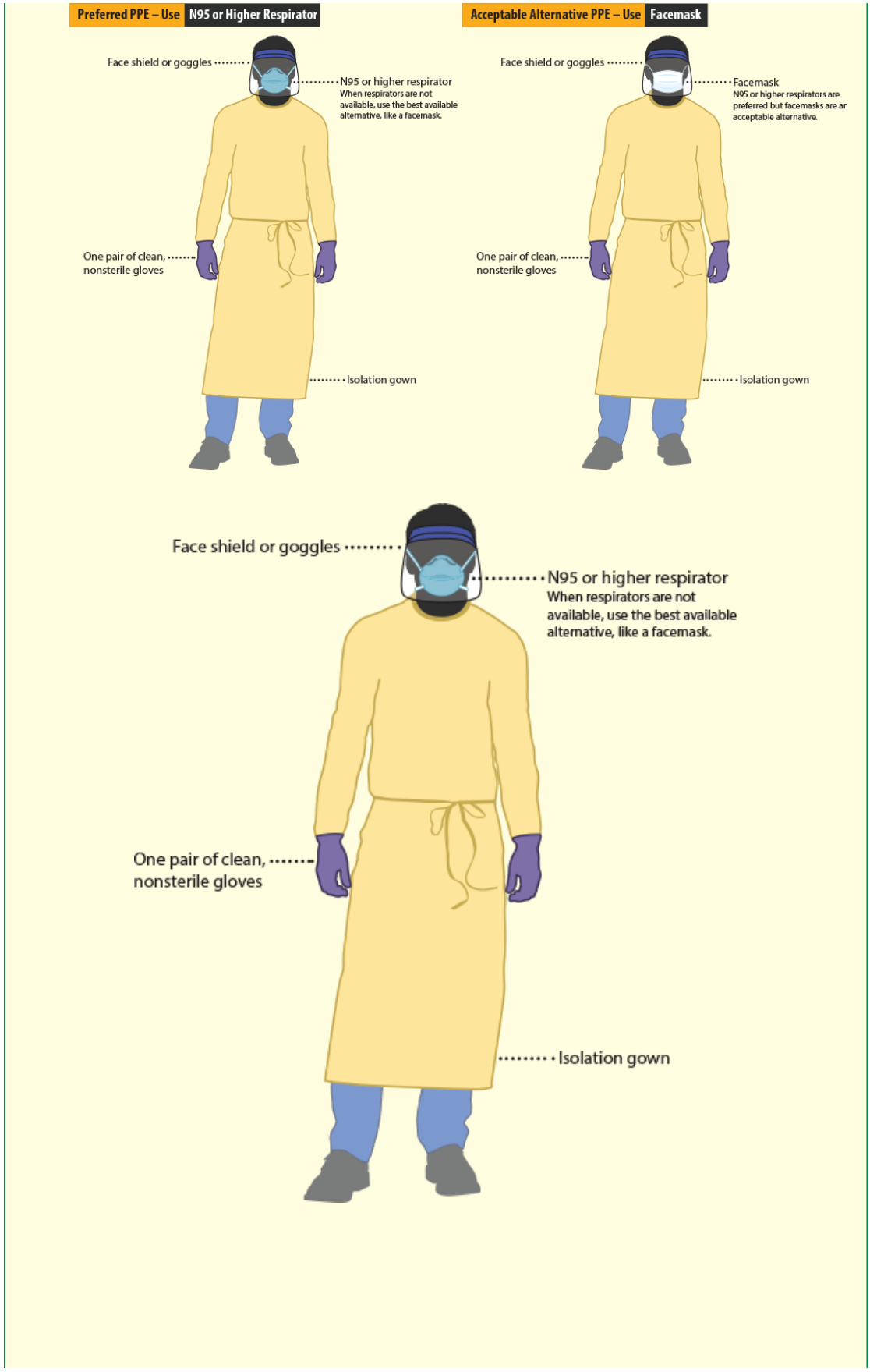
1. **Identify and gather the proper PPE to don.** Ensure choice of gown size is correct (based on training).
2. **Perform hand hygiene using hand sanitizer.**
3. **Put on isolation gown.** Tie all of the ties on the gown. Assistance may be needed by another HCP.
4. **Put on NIOSH-approved N95 filtering facepiece respirator or higher (use a facemask if a respirator is not available).** If the respirator has a nosepiece, it should be fitted to the nose with both hands, not bent or tented. Do not pinch the nosepiece with one hand. Respirator/facemask should be extended under chin. Both your mouth and nose should be protected. Do not wear respirator/facemask under your chin or store in scrubs pocket between patients.[a]
   a. **Respirator:** Respirator straps should be placed on crown of head (top strap) and base of neck (bottom strap). Perform a user seal check each time you put on the respirator.
   b. **Facemask:** Mask ties should be secured on crown of head (top tie) and base of neck (bottom tie). If mask has loops, hook them appropriately around your ears.
5. **Put on face shield or goggles.** When wearing an N95 respirator or half facepiece elastomeric respirator, select the proper eye protection to ensure that the respirator does not interfere with the correct positioning of the eye protection, and the eye protection does not affect the fit or seal of the respirator. Face shields provide full face coverage. Goggles also provide excellent protection for eyes, but fogging is common.
6. **Put on gloves.** Gloves should cover the cuff (wrist) of gown.
7. **HCP may now enter patient room.**

Doffing (Taking Off the Gear)

More than one doffing method may be acceptable. Training and practice using your health care facility's procedure is critical. Below is one example of doffing.

1. **Remove gloves.** Ensure glove removal does not cause additional contamination of hands. Gloves can be removed using more than one technique (e.g., glove-in-glove or bird beak).
2. **Remove gown.** Untie all ties (or unsnap all buttons). Some gown ties can be broken rather than untied. Do so in gentle manner, avoiding a forceful movement. Reach up to the shoulders and carefully pull gown down and away from the body. Rolling the gown down is an acceptable approach. Dispose in trash receptacle.[a]
3. **HCP may now exit patient room.**
4. **Perform hand hygiene.**

5. **Remove face shield or goggles.** Carefully remove face shield or goggles by grabbing the strap and pulling upwards and away from head. Do not touch the front of face shield or goggles.
6. **Remove and discard respirator (or facemask if used instead of respirator).**[a] Do not touch the front of the respirator or facemask.
    a. **Respirator:** Remove the bottom strap by touching only the strap and bring it carefully over the head. Grasp the top strap and bring it carefully over the head, and then pull the respirator away from the face without touching the front of the respirator.
    b. **Facemask:** Carefully untie (or unhook from the ears) and pull away from face without touching the front.
7. **Perform hand hygiene after removing the respirator/facemask** and before putting it on again if your workplace is practicing reuse.


Preferred PPE – Use N95 or Higher Respirator
Face shield or goggles
N95 or higher respirator
When respirators are not available, use the best available alternative, like a facemask.
One pair of clean, nonsterile gloves
Isolation gown
Acceptable Alternative PPE – Use Facemask
Face shield or goggles
Facemask
N95 or higher respirators are preferred but facemasks are an acceptable alternative.
One pair of clean, nonsterile gloves
Isolation gown
Face shield or goggles
N95 or higher respirator
When respirators are not available, use the best available alternative, like a facemask.
One pair of clean, nonsterile gloves
Isolation gown

[a]Facilities implementing reuse or extended use of PPE will need to adjust their donning and doffing procedures to accommodate those practices.

Reprinted from Centers for Disease Control and Prevention (CDC). COVID-19 Factsheets. Retrieved on 2/16/2021 at: www.cdc.gov/coronavirus/2019-ncov/downloads/A_FS_HCP_COVID19_PPE.pdf

Antibiotic-Resistant Organisms

Extensive use of antibiotic agents in agriculture and health care has led to a growing prevalence of organisms with fewer effective antibiotics. Approximately 3 million people develop antibiotic-resistant infections in the United States each year, and approximately 35,000 die from these infections (CDC, 2019a). Bacteria that most commonly develop resistance include *P. aeruginosa* (resistant to fluoroquinolone antibiotics, carbapenems), *Acinetobacter* species (resistant to many antibiotics, including carbapenems), and both *Klebsiella pneumoniae* and *Escherichia coli* (resistant to extended-spectrum beta-lactam antibiotics).

Concerns about antibiotic-resistant organisms and the loss of effective antibiotic therapy for serious infections have grown. The Joint Commission National Patient Safety Goals include requirements to have a program to analyze and reduce antibiotic resistant-infections (The Joint Commission, 2021). The CDC provides explanations about the causes of multiple drug resistant organisms, current efforts

to control them, estimates of incidence, and mortality rates for significant pathogens (CDC, 2019a).

Clostridioides difficile

C. difficile is a spore-forming bacterium that has significant HAI potential. An especially virulent strain has affected health care facilities throughout North America in the past several years. After marked increases in the first decade after 2000, a 29% decrease in the rate of hospital-onset *C. difficile* infection from 2015 to 2018 was recorded (CDC, 2019b). While the exact reason for the decrease is not clear, some believe it is due to increased focus on antimicrobial stewardship, a program to assure the right antibiotic for the right patient at the right time (CDC, 2019b). Despite this drop in rates of infection, *C. difficile* is considered the most common cause of HAI in U.S. hospitals (CDC, 2019b). Infection is usually preceded by antibiotic agents that disrupt normal intestinal flora and allow the antibiotic-resistant *C. difficile* spores to proliferate within the intestine. The organism causes pathology by releasing toxins into the lumen of the bowel. In pseudomembranous colitis (the most extreme form of *C. difficile* infection), debris from the injured lumen of the bowel and from white blood cells accumulates in the form of pseudomembranes or studded areas of the colon. The destruction of such a large anatomic area can cause sepsis.

Because antibiotics are used so extensively in health care settings, many patients are at risk for infection with *C. difficile.* The potential for health care–associated acquisition is increased because the spore is relatively resistant to disinfectants and can be spread on the hands of health care providers after contact with equipment previously contaminated with *C. difficile.* Control is best achieved by using contact precautions for patients who are infected, with use of gowns and gloves for all patient contact. Because the spores are resistant to alcohol, waterless hand products are not as effective as handwashing with soap and water for use in hand hygiene. Bleach-based cleaning products are optimal because bleach can kill spores, whereas other cleaning agents often do not. Frequently touched equipment, such as overbed tables and side rails, should be cleaned daily and whenever visibly soiled. IV poles and other peripheral items should be cleaned when the patient is discharged (CDC, 2019c).

Methicillin-Resistant *Staphylococcus aureus*

Methicillin-resistant *Staphylococcus aureus* (MRSA), a common human pathogen, refers to *S. aureus* that is resistant to methicillin or its comparable pharmaceutical agents, oxacillin and nafcillin. Soon after penicillin was discovered in the 1940s, *S. aureus* became all but universally penicillin resistant. Alternative therapies in the form of cephalosporins and synthetic penicillin solutions such as methicillin were introduced. During the late 1970s, MRSA became increasingly more prevalent, as transmission within hospitals and nursing homes was well documented.

Health Care–Associated MRSA. Health care providers transmit MRSA to patients easily because *S. aureus* has an affinity for skin colonization. The patient who is colonized with MRSA has an increased probability of developing an

infection with MRSA, especially when invasive procedures (e.g., IV therapy, respiratory therapy, surgery) are performed. Such infections are characterized as healthcare-associated methicillin-resistant *Staphylococcus aureus* (HA-MRSA). HA-MRSA may persist as normal flora in the patient for an extended time. The patient who is colonized also serves as a reservoir for MRSA transmission to others. In recent years, the incidence of invasive HA-MRSA has decreased (Kourtis, Hatfield, Baggs, et al., 2019). Although the exact reasons for the decline are unknown, it is likely that infection control efforts (especially those focused on reduction of bloodstream infections) and declining lengths of hospital stay (therefore decreasing exposure within health care agencies) are important factors.

Community-Associated MRSA. New strains of MRSA have caused infections and outbreaks in children, members of sports teams, and prison inmates, and in other people who had no apparent health care exposure. These community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) infections are typically caused by strains of *S. aureus* that are molecularly distinct from HA-MRSA. The CA-MRSA strains typically produce more toxins than HA-MRSA and localized skin and soft tissue infections, and can lead to necrotizing fasciitis or **bacteremia** (laboratory-confirmed presence of bacteria in the bloodstream). Often, skin symptoms are initially mistaken for insect or spider bites (Kourtis et al., 2019). CA-MRSA infections have resulted in serious skin and soft tissue infections; pneumonia; and, in rare cases, death.

Control of MRSA in Health Care Facilities. Nurses must be prepared to educate patients and their families about the definitions of colonization and infection. The CDC recommends contact precautions for patients with MRSA colonization or infection (CDC, 2007). That guidance has become increasingly controversial as some research has reported that contact precautions may not decrease the acquisition of new infections (Renaudin, Llorens, Goetz, et al., 2017). In facilities that use contact precautions for MRSA, nurses must explain the reason for isolation to patients and their families.

Vancomycin and linezolid are typically the preferred treatment options for serious MRSA infection. However, there is concern that MRSA will eventually become resistant to even these medications because they are used so frequently.

Multidrug Resistant Enterobacteriaceae

A group of gram-negative organisms called Enterobacteriaceae, organisms associated with gastrointestinal colonization, are becoming resistant to multiple classes of antibiotics. Clinically important Enterobacteriaceae include *E. coli* and *Klebsiella* species, among others. Some produce enzymes known as extended spectrum beta-lactamases that disrupt the efficacy of some common antibiotics including penicillins and cephalosporins (Comerford & Durkin, 2020). Extended spectrum beta-lactamases infections increased by approximately 50% between 2012 and 2017 and were identified in the community and all health care settings (CDC, 2019a).

Carbapenem antibiotics can be used for extended spectrum beta-lactamases infections. However, some of these bacteria have also developed resistance to carbapenem antibiotics. These carbapenem-resistant Enterobacteriaceae (CRE)

organisms are very difficult to treat. Among patients who are hospitalized and infected with CRE organisms, the mortality rate is approximately 50% (CDC, 2020f).

Patients with extended spectrum beta-lactam resistance or carbapenem resistance should be isolated, using contact precautions. If multiple patients with CRE on one unit within a facility are identified, or if there is other evidence of transmission, additional prevention steps should be implemented. These steps include dedicating personnel to solely care for these groups of patients, conducting cultures of other patients in the unit or service, and enhanced investigation of new cases (CDC, 2020f).

Candida Auris

Candida auris is a multi-drug resistant fungus, a yeast species that is difficult to identify in the laboratory, and difficult to remove with hospital disinfectants. It has caused outbreaks in acute care and long-term care settings. Between 2017 and 2018, reported cases increased by over 300% (CDC, 2019c). Although a patient can have an asymptomatic colonization, it can also cause bloodstream and other serious infections, with mortality rates approaching 30% (CDC, 2019c).

Patients with *C. auris* colonization or infection should be placed in contact precautions and should be reported to local health departments. When multiple patients are diagnosed with *C. auris*, an investigation should include culturing to detect other patients in the unit or area close to the patient with confirmed *C. auris* who also may be colonized (CDC, 2019c).

Vancomycin-Resistant *Enterococcus*

Vancomycin-resistant *Enterococcus* (VRE) refers to *Enterococcus* bacterium that is resistant to the antibiotic vancomycin; it is the second most frequently isolated source of HAIs in the United States. This gram-positive bacterium can produce significant disease when it infects blood, wounds, or the urinary tract (CDC, 2019a).

Enterococcus has several traits that make it an easily transmittable HAI organism. It is a part of the normal flora of the gastrointestinal tract; it is bile resistant and able to withstand harsh anatomic sites, such as the intestine; and it persists well on the hands of health care providers and on environmental objects.

Enterococcus is a relatively antimicrobial-resistant organism at baseline; thus, therapy is limited to penicillin formulations (e.g., ampicillin), vancomycin in combination with an aminoglycoside (e.g., gentamicin), or linezolid. VRE colonization and infection may serve as a reservoir of vancomycin-resistant coded genes that may be transferred to the more virulent *S. aureus*. The two most frequently cultured enterococcal species are *Enterococcus faecalis* (approximately 7% resistant) and *Enterococcus faecium* (CDC, 2019a).

Health Care–Associated Bloodstream Infections

Any vascular catheter can serve as the source for a bloodstream infection. Central lines (vascular catheters where the tip ends in or near the heart) are more likely to be associated with bloodstream infection. Central line–associated bloodstream

infections (CLABSIs) add an estimated average cost of $50,000 per hospital stay and increase the risk of mortality by an estimated threefold (Agency for Healthcare Research and Quality [AHRQ], 2017). Increasingly, long-term central catheters are used to provide IV therapy to patients who are hospitalized as well as to patients in long-term care facilities, patients in clinics, and patients receiving home health care. In all instances, the nurse must use appropriate care to reduce the risk of bacteremia and to be alert to signs of its presence.

The recommended bundle approach for preventing CLABSIs includes hand hygiene; maximal barrier precautions; chlorhexidine skin antisepsis; optimal catheter site selection, with avoidance of the femoral vein for central venous access in adult patients; and daily review of line necessity with prompt removal of unnecessary lines (see Chapter 11, Chart 11-2).

Preventing Infection in the Community

The CDC as well as state and local public health departments share responsibility for prevention and control of infection in the community. Methods of infection prevention include sanitation techniques (e.g., water purification, disposal of sewage and other potentially infectious materials), regulated health practices (e.g., the handling, storage, packaging, and preparation of food by institutions), and immunization programs.

Most infections occur in the community, out of health care settings. Nurses working in schools or public health facilities educate patients and the public to reduce the incidence of influenza, foodborne infections, and other infections. Local epidemics and pandemics are the most significant type of community-acquired infections.

Pandemics are usually caused by novel viruses which begin to circulate among a population that universally has no immunity. The epidemiologic definition of a pandemic, based on the degree of spread, has often been used socially to instead convey disaster. In recent centuries, significant pandemics have included the 1918 influenza pandemic, the pandemic in the 1980s and 1990s caused by the then-novel human immune deficiency virus (HIV), the 2009 H1N1 influenza pandemic, and most recently the 2019–2021 COVID-19 pandemic (see the discussion of COVID-19 later in this chapter).

Novel virus based pandemics can be catastrophic compared with other anticipated public health problems because they last longer than other emergency events, often occur in “waves,” have the potential to deplete the available health care workforce, and reduce the supply of medical equipment because of their widespread nature. The frequency and severity of pandemics cannot be accurately predicted, but models suggest that even a medium-intensity pandemic can quickly overwhelm the existing health care infrastructure (CDC, 2016).

The COVID-19 pandemic has changed many previous infection prevention practices as well as the way health care is delivered. Some clinicians have proposed that just as the crisis caused by the HIV pandemic led to sweeping changes in the delivery of health care that included the use of Standard

Precautions, the COVID-19 crisis may lead to the use of Universal Pandemic Precautions (Weber, Babcock, Hayden, et al., 2020). These new precautions would have individual implications, as all health care workers would universally use masks and eye protection during patient care (Weber et al., 2020). Health care facilities would increase the screening and isolation for patients with symptoms of possible viral disease (Weber et al., 2020). Such an approach would likely protect workers from exposure to SARS-CoV-2 in anticipated future waves and would protect from other pathogens spread through a contact and droplet route.

Nurses play a crucial role during a pandemic as they provide care while themselves becoming potentially exposed. During these times, nurses demonstrate the importance of following standard precautions and transmission-based precautions. With COVID-19 and other pandemics, critically important PPE supplies as well as lifesaving equipment and drugs can become scarce. As the extreme burden on nurses caring for patients with COVID-19 quickly became evident, formalized recommendations to improve nurse education, to add occupational prevention measures, and to include a nursing perspective in national planning were drafted (Veenema, Meyer, Bell, et al., 2020).

Vaccination Programs

The goal of vaccination programs is to use wide-scale efforts to prevent specific infectious diseases from occurring in a population. Public health decisions about vaccination efforts are complex. Risks and benefits for the person and the community must be evaluated in terms of morbidity, mortality, and financial cost and benefit. Successful vaccine programs have reduced the incidence of many infectious diseases in the United States. (See later section COVID-19 Vaccines for further details of that program.)

Vaccines are suspensions of antigen preparations that are intended to produce a human immune response to protect the host from future encounters with the organism. Because no vaccine is completely safe for all recipients, contraindications on package inserts of a vaccine and CDC "Vaccine Information Statements" must be heeded. These documents provide details about studied experiences with allergy and other complications and provide crucial information about refrigeration, storage, dosage, and administration.

The recommended immunization schedules are revised by the CDC as epidemiologic evidence warrants. The two principal schedules are for children and adults (CDC, 2020b). Variations to the recommended immunization schedule should be made on a case-by-case basis, depending on the patient's risk factors as well as likely exposures. An annual influenza vaccine is recommended for all people 6 months or older, unless contraindicated. Health care workers should be immune to measles, mumps, rubella, pertussis, tetanus, hepatitis B, and varicella.

The CDC provides information about individual vaccines and vaccine-preventable diseases (see the Resources section). Advice about optimal vaccinations for travelers is available at the CDC and WHO Web sites as well.

The incidence of vaccine-preventable diseases, such as measles, mumps, rubella, and diphtheria, is affected by immigration from developing countries.

Vaccine campaigns in developing countries are often financially and logistically constrained, and immigrants from such areas may be more likely than U.S. residents to be unprotected. Individual and epidemic risks are reduced when vaccination campaigns reach all communities.

Reporting Problems with Vaccines

Nurses should ask adult vaccine recipients to provide information about any problems encountered after vaccination. If a patient reports problems after receiving a vaccination, a Vaccine Adverse Event Reporting System (VAERS) form must be completed with the following information: type of vaccine received, timing of vaccination, onset of the adverse event, current illnesses or medication, history of adverse events after vaccination, and demographic information about the recipient. Forms can be submitted online (see the Resources section).

Contraindications to Vaccines

As a general rule, multiple vaccines may be given at the same visit and separating the dosing by time is not indicated. If they must be given on separate visits, it is then wise to separate by at least 4 weeks so that there is no immune reaction interfering with the response to the second vaccine (CDC, 2020b). Patients who have developed anaphylaxis or other moderate or severe sequelae after a previous dose should not receive further doses. Some live vaccines (e.g., varicella, MMR [against measles, mumps, and rubella], yellow fever) are contraindicated for people who are severely immunosuppressed or pregnant. All decisions about vaccination should be made by the patient's primary provider after careful review of vaccine-specific contraindications.

Common Vaccines

Measles, Mumps, and Rubella Vaccine

Since the time of licensing of the MMR vaccines, endemic rubeola (measles) has been eliminated in the United States, and mumps and rubella have decreased substantially. To maintain this effective public health strategy, routine MMR vaccination should be given to children at 12 to 15 months of age, with repeat dosing at 4 to 6 years of age. Adults who have not received the MMR vaccine should receive one to two doses (CDC, 2020b).

Patients should be advised that fever, transient lymphadenopathy, or hypersensitivity reaction might occur following an MMR vaccination. The risk of side effects is greater in vaccine recipients who have not previously received the vaccine than in those who have received repeat doses. Antipyretic agents may be used to decrease the risk of fever.

Varicella (Chickenpox) Vaccine and Zoster (Shingles) Vaccine

Varicella zoster virus (VZV) causes chickenpox and herpes zoster. In its natural state, VZV often attacks children, causing disseminated disease in the form of chickenpox. The severity of chickenpox may be increased among adolescents, adults, pregnant women, and those who are immune compromised (CDC, 2020b).

Transmission occurs by the airborne and contact routes. With rare exception, varicella infects a person only once. The incubation period is about 2 weeks (range, 10 to 21 days). During a prodrome of general malaise (often noticed about 2 days before the rash develops), the newly infected host is capable of transmitting the virus to other susceptible contacts. Typically, the vesicular, pustular rash spreads rapidly from few to many lesions in a matter of hours. New lesions continue to form for 2 to 3 days and appear at different stages throughout this time. By the fourth symptomatic day, the lesions begin to dry, and new lesions usually do not develop. Fever is common during the 4 to 6 days of rash progression. When the lesions have crusted, the patient is no longer contagious.

The varicella vaccine is effective in preventing chickenpox in approximately 70% to 90% of people who receive two doses of vaccine. The vaccine is also available as part of MMRV, a formulation providing a combined vaccine for measles, mumps, rubella, and varicella. The vaccine should not be given to those who have severely depressed immune function, are pregnant, have moderate or severe concurrent illnesses, or have demonstrated allergy to varicella vaccine (CDC, 2019a).

Herpes zoster, also known as shingles, is a painful, localized rash caused by recurrent VZV. Vesicles occur along single associated nerve groups. VZV may be transmitted from the rash of those with shingles to people who are susceptible to varicella; the new varicella infections are manifested as chickenpox, not shingles. It is estimated that more than 30% of people over age 60 will develop shingles. A new vaccine was approved in 2017 and is recommended for people older than age 50 as it reduces the risk of shingles by approximately 90% (CDC, 2020b).

Influenza Vaccine

Influenza is an acute viral respiratory disease that predictably and periodically causes epidemics and pandemics. Epidemics occur every 2 to 3 years, with a highly variable degree of severity. An estimated 12,000 to 61,000 deaths per year since 2010 have been associated with influenza or its sequelae (i.e., pneumonia, cardiopulmonary collapse). Older adults are more susceptible to influenza, and the incidence of the disease in the United States is increasing as the number of older adults increases (CDC, 2020i).

Each year, different influenza vaccine formulations are released and are based on predictions of what strains will likely circulate. The CDC recommends that everyone over the age of 6 months get an annual influenza vaccine. There are now many flu vaccine options. Trivalent vaccines are composed of three strains (two type A influenza and one type B influenza) or quadrivalent, composed of four strains (two of type A and two of type B). The formulations can be given as an injection or as a nasal spray. There are different strengths for different age groups and different formulations available for those with egg allergy (CDC, 2020i).

Although the effectiveness of the vaccine varies from year to year, the vaccine reduces the risk of illness from flu by 50% to 60% overall when the circulating strains are included in the vaccine that year. The vaccine is less effective in preventing illness in older adults but reduces hospitalization and mortality in that age group (CDC, 2020i).

Human Papillomavirus Vaccine

Human Papillomavirus (HPV) is the most prevalent of all sexually transmitted viruses and is the principal cause of cervical cancer (see Chapter 51) (CDC, 2020q). It can also cause reproductive organ and oropharyngeal cancers. HPV vaccination at age 11 or 12 is recommended for both males and females. The vaccines are administered in a series according to CDC guidelines. The vaccine is not recommended for those with a history of hypersensitivity to any vaccine component, those with a history of anaphylactic latex allergy, or for women who are pregnant (Meites, Szilagyi, Chesson, et al., 2019).

Planning for a Pandemic

The U.S. Department of Health and Human Services has published pandemic plans that are updated and revised as new threats are recognized and new containment strategies are developed. The plans address federal, state, and local responsibilities, and the need for coordination with the WHO and other international partnerships and agencies (Homeland Security Council, 2006). These plans encourage all health care institutions to have their own pandemic plans and to test the components of the plans regularly.

Home-Based Care of the Patient with an Infectious Disease

The nurse who cares for the patient with an infectious disease in the home should provide information about infection risk prevention to the patient, the family, and the caregiver (see Chart 66-4). Recognizing that a health history may not identify all active or latent infections, the caregiver should carefully follow standard precautions in the home. The nurse should establish a work environment that facilitates hand hygiene and aseptic technique.

Family caregivers should receive an annual influenza vaccine. This is especially true if the caregiver or the patient is older than 50 years, has underlying cardiac or pulmonary disease, or has underlying immunosuppression.

Patients requiring home care are often people with immunosuppression from underlying conditions, such as HIV infection or cancer, or those who have treatment-induced immunosuppression, as occurs with many antineoplastic agents. Careful assessment for signs of infection is important.

Reducing Risk to the Patient

Equipment Care

All caregivers must pay careful attention to disinfection and aseptic technique while providing care and using medical equipment. Catheter-related sepsis should be suspected in a patient who has unexplained fever, redness, swelling, and drainage around a vascular catheter insertion site. Indwelling urinary catheters

should be discontinued whenever possible, because each day of use increases the risk of infection. The nurse should promptly report signs of urinary tract infection or generalized sepsis to the patient's primary provider.

Chart 66-4  HOME CARE CHECKLIST

Prevention of Infection in the Home Care Setting

At the completion of education, the patient and/or caregiver will be able to:

- State the impact of infectious disease and treatment on physiologic functioning, ADLs, IADLs, roles, relationships, and spirituality.
- State the need for infection risk prevention for the patient (preventing recurrence or new infections), caregivers, and family in the home.
  - Verbalize the route of transmission for agent of infection.
- State the purpose, dose, route, schedule, side effects, and precautions for prescribed medications.
  - Adhere to antibiotic regimen (patient) or completion of vaccination series (patient and caregiver).
- State how to contact all members of the treatment team (e.g., health care providers, home care professionals, and durable medical equipment and supply vendor).
- State changes in lifestyle (e.g., diet, activity) or home environment necessary to decrease risk for infection.
  - Perform satisfactory hand hygiene technique, oral hygiene, total body hygiene, and maintain skin integrity (patient).
  - Ensure thorough hand hygiene (alcohol-based disinfectant or handwashing) after care (family/caregiver).
  - Avoid contact with someone who has a known infectious disease.
  - Cook all foods thoroughly and store meat, poultry, and fish products separately from other food groups.
  - Use separate eating utensils and towels.
  - Demonstrate aseptic technique in the care of technical equipment such as IV catheter and indwelling urinary catheter.
- Identify signs and symptoms of infection to report to the primary provider, such as fever; chills; wet or dry cough; breathing problems; white patches in the mouth; swollen glands; nausea; vomiting; persistent abdominal pain; persistent diarrhea; problems with urination or changes in the character of the urine; red, swollen, or draining wounds; sores or lesions on the body; persistent vaginal discharge with or without itching; and severe fatigue.
- Demonstrate how to monitor for signs of infection.
- Describe to whom, how, and when to report signs of infection.
- Describe appropriate actions to take should infection occur.
- Relate how to reach primary provider with questions or complications.
- State time and date of follow-up medical appointments, therapy, and testing.
- Identify sources of support (e.g., friends, relatives, faith community).
- Identify the contact details for support services for patients and their caregivers/families.
- Identify the need for health-promotion, disease prevention, and screening activities.

Resources

See Chapter 29, Chart 29-7: Home Care Checklist: The Patient at Risk for Infection for additional information.

ADLs, activities of daily living; IADLs, instrumental activities of daily living; IV, intravenous.

Patient Education

When assessing the risk of infection in the home environment of the patient who is immunosuppressed, it is important to realize that intrinsic colonizing bacteria and latent viral infections present a greater risk than do extrinsic environmental contaminants. The nurse should reassure the patient and family that their home needs to be clean but not sterile. Family members seldom need to use masks, gowns, or other elements of PPE. Commonsense approaches to cleanliness and risk reduction are helpful.

For patients with neutropenia or T-cell dysfunction (e.g., patients with acquired immune deficiency syndrome [AIDS]), it is wise to restrict visits of people with potentially contagious illnesses. The patient who is immunosuppressed is vulnerable to acquiring bacterial infection with enteric pathogens from food; therefore, family members should be reminded about the need to follow recommendations for hygiene, storage, and safe cooking times and temperatures.

Reducing Risk to Household Members

Establishing reasonable barriers to infection transmission in the household is an important part of home care. The route of transmission of the organism in question must first be determined. The nurse can then educate household members about strategies to reduce their risk of becoming infected. If the patient has active pulmonary TB, the public health department should be contacted to provide screening and treatment for family members. If the patient has herpes zoster, family members who have had varicella vaccine or who have previously had chickenpox are considered immune and need no precautions. However, if a family member is immunosuppressed or otherwise susceptible to varicella, maintaining physical separation is an important strategy during the time when the patient has draining lesions. When the patient is infected with enteric organisms, the family should be reassured that common household disinfectants are effective in controlling environmental contamination.

Family members who assist in the care of a patient with a bloodborne infection such as HIV or hepatitis C can prevent transmission by carefully handling any sharp objects that are contaminated with blood. Family education may include discussion about the need for caution when shaving the patient, performing dressing changes, or administering any IV or injected medication. To collect and dispose of used needles, syringes, and vascular access equipment, the family should use containers designed for sharps disposal. With the exception of TB, the opportunistic infections associated with AIDS do not usually pose a risk to the

healthy family member. Family members should be reassured that dishes are safe to use after being washed with hot water and that linens and clothing are safe to use after being washed in a hot water cycle.

Chart 66-5  ASSESSMENT

Assessing for Infectious Disease

The nurse should ask the patient the following questions:

- Do you have a history of previous or recurrent infections?
- Have you had fever? How high has your temperature been? Is your temperature constant, or does it rise and fall? Has fever been associated with chills? Have you taken any medication to relieve fever?
- Do you have a cough? Is the cough chronic or acute? Is it associated with shortness of breath? Does the cough produce sputum? Is the sputum bloody? Have you had a tuberculin skin test recently or blood test to detect tuberculosis (TB)? If so, what were the results? Have you been given isoniazid prophylaxis for TB infection? Have you been treated for TB in the past?
- Do you have pain? Where is the pain? What is the nature of the pain? Do you have a sore throat, headache, myalgias, or arthralgias? Is there pain on urination or other activity?
- Do you have any swelling? Is there drainage associated with the swelling? Is the swollen area warm to the touch?
- Do you have a draining lesion? Is the drainage associated with trauma or a previous procedure? Is the drainage pus or clear? Does the drainage have an odor?
- Do you have diarrhea, vomiting, or abdominal pain?
- Do you have a rash? What is the nature of the rash—is it flat, raised, red, crusted, weeping, or lacelike? Have you taken medications that could have induced the rash? Have you been exposed to another person with an identified infectious disease or rash?
- What is your vaccination history? Are your immunizations up-to-date?
- Have you had an insect or animal bite? Have you had an animal scratch or other exposure to pets, farm animals, or experimental animals?
- What medications do you use? Have you taken antibiotic agents recently or long term? Are you being treated with corticosteroids, immunosuppressive agents, or chemotherapy?
- Have you been treated for other infectious diseases in the past? Have you been hospitalized for infectious diseases?
- If sexual history is pertinent: Have you had sexual exposure to another person with a known sexually transmitted infection (STI)? Have you been treated for STIs in the past? Are you pregnant, or have you recently been pregnant? Have you been tested for human immune deficiency virus (HIV)?
- Have you traveled abroad, including developing countries? What was the immunization or antimicrobial prophylaxis used for protection while you were traveling?
- What is your occupation? What are your recreational activities? Hobbies?

Nursing Management

Assessment

Symptoms of infectious diseases vary significantly for different diseases and different people. For some infections, visible symptoms such as rash, redness, or swelling provide early warnings of infection. In other infections, such as TB and HIV, asymptomatic latency is prolonged, and infection must be determined through diagnostic procedures.

A careful history along with a review of the patient's medical record will determine current symptoms and underlying conditions. Chart 66-5 outlines questions the nurse should ask when obtaining a health history.

Physical examination may reveal signs of infection. Generalized signs of chronic infection may include significant weight loss or pallor associated with anemia of chronic diseases. Acute infection may manifest with fever, chills, lymphadenopathy, or rash. Localized signs vary by source of infection. Purulent drainage, pain, edema, and redness are strongly associated with localized infection. Cough and shortness of breath may be caused by influenza, pneumonia, or TB, as well as many noninfectious causes.

Nursing Interventions

Preventing Infection Transmission

Preventing the spread of infection requires an understanding of the usual routes of transmission of the organism. The patient in a health care facility may pose a contagious risk to others if the disease is easily spread (such as *C. difficile*) or is spread through an airborne route (such as TB). In these situations, strict adherence to isolation measures is important to reduce the opportunity for spread. Preventing transmission of organisms from patient to patient requires participation of all members of the health care team. Recent research also highlights the importance of the inpatient environment for potential reservoirs for organisms that cause HAIs (Cohen, Spirito, Liu, et al., 2019). See the Nursing Research Profile in Chart 66-6.

Quality and Safety Nursing Alert

It is imperative that nurses disinfect their hands before and after contact with patients in any setting and after performing a potentially hand-contaminating activity. Hands must be disinfected each time gloves are removed.

Educating About the Infectious Process

The first step in preventing the spread of infections is diagnosis. The nurse can educate the patient to understand the diagnosis and to adhere to the treatment regimen. Infectious diseases often seem mysterious and are frequently socially stigmatizing. Patient education requires empathy and sensitivity. Some infections must be reported to public health officials for contact tracing and complete follow-

up. Nurses are key to educating patients about guidelines for preventing transmission of infectious diseases such as COVID-19 in the community (see later discussion in this chapter).

The nurse must stress the importance of immunization to parents of young children and to others for whom vaccines are recommended, such as older adults or those who are immunosuppressed or have chronic illness or disability. Nurses should recognize their personal responsibility to receive the hepatitis B vaccine and an annual influenza vaccine to reduce potential transmission to themselves and vulnerable patient groups. Most recently, the nurse has a professional responsibility to be vaccinated for COVID-19 and to advocate for all professional and personal contacts to receive the vaccine at the first available opportunity.

Chart 66-6  **NURSING RESEARCH PROFILE**

Environmental Concerns for Possible Inpatient Transmission of Bacterial Pathogens

Cohen, B., Spirito, C. M., Liu, J., et al. (2019). Concurrent detection of bacterial pathogens in hospital roommates. *Nursing Research, 68*(1), 80–83.

Purpose

The inpatient environment is a potential reservoir for organisms. The purpose of this study was to determine the incidence of concurrent detection of bacterial pathogens among hospital roommates.

Design

The study was a retrospective analysis using administrative and clinical data collected from four inpatient facilities in New York City between 2006 and 2012. A computerized algorithm identified the presence of concurrent organisms among roommates, defined as two patients sharing a room for at least 1 day and having a first positive culture for that organism within 3 days following cohabitation.

Findings

A total of 741,271 patient admissions were included in the analysis. The algorithm identified 373 valid concurrent detection events among roommates. Among these events, 158 (42%) were pairs in which the patients' first positive cultures were drawn after they were no longer sharing a room but within 3 days of cohabitation. In 144 pairs (39%), the first positive cultures were drawn while the patients were still sharing a room but on different days. In the remaining 71 pairs (19%), the patients' positive cultures were drawn while they were sharing a room on the same day.

Nursing Implications

This study illustrates the important role nurses play in planning and implementing interventions to reduce bioburden in the inpatient environment, particularly in patient rooms. Nurses need to pay attention to the methods used for environmental decontamination as part of a comprehensive approach to infection prevention in hospitals. In particular, nurses may be able to improve environmental decontamination by identifying frequently missed surfaces or equipment that require attention from environmental services teams.

Controlling Fever and Accompanying Discomforts

Fever must always be investigated to determine the source. Fever may potentiate beneficial functions in the syndrome of reactions known as *acute-phase reaction.* These reactions include changes in liver protein synthesis; alterations in serum metals, such as iron; and increased production of certain classes of white blood cells and other cells of the immune system (Norris, 2019). Most fevers are physiologically controlled so that the temperature remains below 41°C (105.8°F). However, severe fever may cause complications. Even mild fevers accompanied by fatigue, chills, and diaphoresis are often uncomfortable for the patient. Whether

fever is treated or untreated, adequate fluid intake is important during febrile episodes. See Chapter 19 for management of fever in the patient with COVID-19.

Quality and Safety Nursing Alert

Because fever is a key symptom, outpatients with fever should be instructed to obtain accurate temperature readings. Frequently, family caregivers know that a patient has warm skin but do not take a temperature reading. Body temperature information can be very helpful in adjusting therapy or in reevaluating a preliminary diagnosis.

Monitoring and Managing Potential Complications

The patient with a rapidly progressive infectious disease should have vital signs and level of consciousness closely monitored. Results from radiologic and laboratory diagnostics (microbiologic, parasitologic, immunologic, hematologic, cytologic, etc.) must be interpreted in the context of other clinical findings to assess the course of the infectious disease.

Antibiotic therapy is frequently complex, and modifications are necessary because of drug susceptibility test results and disease progression. To rapidly ensure therapeutic blood levels, antibiotic therapy should be initiated as soon as it is prescribed rather than waiting until routine medication scheduling times. Chart 66-7 describes nursing interventions for infection.

Diarrheal Diseases

Worldwide, diarrheal diseases are a significant cause of mortality, especially for children (CDC, 2020j). In the United States, the epidemiology of diarrheal diseases changes continually. Water disinfection, pasteurization, and appropriate food packaging have decreased the incidence of diseases such as typhoid and cholera. However, importation of foreign foods, environmental and ecologic changes, and changes in diagnostic test modalities have led to recognition of new trends and outbreaks.

Transmission

The portal of entry of diarrheal pathogens is oral ingestion. Although food is far from sterile, the high acidity of the stomach and the antibody-producing cells of the small bowel generally decrease the potential of pathogens. Infection can occur when the infectious dose is high enough or if the acidic digestive environment is neutralized. Decreased gastric acidity with disruption of normal bowel flora (as occurs after surgery), the use of antimicrobial agents, and other causes of immune suppression decrease intestinal defenses.

Causes

There are many viral, bacterial, and parasitic causes of diarrheal diseases. The most significant viral cause of diarrhea is the *Calicivirus* (often called *Norovirus*, a virus associated with outbreaks in long-term care facilities and cruise ships) (CDC, 2020k). Common causes of bacterial infection include *Campylobacter, Salmonella, Shigella,* and *E. coli*. A common parasitic infection of importance is *Giardia.* Diarrheal disease may also be caused by *Vibrio cholera*.

Chart 66-7 PLAN OF NURSING CARE

Care of the Patient with an Infectious Disease

Nursing Diagnosis: Risk for infection
Goal: Prevention of infection

Nursing Interventions	Rationale	Expected Outcomes
1. Prevent patient-to-patient infection spread.	1. Organisms that are spread through an airborne route or are very contagious through direct contact can be transmitted in a health care setting.	• No evidence of patient-to-patient transmission of infection • No evidence of transmission via health care workers • No occupationally acquired infections in nurses and other health care workers • No evidence of transmission due to contaminated equipment • Absence of bacteremia and sepsis • Absence of urinary tract infections • Absence of pneumonia
a. Provide isolation according to CDC guidelines and standard precautions.	a. CDC isolation strategies are developed to reduce the likelihood of transmission from patients who are infected to others.	
b. Ensure that patients with airborne infections remain in private rooms during hospital stay. If they must leave their rooms, arrangements should be made to decrease the likelihood of contact with others. Rooms should be ventilated according to CDC criteria. Personal protective equipment that includes N95 respirators should be worn as indicated.	b. Engineering controls are important in the prevention of airborne diseases. The N95 respirator is the minimal level of personal protection for tuberculosis (TB) control. The "N" indicates the filter resistance to oil aerosols; the "95" indicates that the respirator has 95% effectiveness in filtering test particles.	
c. Ensure that patients with highly transmissible, nonairborne	c. Increased prevention strategies are needed when the organism has high epidemic potential.	

organisms such as *C. difficile* and *Shigella* species are physically separated from other patients if hygiene or institutional policy dictates.	
d. Identify areas needing environmental decontamination.	d. Prevents patient-to-patient spread
2. Prevent health care workers' transfer of organisms from patient to patient.	2. Transfer of organisms on the hands of health care workers is a common route of transmission. Hospital organisms colonizing the hands of health care workers may be virulent.
a. Perform hand hygiene (by handwashing or by using alcohol-based solution) consistently and thoroughly, disinfecting hands before and after each patient contact, and after procedures that offer contamination risk while caring for an individual patient.	a. Hand hygiene is important in reducing transient flora on outer epidermal layers of skin. Alcohol-based hand disinfectants are effective methods to reduce transient flora.
b. Use gloves when handling any body fluid from any patient. Change gloves between patient care activities, and disinfect hands after gloves are removed.	b. Gloves provide effective barrier protection. Gloves quickly become contaminated and then become a potential vehicle for the transfer of organisms between patients. Microflora on hands are likely to

	proliferate while gloves are worn.
c. Avoid wearing artificial fingernails or extenders when providing patient care. Keep natural nails less than ¼ inch long and remove nail polish when chipped.	c. Artificial fingernails and extenders harbor microorganisms.
d. Monitor the hand hygiene and glove use behaviors of health care professionals caring for the patient.	d. Poor adherence to hand hygiene among health care workers has been well documented and should be anticipated. It is important for the nurse (as the patient's advocate) to communicate protective behavior.
3. Prevent transmission of infection from patient to health care worker.	3. Health care workers may acquire infections occupationally due to close contact with patients.
a. Avoid risk of infection with TB.	a. The most important element in the reduction of TB is early identification. Many of the symptoms of TB are subtle and may be first observed by the nurse who has prolonged contact with the patient.
1. Participate in the early identification of patients with active disease. Patients will be asked about risk	1. Identification of patients at risk can help to prevent exposure.

	factors, symptoms, previous exposure, and status of tuberculin skin test or other rapid tests.	
	2. Expedite diagnostic workup with chest x-ray, sputum analysis for organisms, and administration of TB testing as appropriate.	2. Confirmation of diagnosis facilitates development of an appropriate treatment plan, including prevention of spread of infection.
	3. Maintain engineering controls. Keep the patient in a private room with a closed door.	3. Confining airflow to the immediate vicinity of the patient and exhausting air to the outside reduces the likelihood of transmission to health care workers in areas outside of the patient room.
	4. Use protection in isolation room or when participating in procedures that are likely to generate cough, such as suctioning, intubation, or administering nebulized medications.	4. N95 respirators are designed to reduce health care workers' risk.
b. Avoid risk of		b. Health care workers

	transmission of bloodborne diseases such as hepatitis B, hepatitis C, and the human immune deficiency virus.	can contract bloodborne diseases via percutaneous injury such as needlestick or by contact with blood or body fluids to mucous membranes, such as eyes and mouth.
	1. Get hepatitis B vaccination.	1. Hepatitis B vaccine should be given to reduce risk from this contagious bloodborne virus.
	2. Use standard precautions as defined by the CDC (see Chapter 32, Chart 32-5).	2. Standard precautions are based on the recognition that most patients are not identified as infected by physical assessment or history taking. Health care workers must assume that all patients may be infected with bloodborne or other infection and must use barrier precautions appropriately for *all* patients.
	3. Use "needleless" syringes and other injury-preventing devices.	3. The use of injury-preventing devices decreases risk of transmission of bloodborne diseases.
c.	Avoid risk of airborne diseases.	c. Influenza vaccine is recommended for health care workers

1. Receive influenza vaccination annually. 2. Get vaccinated or produce proof of immunity to measles, mumps, rubella, and varicella.	to reduce the likelihood of transmission in health care settings where patients who are immunocompromised can be exposed.
4. Prevent patient exposure to contaminated medical equipment.	4. Technologic advances offer increased opportunity for invasive procedures. Equipment may be complex and difficult to clean.
a. Ensure that equipment being inserted through intact skin is sterilized between patient uses.	a. Sterilization renders equipment free of all microorganisms.
b. Ensure that equipment that has contact with mucous membranes is sterilized or receives “high-level disinfection” between patient uses.	b. High-level disinfection renders an object free of all microorganisms with the possible exception of spore-producing organisms.
c. Ensure that equipment used against intact skin is thoroughly cleaned and receives “low-level disinfection” between patient uses.	c. The disinfection goal for low-level disinfection is to reduce the load of microorganisms to a level that is not threatening to the host with intact skin.
5. Follow established guidelines for the routine removal and replacement of IV devices.	5. Indwelling IV devices can serve as a conduit for organisms to migrate into the bloodstream.

6. Remove urinary catheters at the earliest time possible.	6. The risk of urinary tract infections is directly proportional to the length of time that a urinary catheter remains in place.	
7. Remove endotracheal and nasogastric tubes as soon as possible.	7. The risk for pneumonia is increased as the use of indwelling equipment increases.	

NURSING DIAGNOSIS: Lack of knowledge about disease, cause of infection, and preventive measures

GOAL: Acquisition of knowledge about the infectious process

Nursing Interventions	Rationale	Expected Outcomes
1. Listen carefully to what the patient says about illness and previous treatment.	1. Listening facilitates detection of misunderstanding and misinformation and provides opportunity for education.	• Patient actively participates in treatment • Patient adheres to infection control measures
2. Provide pertinent explanations about: a. Organism and route of transmission b. Treatment goals c. Follow-up schedule d. Prevention of transmission to others	2. Knowledge about specific diagnoses and treatments may promote adherence.	
3. Allow opportunities for questions and discussions.	3. The patient's questions indicate issues that need clarification.	
4. Educate the patient and family about: a. Prophylaxis or immunization, if recommended b. Community resources, if necessary	4. Understanding of the risks and precautions associated with an infectious disease may reduce the opportunity for further spread.	

c.	Means of preventing transmission within the home	

NURSING DIAGNOSIS: Fever
GOAL: Return to normal body temperature

Nursing Interventions	Rationale	Expected Outcomes
1. Monitor temperature, pulse, and respirations at regular intervals.	1. Graph fever curve to help evaluate when fever occurs, how long it lasts, and whether it responds to therapy.	• Body temperature within normal limits • Maintenance of fluid and electrolyte balance
2. Administer antipyretic agents as prescribed.	2. Prompt treatment will improve outcomes.	

COLLABORATIVE PROBLEMS: Potential complications include bacteremia or sepsis, septic shock, dehydration, and abscess formation
GOAL: Absence of complications

Nursing Interventions	Rationale	Expected Outcomes
Bacteremia, Sepsis		
1. Assess patient for evidence of infection at any location and monitor laboratory results for indicators of infection.	1. Vigilance for bacterial or fungal infection at any site promotes early recognition and treatment and reduces the likelihood of secondary infections.	• No episode of infection • Effective treatment for identified bacterial and fungal infections without progression to bloodstream infection • Early improvement in septic course
2. Assess treatment effectiveness of all identified infections.	2. The natural course of some infections may be rapid unless antibiotic agents are given promptly.	
3. Administer antibiotic agents as prescribed with first dose given at the earliest time possible.	3. Prompt treatment will improve outcomes.	
Septic Shock		
1. Routinely, and as warranted, monitor vital signs for patients with recognized	1. Early recognition of the signs and prompt treatment of impending shock may reduce the	• Absence of symptoms of septic shock

infections and for patients who are severely immunosuppressed at risk for shock. In particular, be alert to signs of: a. Fever b. Tachycardia (>90 bpm) c. Tachypnea (>20 breaths/min) d. Evidence of decreased perfusion or dysfunction of vital organs in the form of: 1. Change in mental status 2. Hypoxemia as measured by arterial blood gases 3. Elevated lactate levels 4. Urine output (<0.5 mL/kg/h within 6 hours)	associated severity or mortality.	• Hemodynamic and respiratory status within normal range
2. Administer antibiotic agents, fluid replacement, vasopressors, and oxygen as prescribed.	2. Therapeutic maintenance of hemodynamic and respiratory status is necessary until infection is effectively treated with an antimicrobial regimen.	
Dehydration		
1. Assess for dehydration (thirst, dryness of mucous membranes, loss of	1. Signs of dehydration provide a basis for fluid replacement and suggest possible further	• Attains fluid balance (output approximates

skin turgor, reduced peripheral pulses, urine output <400 mL in 24 hours or <0.5 mL/kg/h over 6 hours).	complications of circulatory collapse.	intake: body weight unchanged) • Mucous membranes appear moist; normal skin turgor • Serum electrolytes within normal limits
2. Monitor weight.	2. Rapid changes in weight indicate fluid volume changes.	
3. Monitor intake and output and serum electrolyte levels.	3. Dehydration produces a deficit in some electrolytes. Decreased urine production may indicate hypovolemia and decreased renal perfusion.	
4. Replace fluids as needed. If the patient can tolerate oral fluids, offer fluids every 2–4 hours. Administer IV fluids as prescribed.	4. When possible, oral hydration is preferable because the patient can select the beverage, control the rate and interval of replacement, and care for self at home. In addition, the risks associated with vascular devices are avoided. If IV fluid is required, IV solutions are selected to facilitate intestinal reabsorption of fluid and electrolytes.	
Abscess Formation		
1. Assess vascular access sites, wound sites, pressure injuries, and other appropriate sites for apparent collections of purulent material.	1. Collections of purulent material often require drainage before antimicrobial therapy is effective.	• Absence of abscess • Takes antibiotic agents as prescribed
2. Assess the patient who has had abdominal surgery or trauma to abdominal area for	2. Intra-abdominal abscess formation is most common following traumatic or surgical disruption of the GI tract.	

localized signs of intra-abdominal abscess. These signs include: a. Low-grade fever b. Elevated peripheral white blood cell count c. Localized pain d. Abdominal tenderness e. Visible or palpable mass f. Postoperative diarrhea g. GI bleeding	Signs are often initially subtle.	
3. Assess patient who has had percutaneous abscess drainage to determine whether drainage has been successful. Be alert to all of the previously mentioned signs and symptoms.	3. After percutaneous drainage, recurrent or persistent signs of abscess may indicate the need for surgical treatment.	
4. Administer antibiotic agents as prescribed.	4. Antibiotic agents, along with drainage, are the most important elements of intra-abdominal abscess management.	

CDC, Centers for Disease Control and Prevention; GI, gastrointestinal; IV, intravenous; TB, tuberculosis.

Calicivirus (Norovirus)

Calicivirus, which is often referred to as the *Norovirus,* is the most common cause of foodborne illness and gastroenteritis in the United States. Onset of illness is usually acute, with vomiting and watery diarrhea that generally last for approximately 2 days. Most outbreaks occur between November and April. Dehydration is the most common complication. *Calicivirus* has been associated with large diarrheal outbreaks in schools, day care centers, cruise ships, long-term care facilities, and hospitals (CDC, 2020k).

Calicivirus is transmitted easily from person to person by direct contact and by ingesting contaminated food. Waterborne outbreaks have been associated with

sewage-contaminated wells and contaminated swimming pools. Although people with *Calicivirus* infection typically recover within 2 to 3 days, they may continue to transmit the virus to others for approximately 2 more weeks (CDC, 2020k).

Caliciviruses can withstand environmental extremes of heat or cold and are resistant to chemical disinfection, which are significant reasons for their epidemic potential. Control of *Calicivirus* in health care facilities requires a coordinated program to make decisions about isolation, environmental disinfection diagnosis method, and coordination with public health officials. Contact precautions should be used when caring for patients with incontinence and during outbreaks of the virus. Workers should wear masks if they are cleaning heavily soiled areas or caring for a patient who is actively vomiting. The CDC recommends disinfecting surfaces with a freshly prepared bleach solution, with 5 to 25 tablespoons of bleach per gallon of water, or other product that is approved by the Environmental Protection Agency (EPA) for *Norovirus* disinfection (CDC, 2020k).

Campylobacter Infections

Campylobacter species are frequent causes of diarrheal disease in the United States (CDC, 2020l). The bacterium, which is abundant in animal foods, is especially common in poultry but can also be found in beef and pork. Direct person-to-person transmission appears to be less common than it is for other enteric pathogens, such as *Shigella.*

Cooking and storing food at appropriate temperatures protect against *Campylobacter* infection. Kitchen utensils used in meat preparation must be kept away from other food to prevent transmission from *Campylobacter* and other foodborne organisms (CDC, 2020l).

After a person is infected, the bacterium directly attacks the lumen of the intestine and may cause disease through enterotoxin release. Symptoms can range from mild abdominal cramping and minimal diarrhea to severe disease with profuse watery bloody diarrhea and debilitating abdominal cramping. Antimicrobial therapy is recommended only for patients who are seriously ill (CDC, 2020l).

Salmonella Infection

Salmonella is a gram-negative bacillus with many species, including the very pathogenic *Salmonella typhi* (cause of typhoid fever). Of the nontyphi species, most organisms are prevalent in animal food sources, especially eggs and chicken. However, the bacteria also can contaminate other meats, nuts, produce, and processed foods (CDC, 2020m).

Salmonella infections produce variable symptoms, including an asymptomatic carrier state, gastroenteritis, and systemic infection. Diarrhea with gastroenteritis is common. Disseminated disease and bacteremia, sometimes accompanied by diarrhea, occur less often.

The person with *Salmonella*-caused diarrhea will seldom transmit infections to others. Hand hygiene is imperative after any contact with a person with *Salmonella* diarrhea. Although patients with systemic salmonellosis require antimicrobial

therapy, those with gastroenteritis only are not usually treated, because antibiotic use may increase the period of time that the patient carries the bacteria while not improving the clinical outcome.

Shigella Infection

Shigella species are gram-negative organisms that invade the lumen of the intestine and can cause severe watery (sometimes bloody) diarrhea and disseminated disease. *Shigella* species are spread through the fecal–oral route, with easy transmission from one person to another. *Shigella* exhibits a high level of virulence, as infection with very few bacteria can cause disease. Because transmission occurs easily with improper hygiene, it is not surprising that *Shigella* organisms disproportionately affect pediatric populations. Disease in the very young may infrequently be complicated by pulmonary or neurologic symptoms.

Antimicrobial therapy should be instituted early. Frequently, initial therapy choices must be altered when final microbiologic testing reveals the organism's sensitivity (Williams & Berkley, 2018).

Escherichia coli

E. coli is the most common aerobic organism colonizing the large bowel. When *E. coli* bacteria are cultured from fecal specimens, the results usually reflect normal flora. However, certain strains of *E. coli* with increased virulence have been responsible for significant outbreaks of diarrheal disease in recent years. These more pathologic strains are subgrouped as Shiga toxin–producing *Escherichia coli* (STEC) because of their production of enterotoxins. STEC strains often cause choleralike disease, with rapid, severe dehydration and an increased risk of death.

Several outbreaks of STEC have been linked to the ingestion of undercooked beef and to vegetables that have been contaminated by animal wastewater (Shane, Mody, Crump, et al., 2017). This bacterium lives in the intestines of cattle and can be introduced into meat at the time of slaughter. Prevention of disease from STEC strains is aimed at educating the public to wash fruits and vegetables thoroughly, to separate foods during preparation, and to use a food thermometer to assure meat has been cooked thoroughly (CDC, 2020n).

Giardia lamblia

Transmission of the protozoan *Giardia lamblia* occurs when food or drink is contaminated with viable cysts of the organism. People often become infected while traveling to endemic areas or by drinking contaminated water from mountain streams within the United States. The organism can be transmitted by close contact, such as occurs in day care settings. Transmission by sexual contact has also been documented.

Frequently, the infection goes unnoticed. Infection is often recognized more easily in children than in adults. In extreme cases, the patient may experience abdominal pain and chronic diarrhea, usually described as containing mucus and

fat but not blood. Microscopic examination of stool specimens reveals the trophozoite or cyst stages of the parasitic life cycle.

The CDC recommends metronidazole to treat *Giardia* (CDC, 2020o). Patients with *Giardia* infections should be instructed that the organism can be easily transmitted in family or group settings. Personal hygiene measures should be reinforced, and those who travel or camp where water is not treated and filtered should be advised to avoid local water supplies unless water is purified before drinking or using it in cooking.

Vibrio Cholerae

Cholera is rare in the United States but remains a significant infectious cause of death worldwide. The causative organism is transmitted by contaminated food or water. Cases in the United States have been from contaminated shellfish found in the Gulf of Mexico or from contaminated shellfish brought into the United States by visitors. Cholera causes disease with a very rapid onset of copious diarrhea in which up to 1 L of fluid per hour can be lost. Dehydration, with subsequent cardiopulmonary collapse, may cause rapid progression from onset of signs and symptoms to death. Rehydration efforts should be vigorous and sustained. If oral rehydration cannot be accomplished, the patient may need IV fluid replacement (CDC, 2018).

Cholera should be suspected in patients who have watery diarrhea after eating shellfish harvested from the Gulf of Mexico. Confirmation of the causative organism can be made by stool culture. It is imperative that all cases are reported to local and state public health authorities.

NURSING PROCESS

The Patient with Infectious Diarrhea

Assessment

The most important element of assessment in the patient with diarrhea is to determine hydration status. The goal of rehydration is to correct the dehydration. Assessment includes evaluation for thirst, dryness of oral mucous membranes, sunken eyes, a weakened pulse, and loss of skin turgor. Careful observation for these signs is especially important in cases of rapidly dehydrating diseases (most notably cholera) and in younger children.

Intake and output measurements are crucial in determining fluid balance. Liquid stool should be measured and recorded, along with the frequency of stools. It is important to note the consistency and appearance of stool as key indicators of the type and severity of the diarrheal disease. The presence of mucus or blood should also be documented.

When conducting a health history, the nurse asks the patient what they have eaten recently and about recent travel, treatment with antibiotics, and potential exposure to others with diarrheal disease. Frequently, patients attribute symptoms to the most recent meal eaten. However, because the incubation period for most diarrheal conditions is longer than the time interval between meals, the nurse must obtain detailed information about the meal preceding the illness as well as all food intake in the previous 3 to 4 days. When eliciting this kind of history, it is helpful to ask the patient to list every food tasted. The nurse also asks if the patient is employed in a food preparation service, because the local public health departments should be notified about any person with infectious diarrhea who works in the food industry.

Diagnosis

Nursing Diagnoses

Based on the assessment data, nursing diagnoses may include the following:

- Hypovolemia associated with fluid lost through diarrhea
- Lack of knowledge about the infection and the risk of transmission to others

Collaborative Problems/Potential Complications

Potential complications may include the following:

- Bacteremia
- Hypovolemic shock

Planning and Goals

The most important goals are maintenance of fluid and electrolyte balance, increased knowledge about the disease and risk of transmission, and absence of complications.

Nursing Interventions

Correcting Dehydration Associated With Diarrhea

The patient is assessed to determine the degree of dehydration and the amount and route of rehydration needed. Oral rehydration therapy is a strategy used to reduce the severe complications of diarrheal disease regardless of causative agent. It is inexpensive and effective for most patients, but it is often underused due to some cultural beliefs worldwide discouraging oral intake during episodes of diarrhea. The WHO and the United Nations Children's Emergency Fund (UNICEF) recommend zinc replacement and oral rehydration salts (ORS) solution for the treatment of children and adults with dehydration and electrolyte imbalance associated with cholera and other forms of diarrheal disease. Commercial ORS preparations are available and should be mixed with clean, safe water. When the ORS preparations are not available, salted vegetable soup or chicken soup can be used for fluid replacement. The ORS formula contains (in grams per liter) (CDC, 2018):

- sodium chloride: 2.6
- glucose (anhydrous): 13.5
- potassium chloride: 1.5
- trisodium citrate (dihydrate): 2.9

The most important consideration is to provide more fluid than normal. Sports drinks do not replace fluid losses correctly and should not be used, unless they are the only fluid that is available or tolerated (CDC, 2018).

Mild Dehydration. The patient exhibits dry oral mucous membranes of the mouth and increased thirst. The rehydration goal at this level of dehydration is to deliver about 50 mL of ORS per 1 kg of weight over a 4-hour interval (CDC, 2018).

Moderate Dehydration. Common findings are sunken eyes, loss of skin turgor, increased thirst, and dry oral mucous membranes. The rehydration goal at this level of dehydration is to deliver about 100 mL/kg of ORS over 4 hours.

Severe Dehydration. The patient with severe dehydration shows signs of shock (i.e., rapid thready pulse, cyanosis, cold extremities, rapid breathing, lethargy, or coma; see Chapter 11) and should receive IV replacement until hemodynamic and mental status return to normal. When improvement is evident, the patient can be treated with ORS.

Administering Rehydration Therapy

Because diarrheal episodes are often accompanied by vomiting, rehydration and refeeding can be difficult. Oral rehydration therapy should be delivered frequently in small amounts. When patients are persistently vomiting, they often require frequent administration of fluids by spoonfuls. IV therapy is necessary for the patient who is severely dehydrated or in shock.

It is important for children and adults with acute diarrheal symptoms to maintain caloric intake. As soon as dehydration has been corrected, an age-appropriate, unrestricted diet is allowed. Recommended foods include starches, cereals, yogurt, fruits, and vegetables. Foods that are high in simple sugars, such as undiluted apple juice or gelatin, should be avoided (CDC, 2018).

Increasing Knowledge and Preventing Spread of Infection

Public health nurses, school nurses, and others who are involved in patient education should emphasize principles of safe food preparation, with special attention to meat, poultry, and fish preparation and cooking as follows (CDC, 2020p):

- Fish and whole cuts of meat must reach a temperature of 145°F (63°C).
- Ground meat must reach 160°F (71°C).
- Leftovers and poultry (both ground or whole cut) must reach 165°F (74°C).
- Before and after food preparation, all food should be maintained at temperatures below 40°F (5°C) or above 140°F (60°C).

In planning events that involve food preparation for groups of people, it is important to ensure adequate provision for proper storage and reheating to temperature thresholds. It is also important to use different surfaces, knives, and other equipment for raw meat, poultry, and fish and to keep these items separate from other foods.

Diarrheal diseases discussed in this section must be reported to local or state health departments. The goal of reporting is to provide information for determining incidence trends and promptly identifying any restaurants or other food preparation establishments that may have served contaminated food.

In both homes and health care delivery settings, good hygiene and principles of standard precautions should be emphasized.

Monitoring and Managing Potential Complications

Bacteremia. *E. coli, Salmonella,* and *Shigella* are organisms that can enter the bloodstream and disseminate to other organs. Blood cultures are necessary for the patient who is acutely febrile with diarrhea. If initial smear results reveal gram-negative organisms, antibiotic therapy is instituted.

Hypovolemic Shock. Shock associated with diarrheal diseases demands accurate intake and output assessment and vigorous fluid replacement. In rare instances, patients with severe fluid imbalance require intensive care nursing support with aggressive hemodynamic monitoring (see Chapter 11).

Evaluation

Expected patient outcomes may include:

1. Attains fluid balance
   a. Output approximates intake.
   b. Mucous membranes appear moist.
   c. Skin turgor is normal.
   d. Adequate amounts of fluids and calories are ingested.
   e. Absence of vomiting.
   f. Stools are of normal color and consistency.
2. Acquires knowledge and understanding about infectious diarrhea and transmission potential
   a. Takes proper precautions to prevent spread of infection to others.

b. Describes principles and techniques of safe food storage, preparation, and cooking.

3. Absence of complications
   a. Temperature is within normal range.
   b. Blood culture reports are negative.
   c. Fluid balance is achieved.

Sexually Transmitted Infections

Sexually transmitted infections (STIs) are diseases acquired through sexual contact with a person who is infected. Select STIs and their routes of transmission are included in Table 66-1. Infections caused by organisms not generally considered STIs can also be transmitted during sexual contact—for example, *G. lamblia,* usually associated with contaminated water, can be transmitted through sexual exposure. STIs are sometimes called sexually transmitted diseases (STDs) as well.

STIs are the most common infectious diseases in the United States and are epidemic in most parts of the world. Portals of entry of STI-causing microorganisms and sites of infection include the skin and mucosal linings of the urethra, cervix, vagina, rectum, and oropharynx.

More than 2 million STIs are reported among Americans annually. However, many infections go undiagnosed or unreported, so surveillance data underestimate true incidence. Surveillance reliability is diminished when public health departments are underfunded, and when some populations have decreased access to care (CDC, 2020q).

Education about prevention of STIs includes information about risk factors and behaviors that can lead to infection. Using straightforward language and personal testimonials for targeted audiences (e.g., people who want information about protecting themselves) and conducting presentations with trusted establishments (e.g., churches, health care facilities) are the recommended educational strategies. Included in this education is information about the relative value of condoms in reducing the risk of infection. The use of condoms to provide a protective barrier from transmission of STI-related organisms has been broadly promoted, especially since the recognition of HIV/AIDS. At first referred to as a method to ensure *safe sex,* the use of condoms has been shown to reduce but not eliminate the risk of transmission of HIV and other STIs. Thus, the term *safer sex* more appropriately connotes the public health message to be used when promoting the use of condoms. See Chapter 32 for most information about AIDS and HIV.

STIs provide a unique set of challenges for nurses, physicians, and public health officials. Because of perceived stigma and possible threat to emotional relationships, people with symptoms of STIs are often reluctant to seek health care in a timely fashion. STIs may progress without symptoms, and a delay in diagnosis and treatment is potentially harmful because the risk of complications for the person who is infected and the risk of transmission to others increase over time.

Infection with one STI suggests the possibility of infection with other diseases as well. After one STI is identified, diagnostic evaluation for others should be conducted. The possibility of HIV infection should be pursued when any STI is diagnosed.

Syphilis

Syphilis is an acute and chronic infectious disease caused by the spirochete *Treponema pallidum.* It is acquired through sexual contact or may be congenital in origin. The rates of primary and secondary syphilis have been on the rise, with a 15% increase between 2017 and 2018 (CDC, 2020q).

Stages of Syphilis

The course of untreated syphilis can be divided into three stages: primary, secondary, and tertiary. These stages reflect the time from infection and the clinical manifestations observed in that period and are the basis for treatment decisions.

Primary syphilis occurs 2 to 3 weeks after initial inoculation with the organism. Painless lesions at the site of infection, called chancres, usually resolve spontaneously within 3 to 12 weeks, with or without treatment (Norris, 2019).

Secondary syphilis occurs by hematogenous spread leading to generalized infection. The rash of secondary syphilis occurs from 1 week to 6 months after the chancre (Norris, 2019). Transmission can occur through contact with these lesions. Generalized signs of infection may include lymphadenopathy, arthritis, meningitis, hair loss, fever, malaise, and weight loss.

After the secondary stage, there is a period of latency, when the person who is infected has no signs or symptoms of syphilis. Latency can be interrupted by a recurrence of secondary syphilis symptoms (Norris, 2019).

Tertiary syphilis is the final stage in the natural history of the disease. It is estimated that between 20% and 40% of those infected do not exhibit signs and symptoms in this final stage. Tertiary syphilis may present as a slowly progressive inflammatory disease with the potential to affect multiple organs. The most common manifestations at this level are aortitis and neurosyphilis, as evidenced by dementia, psychosis, paresis, stroke, or meningitis (Norris, 2019).

Assessment and Diagnostic Findings

Because syphilis shares symptoms with many diseases, clinical history and laboratory evaluation are important. The conclusive diagnosis of syphilis can be made by direct identification of the spirochete obtained from the chancre lesions of primary syphilis. Serologic tests used in the diagnosis of secondary and tertiary syphilis require clinical correlation in interpretation. The serologic tests are summarized as follows (O'Bryne, 2019):

- *Nontreponemal* or *reagin tests,* such as the Venereal Disease Research Laboratory (VDRL) or the rapid plasma reagin circle test (RPR-CT), are

generally used for screening and diagnosis. After adequate therapy, the test result is expected to decrease quantitatively until it is read as negative, usually about 2 years after therapy is completed.

- *Treponemal tests,* such as the fluorescent treponemal antibody absorption (FTA-ABS) test and the microhemagglutination test for *Treponema pallidum* (MHA-TP), are used to verify that the screening test did not represent a false-positive result. Positive results usually are positive for life and therefore are not appropriate to determine therapeutic effectiveness

Medical Management

Treatment of all stages of syphilis is administration of antibiotic medications. Penicillin G benzathine is the medication of choice for early syphilis or early latent syphilis of less than 1 year's duration. It is given by intramuscular injection at a single session. Patients with late latent or latent syphilis of unknown duration should receive three injections at 1-week intervals. Patients who are allergic to penicillin are usually treated with doxycycline. The patient treated with penicillin is monitored for 30 minutes after the injection to observe for a possible allergic reaction (CDC, 2020s).

Treatment guidelines established by the CDC are updated on a regular basis. Recommendations provide special guidelines for treatment in the setting of pregnancy, allergy, HIV infection, pediatric infection, congenital infection, and neurosyphilis. The CDC Web site, "Sexually Transmitted Diseases," provides a link to the most recent guidelines as well as additional information about drug shortages and other concurrent treatment considerations. The Web site also regularly updates guidance about how to modify usual STI/STD screening and treatment care during the COVID-19 pandemic (CDC, 2020s).

Nursing Management

Syphilis is a reportable communicable disease. In any health care facility, a mechanism must be in place to ensure that all patients who are diagnosed are reported to the state or local public health department to ensure community follow-up. The public health department is responsible for identification of sexual contacts, contact notification, and contact screening.

Lesions of primary and secondary syphilis may be highly infective. Gloves are worn when direct contact with lesions is likely, and hand hygiene is performed after gloves are removed. Isolation in a private room is not required (see Chart 66-8).

Chlamydia trachomatis and *Neisseria gonorrhoeae* Infections

Chlamydia trachomatis and *Neisseria gonorrhoeae* are the most commonly reported infectious diseases in the United States. Coinfection with *C. trachomatis*

often occurs in patients infected with *N. gonorrhoeae.* The greatest risk of *C. trachomatis* infection occurs in young women between 15 and 24 years of age (CDC, 2020q, 2020r).

Chart 66-8 PATIENT EDUCATION

Preventing the Spread of Syphilis

The nurse instructs the patient to:

- Complete the full course of therapy if multiple penicillin injections are required.
- Refrain from sexual contact with previous or current partners until the partners have been treated.
- Be aware that if you have primary or secondary syphilis, skin lesions and other sequelae of infection will improve with proper treatment, and serology eventually will reflect cure.
- Recognize that condoms significantly reduce the risk of transmission of syphilis and other STIs.
- Be aware that having multiple sexual partners increases the risk of acquiring syphilis and other STIs.

STIs, sexually transmitted infections.

Clinical Manifestations

Both *C. trachomatis* and *N. gonorrhoeae* infections frequently do not cause symptoms in women. When symptoms are present, mucopurulent cervicitis with exudates in the endocervical canal is the most frequent finding. Women with gonorrhea can also present with symptoms of urinary tract infection or vaginitis. See Chapter 51 for more in-depth coverage of STIs in women.

Although men are more likely than women to have symptoms when infected, infection with *N. gonorrhoeae* or *C. trachomatis* can be asymptomatic. When symptoms are present, they may include burning during urination and penile discharge. Patients with *N. gonorrhoeae* infection may also report painful, swollen testicles (CDC, 2020q, 2020r).

Complications

In women, pelvic inflammatory disease (PID), ectopic pregnancy, endometritis, and infertility are possible complications of either *N. gonorrhoeae* or *C. trachomatis* infection. In men, epididymitis, a painful disease that may lead to infertility, may result from infection with either bacterium. In both men and women, arthritis or bloodstream infection may be caused by *N. gonorrhoeae* (CDC, 2020q, 2020r).

Assessment and Diagnostic Findings

The patient is assessed for fever, discharge (urethral, vaginal, or rectal), and signs of arthritis. Diagnostic methods used in *N. gonorrhoeae* infection include Gram stain (appropriate only for male urethral samples), culture, and nucleic acid amplification tests (NAATs). Gram stain and the direct fluorescent antibody test can be used in chlamydia. NAATs are also available for *C. trachomatis*. In the female patient, samples are obtained from the endocervix, anal canal, and pharynx. In the male patient, specimens are obtained from the urethra, anal canal, and pharynx. Because *N. gonorrhoeae* organisms are susceptible to environmental changes, specimens for culture must be delivered to the laboratory immediately after they are obtained.

Because as many as 70% of chlamydial infections are asymptomatic, the CDC recommends *Chlamydia* testing for all women who are pregnant. Annual testing is also recommended for women younger than 25 years who are sexually active, and for women over 25 years who have a new sexual partner or multiple partners (CDC, 2020q, 2020r).

Medical Management

Because patients are often coinfected with both gonorrhea and chlamydia, dual therapy is recommended, even if only gonorrhea has been laboratory proven (CDC, 2020r). The CDC guidelines should be used to determine alternative therapy for the patient who is pregnant or allergic or who has a complicated chlamydial infection. The CDC updates STI therapy recommendations regularly because of growing challenges with bacterial antibiotic resistance patterns and drug shortages (CDC, 2020r).

Although the number of resistant strains of gonorrhea has increased, that is not the reason for the use of combination antibiotic therapy. Such therapy is prescribed in order to treat both gonorrhea and chlamydia, because many patients with gonorrhea have a coexisting chlamydial infection.

Patients with uncomplicated gonorrhea who are treated with CDC-recommended therapy do not routinely need to return for a proof-of-cure visit. If the patient reports a new episode of symptoms or tests are positive for gonorrhea again, the most likely explanation is reinfection rather than treatment failure. Serologic testing for syphilis and HIV should be offered to patients with gonorrhea or chlamydia, because any STI increases the risk of other STIs (CDC, 2020r).

Nursing Management

Gonorrhea and chlamydia are reportable communicable diseases. In any health care facility, a mechanism should be in place to ensure that all patients who are diagnosed are reported to the local public health department to ensure follow-up of the patient. The public health department also is responsible for interviewing the patient to identify sexual contacts so that contact notification and screening can be initiated.

The target group for preventive patient education about gonorrhea and chlamydia is the adolescent and young adult population. Along with reinforcing the importance of abstinence, when appropriate, education should address postponing the age of initial sexual exposure, limiting the number of sexual partners, and using condoms for barrier protection. Young women and those who are pregnant should also be instructed about the importance of routine screening for chlamydia.

NURSING PROCESS

The Patient with a Sexually Transmitted Infection

Assessment

The patient should be asked to describe the onset and progression of symptoms and to characterize any lesions by location and by describing drainage, if present. Brief explanations of why the information is needed are often helpful. Clarification of terms may be necessary if either the patient or nurse uses words that are unfamiliar to the other.

Protecting confidentiality is important when discussing sexual issues. When a detailed sexual history is necessary, it is important to respect the patient's right to privacy. When obtaining a sexual history, the CDC recommends the following systematic interview of key areas, the "five Ps": *p*artners, *p*revention of pregnancy, *p*rotection from STIs, *p*ractices, and *p*ast history of STIs.

Asking specific information about sexual contacts usually should be done only when the nurse is part of a team that will conduct partner notification. The nurse should describe to the patient the public health notification process and resources that are available to assist sexual partners or infants and children.

During the physical examination, the examiner looks for rashes, lesions, drainage, discharge, or swelling. Inguinal nodes are palpated to elicit tenderness and to assess swelling. Women are examined for abdominal or uterine tenderness. The mouth and throat are examined for signs of inflammation or exudate. The nurse wears gloves while examining the mucous membranes, and gloves are changed and replaced after vaginal or rectal examination.

Diagnosis

Nursing Diagnoses

Based on assessment data, major nursing diagnoses may include the following:

- Lack of knowledge about the disease and risk for spread of infection and reinfection
- Anxiety associated with anticipated stigmatization and to prognosis and complications
- Impaired ability to manage regime associated with integrating a therapeutic regimen for treatment

Collaborative Problems/Potential Complications

Potential complications may include the following:

- Ectopic pregnancy
- Infertility
- Transmission of infection to fetus, resulting in congenital abnormalities and other outcomes
- Neurosyphilis
- Gonococcal meningitis
- Gonococcal arthritis

- Syphilitic aortitis
- HIV-related complications

Planning and Goals

Major goals are increased patient understanding of the natural history and treatment of the infection, reduction in anxiety, increased adherence with therapeutic and preventive goals, and absence of complications.

Nursing Interventions

Increasing Knowledge and Preventing Spread of Disease

Education about STIs and prevention of the spread to others are often accomplished simultaneously. The patient who is infected should be told what the causative organism is and should receive an explanation of the usual course of the infection (including the interval of potential communicability to others) and possible complications. The nurse should stress the importance of following therapy as prescribed and the need to report any side effects or symptom progression. Discussion should emphasize that the same behaviors that led to infection with one STI increase the risk of infection with other STIs, including HIV. Methods used to contact sexual partners should be discussed. The patient should understand that until the partner has been treated, continued sexual exposure to the same person may lead to reinfection.

Target groups for preventive patient education about STIs include the adolescent and young adult populations. Along with reinforcing the importance of abstinence, when appropriate, education should address postponing the age of initial sexual exposure, limiting the number of sexual partners, and using condoms for barrier protection. The use of condoms reduces but does not eliminate the risk of transmission of HIV and other STIs.

Reducing Anxiety

When appropriate, the patient is encouraged to discuss anxieties and fear associated with the diagnosis, treatment, or prognosis. By individualizing education, factual information applied to specific needs may offer reassurance. Patients may need help in planning discussion with partners. If the patient is especially apprehensive about this aspect, referral to a social worker or other specialist may be appropriate. For example, such support is especially important when the patient has newly diagnosed HIV infection. Patients with HIV may benefit from programs that combine support, education, counseling, and therapeutic goals. Such programs are designed to offer coordinated care throughout the course of disease progression.

Increasing Adherence

In group settings (e.g., an outpatient obstetric setting) or in a one-to-one setting, open discussion about STI information facilitates patient education. Discomfort can be reduced by factual explanation of causes, consequences, treatments, prevention, and responsibilities. Because most communities have expanded STI prevention resources, referrals to appropriate agencies can complement

individual educational efforts and ensure that later questions or uncertainties can be addressed by experts.

Monitoring and Managing Potential Complications

Infertility and Increased Risk of Ectopic Pregnancy. STIs may lead to PID and increased risk of ectopic pregnancy and infertility. See Chapters 50 and 51 for additional information.

Congenital Infections. All STIs can be transmitted to infants in utero or at the time of birth. Complications of congenital infection can range from localized infection (e.g., throat infection with *N. gonorrhoeae*), to congenital abnormalities (e.g., stunting of growth or deafness from congenital syphilis), and to life-threatening disease (e.g., congenital herpes simplex virus).

Neurosyphilis, Gonococcal Meningitis, Gonococcal Arthritis, and Syphilitic Aortitis. STIs can cause disseminated infection. The central nervous system may be infected, as seen in cases of neurosyphilis or gonococcal meningitis. Gonorrhea that infects the skeletal system may result in gonococcal arthritis. Syphilis can infect the cardiovascular system by forming vegetative lesions on the mitral or aortic valves (CDC, 2020s).

Human Immune Deficiency Virus–Related Complications. HIV infection, if untreated, leads to the profound immunosuppression that is characteristic of AIDS. Complications of HIV infection include many opportunistic infections, including those due to *Pneumocystis jirovecii, Cryptococcus neoformans,* cytomegalovirus, and *Mycobacterium avium* (see Chapter 32).

Evaluation

Expected patient outcomes may include:

1. Exhibits knowledge about STIs and their transmission
2. Demonstrates a less anxious demeanor
   a. Discusses anxieties and goals for treatment
   b. Inspects self for lesions, rashes, and discharge
   c. Accepts support, education, and counseling when indicated
   d. Assists with sharing information about infection with sexual partners
   e. Discusses risk reduction behaviors and safer sex practices
3. Adheres to treatment
4. Achieves effective treatment
5. Reports for follow-up examinations if necessary
6. Absence of complications

Emerging Infectious Diseases

As defined by the CDC, **emerging infectious diseases** are human diseases of infectious origin that have increased within the past two decades or that are likely to increase in the near future. Examples of emerging infectious diseases presented

here include COVID-19, Zika virus, West Nile virus, Ebola virus disease, Legionnaires disease, and pertussis. Bioterrorism agents such as anthrax and plague are also considered emerging infectious diseases because a bioterrorist act would introduce a new mode of transmission for these agents. Other examples, covered earlier in this chapter, include novel influenza viruses, CRE, and *C. auris*.

Infectious diseases may begin anywhere in the world; therefore, epidemiologists worldwide collaborate to share information about the detection of new diseases, their clinical presentations, laboratory identification methods, and possible treatments. In the United States, the CDC is the central agency for this coordination. The CDC collaborates with numerous agencies, including other U.S. government agencies (such as the National Institutes of Health [NIH] and Food and Drug Administration [FDA]) as well as the WHO and other international agencies, faith-based agencies, nongovernmental organizations, and businesses throughout the world. Elaborate disease surveillance and reporting methods are established with the goal of early detection and control of actual and potential epidemics and pandemics (CDC, 2017).

Many factors contribute to newly emerging or re-emerging infectious diseases. These include travel, globalization of food supply and central processing of food, population growth, increased urban crowding, population movements (e.g., those that result from war, famine, or human-made or natural disasters), ecologic changes, human behavior (e.g., risky sexual behavior, IV/injection drug use), antimicrobial resistance, and breakdown in public health measures.

Emerging infectious diseases are important from an epidemiologic standpoint because their incidence is not stable. When the pattern of disease in a community is not well understood in the medical-scientific community, patients, families, and others in the community often become alarmed about these diseases. During times of increased concern about bioterrorism, whether triggered by actual events or by hoaxes, nurses have responsibility to rationally separate facts from fears. In discussions with patients and other caregivers, it is important to keep the focus on what is known and to clarify the plan for diagnosis, treatment, and containment.

COVID-19

The COVID-19 pandemic began in Wuhan, China, in late 2019. As research into the novel pathogen responsible for the 2019–2021 global pandemic progresses, new information about the pathogenesis, risks, clinical manifestations, and management of patients infected with SARS-CoV-2 continues to emerge. Of those individuals in the United States diagnosed with COVID-19, the case fatality rate is estimated to be 5.6% (Johns Hopkins University & Medicine Coronavirus Resource Center, 2020).

Pathophysiology

COVID-19 transmission occurs through virus-laden droplets and aerosols exhaled by an infected host while breathing, speaking, coughing, and sneezing (Prather,

Wang, & Schooley, 2020). SARS-CoV-2 gains entry into host cells through the angiotensin-converting enzyme 2 (ACE2) cellular surface receptors (see Chapter 27, Fig. 27-2) (Vaduganathan, Vardeny, Michel, et al., 2020). In addition, the aerosols of SARS-CoV-2 can accumulate, remain infectious in indoor air for hours, and can be inhaled deep into the lungs (Prather et al., 2020). The virus multiplies rapidly within an infected host and, unless checked by the immune system, symptoms begin with a week of transmission (Prather et al., 2020).

Risk Factors

Individuals of any age, gender, and ethnicity can be at risk for infection; however, adults 65 years of age and older, and those who reside in long-term care or skilled nursing facilities are at higher risk of death from COVID-19 (NIH COVID-19 Treatment Guidelines Panel, 2020). Some studies suggest that men with COVID-19 have a higher fatality rate compared to women (Chen, Zhou, Dong, et al., 2020; Deng, Yin, Chen, et al., 2020). While information on risk continues to evolve, Chart 66-9 lists the demonstrated and possible risk factors for COVID-19 in adults. Having a history of several chronic diseases, particularly if the diseases are not properly managed, appears to be associated with higher risk of severe disease and death (CDC, 2020g; CDC, 2020h). Patients who are immunosuppressed for a variety of reasons (e.g., active neoplasm, organ transplant recipient) are also thought to be at higher risk of dying from COVID-19 (CDC, 2020g; CDC, 2020h; NIH COVID-19 Treatment Guidelines Panel, 2020).

Clinical Manifestations

COVID-19 clinical manifestations occur on a wide spectrum, from mild symptoms that can be managed at home to severe illness with manifestations that can cause multisystem morbid complications requiring care in an ICU setting. While primarily respiratory in nature, mild COVID-19 manifestations may include fever, nonproductive cough, sore throat, fatigue, myalgias (muscle aches), nasal congestion, nausea, vomiting, diarrhea, anosmia (loss of smell), and ageusia (loss of taste) (Cascella, Rajnik, Cuomo, et al., 2020; Kim & Gandhi, 2020). See Chapter 19 for further discussion of the spectrum of clinical manifestations in the patient with COVID-19.

Chart 66-9  RISK FACTORS

Development of Severe Illness due to COVID-19 in Adults

Increased Risk Demonstrated

- Cancer
- Chronic kidney disease
- COPD
- Down Syndrome
- Heart failure, coronary artery disease, or cardiomyopathy
- Immunocompromised state from solid organ transplant
- Obesity (body mass index [BMI] of 30 kg/m^2 or higher but ≤40 kg/m^2)
- Severe obesity (BMI ≥40 kg/m^2)
- Pregnancy
- Sickle cell disease
- Smoking
- Type 2 diabetes

Possible Increased Risk

- Asthma (moderate-to-severe)
- Cerebrovascular disease
- Cystic fibrosis
- Dementia
- Hypertension
- Immunocompromised state from blood or bone marrow transplant, immune deficiencies, HIV, use of corticosteroids, or use of other immune weakening medicines
- Liver disease
- Overweight (BMI ≥25 kg/m^2, but ≤30 kg/m^2)
- Pulmonary fibrosis
- Thalassemia
- Type 1 diabetes

COPD, chronic obstructive pulmonary disease.

Adapted from Centers for Disease Control and Prevention (CDC). (2020g). Interim clinical guidance for management of patients with confirmed coronavirus disease (COVID-19). Retrieved on 7/24/2020 at: www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html; Centers for Disease Control and Prevention (CDC). (2020h). COVID-19: People with certain medical conditions. Retrieved on 7/24/2020 at: www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html

Medical Management

Patients with mild symptoms, about 80% of patients, can be managed at home (Cascella et al., 2020; Kim & Gandhi, 2020). Those with severe illness are hospitalized (Kim & Gandhi, 2020). See Chapter 19 for further discussion of medical management of the patient with mild, moderate, and severe COVID-19 infection.

Nasopharyngeal samples are the recommended method of diagnosing SARS-CoV-2 (NIH COVID-19 Treatment Guidelines Panel, 2020). Those testing people for possible infection with SARS-CoV-2 either work with their state, tribal, local, and territorial health departments to coordinate testing through public health laboratories, or with commercial or clinical laboratories using molecular and antigen tests. The type of specimen collected is based on the test being used and the specific manufacturer instructions (CDC, 2020a).

Ideally, the diagnosis of COVID-19 is confirmed by patient self-administration of bilateral nasal swabbing for viral antigen or nucleic acid. Self-swabbing minimizes the risk of person-to-person transmission of respiratory droplets. The act of patient self-swabbing should be observed by a health care provider whenever possible to assure it is performed properly (CDC, 2020a).

COVID-19 Vaccines

Operation Warp Speed was an unprecedented response to the study of safety and efficacy of new vaccine platforms never before used in humans (Castells & Phillips, 2020). Two SARS-CoV-2 mRNA vaccines were authorized for emergency use in the United States in December of 2020, less than a year after the SARS-CoV-2 sequence was discovered (Castells & Phillips, 2020). Both vaccines require 2 doses for efficacy, the second dose of the Pfizer-BioNTech 21 days after the first dose, and the Moderna mRNA 28 days later. Early reports indicated the Pfizer-BioNTech vaccine had an anaphylaxis rate of 1 in 100,000 compared with a rate of 1 in 1,000,000 for other vaccines (Castells & Phillips, 2020). Ongoing efforts are needed by nurses and all health care workers to maintain a proactive response to support public confidence and reduce vaccine hesitancy. Anaphylaxis is a treatable reaction that requires early recognition and an appropriate and timely response (see Chapter 33). A VAERS form must be completed for any adverse reaction and can be submitted online (see the Resources section). Nurses should be vaccinated for COVID-19 and should advocate for all of their professional and personal contacts receiving the vaccine at the first available opportunity.

Nursing Management

Nursing management of the patient with COVID-19 mirrors that of medical management. The majority of patients with known or suspected mild COVID-19 may be managed on an outpatient basis within their homes, which conserves hospital resources and diminishes the likelihood of exposure to others, including health care workers (Kim & Gandhi, 2020). Few medications are used to either

treat COVID-19 or to mitigate its effects in patients with mild disease who are managed at home; thus, care is largely supportive. The nursing management of patients with mild COVID-19 mirrors that of other viral respiratory illnesses.

Patients with moderate or severe COVID-19 are most often managed in the hospital setting. Health care workers are at increased risk for acquiring COVID-19 and should wear complete PPE as discussed earlier in this chapter (CDC, 2020c). See Chapter 19 for further discussion of nursing management of the patient with mild, moderate, and severe COVID-19 infection. Supportive care for a patient, whether at home or in the hospital setting, requires very careful use of infection control measures and psychological support for the patient and family.

Early in the COVID-19 pandemic, important measures were recommended by the CDC to help mitigate the spread of SARS-CoV-2. Nurses should provide education to help patients and their families implement these measures to help slow viral transmission. One measure is to wear a mask with 2 or more layers of breathable fabric that snugly covers the nose and mouth; this type of mask should be worn in public places to help patients and families protect themselves and others (Prather et al., 2020). One study of mask usage reported that among 139 clients exposed to two symptomatic hair stylists with confirmed COVID-19, while both the stylists and the clients wore face masks, no symptomatic secondary cases were identified (Hendrix, Walde, Findley, et al., 2020). Another important practice is to 'socially distance' by remaining at least 6 feet apart from others and avoiding crowds. The nurse should also encourage frequent handwashing with at least 20 seconds of scrubbing, rinsing, and drying after washing (CDC, 2002). If handwashing is not possible, then hand sanitizer with at least 60% alcohol should be used.

Zika Virus

The Zika virus was first discovered as a pathogen in monkeys in the Zika Forest of Uganda in the 1940s; it was found to cause human disease in the 1950s. The epidemiologic pattern changed as the first large outbreak in humans did not occur until 2007 in Micronesia. The disease was not seen in the Western Hemisphere until July 2015, when a large outbreak began in Brazil. Within the next year, infections were noted in countries throughout the Americas and Pacific Islands (WHO, 2016).

The incubation period for Zika virus disease is estimated to be between 3 and 14 days (Krow-Lucal, Biggerstaff, & Staples, 2017). Among patients who are symptomatic, most have self-limiting illness of 2 to 7 days duration with mild fever, rash, headache, conjunctivitis, or joint and muscle pain. Zika has been associated with microcephaly and other congenital abnormalities in infants of some women infected with Zika during pregnancy. The virus can also cause Guillain–Barré syndrome, a condition with nerve and muscle weakness that often quickly progresses to a paralysis (WHO, 2016).

Zika is primarily transmitted through bites of infected mosquitos from the *Aedes* genus. Sustained outbreaks have been more common in tropical areas where these mosquitos thrive. The *Aedes* mosquito is also the carrier of other mosquito-

borne viruses such as dengue, chikungunya, and yellow fever. Unlike these other mosquito-borne diseases, Zika can also be transmitted through sexual transmission. This combination of transmission routes makes prevention efforts especially challenging. People can travel to epidemic areas, and later, as asymptomatic infected carriers, transmit the virus to their sexual partners. Because of the concern about congenital infection, women who are pregnant are advised to avoid travel to endemic areas and to use abstinence or safer sex methods if their sexual partners have traveled to such regions. Similarly, couples with exposure to areas where there is ongoing transmission are counseled in contraceptive options (CDC, 2020s).

West Nile Virus

The West Nile virus was first recognized in the 1930s in Africa and was first seen in humans in the United States in 1999. Those infected have a range of presentations. Approximately 20% of people who are infected have a mild disease called *West Nile fever*. These patients usually experience headache, fever, and a persistent fatigue that may continue for several months. In these patients, fewer than 1% of infections develop into more serious disease, which is characterized by severe neuroinvasive illness, meningitis, encephalitis, and paralysis or poliomyelitis. The mortality rate for people with neuroinvasive diseases is approximately 10% (CDC, 2020t).

The incubation period (i.e., from mosquito bite to onset of symptoms) is between 2 and 14 days. Currently, there is no treatment for West Nile virus infection. Medical and nursing management consists of fluid replacement, airway management, and supportive nursing care when meningitis or symptoms are present.

Birds are the natural reservoir for the virus, and since 1999, the population of infected birds in the United States has increased steadily. Mosquitoes become infected when feeding on birds and can transmit the virus to animals and humans. Human-to-human transmission of West Nile virus is very rare; however, transplacental mother-to-infant transmission and blood transfusion or organ transplant transmission have rarely occurred (CDC, 2020t).

Ebola Virus Disease

The first human outbreak of Ebola virus disease occurred in 1976. For decades, the virus maintained a pattern of sporadic outbreaks in remote African villages, followed by intervening periods without any recognized cases worldwide. In 2014, the virus broke this pattern and rampaged through the West African countries Liberia, Guinea, and Sierra Leone, with secondary cases in other countries in Africa, Europe, and the United States with approximately 28,600 cases (CDC, 2020u). Between 2017 and 2020, several significant outbreaks occurred in the Republic of the Congo, with an estimated 3400 cases (CDC, 2020u).

Pathophysiology

Ebola is spread through direct contact with blood or body fluids (urine, vomit, feces, saliva, sweat, semen, and breast milk) from the person who is ill from the virus and possibly from contact with semen of a man who has recovered from Ebola. It is not spread through air, water, or insect bite. In Africa, it may occasionally be spread by handling infected bats or infected wild animals that are sometimes hunted for food. Ebola virus is only detected in blood after the patient becomes symptomatic and viral levels rise significantly as the disease progresses (CDC, 2020u).

The incubation period from exposure to first symptoms ranges from 2 to 21 days. If there are no symptoms by 21 days after exposure, there is essentially no risk of developing Ebola. Patients are not contagious to others before symptoms occur. Thorough identification of Ebola contacts and careful symptom monitoring can prevent subsequent waves of transmission (CDC, 2020u).

Clinical Manifestations

The initial clinical manifestations include high fever, muscle aches, and fatigue. Between the third and fifth symptomatic day, the patient often develops severe diarrhea, abdominal pain, and vomiting. Patients are at great risk for severe dehydration at this point as many produce over 5 L of liquid stool per day. This stage can persist for a week or more, and many patients develop hemodynamic shock (see Chapter 11). Patients may also show increasing neurologic symptoms during that period, such as confusion, agitation, delirium, or encephalitis. Approximately 5% will develop bleeding or hemorrhage, a very poor prognostic indicator. Patients who do not die during the first 2 weeks of the disease are likely to survive (CDC, 2020u).

Medical Management

No therapies have been approved for Ebola, but two antiviral treatments are under investigation (CDC, 2020u). Treatment is largely supportive maintenance of the circulatory and respiratory systems. It is likely that the patient who is infected will need ventilator and dialysis support during the acute phase of illness (CDC, 2020u).

Ebola Vaccines

In late 2019, the FDA approved the first Ebola vaccine effective at reducing the incidence of the Zaire strain of Ebola. The vaccine is approved for adults 18 years and older. Patient education is important as potential recipients should be informed that the vaccine has not shown protection for strains other than the Zaire strain, and adverse reactions (including anaphylaxis) have been reported (U.S. FDA, 2019).

Nursing Management

Nursing management mirrors that of medical management and is largely supportive. Supportive care for a patient with such a devastating disease requires very careful use of infection control measures and psychological support for the patient and family.

Health care workers are at increased risk for acquiring Ebola because they may have contact with body fluids or equipment contaminated from exposure to body fluids. Because patients with Ebola emit abundant viral particles in body fluids, especially in vomit and diarrhea, the patient should be promptly isolated in a private room, away from other patients. Health care workers should wear complete PPE. Systems must be set up so that an observer guides each worker to meticulously don PPE before direct contact with a patient who is infected to ensure that all equipment is worn correctly. After a worker has direct contact with a patient who is infected, an observer should direct careful doffing (removal) of PPE to ensure that no exposure occurs in the process. (See Chart 66-3 and Resources section for more information on donning and doffing PPE.) Equipment used for the patient with Ebola virus should be used solely for that patient and should be disposed of after use. If equipment must be reused, it should be sterilized or scrupulously cleaned with a bleach-based solution before reuse. Care for the patient with Ebola requires hospitals and transport systems to develop plans to coordinate staffing, supply maintenance, handling of waste, and communication with the public (WHO, 2020). Because care for Ebola patients is so complex, during a time of increased risks, communities are encouraged to assign some facilities as the designated facilities for Ebola care. Other facilities will have the responsibility to carefully screen patients with suspected Ebola and to cautiously transport them to a designated Ebola care facility.

Legionnaires Disease

Legionnaires disease is a multisystem illness that usually includes pneumonia and is caused by the gram-negative bacterium *Legionella pneumophila.* Named after an outbreak among people attending a convention of the American Legion in 1976, its potential to cause outbreaks has been demonstrated repeatedly in hospitals and other settings. It continues to be considered an emerging infectious disease because there are new patterns in recent years. There are approximately 5000 new cases each year (CDC, 2020v).

Legionella organisms are found in many man-made and naturally occurring water sources. Although the organisms may initially be introduced to the plumbing system in low numbers, growth is enhanced by water storage, sediment, temperatures ranging from 25°C to 42°C (77°F to 108°F), and certain amoebae frequently present in water that can support intracellular growth of legionellae. Because incidence appears to increase in the summer and autumn months, vacation-related exposure to hotel or cruise ship plumbing and air-conditioning systems, whirlpool spas, and decorative fountains may be the causative risk (Soda, Barskey, Shah, et al., 2017).

Pathophysiology

Legionella pneumophila is transmitted by the aerosolized route from an environmental source to a person's respiratory tract. In hospitals, patients may be exposed to aerosols created by cooling towers, water exposure from in-room plumbing, and respiratory therapy equipment. Person-to-person transmission does not occur. Because underlying medical conditions can increase host susceptibility and subsequent severity of disease, and because hospital plumbing systems are often very complex, outbreaks occur in hospitals more frequently than at other centers within the community. The mortality rate for Legionnaires disease may be as high as 10%; for those who acquire the disease while in a health care facility, the rate is approximately 25% (Soda et al., 2017).

Risk Factors

Risk factors for *Legionella* infection include diseases that lead to severe immunosuppression, such as AIDS, hematologic malignancy, end-stage kidney disease, or the use of immunosuppressive agents. Other factors associated with increased risk include diabetes, smoking, exposure to whirlpool spas, and recent travel (CDC, 2020v; Soda et al., 2017).

Clinical Manifestations

The lungs are the principal organs of infection; however, other organs may also be involved. The incubation period ranges from 2 to 10 days. Early symptoms may include malaise, myalgias, headache, and dry cough. The patient develops increasing pulmonary symptoms, including productive cough, dyspnea, and chest pain. Patients are usually febrile, and body temperatures may reach or exceed 39.4°C (103°F). Diarrhea and other gastrointestinal symptoms are common. In severe cases, multiorgan involvement and failure may follow (CDC, 2020v).

Assessment and Diagnostic Findings

The diagnostic approach generally involves using information obtained from the history, physical examination, x-rays, laboratory findings, and assessment of therapeutic effectiveness. Chest x-ray abnormalities may vary in severity and in location within the lungs. Laboratory tests available for the diagnosis of *Legionella* include culture or tests that detect either antigen or antibody. The most frequently used test is the urinary antigen. The greatest limitation of the test is that it detects only one subgroup of one of the several species of *Legionella.* The CDC recommends using multiple tests when Legionnaires disease is suspected because none of the tests is completely accurate (CDC, 2020v).

Medical Management

The antibiotic agents of choice are azithromycin or a fluoroquinolone such as moxifloxacin. The antibiotic doxycycline may also be used (CDC, 2020v).

Nursing Management

The nursing management described for the patient with any pneumonia (see Chapter 19) should form the basis of care for the patient with *Legionella* pneumonia. Isolation is not required because *Legionella* is not transmitted between humans. Legionellosis should be reported to public health authorities. When the patient has acquired the infection in a health care facility, water sampling should be performed to determine if the water supply is contaminated and to verify eradication after water treatment.

Pertussis

Pertussis, also known as whooping cough, a common childhood disease in the pre-vaccine era, is an example of a disease that has re-emerged. Incidence rates declined until the 1980s, when rates for all age groups began to increase steadily for the next three decades, peaking in 2012 and plateauing in the following years (CDC, 2020w).

Pertussis is caused by the bacterium *Bordetella pertussis*. It is highly contagious, and patients usually present to health care professionals with a paroxysmal (sudden) cough that is accompanied by a characteristic whoop—a high-pitched noise heard when inhaling.

Pathophysiology

B. pertussis is transmitted by droplets. The bacteria easily attach to pharyngeal epithelial cells, where they release a number of antigens, toxins, and other substances that trigger the immune system. Because most of the disease manifestations are caused by this immune reaction, patients are usually contagious only early in the disease (when the bacteria are still present) and not during the protracted period of cough (when the immune reaction is causing the pathology).

Clinical Manifestations

Pertussis causes a range of respiratory symptoms, with cough being the most frequent. It is generally most severe for infants who have not yet been vaccinated. Pneumonia is the most common consequence of infection, but the disease can also lead to seizures, encephalopathy, and, rarely, death. People who have been vaccinated seldom have severe disease (CDC, 2020w).

Assessment and Diagnostic Findings

Most diagnoses of pertussis are made, at least initially, without laboratory confirmation. The clinical case definition, unless there is a preexisting condition to

explain the symptoms, is a new cough lasting at least 2 weeks with inspiratory whoop or vomiting after cough. Laboratory confirmation can be made by clinical culture or by polymerase chain reaction assay for *B. pertussis*. Serologic testing, although less reliable, can also strengthen the diagnostic suspicion. The best source for a culture is a nasopharyngeal specimen obtained by swab or aspirate (CDC, 2020w).

Medical Management

Early treatment for pertussis is important to prevent complications. The antibiotic agents of choice are azithromycin, erythromycin, or clarithromycin (Comerford & Durkin, 2020). The antibiotic trimethoprim sulfamethoxazole may also be used (CDC, 2020w). Close contacts of a patient with proven or suspected pertussis should receive prophylaxis with one of these agents to reduce the risk of disease.

Nursing Management

Patients who are hospitalized with pertussis should be isolated in droplet precautions until they have received 5 days of appropriate therapy. Household members should receive antimicrobial prophylaxis and should be advised to report any symptoms of an upper respiratory infection.

Immunization is an important element of pertussis prevention. There are two acellular formulations of pertussis vaccine; both are combinations of diphtheria and pertussis. The pediatric formula, called DTaP, is designed for children between 2 months and 6 years. The teen and adult formulation, called Tdap, contains a decreased amount of the diphtheria element. Tdap should be given to children over 11 years, all adults every 10 years, and pregnant women early in pregnancy (CDC, 2020w). All adults who are around infants under 12 months on a regular basis should be vaccinated to reduce the risk of transmitting pertussis.

Travel and Immigration

Travel, trade, migration, and wars have led to many epidemics throughout history. The potential for epidemics is greatest when travelers and immigrants introduce microorganisms to which the host population has little or no immunity. Examples of important epidemics in the Western Hemisphere have included yellow fever, malaria, hookworm, leprosy, smallpox, measles, mumps, and syphilis. The COVID-19 pandemic demonstrates how global travel contributes to a rapidly occurring epidemic.

In the United States, an infrastructure with enforced vaccination, clean water, and insect and rodent control decreases the risk that epidemics will progress even when travel may introduce exotic microorganisms. The CDC maintains an active surveillance system to monitor and halt the incidence of many diseases prospectively. However, the 2016 experience with Zika virus reinforced knowledge

that insect transmission can lead to significant outbreaks. Insects can infest cargo; in addition, travelers who may have been exposed abroad to insect-borne infections may then serve as reservoirs for further disease spread. For example, concern grows that vector-borne diseases such as dengue and malaria may increase in the United States as mosquitoes can transmit disease locally when a reservoir of infected humans is established.

Immigration and Acquired Immune Deficiency Syndrome

The fact that AIDS reached pandemic proportions less than a decade after its recognition attests to the efficiency of world travel in spreading disease. Such rapid transmission rates are especially dramatic because HIV essentially requires intimate contact between two people through sexual activity or sharing blood through needles (see Chapter 32).

Immigration and Tuberculosis

Immigration has long been an important influence in the epidemiology of TB in the United States. In 2017, the year with the lowest total of new TB cases in the United States since the 1950s, 70% of those reported were individuals who were foreign-born. The incidence among those who are foreign-born has been increasing steadily (CDC, 2020x). Multi-drug resistance is also more prevalent in cases among those who are foreign-born because the bacille Calmette–Guérin (BCG) vaccine is used in many countries. After receiving BCG, people often have some degree of tuberculin skin test reactivity for a prolonged time, thus making the diagnosis of TB infection challenging.

The QuantiFERON-TB Gold (QFT-G) test is an enzyme-linked immunosorbent assay (ELISA) that detects the release of interferon-gamma by white blood cells when the blood of a patient with TB is incubated with peptides similar to those in *M. tuberculosis*. The results of the QFT-G test are available in less than 24 hours and are not affected by prior vaccination with BCG. See Chapter 19 for more detailed discussion.

Immigration and Vector-Borne Diseases

Malaria and dengue are diseases that cause significant morbidity and mortality throughout the developing world. These diseases may be introduced to the United States via travel, immigration, or commerce with approximately 2000 cases each year (CDC, 2020y). Malaria and dengue are caused by microorganisms that can be spread to humans by mosquitoes in the United States that thrive in tropical zones and breed in stagnant water sources. Although malaria was eradicated in the United States in the 1950s, limited local outbreaks have occurred regularly when mosquitoes acquire the bacteria from a person recently traveling from an area in which malaria is endemic and transmit it to a small number of people. Similarly, an

increase of dengue virus in the Caribbean has caused concern that outbreaks may occur in the United States (CDC, 2020y).

CRITICAL THINKING EXERCISES

1 ebp The community clinic where you work has had an increase in STIs in the last 6 months. Identify how STIs occur. What evidence-based strategies could be used in the community to decrease the incidence of STIs? Identify the criteria used to evaluate the strength of the evidence for the practices you identify.

2 pq You are a home health nurse making a home visit for a 75-year-old patient with multiple medical conditions who has recently been discharged from the hospital following an ICU stay of 10 days for COVID-19. What are your priorities for providing information about infection prevention to the patient, the family, and the caregiver?

3 ipc You are serving on a committee to address pandemic preparation. What members of the interprofessional care team should be included in this committee? What methods should the team offer to address possible shortages of PPE? What methods could be used to provide prophylaxis or vaccines, if they are available?

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*Asterisk indicates nursing research.
**Double asterisk indicates classic reference.

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Resources

American Public Health Association (APHA), www.apha.org
Association for Professionals in Infection Control and Epidemiology (APIC), www.apic.org
Centers for Disease Control and Prevention (CDC) (includes video demonstrations of donning and doffing PPE), www.cdc.gov
Hospital Compare, www.medicare.gov/hospitalcompare
Infectious Diseases Society of America (IDSA), www.idsociety.org
Johns Hopkins University & Medicine, Coronavirus Resource Center, coronavirus.jhu.edu
National Foundation for Infectious Diseases (NFID), www.nfid.org
National Institute of Allergy and Infectious Diseases (NIAID), www.niaid.nih.gov
Occupational Safety and Health Administration (OSHA), www.osha.gov
Society for Healthcare Epidemiology of America (SHEA), www.shea-online.org
Vaccine Adverse Event Reporting System (VAERS), www.vaers.hhs.gov
World Health Organization (WHO), www.who.int/en/

67 Emergency Nursing

LEARNING OUTCOMES

On completion of this chapter, the learner will be able to:

1. Describe emergency care as a collaborative, holistic approach that ideally includes the patient, the family, and significant others.
2. Identify the priorities of care for the patient with an emergency disorder, particularly the patient with multiple system injuries.
3. Compare and contrast the emergency management of patients with heat stroke, frostbite, and hypothermia.
4. Specify the similarities and differences of the emergency management of patients with swallowed or inhaled poisons, skin contamination, and food poisoning.
5. Explain the emergency management of patients with drug overdose, those with acute alcohol intoxication, those who have been sexually assaulted, and those who have been victims of human trafficking.
6. Differentiate between the emergency care of patients who are overactive, those who are violent, those who are depressed, and those who are suicidal.

NURSING CONCEPTS

Addiction
Assessment
Behaviors
Medical Emergencies
Oxygenation
Thermoregulation
Violence

GLOSSARY

antivenin: antitoxin manufactured from venom of poisonous snakes to assist the patient's immune system response to envenomation

carboxyhemoglobin: hemoglobin that is bound to carbon monoxide and therefore is unable to bind with oxygen, resulting in hypoxemia

corrosive poison: alkaline or acidic agent; causes tissue destruction after contact

cricothyroidotomy: surgical opening of the cricothyroid membrane to obtain an airway that is maintained with a tracheostomy or endotracheal tube

envenomation: injection of a poisonous material by sting, spine, bite, or other means

fasciotomy: surgical incision of the extremity to the level of the fascia to relieve pressure and restore neurovascular function to the extremity

multiple trauma: trauma caused by a single catastrophic event that causes life-threatening injuries to at least two distinct organs or organ systems

primary survey: an assessment of the patient triaged to the emergent or resuscitation category that focuses on stabilizing life-threatening conditions; uses the mnemonic ABCDE, which stands for *A*irway, *B*reathing, *C*irculation, *D*isability, and *E*xposure

rhabdomyolysis: a toxic syndrome caused by widespread injury to skeletal muscle, resulting in myoglobinuria and acute kidney injury

secondary survey: an assessment of the patient triaged to the emergent or resuscitation category that commences after the primary survey is completed and life-threatening insults addressed; includes obtaining vital signs, completing a head-to-toe examination, and obtaining the patient's pertinent medical-surgical history, including the history of the current event

sentinel event: an unanticipated event that results in patient harm

triage: process of assessing patients to determine management priorities

The term *emergency management* traditionally refers to care given to patients with urgent and critical needs. However, because many people lack access to health care, the emergency department (ED) is used frequently for nonurgent problems. Therefore, the philosophy of emergency management has broadened to include the concept that an emergency is whatever the patient or the family considers it to be.

The emergency nurse has had specialized education, training, and expertise in assessing and identifying patients' health problems in crisis situations. In addition, the emergency nurse establishes priorities, monitors, and continuously assesses patients who are acutely ill and injured, supports and attends to families, supervises allied health personnel, and educates patients and families within a time-limited, high-pressured care environment. Nursing interventions are accomplished interdependently, in consultation with or under the direction of a physician or advanced practitioner such as a nurse practitioner or physician assistant. The roles of nursing and medicine are complementary in an emergency situation. Appropriate nursing and medical interventions are anticipated based on assessment data. Members of the ED staff work as a team in performing the highly technical, hands-on skills required to care for patients in emergency situations (Emergency Nurses Association [ENA], 2020a).

People seek emergency care for serious life-threatening conditions, such as cardiac arrhythmias, acute coronary syndrome, acute heart failure, pulmonary edema, and stroke. Priorities for managing these cardiac and other conditions are discussed in Chapters 22, 23, 25, and 62. Emergency management of trauma and conditions not found elsewhere in this book are discussed in this chapter. Facts about ED visits in the United States are presented in Chart 67-1.

Chart 67-1

Facts About Emergency Department Visits—2017

In 2017, there were 139 million visits to emergency departments (EDs); 40 million were as a result of an injury. Additional relevant statistics included the following:

- The most common reasons for ED visits were abdominal pain, chest pain, cough, and fever.
- Most patients had health insurance, with only 16% of patients without insurance.
- Approximately 14.5% of patients arrived at the ED by ambulance.
- 14.5 million visits resulted in admission; of these, 2 million required admission to an intensive care unit (ICU).
- Injuries and poisonings accounted for 18.9% of all ED visits.
- The leading causes of injuries were unintentional, totaling 68.2% of injury admissions, with falls and motor vehicle collisions making up 32% of these.
- Nearly 40% of patients were seen by a provider in less than 15 minutes after arrival to the ED.

Adapted from Rui, P., & Kang, K. (2017). National Hospital Ambulatory Medical Care Survey: 2017 emergency department summary tables. National Center for Health Statistics. Retrieved on 4/20/2020 at: www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf

ISSUES IN EMERGENCY NURSING CARE

Emergency nursing is demanding because of the diversity of conditions and situations that present unique challenges. These challenges include legal issues, occupational health and safety risks for ED staff, and the challenge of providing holistic care in the context of a fast-paced, technology-driven environment in which serious illness and death are encountered on a daily basis. Another dimension of emergency nursing is providing nursing care in disasters. Disasters result in mass casualty incidents that ensue after natural disasters (e.g., earthquakes, tsunamis); from exposure to pathogens during outbreaks, epidemics, and pandemics; from human-made unintentional disasters (e.g., bridge collapse, train crash); or from weapons of terror (e.g., blast, biologic, chemical, radiologic terroristic events) (see Chapter 68).

Documentation of Consent and Privacy

Consent to examine and treat the patient is part of the ED record. The patient needs to give consent for invasive procedures (e.g., angiography, lumbar puncture) unless they

are unconscious or in a critical condition and unable to make decisions. If the patient is unconscious and brought to the ED without family or friends, this fact must be documented. Monitoring of the patient's condition, as well as all instituted treatments and the times at which they were performed, must be documented. After treatment, a notation is made on the record about the patient's condition, response to the treatment, and condition at discharge or transfer and about instructions given to the patient and family for follow-up care.

The patient is also provided with a statement of the privacy policy of the health care agency, according to federal law. Patients involved in violent events can be provided with an alias, and access to the electronic health record (EHR) is limited to protect the privacy of the patient. A patient may also request extra privacy by limiting access to their room and by choosing not to receive phone calls, mail, flowers, other gifts, or certain visitors. These practices relate to the federally mandated privacy policy stipulated in the Health Insurance Portability and Accountability Act (HIPAA).

According to the Emergency Medical Treatment and Active Labor Act (EMTALA), every ED with a Medicare provider agreement must perform a medical screening examination on all patients arriving with an emergency medical complaint if their acute signs and symptoms could result in serious injury or death if left untreated. EDs are also required to provide treatment aimed at stabilizing each patient's condition. If the patient must be transferred to another facility, the patient's consent for transfer should be obtained, if possible. In addition, acceptance by the receiving facility and primary provider must be obtained, and an appropriate method of transfer for the patient should be secured. Documentation of assessment and treatment must be sent with the patient upon transfer (ENA, 2020a).

Limiting Exposure to Health Risks

ED staff are at an increased risk for exposure to communicable diseases through blood, respiratory droplets, or other body fluids. This risk for exposure to any communicable disease is further compounded because of the common use of a multitude of invasive treatments for patients in the ED (e.g., suturing, wound débridement, aerosol generating procedures). This increased risk had been apparent for many years because of increasing numbers of people infected with hepatitis, human immune deficiency virus (HIV), and tuberculosis; however, these risks became magnified because of concerns of infecting ED staff with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus responsible for the pandemic of coronavirus disease 2019 (COVID-19); see following discussion.

The potential for exposure to highly contagious organisms, hazardous chemicals or gases, and radiation related to acts of terrorism or natural or human-engineered disasters presents additional risks to ED staff. See Chapter 68 for information about decontamination procedures.

Quality and Safety Nursing Alert

To limit the risk of exposure to airborne diseases, early identification and strict adherence to transmission-based precautions for patients who are potentially infected and contagious is crucial.

COVID-19 Considerations

In response to the COVID-19 pandemic, all emergency health care providers must adhere strictly to standard precautions for minimizing exposure, because not all patients who are infected with SARS-CoV-2 are symptomatic. Universal screening measures should be implemented upon arrival to the ED for all ED staff, patients, and visitors/family members (assuming that their presence in the ED is not prohibited). Patients and visitors/family members should wear their own mask or face coverings as tolerated, and if they do not have them, they should be provided upon their arrival to the ED. ED staff should wear facemasks at all times while in the hospital. In general, cloth masks, bandanas, and scarves are not considered suitable masks for use by health care workers (ENA, 2020b). Health care workers, patients, and visitors all need to be educated on the importance of hand hygiene and social distancing (Centers for Disease Control and Prevention [CDC], 2020a).

The ENA (2020b) issued a statement that all emergency nurses providing direct care for patients with suspected or confirmed COVID-19 must be provided the appropriate level of personal protective equipment (PPE) to safely care for these patients. The PPE provided to emergency nurses in this situation should meet standards set by the National Institute for Occupational Safety and Health (NIOSH) (see Chapter 66 for further discussion of PPE); N95 respirators, which include a facemask that seals firmly to the face and that filters at least 95% of airborne particles, are recommended over other less effective masks or face coverings (CDC, 2020b).

Violence in the Emergency Department

Not only do ED staff members encounter patients who may be violent because of the effects of substance use disorder (SUD), injury, or other emergencies, they may also encounter other violent situations. Patients and families waiting for assistance may be emotionally volatile. Often, ED waiting rooms are the sites where feelings of dissatisfaction, fear, and anger are channeled violently. EDs assign security officers to the area and have installed silent alarm systems or metal detectors to identify weapons in order to protect patients, families, and staff. Safety is the first priority.

Patients and family members under the influence of illicit drugs or alcohol, or who may have psychiatric disorders, including delirium or dementia, or who may be influenced by social situations such as gang membership, are at risk for committing a violent act, whether intentional or not (CDC, 2019a). The environment of the ED, including being subjected to long wait times and at times crowded conditions, may also increase their risk of committing violent events. Physical threats are most often accompanied by verbal abuse, which is the most common type of violence (Copeland & Henry, 2017). Although not a typical occurrence, a patient or family member may come to the ED armed. To avoid angry confrontations, members of gangs and families who are feuding need to be separated in the ED, in the waiting room, and later in the inpatient nursing unit. Nurses and other personnel must be prepared to deal with these circumstances. The ED should be locked against entry if security is questionable.

Patients who are violent or potentially violent must be vigilantly monitored by the ED staff. Care must be taken to avoid injury. Patients from prison and those who are under guard need to be handcuffed to the bed and appropriately assessed to ensure the

safety of hospital staff and other patients. The emergency nurse must understand how to employ safe use of restraints. The Joint Commission has strict standards regarding documentation of the reason, monitoring for safety, and ensuring the dignity of the patient who is restrained. Precautions to be taken to avoid injury include the following situations (ENA 2020a; Ziaei, Massoudifar, Rajabpour-Sanati, et al., 2018):

- For prisoners, the hand or ankle restraint (handcuff) is never released, and a guard is always present in the room.
- A mask can be placed on the patient to prevent spitting or biting, if a mask is not already being used.
- Nonrestraint techniques should be tried when possible—for example, talking with the patient, minimizing environmental stimulation.
- Physical restraints are used on any patient who is violent only as needed and, if used, should be humanely and professionally given; nonetheless, the staff should be cognizant that the patient could head-butt, even if restrained.
- Distance should be maintained from the patient to avoid grabbing; staff should not wear items that can be grabbed by the patient, such as dangling jewelry and stethoscopes. Furthermore, distance should be maintained between the patient and the door so that an escape route for the staff member is preserved.
- Objects should not be left within patient reach; even an intravenous (IV) line spike can become a tool of violence if the patient is determined.
- Courses on safety (de-escalation and physical restraint techniques) assist the staff with preparing for various violent situations.

In the case of gunfire in the ED, self-protection is a priority. There is no advantage to protecting others if health care providers are injured. Security officers and police must gain control of the situation first, and then care is provided to the injured.

Providing Holistic Care

Patients and families experiencing sudden injury or illness are often overwhelmed by anxiety because they have not had time to adapt to the crisis. They experience real and terrifying fear of death, mutilation, immobilization, and other assaults on their personal identity and bodily integrity. When confronted with trauma, severe disfigurement, severe illness, or sudden death, the family experiences several stages of crisis. The stages begin with anxiety and progress through denial, remorse and guilt, anger, grief, and reconciliation. The initial goal for the patient and family is anxiety reduction, a prerequisite to effective and appropriate coping. During this stressful time, safety is of primary importance. Close observation and preplanning are essential and security personnel are stationed nearby in the event that a patient or family member responds to stress with physical violence.

Assessment of the patient and family's psychological function includes evaluating emotional expression, degree of anxiety, and cognitive functioning. Possible nursing diagnoses include:

- Anxiety or death anxiety associated with uncertain potential outcomes of the illness or trauma
- Difficulty coping associated with acute situational crisis

Possible nursing diagnoses for the family include:

- Family grief
- Interrupted family process
- Impaired or risk for impaired family coping associated with acute situational crises

Patient-Focused Interventions

Clinicians caring for the patient should act confidently and competently to relieve anxiety and promote a sense of security. Explanations should be given that the patient can understand. Human contact and reassuring words reduce the panic of the person who is severely injured or ill and aid in dispelling fear of the unknown.

The patient who is unconscious should be treated as if conscious—that is, the patient should be touched, called by name, and provided an explanation of every procedure that is performed. As the patient regains consciousness, the nurse should orient the patient by stating their name, the date, and the location. This basic information should be provided repeatedly, as needed, in a reassuring way.

Ensuring patient safety is a major focus in clinical practice settings. Some of the most common **sentinel events** (unanticipated events that result in patient harm) in the ED include delays to care and medication errors. Common root causes for these sentinel events revolve around nurse staffing patterns, patient volume, and specialty availability. Solutions to patient safety issues in the ED include ensuring optimal nurse staffing, pharmacy presence, and rapid diagnostics turnaround times to minimize wait time to diagnosis and fostering teamwork and support by leadership. All errors should be reported and investigated even if a patient was not harmed. In this way, future injury or death may be avoided (The Joint Commission, 2020).

Family-Focused Interventions

The family is kept informed about where the patient is, how they are doing, and the care that is being given. Encouraging family members to stay with the patient, when possible, also helps alleviate their anxieties. In many facilities, family presence during resuscitation is permitted to assist the family to cope through this difficult time. Many family members respond very well to this approach. Research has indicated that families view emergency professionals favorably when a family member was resuscitated. They view their role as supportive and protective of the patient. Allowing family presence in the critical care areas of the hospital, whenever possible, enhances the family role and builds trust in the caregivers (Toronto & LaRocco, 2019). The presence of a family facilitator, who is trained to provide support to family members, is vital to the success of a family presence program (ENA, 2017). Additional interventions are based on the assessment of the stage of crisis that the family is experiencing. Measures to help family members cope with sudden death are presented in Chart 67-2.

Chart 67-2

Helping Family Members Cope with Sudden Death

When able to do so, the nurse takes the following actions:

- Take the family to a private place.
- Talk to the family together so that they can grieve together and hear the information given together.
- Reassure the family that everything possible was done; inform them of the treatment rendered.
- Avoid using euphemisms such as "passed on." Show the family that you care by touching, offering coffee, water, and the services of a chaplain.
- Encourage family members to support each other and to express emotions freely (grief, loss, anger, helplessness, tears, disbelief).
- Avoid giving sedation to family members; this may mask or delay the grieving process, which is necessary to achieve emotional equilibrium and to prevent prolonged depression.
- Encourage the family to view the body if they wish; this action helps to integrate the loss. Cover disfigured and injured areas before the family sees the body. Go with the family and do not leave them alone. Show acceptance by touching the body to give the family "permission" to touch.
- Spend time with the family, listening to them and identifying any needs that they may have for which the nursing staff can be helpful.
- Allow family members to talk about the deceased and what the person meant to them; this permits ventilation of feelings of loss. Encourage the family to talk about events preceding admission to the emergency department. Do not challenge initial feelings of anger or denial.
- Avoid volunteering unnecessary information (e.g., the patient was drinking).

Note: These interventions might not be advisable or permitted if "social distancing" prohibitions are in place, such as those prohibitions implemented to thwart transmission of severe acute respiratory coronavirus 2 (SARS-CoV-2) infection during the coronavirus disease (COVID-19) pandemic.

Anxiety and Denial

During these crises, family members are encouraged to recognize and talk about their feelings of anxiety. Asking questions is encouraged. Honest answers given at the level of the family's understanding must be provided. Although denial is an ego-defense mechanism that protects individuals from recognizing painful and disturbing aspects of reality, prolonged denial is not encouraged or supported. The family must be prepared for the reality of what has happened and what may come (Ocak & Avsarogullari, 2019).

Remorse and Guilt

Expressions of remorse and guilt are common, with family members accusing themselves (or each other) of negligence or minor omissions. Family members are urged to verbalize their feelings to help them cope appropriately.

Anger

Expressions of anger, common in crisis situations, are a way of handling anxiety and fear. Anger is frequently directed by the family at the patient, but it is also often expressed toward the physician, the nurse, or admitting personnel. The therapeutic

approach is to allow the anger to be expressed and to assist the family members to identify their feelings of frustration.

Grief

Grief is a complex emotional response to anticipated or actual loss. The key nursing intervention is to help family members work through their grief and to support their coping mechanisms, letting them know that it is normal and acceptable for them to cry, feel pain, and express loss. The hospital chaplain and social services staff serve as invaluable members of the team when assisting families to work through their grief (see Chapter 13).

Caring for Emergency Personnel

Concerted efforts have been made to focus on the needs of the ED staff, especially after serious and stressful events (ENA, 2020a). Events can range from a local trauma case involving children; to treating someone known to the emergency worker, such as a colleague or family member; to a more complex natural disaster or mass casualty incident. It is important to remember that all staff members may not necessarily respond in the same way; an event that is stressful to one person may not be as stressful to another. Compassion fatigue may result from continuous exposure to suffering and injury, and energy is expended on a daily basis. Fatigue occurs when the affected staff members cannot replenish energy stores (Schmidt & Haglund, 2017). In addition, because stress is a daily occurrence in the ED, staff may not recognize the personal effect of any one event or the cumulative effect of day-to-day crisis interventions. ED leadership should be aware of staff coping patterns and support systems, patterns of interactions between staff members, staff members' health problems, including addiction, and appropriately assist with identifying behaviors caused by workplace stress. The availability of nonjudgmental counseling is essential to promoting a healthy staff.

After serious events, critical incident stress management (CISM) is useful to critique individual and group performance and to facilitate healthy coping. Optimally, this consists of three steps: defusing, debriefing, and follow-up. Defusing occurs immediately after the critical incident. During this session, affected staff are encouraged to discuss their feelings about the incident, are reassured that negative reactions and feelings are normal but that these diminish over time, and are given contact information so that they may talk to someone if they have disturbing symptoms (e.g., sleeplessness, excessive worry). Debriefing typically occurs 1 to 10 days after the critical incident. Debriefing sessions follow a format similar to the initial defusing session; however, during these sessions, participating staff are encouraged to discuss their feelings about the incident and are again reassured that their negative reactions and feelings are normal and that their negative feelings will diminish over time. At the end of these sessions, participants should have a feeling of closure and be able to resume their professional roles at an emotional level commensurate to that prior to the critical incident. Some staff may require further professional follow-up, however. Follow-up may occur after the debriefing session is completed for those participants who have persistent negative symptoms and may consist of continued individual or group counseling and therapy (Schmidt & Haglund, 2017).

COVID-19 Considerations

Holistic, patient-centered care remains a top priority in EDs, even during disaster situations such as the COVID-19 pandemic. It is also a top priority that emergency nurses have the mechanisms and support to properly manage their heightened stress during such situations. Assuring holistic care of patients and families and supporting the emotional well-being of emergency staff pose unique challenges during such disasters as the COVID-19 pandemic.

In particular, regulations and mitigation strategies enforced in response to the COVID-19 pandemic prohibit family and visitor presence during hospitalizations in geographic regions experiencing an upswing in confirmed cases in order to keep patients, family members, and health care workers safe (Hart, Turnbull, Oppenheim, et al., 2020). Family presence and visitation policies are adapted in efforts to maintain open communication and family involvement in patient care. These adaptive strategies rely heavily on technology, which include the use of smartphones and computers, and require stable Internet connection and technologic literacy. Barriers exist for patients and families who either lack technologic literacy or who come from socioeconomically disadvantaged backgrounds, which preclude their ability to be able to tap into engaging in virtual conversations (Hart et al., 2020).

During these difficult times, ED staff are encouraged to develop a communication plan with family members, designating one person as the point of contact, ensuring that contact person has adequate access to technology, and identifying and eliminating any barriers to effective communication. Videoconferencing can be used when possible, particularly during end-of-life situations (Hart et al., 2020). The use of support teams that includes pastoral care, palliative care, and behavioral health should be mobilized to assist in the grieving process (Hart et al., 2020).

The emotional burden experienced by emergency nurses on the frontlines of the COVID-19 pandemic has been reported to be greatly magnified. Emergency nurses reportedly experienced fear as they faced a shortage of PPE, emotional and physical exhaustion, and ongoing stress. In some cases, nurses were the only persons physically present with patients who were severely ill and provided the only source of distant communication between patients and their family members. Confronted with not being able to provide the care for patients as they would have done under nonpandemic conditions, many emergency nurses experienced moral distress. Moral distress can be disruptive to emotional health; symptoms may include “self-criticism, intense feelings of shame, guilt, or disgust and may contribute to depression or post-traumatic stress disorder” (American Psychiatric Nurses Association, 2020, p. 1). Although the ultimate long-term impact of COVID-19 on the health of emergency nurses is not known at this time, supportive strategies must be implemented in order to preserve the health care workforce that has experienced severe stress as a consequence of COVID-19 (The Joint Commission, 2020).

EMERGENCY NURSING AND THE CONTINUUM OF CARE

A key principle underlying emergency care is that the patient is rapidly assessed, treated, and referred to the appropriate setting for ongoing care. This makes the ED a temporary

point on the continuum of care. In 2017, only 10.4% of patients who received care in an ED in the United States were admitted to the hospital, which means emergency nurses must plan and facilitate the patient's safe discharge and follow-up care in the home, community, and the transitional care environment (CDC, 2017a).

Discharge Planning

Before discharge, instructions for continuing care are given to the patient and to the family or significant others, if possible. A variety of formats are used including verbal, written, or video instructions; research findings suggest that video instructions are well received by patients and family members (Wilkin, 2020). Many EDs have preprinted standard instruction sheets for the more common conditions (e.g., concussion), which can then be individualized. Discharge instructions should be available in commonly used languages. A language interpreter should be used as necessary to provide instructions in any format.

Instructions should include information about prescribed medications, treatments, diet, activity, and when to contact a health care provider or schedule follow-up appointments. Discharge planning is the "teachable moment" for the patient, providing the opportunity to present injury prevention or smoking cessation strategies, alcohol counseling opportunities, and more. It is imperative that instructions are written legibly, use simple language, and are clear in their important points. When providing discharge instructions, the nurse also considers any special needs the patient may have related to hearing or visual impairments. Alternative formats of instruction (e.g., large print, Braille, audiotape, online videoclips) should be available to meet the needs of patients with hearing or visual impairments.

Community and Transitional Services

Before discharge, some patients require the services of a social worker to help them meet continuing health care needs. Home health care resources may be contacted before discharge to arrange services. This is particularly important for patients who may need assistance, such as those who are older adults or those with disability. Identifying continuing health care needs and making arrangements for meeting these needs can prevent return visits to the ED or readmission to the hospital.

For patients who are returning to long-term care facilities and for those who already rely on community agencies for continuing health care, communication about the patient's condition and any changes in health care needs that have occurred must be provided to the appropriate facilities or agencies. This communication is essential to promote continuity of care and to ensure ongoing care that meets the patient's changing health care needs.

Many patients who utilize EDs have health problems that are nonurgent. Moreover, some patients return repeatedly to the ED with nonurgent problems (ENA, 2019). It is posited that patients who present to the ED with nonurgent problems do so because there is a dearth of outpatient health care resources to fill their needs. In order to fill these gaps, some areas of the United States, particularly rural areas, are offering mobile integrated health-community paramedicine programs. Emergency medical system (EMS) personnel provide in-home visits, without emergency calls, to identify needs and

provide education and in-home care. If necessary, they can also transport patients to the ED. These programs have decreased unnecessary EMS calls (ENA, 2019).

Gerontologic Considerations

The ED is a common point of entry into the health care system for patients 65 years and older. The CDC (2017b) reports that 32% of ED visits by patients older than 65 years resulted in hospital admission. As age increases, the percentage of admissions increases. Of these admissions, 17% were related to trauma, primarily falls (CDC, 2017b). Older adult patients typically arrive with one or more presenting conditions. Nonspecific symptoms, such as weakness and fatigue, episodes of falling, incontinence, and change in mental status, may be manifestations of acute, potentially life-threatening illness in the older person. Emergencies in this age group may be more difficult to manage because older adult patients may have an atypical presentation, an altered response to treatment, a greater risk of developing complications, or a combination of these factors.

The older adult patient may perceive the emergency as a crisis signaling the end of an independent lifestyle or even death. The nurse should give attention to the patient's feelings of anxiety and fear (Cortez, 2018).

The older adult patient may have limited sources of social and financial support during times of crises. The nurse should assess the psychosocial resources of the patient (and of the caregiver, if necessary) and anticipate discharge needs. Referrals for support services (e.g., to the social service department or a gerontologic nurse specialist) may be necessary.

Obesity Considerations

The growing rate of obesity in the United States has implications for treating patients with obesity within the ED, in terms of stocking appropriately sized equipment, gowns, and stretchers; ensuring that equipment (e.g., computed tomography [CT] scanners) is able to handle a greater weight capacity; and recognizing specific disorders and complications that may occur in these patients. For instance, research suggests that increased mortality is associated with the degree of obesity (ENA, 2020a). Other considerations in ED management of patients with obesity include an understanding that it is generally more challenging to insert IV lines and airways. Ventilation also can be a challenge from the increased weight of the chest wall and the increased incidence of hypoventilation and sleep apnea among patients with obesity. Special consideration must be taken with lipophilic medications, as they take longer to clear from the larger volume of adipose tissue. Weight-based medications must be calculated carefully using ideal body mass. X-rays may be difficult to visualize because of poor penetration (Richardson & Harris, 2018).

Complications that patients with obesity are more prone to experience during hospitalization include respiratory failure, acute kidney injury (AKI), pneumonia, deep vein thrombosis, and pressure injuries. Patients with severe obesity who have femur fractures have a significantly higher risk of death, as well as a higher risk of acute respiratory distress syndrome (ARDS) and sepsis than patients of normal weight

(Richardson & Harris, 2018). Although many of these complications do not occur until later in the hospital stay, some preventive measures (e.g., encouraging turning, coughing, and deep-breathing exercises to prevent atelectasis) may be initiated in the ED. Functional recovery time is extended in patients with obesity, resulting in longer lengths of stay and increased hospital costs. Initiating prevention measures in the ED, such as early backboard removal and providing early preventive respiratory care, are targeted to improve recovery time (Richardson & Harris, 2018). Arranging transfers of patients with obesity must also take into consideration the availability of appropriately sized equipment.

PRINCIPLES OF EMERGENCY CARE

By definition, emergency care is care that must be rendered without delay. In an ED, several patients with diverse health problems—some life-threatening, some not—may present to the ED simultaneously. One of the first principles of emergency care is triage.

Triage

The word **triage** comes from the French word *trier,* meaning "to sort." In the daily routine of the ED, triage is used to sort patients into groups based on the severity of their health problems and the immediacy with which these problems must be treated.

A basic and widely used triage system that had been in use for many years utilized three categories: emergent, urgent, and nonurgent. In this system, emergent patients had the highest priority, urgent patients had serious health problems but not immediately life-threatening ones, and nonurgent patients had episodic illnesses.

A comprehensive, valid, and reliable five-level triage severity rating system that recognizes that EDs are used for both emergency and routine health care is also used. The increased number of triage levels assists the triage nurse to more precisely determine the needs of the patient and the urgency for treatment. Systems that meet these criteria for validity and reliability that are commonly used in the United States are the Emergency Severity Index (ESI) and the Canadian Triage and Acuity Scale (CTAS). The ESI assigns patients into five levels, from level 1 (most urgent) to level 5 (least urgent). With the ESI, patients are assigned to triage levels based on both their acuity and their anticipated resource needs (Soontorn, Sitthimongkol, Thosingha, et al., 2018). The CTAS system's five levels include time parameters that guide how frequently patients must be reassessed by either a nurse or provider. Patients assigned to the *resuscitation* category must receive continuous nursing surveillance, those in the *emergent* category must be reassessed at least every 15 minutes, patients in the *urgent* category must be reassessed at least every 30 minutes, patients in the *less urgent* category must be reassessed at least every 60 minutes, and those in the *nonurgent* category must be reassessed at least every 120 minutes. The goal of all triage is rapid assessment and decision making, preferably under 5 minutes (ENA, 2020a).

Although the ESI and the CTAS are valid and reliable triage severity rating systems, many EDs in the United States have high patient volumes and slow flow. Patients arriving at the ED may experience bottlenecks at triage. To further refine the system, triage bypass moves an incoming patient directly to a bed if open beds are available in

the ED. This reduces patient waiting time; the receiving nurse performs the initial assessment and vital signs. In team triage (or provider in triage [PIT]), the triage nurse works with the physician or nurse practitioner or physician assistant within the triage area itself. Team triage can move patients to diagnostics and possibly discharge without full admission to the ED. Both of these additional triage concepts decrease wait time for treatment and improve flow in the ED (ENA, 2020a). The flow of patients within the ED needs to be as efficient as possible so that wait times are diminished, and so that flow is conducive for EMS agencies and for true emergencies.

Triage is an advanced skill. Emergency nurses spend many hours learning to classify different illnesses and injuries to ensure that patients most in need of care do not needlessly wait. Protocols may be followed to initiate laboratory or x-ray studies while the patient is in the triage area. Collaborative protocols are developed and used by the triage nurse based on their level of experience (ENA, 2018a). Nurses in the triage area collect additional crucial baseline data: full vital signs including pain assessment, history of the current event and past medical history, neurologic assessment findings, weight, allergies (especially to latex and medications), intimate partner violence screening, and necessary diagnostic data. Asking questions is key to appropriate triage decisions. The following questions reflect the minimum information that should be obtained from the patient or from the person who accompanied the patient to the ED (so long as that person is not suspected of abuse or neglect; see later discussion) and then are documented (ENA, 2020a):

- What were the circumstances, precipitating events, location, and time of the injury or illness?
- When did the symptoms appear?
- Was the patient unconscious after the injury or onset of illness?
- How did the patient get to the ED?
- What was the health status of the patient before the injury or illness?
- Is there a history of medical illness or previous surgeries? A history of admissions to the hospital?
- Is the patient currently taking any medications, especially hormones, insulin, digitalis, or anticoagulants? Is the patient using any complementary or alternative therapies such as herbology, naturopathy, Reiki, massage, or acupuncture?
- Does the patient have any allergies, especially to latex, medications, eggs, or nuts?
- Does the patient use tobacco products or recreational drugs? How frequently? What type? When was the last time they were used?
- Does the patient have any fears? Does the patient feel in danger or in an unsafe situation?
- When was the last meal eaten? (This is important if general anesthesia is to be given or if the patient is unconscious.)
- When was the last menstrual period?
- Is the patient under a provider's care? What is the name and contact information for the provider?
- What was the date of the patient's most recent tetanus immunization?

In addition to the collection of initial vital signs and medical history, triage consists of providing basic first aid, which may include application of ice, bleeding control, and

basic wound care, as well as initiating protocol-based prescriptions (e.g., x-rays, administering antipyretic or mild analgesic agents, obtaining an electrocardiogram [ECG] or urinalysis, removing sutures). The triage nurse also is responsible for and monitors the waiting area, maintains a safe environment, reassesses patients who are waiting, and is the initial liaison to the families of patients.

Routine ED triage protocols differ significantly from the triage protocols used in disasters and mass casualty incidents (field triage). Routine triage directs all available resources to the patients who are most critically ill, regardless of potential outcome. In field triage (or hospital triage during a disaster), scarce resources must be used to benefit the most people possible (ENA, 2020a). This distinction affects triage decisions (see Chapter 68).

COVID-19 Considerations

In response to the COVID-19 pandemic, it is important to decrease the spread of infection and properly screen and triage all patients presenting to the ED for infection with or exposure to SARS-CoV-2. All patients should enter the ED with a face covering, which may be cloth, and maintain social distance restrictions away from other patients of 6 feet, if possible. If possible, patients should monitor their own temperature prior to arrival to the ED and notify the ED staff if they are experiencing any of the signs and symptoms of COVID-19. These include (CDC, 2020c):

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

It is also important that all patients who present to the ED are screened to find if they have traveled to areas with a high prevalence of COVID-19, or been exposed to others suspected or known to be infected with SARS-CoV-2 within the last 2 weeks. Patients who are asymptomatic and without any possible exposure within the past 2 weeks should be triaged to a designated area away from those patients who are symptomatic or were likely exposed (CDC, 2020c).

Assess and Intervene

For the patient assigned to an urgent or higher triage category, stabilization, provision of critical treatments, and prompt transfer to the appropriate setting (intensive care unit, operating room, general care unit) are the priorities of emergency care. Although treatment is initiated in the ED, ongoing definitive treatment of the underlying problem

is provided in other settings, and the sooner the patient is stabilized and moved to that area, the better the outcome.

A systematic approach to effectively establishing and treating health priorities is the primary survey/secondary survey approach. The **primary survey** focuses on stabilizing life-threatening conditions. The ED staff work collaboratively and follow the ABCDE (*A*irway, *B*reathing, *C*irculation, *D*isability, *E*xposure) method:

- Establish a patent airway.
- Provide adequate ventilation, employing resuscitation measures when necessary. Patients who have experienced trauma must have the cervical spine protected and chest injuries assessed first, immediately after the airway is established.
- Evaluate and restore cardiac output by controlling hemorrhage, preventing and treating shock, and maintaining or restoring effective circulation. This includes the prevention and management of hypothermia. In addition, peripheral pulses are examined, and any immediate closed reductions of fractures or dislocations are performed if an extremity is pulseless.
- Determine neurologic disability by assessing neurologic function using the Glasgow Coma Scale (GCS) (see Chapter 63, Chart 63-4) and a motor and sensory evaluation of the spine (see Chapter 60, Fig. 60-9). A quick neurologic assessment may be performed using the AVPU mnemonic:
  - *A*—alert. Is the patient alert and responsive?
  - *V*—verbal. Does the patient respond to verbal stimuli?
  - *P*—pain. Does the patient respond only to painful stimuli?
  - *U*—unresponsive. Is the patient unresponsive to all stimuli, including pain?
- Undress the patient quickly but gently so that any wounds or areas of injury are identified; this may entail cutting away articles of clothing (ENA, 2020a).

After these priorities have been addressed, the ED team proceeds with the **secondary survey**. This includes the following:

- Complete health history, including the history of the current event
- Head-to-toe assessment (includes a reassessment of airway and breathing parameters and vital signs)
- Diagnostic and laboratory testing
- Insertion or application of monitoring devices such as ECG electrodes, arterial lines, or urinary catheters
- Splinting of suspected fractures
- Cleansing, closure, and dressing of wounds
- Performance of other necessary interventions based on the patient's condition

Once the patient has been assessed, stabilized, and tested, appropriate medical and nursing diagnoses are formulated, initial important treatment is started, and plans for the proper disposition of the patient are made (ENA, 2020a). Many emergent and urgent conditions and priority emergency interventions are discussed in detail in the remaining sections of this chapter.

In addition to the management of the illness or injury, the ED nurse must also focus on providing comfort and emotional support to the patient and family. Included in this is pain management. Effective pain management must be instituted early and should include rapid-acting agents that result in minimal sedation so that the patient can

continue to interact with the staff for ongoing assessment. Moderate sedation can help facilitate short procedures in the ED; the patient will not remember the procedure later. The patient is closely monitored during the procedure and then rapidly awakens when it is complete (see Chapter 15).

It is essential that family crisis intervention services are available for families of patients in the ED. Even if a patient's condition is not emergent, the situation may be perceived as such by the family. Every family needs attention and support. The chaplain and social worker may be available to assist with interventions.

AIRWAY OBSTRUCTION

Acute upper airway obstruction is a life-threatening medical emergency.

Pathophysiology

The airway may be partially or completely occluded. Partial obstruction of the airway can lead to progressive hypoxia, hypercarbia, and respiratory and cardiac arrest. If the airway is completely obstructed, permanent brain injury or death will occur within 3 to 5 minutes secondary to hypoxia. Air movement is absent in the presence of complete airway obstruction. Oxygen saturation of the blood decreases rapidly because obstruction of the airway prevents entry of air into the lungs. Oxygen deficit occurs in the brain, resulting in unconsciousness, with death following rapidly.

Upper airway obstruction has a number of causes, including aspiration of foreign bodies, anaphylaxis, viral or bacterial infection, trauma, and inhalation or chemical burns. For older adult patients, especially those in extended care facilities, sedative and hypnotic medications, diseases affecting motor coordination (e.g., Parkinson's disease), and mental dysfunction (e.g., dementia, intellectual disability) are risk factors for asphyxiation by food. As patients age, atrophy of the posterior pharynx occurs, resulting in aspiration or difficulty swallowing. In adults, aspiration of a bolus of meat is the most common cause of airway obstruction. Peritonsillar abscesses, epiglottitis, and other acute infectious processes of the posterior pharynx can also result in airway obstruction. The most common causes of airway obstruction are from an allergic reaction (i.e., causing laryngospasm), infection, or angioedema (ENA, 2020a).

Clinical Manifestations

Typically, a person with a foreign-body airway obstruction cannot speak, breathe, or cough. The patient may clutch the neck between the thumb and fingers (i.e., universal distress signal). Other common signs and symptoms include choking, apprehensive appearance, refusing to lie flat, inspiratory and expiratory stridor, labored breathing, the use of accessory muscles (suprasternal and intercostal retraction), flaring nostrils, increasing anxiety, restlessness, and confusion. Cyanosis and loss of consciousness, which develop as hypoxia worsens, are late signs. Action must be taken before these manifestations develop, if possible, or immediately if the patient has already exhibited these signs.

Assessment and Diagnostic Findings

Assessment of the patient who has a foreign object occluding the airway may involve simply asking the person whether they are choking and require help. If the person is unconscious, inspection of the oropharynx may reveal the offending object. X-rays, laryngoscopy, or bronchoscopy also may be performed. Oxygen supplementation should be considered immediately.

Management

If the patient can breathe and cough spontaneously, a partial obstruction should be suspected. The patient is encouraged to cough forcefully and to persist with spontaneous coughing and breathing efforts as long as good air exchange exists. There may be some wheezing between coughs. If the patient demonstrates a weak, ineffective cough, high-pitched noise while inhaling, increased respiratory difficulty, or cyanosis, the patient should be managed as if there were complete airway obstruction.

After the obstruction is removed, rescue breathing is initiated. If the patient has no pulse, cardiac compressions are instituted. These measures provide oxygen to the brain, heart, and other vital organs until definitive medical treatment can restore and support normal heart and ventilatory activity (ENA, 2020a). See Chapter 25 for review of current CPR guidelines.

Establishing an Airway

Establishing an airway may be as simple as repositioning the patient's head to prevent the tongue from obstructing the pharynx. Alternatively, other maneuvers, such as the head-tilt/chin-lift maneuver, the jaw-thrust maneuver, or insertion of specialized equipment, may be needed to open the airway, remove a foreign body, or maintain the airway. In all maneuvers, the cervical spine must be protected from injury. After these maneuvers are performed, the patient is assessed for breathing by watching for chest movement and listening and feeling for air movement. In such a case, nursing diagnoses would include impaired airway clearance associated with obstruction of the airway by the tongue, an object, or fluids (blood, saliva) and impaired breathing associated with airway obstruction or injury.

An oropharyngeal airway is a semicircular tube or tubelike plastic device that is inserted over the back of the tongue into the lower posterior pharynx in a patient who is breathing spontaneously but who is unconscious. This type of airway prevents the tongue from falling back against the posterior pharynx and obstructing the airway. It also allows health care providers to suction secretions. The nasopharyngeal airway provides the same airway access but is inserted through the nares. With an airway in place the patient may breathe spontaneously. If breathing is ineffective or absent, bag-valve-mask ventilation is necessary (Atanelov & Rebstock, 2020).

Quality and Safety Nursing Alert

In the case of potential facial trauma or basal skull fracture, the nasopharyngeal airway should not be used because it could enter the brain cavity instead of the pharynx.

Endotracheal Intubation

The purpose of endotracheal intubation is to establish and maintain the airway in patients with respiratory insufficiency or hypoxia. Endotracheal intubation is indicated to establish an airway for a patient who cannot be adequately ventilated with an oropharyngeal or nasopharyngeal airway, bypass an upper airway obstruction, prevent aspiration, permit connection of the patient to a resuscitation bag or mechanical ventilator, or facilitate the removal of tracheobronchial secretions (see Fig. 67-1). Because of the level of skill required, endotracheal intubation is performed only by those who have had extensive training. These may include physicians, nurse anesthetists, respiratory therapists, flight nurses, and nurse practitioners. However, the emergency nurse commonly assists with intubation.

Rapid sequence intubation may be indicated, which provides management of the patient in a situation similar to that in the operating room. Medications used to facilitate rapid sequence intubation include a sedative, an analgesic, and a neuromuscular blockade agent; these are usually given by the provider performing the intubation.

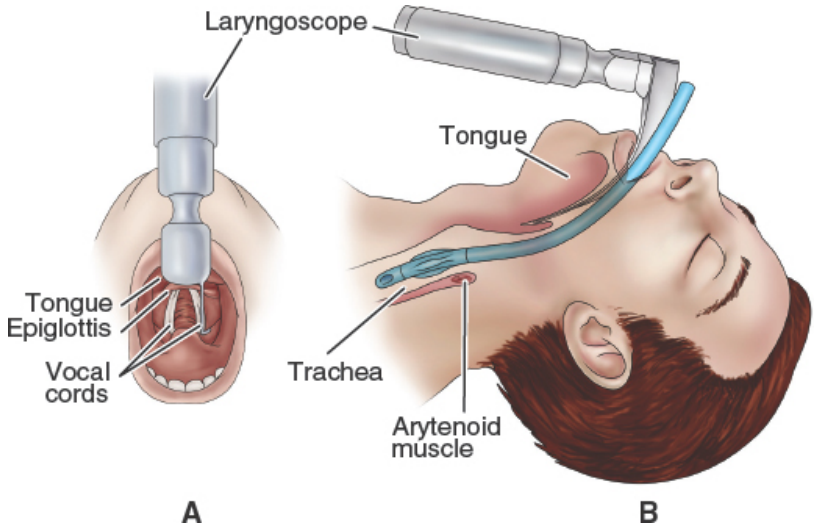


Figure 67-1 • Endotracheal intubation in a patient without a cervical spine injury. **A.** The primary glottic landmarks for tracheal intubation as visualized with proper placement of the laryngoscope. **B.** Positioning the endotracheal tube.

Intubation with a King Tube or Laryngeal Mask Airway

If the patient is not hospitalized and cannot be intubated in the field, emergency medical personnel may insert a King Tube, which rapidly provides pharyngeal ventilation. When the tube is inserted into the trachea, it functions like an endotracheal tube (see Fig. 67-2).

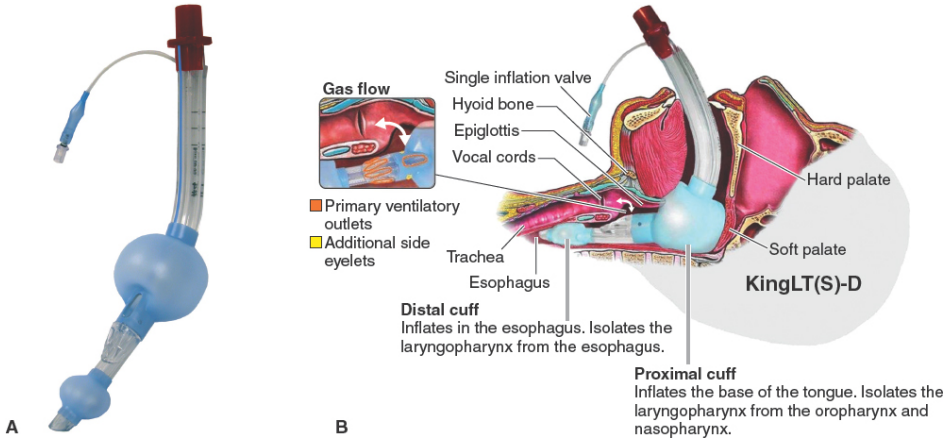


Figure 67-2 • King Tube (**A**) correctly placed in esophageal position (**B**). Reprinted with permission from King Systems Corporation, Noblesville, Indiana.

The two balloons that surround the tube are inflated after the tube is inserted. One balloon is large and occludes the oropharynx. This permits ventilation by forcing air through the larynx. The smaller balloon is inflated with air and occludes the esophagus at a site distal to the glottis. Breath sounds are auscultated after balloon inflation to make sure that the oropharyngeal balloon (or cuff) does not obstruct the glottis. One variant type of King Tube is designed so that a gastric tube may also be passed for suction. If it is difficult to establish an airway, a laryngeal mask airway (LMA) may be inserted as an interim airway device. The design of the LMA provides a "mask" in the subglottic airway with a cuff inflated within the esophagus. It allows easy insertion for rapid airway control until a more definitive airway can be placed. Some LMAs also permit removal of secretions from the esophagus (Bosson & Gordon, 2018) (see Chapter 15, Fig. 15-4A).

Cricothyroidotomy

Cricothyroidotomy is the opening of the cricothyroid membrane to establish an airway. This procedure is used in emergency situations in which endotracheal intubation is either not possible or contraindicated, as in airway obstruction from extensive maxillofacial trauma, cervical spine injuries, laryngospasm, laryngeal edema (after an allergic reaction or extubation), hemorrhage into neck tissue, or obstruction of the larynx. A cricothyroidotomy is replaced with a formal tracheostomy when the patient is able to tolerate this procedure.

Maintaining Ventilation

After the airway is determined to be unobstructed, the nurse must ensure that ventilation is adequate by checking for equal bilateral breath sounds. Satisfactory management of ventilations may prevent hypoxia and hypercapnia. The nurse must quickly assess for absent or diminished breath sounds, open chest wounds, and difficulty delivering artificial breaths for the patient. The nurse should monitor pulse oximetry, capnography, and arterial blood gases if the patient requires airway or ventilatory assistance. A tension pneumothorax can mimic hypovolemia, so ventilatory assessment precedes assessment for hemorrhage. A pneumothorax (both simple and tension) or sucking (open) chest

wound is managed with a chest tube and occlusion of the sucking wound; immediate relief of increasing positive intrathoracic pressure and maintenance of adequate ventilation should occur (see Chapter 19).

HEMORRHAGE

Stopping bleeding is essential to the care and survival of patients in an emergency or disaster situation. Hemorrhage that results in the reduction of circulating blood volume is a main cause of shock. Minor bleeding, which is usually venous, generally stops spontaneously unless the patient has a bleeding disorder or has been taking anticoagulant agents. Internal hemorrhage can hide in many anatomic spaces and compartments, resulting in shock without external evidence of hemorrhage. The internal spaces and compartments that are capable of housing large amounts of blood include the retroperitoneum, pelvis, chest, and thighs (ENA, 2020a).

The patient is assessed for signs and symptoms of shock: cool, moist skin (resulting from poor peripheral perfusion), decreasing blood pressure, increasing heart rate, delayed capillary refill, and decreasing urine volume (see Chapter 11). The goals of emergency management are to control the bleeding, maintain adequate circulating blood volume for tissue oxygenation, and prevent shock. Patients who hemorrhage are at risk for cardiac arrest caused by hypovolemia with secondary anoxia. Nursing interventions are carried out collaboratively with other members of the emergency health care team (ENA, 2020a).

Management

Fluid Replacement

Whenever a patient is hemorrhaging—whether externally or internally—a loss of circulating blood results in a fluid volume deficit and decreased cardiac output. Therefore, fluid replacement is imperative to maintain circulation. Typically, two large-gauge IV catheters are inserted, preferably in an uninjured extremity, to provide a means for fluid and blood replacement. Blood samples are obtained for analysis, typing, and cross-matching. Replacement fluids are given as prescribed, depending on clinical estimates of the type and volume of fluid lost. Replacement fluids may include isotonic electrolyte solutions (e.g., lactated Ringer's, normal saline), colloids, and blood component therapy.

Packed red blood cells are infused when there is massive blood loss, which may also necessitate transfusion of other blood components, including platelets and clotting factors (ENA, 2020a). See Chapter 28 for full discussion of blood component therapy indications and treatment.

Quality and Safety Nursing Alert

The infusion rate is determined by the severity of the blood loss and the clinical evidence of hypovolemia. Blood replacement therapy that involves transfusing several units of blood products should be given via warmer when possible, because administration of large amounts of blood that has been refrigerated has a core cooling effect that may lead to cardiac arrest and coagulopathy.

Control of External Hemorrhage

If a patient is hemorrhaging externally (e.g., from a wound), a rapid physical assessment is performed as the patient's clothing is cut away in an attempt to identify the area of hemorrhage. Direct, firm pressure is applied over the bleeding area or the involved artery at a site that is proximal to the wound (see Fig. 67-3). Most bleeding can be stopped or at least controlled by application of direct pressure. Otherwise, unchecked arterial bleeding can result in death. A firm pressure dressing is applied, and the injured part is elevated to stop venous and capillary bleeding, if possible. If the injured area is an extremity, the extremity is immobilized to control blood loss.

A tourniquet is applied to an extremity when the external hemorrhage cannot be controlled in any other way and until surgery can be performed. The tourniquet is applied just proximal to the wound and tied tightly enough to control arterial blood flow. The tourniquet is labeled with the date and time it was applied. If the patient has suffered a traumatic amputation with uncontrollable hemorrhage, the tourniquet remains in place until the patient is in the operating room. Time of tourniquet application and removal should be documented. Tourniquet placement among military personnel with battle-associated trauma has demonstrated clear mortality reduction, although it occasionally has led to amputation or fasciotomy (Cornelius, Campbell, & McGauly, 2017).

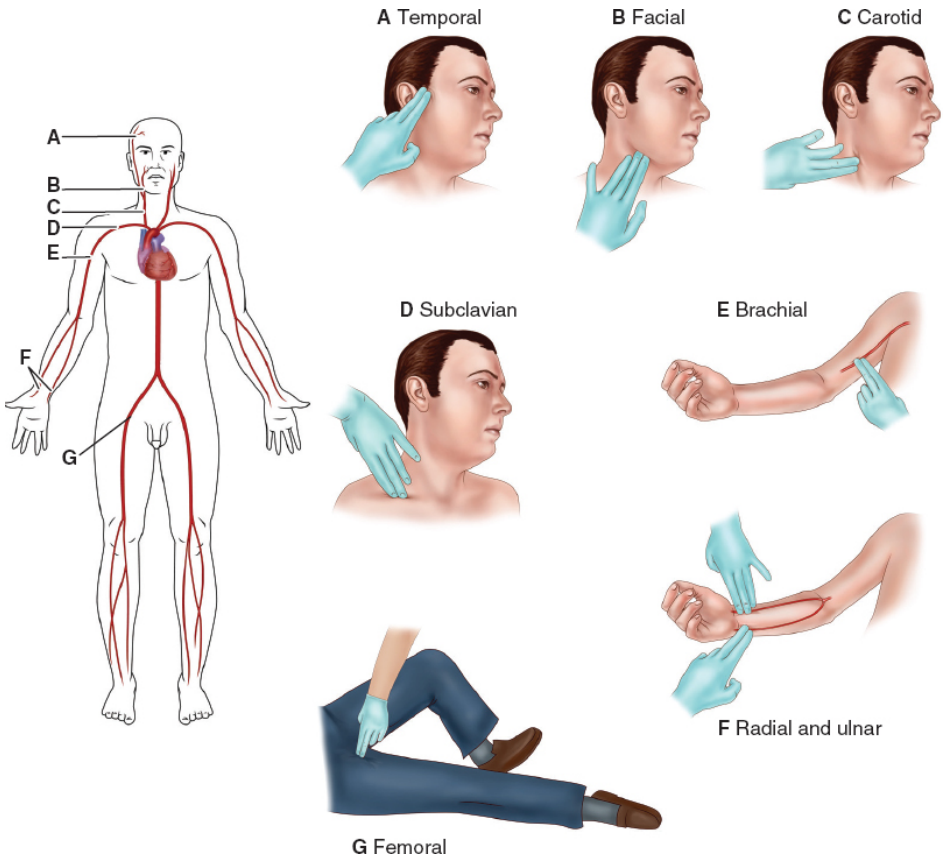


Figure 67-3 • Pressure points for control of hemorrhage.

Control of Internal Hemorrhage

If the patient shows no external signs of bleeding but exhibits tachycardia, falling blood pressure, thirst, apprehension, cool and moist skin, or delayed capillary refill, internal hemorrhage is suspected. Typically, packed red blood cells, plasma, and platelets are given at a rapid rate, and the patient is prepared for more definitive treatment (e.g., surgery, pharmacologic therapy). In addition, arterial blood gas specimens are obtained to evaluate pulmonary function and tissue perfusion and to establish baseline hemodynamic parameters, which are then used as an index for determining the amount of fluid replacement the patient can tolerate and the response to therapy. The patient is maintained in the supine position and monitored closely until hemodynamic or circulatory parameters improve, or until they are transported to the operating room or intensive care unit.

HYPOVOLEMIC SHOCK

Shock is a condition in which there is loss of effective circulating blood volume. Inadequate organ and tissue perfusion follows, ultimately resulting in cellular metabolic derangements. In any emergency situation, the onset of shock should be anticipated by immediately assessing all people who are injured. The underlying cause of shock (hypovolemic, cardiogenic, neurogenic, anaphylactic, or septic) must be determined. Of

these, hypovolemia is the most common cause. See Chapter 11 for further discussion of management of hypovolemic shock.

WOUNDS

Wounds involving injury to soft tissues can vary from minor tears to severe crushing injuries. The types of wounds that may occur are defined in Chart 67-3. The main goal of treatment is to restore the physical integrity and function of the injured tissue while minimizing scarring and preventing infection. Proper documentation of the characteristics of the wound, using precise descriptions and correct terminology, is essential. Such information may be needed in the future for forensic evidence. Photographs are helpful because they provide an accurate, visible depiction of the wound. Photographs also become important for exigent wounds (i.e., wounds that will eventually heal). Patients experiencing intimate partner violence (IPV) or trauma may need the photographs later to visually describe the extent of injury.

Chart 67-3

Definition of Terms: Wounds

Abrasion: denuded skin
Avulsion: tearing away of tissue from supporting structures
Cut: incision of the skin with well-defined edges, usually longer than deep
Ecchymosis/contusion: blood trapped under the surface of the skin
Hematoma: tumorlike mass of blood trapped under the skin
Laceration: skin tear with irregular edges and vein bridging
Patterned: wound representing the outline of the object (e.g., steering wheel) causing the wound
Stab: incision of the skin with well-defined edges, usually caused by a sharp instrument; a stab wound is typically deeper than long

Determining *when* and *how* the wound occurred is important because a treatment delay increases infection risk. Using aseptic technique, the clinician inspects the wound to determine the extent of damage to underlying structures or the presence of a foreign body. Sensory, motor, and vascular function is evaluated for changes that might indicate complications.

Management

Wound Cleansing

Hair around the wound may be clipped (only as directed) if it is anticipated that the hair will interfere with wound closure. Typically, the area around the wound is cleansed with normal saline solution or a polymer agent (e.g., Shur-Clens). The antibacterial agent povidone-iodine should not be allowed to get deep into the wound without thorough rinsing. Povidone-iodine is used only for the initial cleansing because it injures exposed and healthy tissue, resulting in further tissue damage (ENA, 2020a).

If indicated, the area is infiltrated with a local intradermal anesthetic through the wound margins or by regional block. Patients with soft tissue injuries usually have localized pain at the site of injury. The nurse then assists with cleaning and débriding the wound. The wound is irrigated gently and copiously with sterile isotonic saline solution to remove surface dirt. Devitalized tissue and foreign matter are removed because they impede healing and may promote infection. Any small bleeding vessels are clamped, tied, or cauterized. After wound treatment, a nonadherent dressing is applied to protect the wound and to serve as a splint and as a reminder to the patient that the area is injured.

Primary Closure

The decision to suture a wound depends on the nature of the wound, the time since the injury was sustained, the degree of contamination, and the vascularity of tissues. If primary closure is indicated, the wound is sutured or stapled, usually by the emergency provider, with the patient receiving either local anesthesia or moderate sedation (see Chapter 15). Wound closure begins when subcutaneous fat is brought together loosely with a few sutures to close off the dead space. The subcuticular layer is then closed, and finally the epidermis is closed. Sutures are placed near the wound edge, with the skin edges leveled carefully to promote optimal healing. Instead of sutures, sterile strips of reinforced microporous tape or a bonding agent (skin glue) may be used to close clean, superficial wounds (ENA, 2020a).

Delayed Primary Closure

Delayed primary closure may be indicated if tissue has been lost or there is a high potential for infection. A thin layer of gauze (to ensure drainage and prevent pooling of exudate), covered by an occlusive dressing, may be used. The wound is splinted in a functional position to prevent motion and decrease the possibility of contracture.

If there are no signs of suppuration (formation of purulent drainage), the wound may be sutured (with the patient receiving a local anesthetic). The use of antibiotic agents to prevent infection depends on factors such as how the injury occurred, the age of the wound, and the risk of contamination. The site is immobilized and elevated to limit accumulation of fluid in the interstitial spaces of the wound.

Tetanus prophylaxis is given as prescribed, based on the condition of the wound and the patient's immunization status. If the patient's last tetanus booster was given more than 5 years ago, or if the patient's immunization status is unknown, a tetanus booster must be given (ENA, 2020a). The patient is educated about signs and symptoms of infection and is instructed to contact the primary provider or clinic if there is sudden or persistent pain, fever or chills, bleeding, rapid swelling, foul odor, drainage, or redness surrounding the wound.

TRAUMA

Trauma (an unintentional or intentional wound or injury inflicted on the body from a mechanism against which the body cannot protect itself) is the fourth leading cause of death in the United States. Trauma is the leading cause of death in children and in adults

younger than 44 years. The incidence is increasing in adults older than 44 years. SUD is often implicated as a factor in both blunt and penetrating trauma (ENA, 2020a).

Collection of Forensic Evidence

In assessing and managing any patient with an emergency condition, but especially the patient experiencing trauma, meticulous documentation is essential. Included in documentation are descriptions of all wounds, mechanism of injury, time of events, and collection of evidence. In trauma care, the nurse must be exceedingly careful with all potential evidence, handling and documenting it properly.

The basics of care management for patients with traumatic injury include an understanding that trauma in any patient (living or dead) has potential legal or forensic science implications if criminal activity is suspected. Hence, proper management from both a medical and forensic evidence perspective is essential.

When clothing is removed from the patient who has experienced trauma, the nurse must be careful not to cut through or disrupt any tears, holes, blood stains, or dirt present on the clothing if criminal activity is suspected. Each piece of clothing should be placed in an individual paper bag. Plastic bags are not used because they retain moisture; moisture may promote mold and mildew formation, which can destroy evidence. If the clothing is wet, it should be hung to dry. Clothing should not be given to families. Valuables should be inventoried and either placed in the hospital safe or clearly documented to which family member they were given. If a police officer is present to collect clothing or any other items from the patient, each item is labeled and the transfer of custody to the officer, the officer's name, the date, and the time are documented. Evidence cannot be left unattended in the room; a formal chain of custody must be maintained for the evidence to be valid and useful for legal purposes (ENA, 2020a).

All deaths of patients who experienced trauma are reported to the medical examiner. If suicide or homicide is suspected in a patient who experienced trauma, the medical examiner examines the body on site or has the body moved to the coroner's office for autopsy. All tubes and lines must remain in place. The patient's hands must be covered with paper bags to protect evidence on the hands or under the fingernails. In the patient who has survived trauma, tissue specimens may be swabbed from the hands and nails as potential evidence. Photographs of wounds or clothing are essential and should include a reference ruler in one photo and another without the ruler.

Documentation should also include any statements made by the patient in the patient's own words and surrounded by quotation marks. A chain of evidence is essential. If the patient's case is reviewed in a court of law in the future, clear documentation assists the judicial process and helps to identify the activities that occurred in the ED.

Injury Prevention

Any discussion of trauma management must address injury prevention. A component of the emergency nurse's daily role is to provide injury prevention information to every patient with whom there is contact, including patients admitted for reasons other than injury (ENA, 2020a). The only way to reduce the incidence of trauma is through prevention.

There are three components of injury prevention. The first is education. Providing information and materials to help prevent violence and to maintain safety at home and in vehicles is important. Involvement in local injury prevention organizations, nursing organizations, and health fairs promotes wellness and safety. In practice, nursing and other health care professionals should avoid using the word *accident,* because trauma events are *preventable* and should be viewed as such rather than as "fate" or "happenstance." Responsibility and accountability must be assigned to traumatic incidents, particularly because of the high rate of trauma recidivism (repeated trauma). People who are at risk for trauma and trauma recidivism should be identified and provided with education and counseling directed toward altering risky behaviors and preventing further trauma (ENA, 2020a).

The second component of injury prevention is legislation. Nurses should be actively involved in safety legislation at the local, state, and federal levels. Such legislation is meant to provide universal safety measures, not to infringe on rights.

The third component is automatic protection. Airbags and automotive design are included in this category. These mechanisms provide for safety without requiring personal intervention.

Emergency nurses may develop injury prevention programs using a focus similar to the ABCDE approach used in the primary survey in trauma care. In this case, however (ENA, 2020a):

- *A*—describes *a*ssessment of the community for common injury mechanisms
- *B*—is used to describe *b*uilding a coalition of key community members
- *C*—refers to *c*ommunicating awareness of the trauma mechanisms and risks prevalent in the local community
- *D*—stands for *d*eveloping and implementing interventions, which may be educational or legislative
- *E*—refers to *e*valuating the injury prevention program soon after it is launched, which may result in either continuation or revision of the program

Multiple Trauma

Multiple trauma is caused by a single catastrophic event that causes life-threatening injuries to at least two distinct organs or organ systems. Mortality in patients with multiple trauma is related to the severity of the injuries, the number of systems and organs involved, and the severity of each injury alone and in combination. Patients with single-system trauma can also have life-threatening or very severe traumatic injuries. Immediately after injury from major trauma, including multiple trauma or severe single-system trauma, the body is hypermetabolic and severely stressed. In addition, major trauma can cause hypothermia, acidosis, and coagulopathy, sometimes called the *triad of death* because each of these factors is associated with increased mortality (Saqe-Rockoff, Schubert, Ciardiello, et al., 2018).

Assessment and Diagnostic Findings

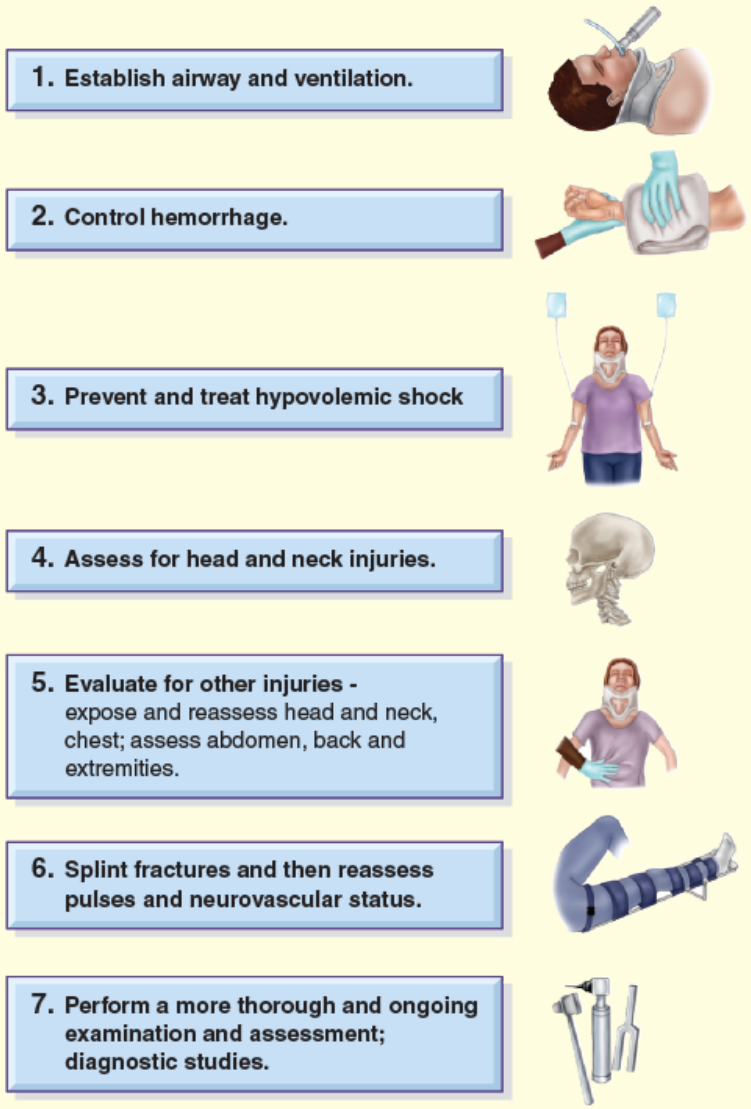
External evidence of trauma may be sparse or absent. Patients with multiple trauma should be assumed to have a spinal cord injury until it is proven otherwise. The injury regarded as the least significant in appearance may be the most lethal. For example, the pelvic fracture not identified until an x-ray is obtained may cause rapid and massive hemorrhage into the pelvic cavity, but an obvious amputation of the arm may have already stopped bleeding from the body's normal response of vasoconstriction.

Management

The goals of treatment are to determine the extent of injuries and to establish priorities of treatment. Any injury interfering with a vital physiologic function (e.g., airway, breathing, circulation) is an immediate threat to life and has the highest priority for immediate treatment. Essential lifesaving procedures are performed simultaneously by the emergency team. As soon as the patient is resuscitated, clothes are removed or cut off and a rapid physical assessment is performed. Transfer from field management to the ED must be orderly and controlled, with attention and silence given to listen to the verbal report from EMS personnel. Treatment in a trauma center is appropriate for patients experiencing major trauma. Treatment priorities are presented in Chart 67-4.

Chart 67-4

Priority Management in Patients with Multiple Injuries



Adapted from American College of Surgeons. (2018). *Advanced trauma life support* (10th ed.). Chicago, IL: Author.

A trauma alert is typically activated for patients with major trauma who present to trauma centers. Trauma alert activations are based upon specific criteria that are established by the individual institution. The trauma alert mobilizes the designated members of the trauma team, whose composition varies depending upon the size of the hospital and availability of its resources and staff (Dehli, Uleberg, & Wisborg, 2018). Common members of the trauma team include a trauma surgeon, trauma emergency nurse, x-ray technician, and nursing assistant. An advanced practice nurse and a chaplain may also be included as members of the trauma team (Crawford, 2019). The trauma emergency nurse typically is responsible for assessing and monitoring the patient, ensuring/maintaining airway and IV access, administering prescribed medications, collecting laboratory specimens, and documenting activities and the patient's subsequent responses.

In addition to managing the treatment priorities described in Chart 67-4, the trauma emergency nurse must implement interventions that can mitigate the effects of hypothermia. In some trauma centers, the ambient temperature in the trauma bay where the patient with major trauma is treated is kept higher than normal (e.g., 26°C [78.8°F]). Any wet clothing is removed and warm blankets may be applied. IV fluids may be warmed while they are infusing. See the Nursing Research Profile in Chart 67-5.

Large volumes of IV crystalloids might need to be infused to manage the effects of hypovolemia (see Chapter 11); however, normal saline can exacerbate the metabolic acidosis that ensues. Therefore, the preferred IV crystalloid solution is typically lactated Ringer's. However, large volumes of any crystalloid solution may also dilute the presence of clotting factors, causing coagulopathy. Therefore, the patient with major trauma is judiciously managed with crystalloid IV fluids as needed. Blood component therapy may be required (see Chapter 28). The trauma team is responsible for continuously monitoring the patient's hemodynamic status as well as the temperature of the patient and the ambient environment in order to reduce the risks of the deadly trio of hypothermia, acidosis, and coagulopathy (Saqe-Rockoff et al., 2018).

Intra-Abdominal Injuries

Intra-abdominal injuries are categorized as penetrating or blunt trauma. *Penetrating* abdominal injuries (i.e., gunshot wounds, stab wounds) are serious and usually require surgery. Penetrating abdominal trauma results in a high incidence of injury to hollow organs, particularly the small bowel. The liver is the most frequently injured solid organ due to its size and anterior placement in the right upper quadrant of the abdomen. In gunshot wounds, the most important prognostic factor is the velocity at which the missile enters the body. High-velocity missiles (bullets) produce extensive tissue damage. All abdominal gunshot wounds that cross the peritoneum require surgical exploration. On the other hand, some stab wounds may be managed nonoperatively due to low velocity and less penetration of the implement (i.e., weapon) (ENA, 2020a).

Blunt trauma to the abdomen may result from motor vehicle crashes, falls, blows, or explosions. Blunt trauma is commonly associated with extra-abdominal injuries to the chest, head, or extremities. Patients with blunt trauma pose a challenge because injuries may be difficult to detect. The incidence of delayed and trauma-related complications is greater than for penetrating injuries. This is especially true of blunt injuries involving the liver, kidneys, spleen, or blood vessels, which can lead to massive blood loss into the peritoneal cavity (ENA, 2020a).

Assessment and Diagnostic Findings

As the history of the traumatic event is obtained, the abdomen is inspected as a part of the secondary survey for obvious signs of injury, including penetrating injuries, bruises, and abrasions. Abdominal assessment continues with auscultation of bowel sounds to provide baseline data from which changes can be noted. Absence of bowel sounds may be an early sign of intraperitoneal involvement, although stress can also decrease or halt peristalsis and thus bowel sounds. Further abdominal assessment may reveal progressive abdominal distention, involuntary guarding, tenderness, pain, muscular rigidity, or rebound tenderness along with changes in bowel sounds, all of which are signs of

peritoneal irritation. Hypotension and signs and symptoms of shock may also be noted. In addition, the chest and other body systems are assessed for injuries that frequently accompany intra-abdominal injuries (ENA, 2020a).

Chart 67-5  **NURSING RESEARCH PROFILE**

Improving Thermoregulation for Patients with Trauma

Saqe-Rockoff, A., Schubert, F. D., Ciardiello, A., et al. (2018). Improving thermoregulation for trauma patients in the emergency department: An evidence-based practice project. *Journal of Trauma Nursing*, *25*(1), 14–20.

Purpose

Research indicates there is a strong association between increased mortality in patients with trauma and hypothermia. Therefore, hypothermia is an important modifiable risk factor for patients with trauma. A variety of rewarming methods currently exist and are utilized with varying degrees of success. Gaps in emergency nursing practice include the assessment of temperature as well as limited personnel knowledge regarding the management of patients with hypothermia and the utilization of rewarming techniques.

Design

The setting was a 450 bed Level I trauma center with more than 75,000 annual ED visits. The project goals were to decrease time to temperature assessment upon patient arrival to the trauma bay and to improve use of best practice rewarming methods among patients with trauma. The research team utilized the Iowa Model of Evidence-Based Practice to provide a framework for the evaluation of current practice and implementation of best practices. Practice changes that were instituted on patients with trauma during the study period included providing warmed blankets, ensuring regulated standardized trauma bay temperature, assessing patient temperature on arrival with appropriate escalation of rewarming as needed, and using a rapid infuser with warmed fluid as needed. In order to implement these changes, a standardized protocol checklist was developed. The impact of the interventions was assessed by *post hoc* chart reviews. Data analysis included descriptive statistics for assessment of differences pre and post project implementation.

Findings

There were 193 patients with trauma during the study period. There was no appreciable difference in time to temperature assessment upon patient arrival to the trauma bay pre and post project implementation. However, there was an increase in patients identified with hypothermia post implementation and a significant increase in core temperature assessment from 4% to 23% ($p < 0.001$). Use of blankets in normothermic patients increased ($p = 0.002$). There was a significant increase in the average temperature of the trauma bay post implementation.

Nursing Implications

Nurses often identify lack of education, access to information, and lack of time as barriers for implementing evidence-based practice changes. Staff education and implementation of relatively simple tools such as the hypothermia checklist used in this study can encourage implementation of best practices and consistency of care of patients with trauma who are at risk for hypothermia. Incorporating best practices for thermoregulation of the patient with trauma may lead to improved patient outcomes and decreased mortality rates.

Laboratory studies that aid in assessment include the following:

- Serial hemoglobin and hematocrit levels to evaluate trends reflecting the presence or absence of bleeding

- Lactate to determine acidosis and need for continued resuscitation
- Arterial blood gas (ABG) for pH (acidosis), base deficit for resuscitation evaluation, and ventilation parameters ($PaCO_2$, PaO_2)
- International normalized ratio (INR) to identify coagulopathy or presence of pharmacologically induced anticoagulation
- White blood cell (WBC) count to detect elevation (generally associated with trauma)

Internal Hemorrhage

Hemorrhage frequently accompanies abdominal injury, especially if the liver or spleen has been traumatized. Therefore, the patient is assessed continuously for signs and symptoms of external and internal bleeding. The front of the body, flanks, and back are inspected for bluish discoloration, asymmetry, abrasion, and contusion. Abdominal CT scans permit detailed evaluation of abdominal contents and retroperitoneal examination. Abdominal ultrasounds can be used to rapidly assess patients who are hemodynamically unstable to detect intraperitoneal bleeding. This is referred to as the focused assessment with sonography for trauma (FAST) examination. During the resuscitation period, pain is managed using administration of small dosages of opioids (ENA, 2020a).

Quality and Safety Nursing Alert

The location of pain can indicate certain types of intra-abdominal injuries. Pain in the left shoulder is common in a patient with bleeding from a ruptured spleen, whereas pain in the right shoulder can result from laceration of the liver.

Intraperitoneal Injury

The abdomen is assessed for tenderness, rebound tenderness, guarding, rigidity, spasm, increasing distention, and pain. Referred pain is a significant finding because it suggests intraperitoneal injury. To determine if there is intraperitoneal injury and bleeding, the patient is usually prepared for diagnostic procedures, such as diagnostic peritoneal lavage (DPL), abdominal ultrasonography, or abdominal CT scanning. DPL, although no longer the standard diagnostic study used to evaluate a traumatized abdomen, remains a viable backup procedure that is easily performed and is very useful during mass casualty incidents when CT scanners may not be readily available. DPL involves the instillation of 1 L of warmed lactated Ringer's or normal saline solution into the abdominal cavity. After a minimum of 400 mL has been returned, a fluid specimen is sent to the laboratory for analysis. Positive laboratory findings include a red blood cell count greater than 100,000/mm^3; a WBC count greater than 500/mm^3; or the presence of bile, feces, or food (ENA, 2020a).

Genitourinary Injury

A focused genitourinary examination, which typically includes a rectal and vaginal examination, is performed to determine any injury to the pelvis, bladder, urethra, vagina, or intestinal wall. In the male patient, a high-riding prostate gland (abnormal position) discovered during a rectal examination indicates a potential urethral injury. A digital

vaginal examination is performed on female patients to determine if there is an open pelvic fracture that has torn the vagina (ENA, 2020a).

Quality and Safety Nursing Alert

To decompress the bladder and monitor urine output in a patient with a genitourinary injury, an indwelling catheter is inserted after a rectal examination has been completed, not before the examination. In addition, urethral catheter insertion when a possible urethral injury is present is contraindicated; a urology consultation and further evaluation of the urethra are required.

Management

As indicated by the patient's condition, resuscitation procedures (restoration of airway, breathing, and circulation) are initiated as described previously.

With blunt trauma, the patient is kept on a stretcher to immobilize the spine. If the patient has been placed on a backboard, it should be removed as early as possible to prevent skin breakdown. Cervical spine immobilization is maintained until cervical x-rays have been obtained and cervical spine injury has been ruled out. Likewise, once the backboard is removed, logrolling can be used to protect the spine until x-rays are obtained and confirm that there is no evidence of injuries.

Knowing the mechanism of injury (e.g., penetrating force from a gunshot or knife, blunt force from a blow) is essential to determining the type of management needed. All wounds are located, counted, and documented. If abdominal viscera protrude, the area is covered with sterile, moist saline dressings to keep the viscera from drying.

Typically, oral fluids are withheld in anticipation of surgery, and the stomach contents are aspirated with an orogastric tube to reduce the risk of aspiration and to decompress the stomach in preparation for diagnostic procedures.

Trauma predisposes the patient to infection by disruption of mechanical barriers, exposure to exogenous bacteria from the environment at the time of injury, aspiration of vomitus, and diagnostic and therapeutic procedures (hospital-acquired infection). Tetanus prophylaxis and broad-spectrum antibiotics are given as prescribed.

Throughout the stay in the ED, the patient's condition is continuously monitored for changes. If there is continuing evidence of shock, blood loss, free air under the diaphragm, evisceration, hematuria, severe head injury, musculoskeletal injury, or suspected or known abdominal injury, the patient is rapidly transported to surgery. In most cases, blunt liver and spleen injuries are managed nonsurgically. The goal for the management of all patients who have experienced trauma is to minimize the length of stay in the ED. The patient should be moved to the definitive destination quickly so that care and rehabilitation can continue (ENA, 2020a).

Crush Injuries

Crush injuries occur when a person is caught between opposing forces (e.g., run over by a moving vehicle, crushed between two cars, crushed under a collapsed building).

Assessment and Diagnostic Findings

The patient is observed for the following:

- Hypovolemic shock resulting from extravasation of blood and plasma into injured tissues after compression has been released (see Chapter 11)
- Spinal cord injury (see Chapter 63)
- Erythema and blistering of skin (see Chapter 56)
- Fractures (usually an extremity) (see Chapter 37)
- AKI (e.g., acute tubular necrosis [ATN]) (see Chapter 48)

Management

In conjunction with maintaining the airway, breathing, and circulation, the patient is observed for AKI. Injury to the back can cause renal trauma. Severe muscular damage may cause **rhabdomyolysis**, a toxic syndrome caused by a release of myoglobin from ischemic skeletal muscle, resulting in ATN. See Chapter 48 for the treatment of AKI, renal trauma, and ATN. Rhabdomyolysis may also result from major burns (see Chapter 57), heat stroke, and abuse of illicit drugs, in addition to crush injuries (see later discussions). The classic triad of clinical manifestations suggestive of rhabdomyolysis includes myalgias (muscle cramps), generalized muscle weakness, and darkened urine. The serum creatine kinase (CK) is monitored as the most sensitive indicator of rhabdomyolysis; levels in excess of 6000 IU/L are considered diagnostic (Atias-Varon, Sherman, Yanovich, et al., 2017). In addition to treatment aimed at preventing or treating ATN, major soft tissue injuries are splinted promptly to control bleeding and pain. The serum lactic acid level is monitored; a decrease to less than 2.0 mmol/L is an indication of successful resuscitation (Nicks, McGinnism, Borron, et al., 2018).

If an extremity is injured, it is elevated to relieve swelling and pressure. If compartment syndrome develops, the physician may perform a **fasciotomy** (i.e., surgical incision to the level of the fascia) to restore neurovascular function (see Chapter 37). Medications for pain and anxiety are then given as prescribed, and the patient is quickly transported to the operating suite for wound débridement and fracture repair. A hyperbaric oxygen chamber (if available) may be used to hyperoxygenate crushed tissue, if indicated.

Fractures

Immediate appropriate management of a fracture may determine the patient's eventual outcome and may mean the difference between recovery and disability. When the patient is being examined for fracture, the body part is handled gently and as little as possible. Clothing is cut off to visualize the affected body part. Assessment is conducted for pain over or near a bone, swelling (from blood, lymph, and exudate infiltrating the tissue), and circulatory disturbance. The patient is assessed for ecchymosis, tenderness, and crepitation (see Chapter 37). The nurse must remember that the patient may have multiple fractures accompanied by head, chest, spine, or abdominal injuries.

Management

Immediate attention is given to the patient's general condition. Assessment of airway, breathing, and circulation (which includes pulses in the extremities) is conducted. The patient is also evaluated for neurologic or abdominal injuries before the extremity is treated, unless a pulseless extremity is detected.

If a pulseless extremity is identified, repositioning of the extremity to proper alignment is required. If the pulseless extremity involves a fractured femur, Hare traction (a portable in-line traction device) may be applied to assist with alignment. If repositioning is ineffective in restoring the pulse, a rapid total-body assessment must be completed, followed by transfer of the patient to the operating room for arteriography and possible arterial repair versus amputation.

After the initial evaluation has been completed, all injuries identified are evaluated and treated. The fractured body part is inspected. Using a systematic head-to-toe approach, the nurse inspects the entire body, observing for lacerations, swelling, and deformities, including angulation (bending), shortening, rotation, and asymmetry. All peripheral pulses, especially those distal to the fractured extremity, are palpated. The extremity is also assessed for coolness, blanching, and decreased sensation and motor function, which are indicative of injury to the extremity's neurovascular supply.

A splint is applied before the patient is moved. Splinting immobilizes the joint at a site distal and proximal to the fracture, relieves pain, restores or improves circulation, prevents further tissue injury, and prevents a closed fracture from becoming an open one. To splint an extremity, one hand is placed distal to the fracture and some traction is applied while the other hand is placed beneath the fracture for support. The splints should extend beyond the joints adjacent to the fracture. Upper extremities must be splinted in a functional position. If the fracture is open, a moist, sterile dressing is applied.

After splinting, the vascular status of the extremity is checked by assessing color, temperature, pulse, and blanching of the nail bed. In addition, the patient is assessed for neurovascular compromise if pain or pressure is reported. See Chapter 37 for a complete description of fracture management (ENA, 2020a).

ENVIRONMENTAL EMERGENCIES

Emergencies that can occur due to environmental factors include heat related illnesses, including the extremes of heat stroke, frostbite, and hypothermia; nonfatal drowning; decompression sickness; animal, human, and insect bites.

Heat-Induced Illnesses

Heat-induced illnesses may range in severity from mild and self-limiting to life-threatening emergencies. The most serious of these—heat stroke—is an acute medical emergency caused by failure of the heat-regulating mechanisms of the body. It is the inability to maintain cardiac output in the face of moderately high body temperatures and is associated with dehydration. The most common cause of heat stroke is nonexertional, prolonged exposure to an environmental temperature of greater than 39.2°C (102.5°F), although a heat index of greater than 35°C (95°F) is associated with increased mortality (ENA, 2020a). It usually occurs during extended heat waves,

especially when they are accompanied by high humidity. Exertional heat stroke is caused by strenuous physical activity that occurs in a hot environment (ENA, 2020a).

Chart 67-6 HEALTH PROMOTION

Preventing Heat-Induced Illnesses

The nurse provides the following advice for the patient treated for heat-induced illness:

- Avoid immediate re-exposure to high temperatures; hypersensitivity to high temperatures may remain for a considerable time.
- Maintain adequate fluid intake, wear loose clothing, and reduce activity in hot weather.
- Monitor fluid losses and weight loss during workout activities or exercise and replace fluids and electrolytes.
- Use a gradual approach to physical conditioning, allowing sufficient time for return to baseline temperature.
- Plan outdoor activities to avoid the hottest part of the day (between 10 AM and 2 PM).

For older patients living in urban settings with high environmental temperatures:

- The nurse directs these patients to places where air conditioning is available (e.g., shopping mall, library, church) and advises them that fans alone are not adequate to prevent heat-induced illness.

People at risk for nonexertional heat stroke are those not acclimatized to heat, those who are older or very young, those unable to care for themselves, those with chronic and debilitating diseases, and those taking certain medications (e.g., major tranquilizers, anticholinergics, diuretics, beta-blockers) (ENA, 2020a; Tintinalli, Stapczyski, Ma, et al., 2020). Older adults, the very young, people with mental illness, and people with chronic diseases have the highest rates of mortality (CDC, 2017a). Exertional heat stroke occurs in healthy individuals during sports or work activities (e.g., exercising in extreme heat and humidity). Hyperthermia results because of inadequate heat loss. Strategies used to prevent heat-induced illnesses are reviewed in Chart 67-6.

Less severe forms of heat-induced illnesses include heat exhaustion and heat illness or heat cramps. The causes of heat exhaustion are the same as for heat stroke. Heat illness is caused by a loss of electrolytes, typically during strenuous physical activity in a hot environment (ENA, 2020a).

Gerontologic Considerations

Most heat-related deaths occur in older adults because their circulatory systems are unable to compensate for stress imposed by heat. Older adults have a decreased ability

to perspire as well as a decreased ability to vasodilate and vasoconstrict. They have less subcutaneous tissue, a decreased thirst mechanism, and a diminished ability to concentrate urine to compensate for heat. Many older adults do not drink adequate amounts of fluid, partly because of fear of incontinence, and thus have a greater risk of heat stroke. In addition, many older adults fear being victims of crime, so even if their residence lacks air conditioning, they tend to keep windows closed despite high temperatures and humidity levels (ENA, 2020a).

Assessment and Diagnostic Findings

Heat stroke, whether the cause is exertional or nonexertional, causes thermal injury at the cellular level, resulting in coagulopathies and widespread damage to the heart, liver, and kidneys. Recent patient history reveals exposure to elevated ambient temperature or excessive exercise during extreme heat. When assessing the patient, the nurse notes the following symptoms: profound central nervous system (CNS) dysfunction (manifested by confusion, delirium, bizarre behavior, coma, seizures); elevated body temperature (40.6°C [105°F] or higher); hot, dry skin; and usually anhidrosis (absence of sweating), tachypnea, hypotension, and tachycardia. The patient with heat exhaustion, on the other hand, may exhibit similarly high body temperatures accompanied by headaches, anxiety, syncope, profuse diaphoresis, gooseflesh, and orthostasis. The cardinal manifestations of heat illness include muscle cramps, particularly in the shoulders, abdomen, and lower extremities; profound diaphoresis; and profound thirst (ENA, 2020a).

Management

The main goal is to reduce the high body temperature as quickly as possible, because mortality in heat stroke or morbid progression to heat stroke with less serious forms of heat-induced illnesses is directly related to the duration of hyperthermia. For the patient with heat stroke, simultaneous treatment focuses on stabilizing oxygenation using the CABs (*C*irculation, *A*irway, and *B*reathing) of basic life support. This includes establishing IV access for fluid administration.

After the patient's clothing is removed, the core (internal) temperature is reduced to 39°C (102°F) as rapidly as possible, preferably within 1 hour. One or more of the following methods may be used as prescribed (ENA, 2020a):

- Cool sheets and towels or continuous sponging with cool water
- Ice applied to the neck, groin, chest, and axillae while spraying with tepid water
- Cooling blankets
- Immersion of the patient in a cold water bath is the optimal method for cooling (if available)

During cooling procedures, an electric fan is positioned so that it blows on the patient to augment heat dissipation by convection and evaporation. The patient's temperature is constantly monitored with a thermistor placed in the rectum, bladder, or esophagus to evaluate core temperature. Caution is used to avoid hypothermia and to prevent hyperthermia, which may recur spontaneously within 3 to 4 hours. The cooling process should stop at 38°C (100.4°F) in order to avoid iatrogenic hypothermia (ENA, 2020a).

Throughout treatment, the patient's status is monitored carefully, including vital signs, ECG findings (for possible myocardial ischemia, myocardial infarction, and

arrhythmias), central venous pressure (CVP), and level of responsiveness, all of which may change with rapid alterations in body temperature. A seizure may be followed by recurrence of hyperthermia. To meet tissue needs exaggerated by the hypermetabolic condition, 100% oxygen is given. Endotracheal intubation and mechanical ventilation to support failing cardiopulmonary systems may be required.

IV infusion therapy of normal saline or lactated Ringer's solution is initiated as directed to replace fluid losses and maintain adequate circulation. Fluids are given carefully because of the dangers of myocardial injury from high body temperature and poor kidney function. Cooling redistributes fluid volume from the periphery to the core.

Urine output is also measured frequently, because ATN may occur as a complication of heat stroke from rhabdomyolysis (see previous discussion). Blood specimens are obtained for serial testing to detect bleeding disorders, such as disseminated intravascular coagulation (DIC), and for serial enzyme studies to estimate thermal hypoxic injury to the liver, heart, and muscle tissue. Permanent liver, cardiac, and CNS damage may occur.

Additional supportive care may include dialysis for AKI, anticonvulsant medications to control seizures, potassium for hypokalemia, and sodium bicarbonate to correct metabolic acidosis. Benzodiazepines such as diazepam may be prescribed to suppress seizure activity, while a phenothiazine such as chlorpromazine may be prescribed to suppress shivering (Tintinalli et al., 2020).

Patients with heat exhaustion or heat illness may be managed less aggressively. These patients should lie supine in a cool environment. Patients with heat exhaustion may require IV fluids but may also take oral fluids, if they are tolerated. Patients with heat illness are given oral sodium supplements and oral electrolyte solutions (ENA, 2020a). Patients who have experienced a heat-induced illness should receive education to prevent another heat-related illness (see Chart 67-6).

Frostbite

Frostbite is trauma from exposure to freezing temperatures and freezing of the intracellular fluid and fluids in the intercellular spaces. It results in cellular and vascular damage. Frostbite can result in venous stasis and thrombosis. Body parts most frequently affected by frostbite include the feet, hands, nose, and ears. Frostbite ranges from first degree (redness and erythema) to fourth degree (full-depth tissue destruction) (ENA, 2020a).

Assessment and Diagnostic Findings

A frozen extremity may be hard, cold, and insensitive to touch and may appear white or mottled blue-white. The extent of injury from exposure to cold is not always initially known. The patient history should include environmental temperature, duration of exposure, clothing worn, humidity, and the presence of wet conditions (ENA, 2020a).

Management

The goal of management is to restore normal body temperature. Constrictive clothing and jewelry that could impair circulation are removed. Wet clothing is removed as

rapidly as possible. If the lower extremities are involved, the patient should not be allowed to ambulate as this may exacerbate tissue damage (CDC, 2019b).

Controlled yet rapid rewarming is instituted. Frozen extremities are usually placed in a 37°C to 40°C (98.6°F to 104°F) circulating bath for 30- to 40-minute spans. This treatment is repeated until circulation is effectively restored. Early rewarming appears to decrease the amount of ultimate tissue loss. During rewarming, an analgesic for pain is given as prescribed, because the rewarming process may be very painful. To avoid further mechanical injury, the body part is not handled. Massage is contraindicated.

Once rewarmed, the part is protected from further injury and is elevated to help control swelling. Sterile gauze or cotton is placed between affected fingers or toes to prevent maceration, and a bulky dressing is placed on the extremity. A foot cradle may be used to prevent contact with bedclothes if the feet are involved. Hemorrhagic blebs, which may develop 1 hour to a few days after rewarming, are left intact and not ruptured. Nonhemorrhagic blisters are débrided to decrease the inflammatory mediators found in the blister fluid.

A physical assessment is conducted with rewarming to observe for concomitant injury, such as soft tissue injury, dehydration, alcohol intoxication, or fat embolism. Problems such as hyperkalemia (e.g., from release of potassium in the damaged cells) and hypovolemia, which occur frequently in people with frostbite, are corrected. Risk of infection is also great; therefore, aseptic technique is used during dressing changes, and tetanus prophylaxis is given as indicated. Nonsteroidal anti-inflammatory drugs (NSAIDs) are prescribed for their anti-inflammatory effects and to control pain (ENA, 2020a).

Additional measures that may be carried out when appropriate after emergency stabilization measures have been instituted include the following:

- Whirlpool bath for the affected body parts to aid circulation and débridement of necrotic tissue to help prevent infection
- Escharotomy (incision through the eschar) to prevent further tissue damage, to allow for normal circulation, and to permit joint motion
- Fasciotomy to treat compartment syndrome

After rewarming, hourly active motion of any affected digits is encouraged to promote maximal restoration of function and to prevent contractures (Mayo Clinic, 2019). Discharge instructions also include encouraging the patient to avoid tobacco, alcohol, and caffeine because of their vasoconstrictive effects, which further reduce the already deficient blood supply to injured tissues.

Hypothermia

Hypothermia is a condition in which the core (internal) temperature is 35°C (95°F) or less as a result of exposure to cold or an inability to maintain body temperature in the absence of low ambient temperatures. Urban hypothermia (extreme exposure to cold in an urban setting) is associated with a high mortality rate; older adults, infants, people with concurrent illnesses, and those who are homeless are particularly susceptible. Alcohol ingestion increases susceptibility because it causes systemic vasodilation. Some medications (e.g., phenothiazines) or medical conditions (e.g., hypothyroidism, spinal cord injury) decrease the ability to shiver, hampering the body's innate ability to generate body heat. Fatigue and sleep deprivation are also associated with the

development of hypothermia. Heat loss of 2% is normal but increases with exposure. Wet clothing accelerates heat loss, and immersion in cold water increases heat loss by 25% (ENA, 2020a). Victims of trauma are also at risk for hypothermia resulting from treatment with cold fluids, unwarmed oxygen, and exposure during examination. The patient may also have frostbite, but hypothermia takes precedence in treatment.

Assessment and Diagnostic Findings

Hypothermia leads to physiologic changes in all organ systems. There is progressive deterioration, with apathy, poor judgment, ataxia, dysarthria, drowsiness, pulmonary edema, acid–base abnormalities, coagulopathy, and eventual coma. Shivering may be suppressed at a temperature of less than 32.2°C (90°F), because the body's self-warming mechanisms become ineffective. Cardiac output and blood pressure may be so weak that peripheral pulses become undetectable. Cardiac arrhythmias may also occur. Other physiologic abnormalities include hypoxemia and acidosis (ENA, 2020a).

Management

Management consists of removal of wet clothing, continuous monitoring, rewarming, and supportive care.

Monitoring

The CABs of basic life support are a priority. The patient's vital signs, CVP, urine output, arterial blood gas levels, blood chemistry determinations (blood urea nitrogen [BUN], creatinine, glucose, electrolytes), and chest x-rays are evaluated frequently. Core body temperature is monitored with an esophageal, bladder, or rectal thermistor. Continuous ECG monitoring is performed, because cold-induced myocardial irritability leads to conduction disturbances, especially ventricular fibrillation. An arterial line is inserted and maintained to record blood pressure and to facilitate blood sampling.

Rewarming

Rewarming methods include active internal (core) rewarming and passive (spontaneous) or active external rewarming (Higginson, 2018).

Active internal rewarming methods are used for moderate to severe hypothermia (less than 28°C to 32.2°C [82.5°F to 90°F]) and include cardiopulmonary bypass, warm fluid administration, warmed humidified oxygen by ventilator, and warmed peritoneal lavage. Monitoring for ventricular fibrillation as the patient's temperature increases from 31°C to 32°C (88°F to 90°F) is essential.

Passive or active external rewarming is used for mild hypothermia (32.2°C to 35°C [90°F to 95°F]). Passive external rewarming uses over-the-bed heaters to the extremities and increases blood flow to the acidotic, anaerobic extremities. The cold blood from peripheral tissues has high lactic acid levels. As this blood returns to the core, it causes a significant drop in the core temperature (i.e., core temperature afterdrop) and can potentially cause cardiac arrhythmias and electrolyte disturbances. Active external rewarming uses forced-air warming blankets. Care must be taken to prevent extremity burn from these devices, because the patient may not have effective sensation to feel the burn.

Supportive Care

Supportive care during rewarming includes the following as directed (ENA, 2020a):

- External cardiac compression (typically performed only as directed in patients with temperatures higher than 31°C [88°F])
- Defibrillation of ventricular fibrillation. A patient whose temperature is less than 32°C (90°F) experiences spontaneous ventricular fibrillation if moved or touched. Defibrillation is ineffective in patients with temperatures lower than 31°C (88°F); therefore, the patient must be rewarmed first.
- Mechanical ventilation with positive end-expiratory pressure (PEEP) and heated humidified oxygen to maintain tissue oxygenation
- Administration of warmed IV fluids to correct hypotension and to maintain urine output and core rewarming, as described previously
- Administration of sodium bicarbonate to correct metabolic acidosis if necessary
- Administration of antiarrhythmic medications
- Insertion of an indwelling urinary catheter to monitor urinary output and kidney function

Nonfatal Drowning

Nonfatal drowning is defined as survival for at least 24 hours after submersion that caused a respiratory arrest. The most common consequence is hypoxemia. Children under 5 years of age and those over the age of 85 have the highest risk of drowning. An estimated 320,000 drownings occur throughout the world annually, accounting for 7% of global mortality from unintentional injury (World Health Organization [WHO], 2020). Drowning and nonfatal drowning can be prevented by avoiding rip currents offshore; approximately 85% of shore drownings involve a rip current. Pool drownings can be prevented by surrounding the pool with fencing, a self-latching/closing gate, and providing swimming lessons. Supervision near water is still the best prevention measure. When boating, a personal flotation device (PFD), even for swimmers, prevents drowning events. Approximately 50% of nonfatal drownings require hospital admission for management (WHO, 2020).

Factors associated with drowning and nonfatal drowning include alcohol ingestion, inability to swim, diving injuries, hypothermia, and exhaustion. The majority of drowning events occur in pools, lakes, and bathtubs. Suicide by drowning rarely occurs in pools and rarely involves alcohol (WHO, 2020).

Efforts to save the patient should not be abandoned prematurely. Successful resuscitation with full neurologic recovery has occurred in patients who have experienced nonfatal drowning after prolonged submersion in cold water (Parenteau, Stockinger, Hughes, et al., 2018). This is possible because of a decrease in metabolic demands and the diving reflex. The nonfatal drowning process involves the onset of hypoxia, hypercapnia, bradycardia, and arrhythmias. If there is a violent struggle associated with the nonfatal drowning episode, exercise-induced acidosis and tachypnea can result in aspiration. Hypoxia and acidosis cause eventual apnea and loss of consciousness. When the victim loses consciousness and makes a final effort to breathe, the terminal gasp occurs. Water then moves passively into the airways prior to death.

After resuscitation, hypoxia and acidosis are the major complications experienced by a person who has experienced nonfatal drowning; immediate intervention in the ED is essential. Resultant pathophysiologic changes and pulmonary injury depend on the type of fluid (fresh or salt water) and the volume aspirated. Freshwater aspiration results in a loss of surfactant and, therefore, an inability to expand the lungs. Salt-water aspiration leads to pulmonary edema from the osmotic effects of the salt within the lungs. If a person survives submersion, ARDS, resulting in hypoxia, hypercarbia, and respiratory or metabolic acidosis, can occur (ENA, 2020a).

Management

Therapeutic goals include maintaining cerebral perfusion and adequate oxygenation to prevent further damage to vital organs. Cardiopulmonary resuscitation is the factor with the greatest influence on survival. The most important priority in resuscitation is to manage the hypoxia, acidosis, and hypothermia. Prevention and management of hypoxia are accomplished by ensuring an adequate airway and respiration, thus improving ventilation (which helps correct respiratory acidosis) and oxygenation. Arterial blood gases are monitored to evaluate oxygen, carbon dioxide, bicarbonate levels, and pH. These parameters determine the type of ventilatory support needed. The use of endotracheal intubation with PEEP improves oxygenation, prevents aspiration, and corrects intrapulmonary shunting and ventilation–perfusion abnormalities (caused by aspiration of water). If the patient is breathing spontaneously, supplemental oxygen may be given by mask. However, an endotracheal tube is necessary if the patient does not breathe spontaneously.

Because of submersion, the patient is usually hypothermic. A rectal probe or other core measurement device is used to determine the degree of hypothermia. Prescribed rewarming procedures (e.g., extracorporeal warming, warmed peritoneal dialysis, inhalation of warm aerosolized oxygen, torso warming) are started during resuscitation. The choice of warming method is determined by the severity and duration of hypothermia and available resources. Intravascular volume expansion and inotropic agents are used to treat hypotension and impaired tissue perfusion. ECG monitoring is initiated, because arrhythmias frequently occur. An indwelling urinary catheter is inserted to measure urine output. Hypothermia and accompanying metabolic acidosis may compromise kidney function. Nasogastric intubation is used to decompress the stomach and to prevent the patient from aspirating gastric contents.

Even if the patient appears healthy, close monitoring continues with serial vital signs, serial arterial blood gas values, ECG monitoring, intracranial pressure assessments, serum electrolyte levels, intake and output, and serial chest x-rays. After a nonfatal drowning, the patient is at risk for complications such as hypoxic or ischemic cerebral injury, ARDS, and life-threatening cardiac arrest. The patient is also at heightened risk for aspiration; vomiting frequently occurs in patients requiring rescue breathing and in up to 86% of patients requiring CPR (ENA, 2020a).

Decompression Sickness

Decompression sickness, also known as “the bends,” occurs in patients who have engaged in diving (lake/ocean diving), high-altitude flying, or flying in commercial

aircraft within 24 hours after diving. It occurs relatively infrequently in the United States, but its effects can be hazardous. Being aware of decompression sickness and assessing the patient properly ensures appropriate management and results in decreased morbidity.

Decompression sickness results from formation of nitrogen bubbles that occur with rapid changes in atmospheric pressure. They may occur in joint or muscle spaces, resulting in musculoskeletal pain, numbness, or hypesthesia. More significantly, nitrogen bubbles can become air emboli in the bloodstream and thereby produce stroke, paralysis, or death. Taking a rapid history about the events preceding the onset of symptoms is essential (Tintinalli et al., 2020).

Assessment and Diagnostic Findings

To identify decompression sickness, a detailed history is obtained from the patient or diving partner. Evidence of rapid ascent, loss of air in the tank, buddy breathing, recent alcohol intake or lack of sleep, or a flight within 24 hours after diving suggests possible decompression sickness. Some patients describe a perfect dive yet still have the signs and symptoms of decompression sickness, in which case they must receive treatment for the condition.

Signs and symptoms include joint or extremity pain, numbness, hypesthesia, and loss of range of motion. Neurologic symptoms mimicking those of a stroke or spinal cord injury can indicate an air embolus. Cardiopulmonary arrest can also occur in severe cases and is usually fatal. Any neurologic symptoms should be rapidly assessed. All patients with decompression sickness need rapid transfer to a hyperbaric chamber (ENA, 2020a).

Management

A patent airway and adequate ventilation are established, as described previously, and 100% oxygen is given throughout treatment and transport. A chest x-ray is obtained to identify aspiration, and at least one IV line is started with lactated Ringer's or normal saline solution. Research findings suggest that among patients requiring air transport (e.g., helicopter), oxygen saturations and symptoms improve when both oxygen and IV fluids are given. If air transport is required, the aircraft should remain at low altitude (i.e., below 300 m [approximately 1000 feet]) (Holleran, Wolfe, & Frakes, 2018).

The cardiopulmonary and neurologic systems are supported as needed. If an air embolus is suspected, the head of the bed should be lowered. If the patient's wet clothing is still present, it is removed. The patient is kept warm. Transfer to the closest hyperbaric chamber for treatment is initiated. However, the patient who is awake and alert without central neurologic deficits may be able to travel by ground ambulance or by automobile, depending on the severity of symptoms. Throughout treatment, the patient is continually assessed, and changes are documented. If aspiration is suspected, antibiotic agents and other treatment may be prescribed (ENA, 2020a).

Animal and Human Bites

Bites are a common reason for visits to the ED. Dog bites constitute 80% to 90% of these bites and are responsible for the majority of deaths from bites by a nonvenomous animal (Tintinalli et al., 2020). Cat bites have a high risk of infection because of the presence of *Pasteurella* in their saliva. All animal bites must be reported to public health authorities, which must provide follow-up screening of the offending animal for rabies. If the animal cannot be located and rabies vaccination verified, rabies prophylaxis for the person who has been bitten must be instituted (ENA, 2020a).

Human bites are frequently associated with rapes, sexual assaults, or other forms of battery. The human mouth contains more bacteria than that of most other animals, so a high risk of bite-related infection exists. Depending on the circumstances surrounding the event, the victim may delay seeking treatment. The ED nurse should inspect any bitten tissue for pus, erythema, or necrosis. A health care provider should take photographs, which can be used as evidence in criminal and legal proceedings. Guidelines for collecting forensic evidence for photographing with and without a measuring device should be followed. Cleansing with soap and water is then necessary, followed by the administration of antibiotics and tetanus toxoid as prescribed (Tintinalli et al., 2020).

Snakebites

Venomous (poisonous) snakes caused more than 2000 of the 6000 snakebites in the United States annually (Tintinalli et al., 2020). Across the globe, between 4.5 and 5.4 million people get bitten by snakes each year, with 81,000 to 138,000 dying from complications (WHO, 2019). Children between 1 and 9 years of age are the most likely victims. The greatest number of bites occurs during the daylight hours and early evening of the summer months. The most frequent poisonous snakebite in the United States occurs from Crotalidae, otherwise called pit vipers, such as water moccasins, copperheads, and rattlesnakes. The most common site is the upper extremity (ENA, 2020a). Of pit viper bites, 75% to 80% result in **envenomation** (injection of a poisonous material by sting, spine, bite, or other means); the rest result in what are called *dry bites* (Tintinalli et al., 2020). Venomous snakebites are medical emergencies.

Nineteen different species of venomous snakes are found in various regions within the United States. Nurses should be familiar with the types of snakes common to the geographic region in which they practice. However, the exotic pet industry sells atypical snakes as “pets.” Because of this, venomous snakes such as cobras and asps may be found outside of their native region.

Clinical Manifestations

Snake venom consists primarily of proteins and has a broad range of physiologic effects. It may affect multiple organ systems, especially the neurologic, cardiovascular, and respiratory systems.

Classic clinical signs of envenomation are edema, ecchymosis, and hemorrhagic bullae, leading to necrosis at the site of envenomation. Symptoms include lymph node tenderness, nausea, vomiting, numbness, and a metallic taste in the mouth. Without decisive treatment, these clinical manifestations may progress to include fasciculations, hypotension, paresthesias, seizures, and coma (ENA, 2020a).

Management

Initial first aid at the site of the snakebite includes having the person lie down, removing constrictive items such as rings, providing warmth, cleansing the wound, covering the wound with a light sterile dressing, and immobilizing the injured body part below the level of the heart. CABs are the priorities of care. Ice, incision and suction, or a tourniquet is *not* applied. Tetanus and analgesia should be given as necessary. Initial evaluation in the ED is performed quickly and includes information about the following (Tintinalli et al., 2020):

- Whether the snake was venomous or nonvenomous; discourage bringing the snake for identification—even a dead snake's venom is poisonous. Do *not* handle any snake brought to the ED. If the snake is transported to the ED, caution should be taken because the snake is frequently in a stunned, not dead, state. The bite reflex can remain intact for up to 90 minutes after the death of the snake.
- Where and when the bite occurred and the circumstances of the bite.
- Sequence of events, signs, and symptoms (fang punctures, pain, edema, and erythema of the bite and nearby tissues).
- Severity of poisonous effects. Call the local poison control phone number to gain access to information about an exotic snakebite presentation and management, as necessary. The poison control center may also be able to assist with retrieving antivenin for these particular species.
- Vital signs.
- Circumference of the bitten extremity or area at several points. The circumference of the extremity that was bitten is compared with the circumference of the opposite extremity.
- Laboratory data (complete blood count, urinalysis, and coagulation studies).

The course and prognosis of snakebite injuries depend on the kind and amount of venom injected; where on the body the bite occurred; and the general health, age, and size of the patient. There is no one specific protocol for treatment of snakebites. In general, ice, tourniquets, heparin, and corticosteroids are not used during the acute stage. Corticosteroids are contraindicated in the first 6 to 8 hours after the bite because they may depress antibody production and hinder the action of **antivenin** (antitoxin manufactured from the snake venom and used to treat snakebites).

Parenteral fluids may be used to treat hypotension. If vasopressors are used to treat hypotension, their use should be short term. Surgical exploration of the bite is rarely indicated. Typically, the patient is observed closely for at least 6 hours. The patient is *never* left unattended.

Administration of Antivenin

Although envenomation does not always occur, it should always be suspected with snakebites. An assessment of progressive signs and symptoms is essential before considering administration of antivenin, which is most effective if given within 4 hours and no greater than 12 hours after the snakebite. The decision to administer antivenin depends on worsening tissue injury and evidence of systemic and coagulopathic symptoms. Rattlesnakes are more likely to cause coagulation abnormalities as well as

more systemic effects. Coagulation abnormalities are not restricted to severe envenomation (Tintinalli et al., 2020).

The most readily available antivenin in the United States is Crotalidae polyvalent immune Fab antivenom (FabAV or CroFab). The dose depends on the type of snake and the estimated severity of the bite. Indications for antivenin depend on the progression of symptoms, including coagulopathy and systemic reaction (ENA, 2020a).

Crotalidae polyvalent immune Fab antivenom does not require pretesting (i.e., skin sensitivity screening for an allergic reaction; see Chapter 33), albeit monitoring for a hypersensitivity reaction is still necessary. Outside of the United States, however, other antivenin formulas that may be commercially available may still result in severe serum sickness. If the dose exceeds 10 vials, serum sickness will most likely occur. Serum sickness is a type of hypersensitivity response that results in fever, arthralgias, pruritus, lymphadenopathy, and proteinuria and can progress to neuropathies (ENA, 2020a). However, FabAV must be given cautiously to patients receiving anticoagulation therapy. Administration of FabAV may result in a recurring coagulopathy. The dosage and administration of FabAV are different from previously manufactured types of antivenin and should be reviewed carefully before the medication is given.

Before administering antivenin and every 15 minutes thereafter, the circumference of the affected part is measured. Premedication with diphenhydramine or cimetidine may be indicated, because these antihistamines may decrease the allergic response to antivenin. Antivenin is given as an IV infusion whenever possible, although intramuscular administration can be used.

Depending on the severity of the snakebite, the antivenin is diluted in 500 to 1000 mL of normal saline solution. The infusion is started slowly, and the rate is increased after 10 minutes if there is no reaction. The total dose should be infused during the first 4 to 6 hours after the bite. The initial dose is repeated until symptoms decrease, after which time the circumference of the affected part should be measured every 30 to 60 minutes for the next 48 hours to detect symptoms of compartment syndrome (swelling, loss of pulse, increased pain, and paresthesias) (ENA, 2020a).

There is no limit to the number of antivenin vials that can be given. The decision to continue to administer vials is based upon patient symptoms. Consultation with a snakebite expert is essential at this point; this consultant may be identified and found through contacting the Poison Control Center (see the Resources section) or a local zoo reptile center. The most common cause of allergic reaction to the antivenin is too-rapid infusion. Reactions may consist of a feeling of fullness in the face, urticaria, pruritus, malaise, and apprehension. These symptoms may be followed by tachycardia, shortness of breath, hypotension, and shock. In this situation, the infusion should be stopped immediately and IV diphenhydramine given. Vasopressors are used for patients in shock, and resuscitation equipment must be on standby while antivenin is infusing. It is important to note that serum sickness (hypersensitivity) can occur within the first few weeks after discharge. The patient and the patient's family members should be educated about the clinical manifestations of serum sickness (i.e., fever; rash starting on the chest and spreading to the back; arthralgia; gastrointestinal [GI] disturbances [e.g., nausea, vomiting, diarrhea, abdominal pain], and headache) and return to the ED if they occur (Tintinalli et al., 2020).

Spider Bites

There are two venomous spiders found in the United States that may interact with humans: the brown recluse and the black widow. Both are usually found in dark places such as closets, woodpiles, and attics, as well as in shoes (ENA, 2020a).

Brown recluse spider bites are painless. Systemic effects such as fever and chills, nausea and vomiting, malaise, and joint pain develop within 24 to 72 hours. The site of the bite may appear reddish to purple in color within 2 to 8 hours after the bite. Necrosis occurs in the next 2 to 4 days in approximately 10% of cases. The center of the bite may become necrotic, and surgical débridement may be necessary. Wound care consists of cleansing with soap and water, and hyperbaric oxygen treatments may be helpful. Most wounds heal within 2 to 3 months (ENA, 2020a; Tintinalli et al., 2020).

Black widow spider bites feel like pinpricks. Systemic effects usually occur within 30 minutes—much more rapidly than with brown recluse spider bites. Signs and symptoms include abdominal rigidity, nausea and vomiting, hypertension, tachycardia, and paresthesias. Severe pain also develops within 60 minutes and increases over 1 to 2 days. Treatment involves application of ice to the site to decrease swelling and discomfort, along with elevation and assessment of tetanus immunization status. Analgesic agents and benzodiazepines may relieve muscle spasms. Cardiopulmonary monitoring is essential. Antivenin is effective for severe black widow spider bites. This antivenin is horse serum based; therefore, testing for sensitivity must be performed prior to administration (ENA, 2020a).

Tick Bites

Tick bites are common in many areas of the United States, and they usually occur in grassy or wooded areas. It is important to learn the place where the bite occurred as well as the location of the bite on the body. The tick bite itself is not usually the problem; rather, it is the pathogen transmitted by the tick that can cause serious disease. Ticks can carry diseases such as Rocky Mountain spotted fever, tularemia, west Nile virus, and Lyme disease.

Ticks transmit pathogens through their saliva; therefore, the earlier the tick is removed, the better the prognosis. The tick should be removed with tweezers using a straight upward pull (see Fig. 67-4), and the patient should be informed of the signs and symptoms of diseases carried by ticks, especially if the patient lives in or has visited an area endemic for tick-related diseases (e.g., Lyme disease) (ENA, 2020a).

Lyme disease has three stages. Stage I may present with erythema migrans (a classic "bull's-eye" rash) that typically can be found in the axilla, groin, or thigh area and that appears within 4 weeks after the tick bite, with a peak manifestation time of 7 days after the bite. Classically, this rash is at least 5 cm in diameter with bright red borders. It is accompanied by flulike signs and symptoms that may include chills, fever, myalgia, fatigue, and headache. Without treatment, the rash subsides within 3 to 4 weeks. However, the rash and flulike manifestations can be significantly reduced within days if prompt treatment with antibiotic agents (e.g., doxycycline) is initiated. If antibiotics are not given, stage II Lyme disease may present within 4 to 10 weeks following the tick bite and may manifest with joint pain, memory loss, poor motor coordination, adenopathy, and cardiac abnormalities. Facial nerve palsy is the most common manifestation of stage II Lyme disease (Tintinalli et al., 2020). Stage III can begin anywhere from weeks to more than a year after the bite and has serious long-term

chronic sequelae, including arthritis, neuropathy, myalgia, and myocarditis. Even after appropriate treatment with antibiotics, 10% to 20% of patients may experience long-term effects including fatigue and arthralgias; some experience neurologic symptoms that may persist for over 10 years (Tintinalli et al., 2020).

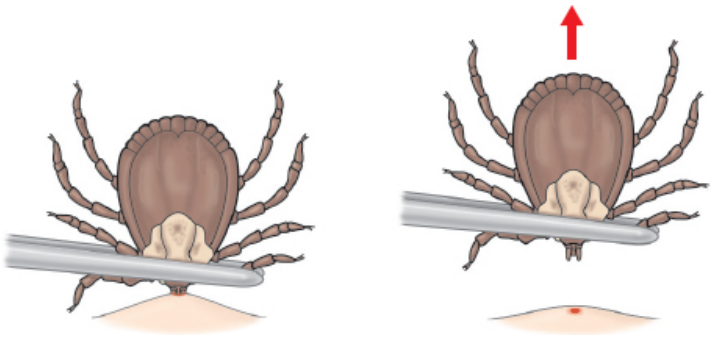


Figure 67-4 • Removal of tick with tweezers using a straight upward pull.

POISONING

A poison is any substance that, when ingested, inhaled, absorbed, applied to the skin, or produced within the body in relatively small amounts, injures the body by its chemical action. Poisoning from inhalation and ingestion of toxic materials, both intentional and unintentional, constitutes a major health hazard and an emergency situation. Emergency treatment is initiated with the following goals:

- Removal or inactivation of the poison before it is absorbed
- Provision of supportive care in maintaining vital organ function
- Administration of a specific antidote to neutralize a specific poison
- Implementation of treatment that hastens the elimination of the absorbed poison

Ingested (Swallowed) Poisons

Swallowed poisons may be corrosive. **Corrosive poisons** include alkaline and acid agents that can cause tissue destruction after coming in contact with mucous membranes. Alkaline products include lye, drain cleaners, toilet bowl cleaners, bleach, nonphosphate detergents, oven cleaners, and button batteries (batteries used to power watches, calculators, hearing aids, or cameras). Acid products include toilet bowl cleaners, pool cleaners, metal cleaners, rust removers, and battery acid.

Control of the airway, ventilation, and oxygenation are essential. In the absence of cerebral or renal damage, the patient's prognosis depends largely on successful management of respiration and circulation. Measures are instituted to stabilize cardiovascular and other body functions. ECG, vital signs, and neurologic status are monitored closely for changes. Shock may result from the cardiodepressant action of the substance ingested, from venous pooling in the lower extremities, or from reduced circulating blood volume resulting from increased capillary permeability (see Chapter

11). An indwelling urinary catheter is inserted to monitor kidney function. Blood specimens are obtained to determine the concentration of drug or poison (ENA, 2020a).

Efforts are made to determine what substance was ingested; the amount; the time since ingestion; signs and symptoms, such as pain or burning sensations, any evidence of redness or burn in the mouth or throat, pain on swallowing or an inability to swallow, vomiting, or drooling; age and weight of the patient; and pertinent health history.

Quality and Safety Nursing Alert

The local poison control center should be called if an unknown toxic agent has been taken or if it is necessary to identify an antidote for a known toxic agent.

Measures are instituted to remove the toxin or decrease its absorption. If there is a specific chemical or physiologic antagonist (antidote), it is given as early as possible to reverse or diminish the effects of the toxin. If this measure is ineffective, procedures may be initiated to remove or dilute the ingested substance. These procedures include administration of multiple doses of activated charcoal, dialysis, or hemoperfusion. Hemoperfusion involves detoxification of the blood by processing it through an extracorporeal circuit and an adsorbent cartridge containing charcoal or resin, after which the cleansed blood is returned to the patient (ENA, 2020a).

The patient who has ingested a corrosive poison, which can be a strong acid or alkaline substance, is given water or milk to drink for dilution. However, dilution is not attempted if the patient has acute airway edema or obstruction; potential for vomiting; or if there is clinical evidence of esophageal, gastric, or intestinal burn or perforation. The following gastric emptying procedures may be used as prescribed:

- Gastric lavage for the patient who is obtunded is only useful within 1 hour of ingestion, for sustained-release substances, or massive life-threatening amounts of a substance; however, complications of aspiration and stomach or esophageal perforation outweigh its usefulness. If performed, gastric aspirate is saved and sent to the laboratory for testing (toxicology screens).
- Activated charcoal administration if the poison is one that is absorbed by charcoal; given orally or by nasogastric tube, it is effective in small intermittent doses to decrease vomiting. It should be diluted as a slurry so that it is easier to drink or pass through the nasogastric tube. Activated charcoal absorbs most commonly ingested poisons except corrosives, heavy metals and hydrocarbons, iron, and lithium.

Cathartics, which had traditionally accompanied the use of activated charcoal, are rarely indicated because they can result in severe electrolyte imbalances, diarrhea, and hypovolemia (ENA, 2020a). Furthermore, syrup of ipecac to induce vomiting in the patient who is alert is not recommended due to the risk of aspiration and should *never* be used with corrosive poisons or with petroleum distillates (e.g., lubricating oil, fuel oil) or further corrosive damage to the upper airway and pharyngeal structures may occur.

Quality and Safety Nursing Alert

Vomiting is never induced after ingestion of caustic substances (acid or alkaline) or petroleum distillates.

Throughout detoxification, the patient's vital signs, CVP, and fluid and electrolyte balance are monitored closely. Hypotension and cardiac arrhythmias are possible. Seizures are also possible because of CNS stimulation from the poison or from oxygen deprivation. If the patient complains of pain, analgesic agents are given cautiously. Severe pain causes vasomotor collapse and reflex inhibition of normal physiologic functions.

After the patient's condition has stabilized and discharge is imminent, written material should be given to the patient indicating the signs and symptoms of potential problems related to the poison ingested and signs or symptoms requiring evaluation by a health care provider. If poisoning was determined to be a suicide or self-harm attempt, a psychiatric consultation should be requested before the patient is discharged. In cases of inadvertent poison ingestion, poison prevention and home poison-proofing instructions should be provided to the patient and family.

Carbon Monoxide Poisoning

Carbon monoxide poisoning may occur as a result of industrial or household incidents or attempted suicide. It is the most common cause of fatality from poisoning and is frequently under-reported to poison control centers or misdiagnosed (Tintinalli et al., 2020). Carbon monoxide exerts its toxic effect by binding to circulating hemoglobin and thereby reducing the oxygen-carrying capacity of the blood. Hemoglobin absorbs carbon monoxide 200 times more readily than it absorbs oxygen. Carbon monoxide–bound hemoglobin, called **carboxyhemoglobin**, does not transport oxygen.

Clinical Manifestations

Because the CNS has a critical need for oxygen, CNS symptoms predominate with carbon monoxide toxicity. A person with carbon monoxide poisoning may appear intoxicated (from cerebral hypoxia). Other signs and symptoms include headache, muscular weakness, palpitation, dizziness, and confusion, which can progress rapidly to coma. Skin color, which can range from pink or cherry-red to cyanotic and pale, is not a reliable sign. Pulse oximetry may reveal a high hemoglobin saturation, which may be deceiving, since the hemoglobin molecule is saturated with carbon monoxide rather than oxygen (ENA, 2020a).

Management

Exposure to carbon monoxide requires immediate treatment. Goals of management are to reverse cerebral and myocardial hypoxia and to hasten elimination of carbon monoxide. Whenever a patient inhales a poison, the following general measures apply:

- Move the patient to fresh air immediately, if possible.
- Open all doors and windows.
- Loosen all tight clothing.

- Initiate traditional cardiopulmonary resuscitation.
- Prevent chilling; wrap the patient in blankets.
- Keep the patient as quiet as possible.
- Do not give alcohol in any form or permit the patient to smoke.

In addition, for the patient with carbon monoxide poisoning, carboxyhemoglobin levels are analyzed on arrival at the ED and before treatment with oxygen if possible. To reverse hypoxia and accelerate the elimination of carbon monoxide, 100% oxygen is given at atmospheric or preferably hyperbaric pressures. Oxygen is given until the carboxyhemoglobin level is less than 5%. The patient is monitored continuously. Psychoses, spastic paralysis, ataxia, visual disturbances, and deterioration of mental status and behavior may persist after resuscitation and may be symptoms of permanent brain damage (Tintinalli et al., 2020).

When unintentional carbon monoxide poisoning occurs, the health department should be contacted so that the dwelling or building in question can be inspected. A psychiatric consultation is warranted if it has been determined that the poisoning was a suicide attempt.

Skin Contamination Poisoning (Chemical Burns)

Skin contamination injuries from exposure to chemicals are challenging because of the large number of possible offending agents with diverse actions and metabolic effects. The severity of a chemical burn is determined by the mechanism of action, the penetrating strength and concentration, and the amount and duration of exposure of the skin to the chemical. A wet chemical should be removed as soon as possible with copious amounts of water. Dry substances should be gently brushed off the skin before the area is flushed (ENA, 2020a). The skin should be flushed with a constant stream of cool water as the patient's clothing is removed. The skin of health care personnel assisting the patient should be appropriately protected if the burn is extensive or if the agent is significantly toxic or still present. Prolonged lavage with generous amounts of tepid water is important. The decontamination shower (deluge) in the ED is the optimal place for total body flushing. The staff attending the patient should wear proper PPE to prevent cross-contamination (Veenema, 2019).

Attempts to determine the identity and characteristics of the chemical agent are necessary in order to specify future treatment. The standard burn treatment appropriate for the size and location of the wound (antimicrobial treatment, débridement, tetanus prophylaxis, antidote administration as prescribed) is instituted (ENA, 2020a) (see Chapter 57). The patient may require plastic surgery for further wound management. The patient is instructed to have the affected area reexamined at 24 and 72 hours and in 7 days because of the risk of underestimating the extent and depth of these types of injuries.

Food Poisoning

Food poisoning is a sudden illness that occurs after ingestion of contaminated food or drink. Botulism is a serious form of food poisoning that requires continual surveillance

(see Chapter 68, Table 68-6). Assessment questions for patients with suspected food poisoning are discussed in Chart 67-7.

The key to treatment is determining the source and type of food poisoning. If possible, the suspected food should be brought to the medical facility and a history obtained from the patient or family.

Food, gastric contents, vomitus, serum, and feces are collected for examination. The patient's respirations, level of consciousness (LOC), blood pressure and hemodynamic status, and muscular activity are monitored closely. Measures are instituted to support the respiratory system. Death from respiratory paralysis can occur with botulism, fish poisoning, and some other food poisonings.

Because large volumes of electrolytes and water are lost by vomiting and diarrhea, fluid and electrolyte status should be assessed. Severe vomiting produces alkalosis, and severe diarrhea produces acidosis. Hypovolemic shock may also occur from severe fluid and electrolyte losses. The patient is assessed for signs and symptoms of fluid and electrolyte imbalances, including lethargy, rapid pulse rate, fever, oliguria, anuria, hypotension, and delirium. Baseline weight and serum electrolyte levels are obtained for future comparisons.

Measures to control nausea are also important to prevent vomiting, which could exacerbate fluid and electrolyte imbalances. An antiemetic medication is given parenterally as prescribed if the patient cannot tolerate fluids or medications by mouth (Tintinalli et al., 2020). For mild nausea, the patient is encouraged to take sips of weak tea, carbonated drinks, or tap water. After nausea and vomiting subside, clear liquids are usually prescribed for 12 to 24 hours, and the diet is gradually progressed to a low-residue, bland diet.

Chart 67-7  **ASSESSMENT**

Food Poisoning

Use the following questions to elicit information about the circumstances surrounding the possibility of food poisoning:

- How soon after eating did the symptoms occur? (Immediate onset suggests chemical, plant, or animal poisoning.)
- What was eaten in the previous meal? Did the food have an unusual odor or taste? (Most foods causing bacterial poisoning *do not* have unusual odor or taste.)
- Did anyone else become ill from eating the same food?
- Did vomiting occur? What was the appearance of the vomitus?
- Did diarrhea occur? (Diarrhea is usually absent with botulism and with shellfish or other fish poisoning.)
- Are any neurologic symptoms present? (These occur in botulism and in chemical, plant, and animal poisoning.)
- Does the patient have a fever? (Fever is characteristic in salmonella, ingestion of fava beans, and some fish poisoning.)

SUBSTANCE USE DISORDER (SUD)

SUD is the misuse of specific substances, such as drugs or alcohol, to alter mood or behavior. Drug abuse is the use of drugs for other than legitimate medical purposes. People who abuse drugs often take a variety of drugs simultaneously (such as alcohol, barbiturates, opioids, and tranquilizers), and the combination may have additive and addictive effects.

"Rave parties" are large-scale parties attended by hundreds of people involved in illicit drug use. At these events, one of the most commonly used drugs is 3,4-methylenedioxymethamphetamine (MDMA), or Ecstasy, a methamphetamine-based drug that users believe produces a "harmless high." ED nurses should be aware of rave parties in their geographic area so that they can prepare for a potential influx of patients who abuse this drug (ENA, 2020a). Others may combine Ecstasy with sildenafil; this drug combination is nicknamed "sextasy."

Spice is a synthetic cannabinoid sold commercially as a smoking mixture under the names "spice," "incense," or "K2." Its chemical structure and effects are similar to marijuana, targeting the same receptor sites in the brain. Spice is sold with variable concentrations and unregulated potency (National Institute on Drug Abuse, 2018).

Bath salts are synthetic stimulants similar to Ecstasy known as "mephedrone," "drone," or "MCAT." Their effects are similar to amphetamines, MDMA, and cocaine. Although bath salts are most commonly swallowed or snorted, they may also be smoked or injected; the method of intake affects the severity and duration of effects (Table 67-1). The structural formula 3,4-methylenedioxypyrovalerone (MDPV) is the most common type of bath salt abused (ENA, 2020a).

Abuse of various inhalants (see Table 67-1) has also increased in popularity; these products generally result more often in cravings than withdrawal when their use is stopped. The method of inhalation varies with the product chosen and requires several deep inhalations to reach euphoria. Methods include sniffing or snorting by directly inhaling the fumes. "Bagging" (sniffing from a bag) or "huffing" (sniffing from a rag or cloth) provide the greatest concentration; "dusting" is another method that delivers the inhalant by directly spraying it into the nostrils. Long-term use results in cortical atrophy and brain stem dysfunction, in addition to cardiomyopathy and emphysema like abnormalities of the lung. Significant others or parents may report that the patient has had poor school or work performance or attendance, weight loss, poor hygiene, fatigue, nosebleeds, and decreased appetite (National Institute on Drug Abuse, 2020).

Clinical manifestations vary with the substance used, but the underlying principles of management are essentially the same. Table 67-1 identifies commonly abused drugs, listing their clinical manifestations and therapeutic management. Treatment goals for a patient with a drug overdose are to support the respiratory and cardiovascular functions, to enhance clearance of the agent, and to provide for safety of the patient and staff. People who abuse IV/injection drugs are at increased risk for HIV infection, acquired immune deficiency syndrome, hepatitis B and C, and tetanus.

Cannabis remains popular, available, and in some states, is now legal. A newer method of cannabis abuse is butane honey oil (BHO) or "dabs." BHO is created at home by heating cannabis with butane to strip the chemical from the plant, which is then heated further to remove the butane. It may be further distilled to "shatter" by being placed in a vacuum to remove any residual butane. The product results in a "dab" which can then be inhaled. Butane in the presence of an ignition source can result in explosion

and fire resulting in chemical and thermal burns (National Institute on Drug Abuse, 2019).

Acute Alcohol Intoxication

Alcohol is a psychotropic drug that affects mood, judgment, behavior, concentration, and consciousness. Many people who drink heavily are young adults or those older than 60 years. There is a high prevalence of alcoholism among patients presenting to the ED for management; up to 31% have histories of SUD with alcohol. Among patients who present to the ED with various injuries, up to 50% may have histories of SUD with alcohol (ENA, 2020a). Because patients with SUD from alcohol return frequently to the ED, they present a challenge to the health professionals who care for them. The CDC advocates routine screening for SUD with alcohol in all outpatient settings, including EDs. Therefore, screenings, brief interventions, and referral to treatment (SBIRT) for patients presenting with suspected SUD with alcohol are recommended. All level I and II verified trauma centers are required to provide this service. SBIRT is considered cost-effective in saving quality of life-years lost and preventing the morbid consequences of continued SUD with alcohol (American College of Emergency Physicians [ACEP], 2017).

Alcohol, or ethanol, is a multisystem toxin and CNS depressant that causes drowsiness, impaired coordination, slurring of speech, sudden mood changes, aggression, belligerence, grandiosity, and uninhibited behavior. In excess, it can also cause stupor and eventually coma and death (i.e., alcohol poisoning). Frequently, underage minors and college students arrive at the ED with alcohol poisoning from binge drinking.

In the ED, the patient who is intoxicated with alcohol or who presents with alcohol poisoning is assessed for head injury, hypoglycemia (which mimics intoxication), and other health problems. Possible nursing diagnoses include impaired breathing associated with CNS depression and impaired impulse control associated with severe intoxication from alcohol.

Treatment involves detoxification of the acute poisoning, recovery, and rehabilitation. Commonly, the patient uses mechanisms of denial and defensiveness. The nurse should approach the patient in a nonjudgmental manner, using a firm, consistent, and accepting attitude. Speaking in a calm and slow manner is helpful because alcohol interferes with thought processes. If the patient appears intoxicated, hypoxia, hypovolemia, and neurologic impairment must be ruled out before it is assumed that the patient is intoxicated. Typically, a blood specimen is obtained for analysis of the blood alcohol level.

TABLE 67-1 Emergency Management of Patients with Drug Overdose

Drug	Clinical Manifestations	Therapeutic Management
Cocaine *Routes may include:* • Intranasally ("snorting")—inhaled into nostrils through straws • By smoking ("freebasing")—cocaine hydrochloride dissolved in ether to yield a pure cocaine alkaloid base ("crack," "rocks"); smoking in a small pipe delivers large quantities of cocaine to lungs. • IV • Polysubstance (cocaine and heroin)	Cocaine is a CNS stimulant that can cause: • Increased heart rate and blood pressure • Hyperpyrexia • Seizures • Sluggish, dilated pupillary response • Muscle rigidity • Increased energy, agitation, aggression • Ventricular arrhythmias • Intense euphoria, then anxiety, sadness, insomnia, and sexual indifference • Cocaine hallucinations with delusions • Psychosis with extreme paranoia and ideas of persecution • Hypervigilance Chronic psychotic symptoms may persist. Overall psychotic symptoms are short-lived compared to methamphetamines	1. Maintain airway and provide respiratory support. 2. Control seizures. 3. Monitor cardiovascular effects; have antiarrhythmic drugs and defibrillator available. 4. Treat for hyperthermia. 5. If cocaine was ingested, evacuate stomach contents and use activated charcoal to treat. Whole bowel irrigation may be necessary to treat body packers ("mules"). 6. Refer for psychiatric evaluation and treatment in an inpatient unit that eliminates access to the drug. Include drug rehabilitation counseling.
Opioids Heroin Opium or paregoric Morphine, codeine, semisynthetic derivatives: oxycodone, methadone, meperidine, tramadol, fentanyl	Acute intoxication (overdose) can result in: • Pinpoint pupils (may be dilated with severe hypoxia) • Decreased blood pressure • Marked respiratory depression/arrest • Pulmonary edema • Stupor → coma • Seizures Fresh needle marks along course of any superficial vein Skin abscesses (from "popping")	1. Support respiratory and cardiovascular functions. 2. Establish IV lines; obtain blood for chemical and toxicologic analysis. Patient may be given bolus of glucose to eliminate possibility of hypoglycemia. 3. Administer narcotic antagonist (naloxone hydrochloride IV, IM) as prescribed to reverse severe respiratory depression and coma.

		4. Continue to monitor level of responsiveness and respirations, pulse, and blood pressure. Duration of action of naloxone hydrochloride is shorter than that of heroin; repeated dosages may be necessary. 5. Send urine for analysis; opioids can be detected in urine. 6. Obtain an ECG. 7. Do not leave patient unattended; they may lapse back into coma rapidly. Clinical status may change from minute to minute. Hemodialysis may be indicated for severe drug intoxication. Activated charcoal may be considered if opioids were taken orally and if the patient is alert. 8. Monitor for pulmonary edema, which is frequently seen in patients who abuse/overdose on narcotics. 9. Refer patient for psychiatric and drug rehabilitation evaluation before discharge.
Barbiturates		
Pentobarbital, secobarbital, amobarbital, gamma-hydroxybutyrate (GHB, "liquid Ecstasy")	*Acute intoxication (may mimic alcohol intoxication):* • Respiratory depression • Flushed face • Decreased pulse rate; decreased blood pressure • Increasing nystagmus (to vertical and horizontal gaze) • Sluggish pupils	1. Maintain airway and provide respiratory support. 2. Endotracheal intubation or tracheostomy is considered if there is any doubt about the adequacy of airway exchange. a. Check airway frequently.

	• Lack of convergence of eyes • Depressed deep tendon reflexes • Decreasing mental alertness • Difficulty in speaking • Poor motor coordination and flaccid muscles • Coma, death *GHB:* • Sexual disinhibition • Amnesia, myoclonus, agitation • Overdoses when mixed with alcohol	b. Perform suctioning as necessary. 3. Support cardiovascular and respiratory functions; most deaths result from respiratory depression or shock. 4. Start infusion through large-gauge needle or IV catheter to support blood pressure; coma and dehydration result in hypotension and respond to infusion of IV fluids with elevation of blood pressure. 5. Evacuate stomach contents or lavage if within 1 h of ingestion to prevent absorption; repeated doses of activated charcoal may be given. 6. Assist with hemodialysis for patient with severe overdose. 7. Maintain neurologic and vital sign flow sheet. 8. Patient awakening from overdose may demonstrate combative behavior. 9. Refer for psychiatric and drug rehabilitation consultation to evaluate suicide potential and drug abuse.
Inhalants Amyl nitrate Freon Propane Trichloroethylene Gasoline Perchloroethylene Toluene (metallic paint spray) Helium Canned air Hand sanitizer *Routes may include:*	Effects mimic those of alcohol, with dizziness and imbalance: • Euphoria, headache, disinhibition, altered level of consciousness to coma • Renal, hepatic, and cardiac toxicity • Aplastic anemia	1. Provide airway support, ventilation, and oxygen. 2. Treat cardiac arrhythmias and hypotension. 3. Provide advanced cardiac life support as needed.

• Sniffing/snorting—direct inhalation of fumes • "Bagging"—sniff from a bag • "Huffing"—sniff from a rag/cloth • "Dusting"—direct spray into the nostrils	• Fetal growth retardation • Respiratory depression, arrest from CNS depression • Vasodilation • Nosebleeding • Vertical and horizontal nystagmus • Lack of convergence of eyes • Sluggish pupils • Temperature fluctuations • Circumoral red spots/rash • Air embolus	4. Monitor for profound hypotension when amyl nitrate is combined with MDMA and sildenafil or with anesthetic agents. 5. Monitor for hypertension when volatile solvents are used.
Amphetamine-Type Drugs (pep pills, "uppers," "speed," "crystal meth")		
amphetamine dextroamphetamine methamphetamine ("speed") 3,4-methylenedioxymethamphetamine (MDMA) ("Ecstasy," "Adam")[a] 3,4-methylenedioxy-*N*-ethylamphetamine (MDEA) ("Eve") 3,4-methylenedioxyamphetamine (MDA); methylphenidate "ice," "rocks," "crystal meth" 3,4-methylenedioxypyrovalerone (MDPV) or 4-methylmethcathinone; "Bath salts" (synthetic stimulant)	• Nausea, vomiting, anorexia • Palpitations, tachycardia • Increased blood pressure • Tachypnea, anxiety • Nervousness • Diaphoresis, mydriasis • Repetitive or stereotyped behavior • Irritability, insomnia, agitation • Visual misperceptions, auditory hallucinations • Fearfulness, anxiety, depression, hostility, paranoia • Hyperactivity, rapid speech, euphoria, hyperalertness • Decreased inhibition • Seizures, coma, hyperthermia • Cardiovascular collapse • Rhabdomyolysis • MDMA is both a hallucinogenic and a stimulant.	1. Provide airway support, ventilation, cardiac monitoring; insert IV line. 2. Use GI evacuation in cases of oral overdose; activated charcoal, gastric lavage if within 1 h of ingestion. 3. Keep in calm, cool, quiet environment; elevated temperature potentiates amphetamine toxicity. Maintain normothermia, cooling the patient as necessary. 4. Administer small doses of diazepam (IV) or haloperidol as prescribed for CNS and muscular hyperactivity. 5. Administer appropriate pharmacologic therapy as prescribed for severe hypertension and ventricular arrhythmias. 6. Treat seizures with benzodiazepines (e.g., diazepam) as prescribed.

	• MDPV and 4-methylmethcathinone effects last >24 h.	7. Treat sympathetic stimulation with beta-blocker agents as prescribed. 8. Try to communicate with patient if delusions or hallucinations are present. 9. Place in a protective environment (preferably psychiatric security room with video monitoring) to observe for suicide attempt. 10. Refer for psychiatric and drug rehabilitation evaluation.
Hallucinogens or Psychedelic-Type Drugs		
Lysergic acid diethylamide (LSD) Phencyclidine HCl (PCP, "angel dust") Mescaline, psilocybin Ketamine ("special K") Synthetic cannabinoids ("spice," "incense," "K2") Butane honey oil (BHo)—"dabs," "shatter"	• Nystagmus • Pupil dilation • Mild hypertension • Marked confusion bordering on panic • Incoherence, hyperactivity • Withdrawn • Combative behavior; delirium, mania, self-injury (lasts 6–12 h) • Hallucinations, body image distortion • Hypertension, hyperthermia, acute kidney injury • Flashback—recurrence of LSD-like state without having taken the drug; may occur weeks or months after drug was taken • Ketamine—"out-of-body" experience; increased aggressiveness • Manufacturing can result in burns	1. Evaluate and maintain patient's circulation, airway, and breathing. 2. Determine by urine or serum drug screen whether the patient has ingested hallucinogenic drug or has a toxic psychosis. 3. Try to communicate with and reassure the patient. a. "Talking down" involves understanding the process through which the patient is proceeding and helping the patient overcome fears while establishing contact with reality. b. Remind the patient that fear is common with this problem. c. Reassure the patient that they are not losing their mind but are experiencing the effect of drugs and

that this will wear off.

d. Instruct the patient to keep the eyes open; this reduces the intensity of reaction.

e. Reduce sensory stimuli by minimizing noise, lights, movement, tactile stimulation.

4. Sedate the patient as prescribed if hyperactivity cannot be controlled; diazepam or a barbiturate may be prescribed.

5. Search for evidence of trauma; patients who use hallucinogens have a tendency to "act out" their hallucinations.

6. Manage seizures with benzodiazepines (e.g., diazepam) as necessary.

7. Observe patient closely; patient's behavior may become hazardous. Have safety officers stationed near the patient's room.

8. Monitor for hypertensive crisis if patient has prolonged psychosis due to drug ingestion.

9. Place patient in a protected environment under proper medical supervision to prevent self-inflicted bodily harm.

Management for Phencyclidine Abuse

1. Place patient in a calm, supportive environment to minimize stimuli; protect from self-injury.

2. Avoid talking down.

		3. Do not leave patient unobserved. Treat symptoms as they occur. a. Drug effects are unpredictable and prolonged. b. Symptoms are likely to exacerbate; patient becomes out of control. 4. Refer all patients in this category for psychiatric and drug evaluation/rehabilitation.
Drugs Producing Sedation, Intoxication, or Psychological and Physical Dependence (nonbarbiturate sedatives)		
diazepam chlordiazepoxide oxazepam lorazepam midazolam flunitrazepam ("roofies," "date rape drug")[a]	Seizures, coma, circulatory collapse, death *Acute intoxication:* • Respiratory depression • Decreasing mental alertness • Confusion • Slurred speech, decreased blood pressure • Ataxia • Pulmonary edema • Coma, death **Flunitrazepam:** • Disinhibition with antegrade amnesia • Weakness and unsteadiness with impaired judgment • Powerlessness	1. Endotracheal tube is inserted as a precaution; use assisted ventilation to stabilize and correct respiratory depression. Observe for sudden apnea and laryngeal spasm. 2. Assess for hypotension. a. Insert indwelling urinary catheter for patient who is comatose; decreased urinary volume is an index of reduced renal flow associated with reduced intravascular volume or vascular collapse. b. Start volume expansion with saline or dextrose as prescribed. 3. Evacuate stomach contents; lavage (if within 1 h of ingestion); activated charcoal. 4. Start ECG monitoring. Observe for arrhythmias. 5. Administer flumazenil, a benzodiazepine

		antagonist (reversal agent). 6. Refer patient for psychiatric evaluation (potential suicide intent).
Salicylate Poisoning		
Aspirin (present in compound analgesic tablets) • Toxic levels (150–200 mg/kg body weight) • Chronic toxicity (occurs in older adults due to decreased kidney function) • Long-term intoxication (>100 mg/kg/day for more than 2 days)	• Restlessness • Tinnitus, deafness • Blurring of vision • Hyperpnea • Hyperpyrexia • Sweating • Epigastric pain, vomiting • Dehydration • Respiratory alkalosis and metabolic acidosis • Disorientation, coma • Cardiovascular collapse • Coagulopathy	1. Treat respiratory depression. 2. Induce gastric emptying by lavage (if within 1 h after ingestion). 3. Give activated charcoal to adsorb aspirin. 4. Support patient with IV infusions as prescribed to establish hydration and correct electrolyte imbalances, including administration of sodium bicarbonate. 5. Enhance elimination of salicylates as directed by forced diuresis, alkalinization of urine, peritoneal dialysis, or hemodialysis, according to severity of intoxication. 6. Monitor serum salicylate level for efficacy of treatment. 7. Administer specific prescribed pharmacologic agent for bleeding and other problems. 8. Recognize that concretions formed in the gut may result in prolonged exposure as they are digested. 9. Refer patient for psychiatric evaluation (potential suicide intent). 10. Monitor thromboelastography for platelet function.

Acetaminophen (present in prescription and nonprescription analgesics, antipyretics, and cold remedies) • Toxic levels (≥140 mg/kg body weight)	Lethargy to encephalopathy and death GI upset, diaphoresis Right upper quadrant pain Abnormal liver function tests, prolonged prothrombin time, increased bilirubin, disseminated intravascular coagulation Hepatomegaly leading to liver failure Metabolic acidosis Hypoglycemia Stage I—within 24 h; GI irritation, possible metabolic acidosis and coma if severe ingestion Stage II—24–48 h; monitor liver and coagulation studies. Stage III—after 48 h; hepatic encephalopathy/jaundice, vomiting, right upper quadrant pain, coagulopathy, hypoglycemia, acute kidney injury	1. Maintain airway. 2. Obtain acetaminophen level. 3. Laboratory studies—liver function tests, prothrombin time/partial thromboplastin time, complete blood count, blood urea nitrogen, creatinine. 4. Lavage (if within 1 h after ingestion); activated charcoal. 5. Prepare for possible hemodialysis, which clears acetaminophen but does not halt liver damage. 6. Administer NAC as soon as possible. NAC replenishes essential liver enzymes and requires a total of 18 doses every 4 h. Charcoal absorbs NAC; do not administer together. Repeat NAC dose if patient vomits. 7. Refer patient for psychiatric evaluation (potential suicide intent).
Tricyclic Antidepressants		
amitriptyline doxepin nortriptyline imipramine	Arrhythmia: ventricular fibrillation/tachycardia, sinus tachycardia Hypotension Pulmonary edema, hypoxemia, acidosis Confusion, agitation, coma Visual hallucinations Clonus, tremors, hyperactive reflexes, nystagmus, myoclonic jerking Seizures Blurred vision, flushing, hyperthermia	1. Provide airway support, ventilation, cardiac monitoring; insert IV line with normal saline solution. 2. If within 1–2 h after overdose, insert a nasogastric tube and instill activated charcoal every 4 h × 3. 3. Administer a sodium bicarbonate drip to decrease arrhythmias; the alkaline environment increases the protein binding of the

		metabolite. Synchronized cardioversion may be indicated with some arrhythmias refractory to sodium bicarbonate. Torsades de pointes should be treated with IV magnesium sulfate. 4. Administer vasopressors. 5. Manage seizure activity with benzodiazepines (e.g., diazepam) as necessary. 6. Refer patient for psychiatric evaluation for potential suicide intent and evaluation of medication regimen for effectiveness.
Selective Serotonin Reuptake Inhibitors and Other Antidepressants		
trazodone fluoxetine paroxetine sertraline venlafaxine escitalopram bupropion	Decreased level of consciousness, confusion Respiratory depression Increased heart rate Serotonin syndrome may occur if the SSRI was taken in conjunction with dextromethorphan or meperidine Agitation, seizures Hyperthermia, diaphoresis Hypertension, headache, shivering, "goose flesh," cardiac arrhythmias, loss of consciousness	1. Administer activated charcoal with possibly whole bowel irrigation if a sustained-release medication was taken. 2. Use seizure precautions and administer benzodiazepines (e.g., diazepam) as prescribed.
Anabolic Steroids		
"roids," "juice," methandrostenolone, stanozolol, nandrolone Synthetic testosterone	Increase in LDL, decrease in HDL Alter carbohydrate metabolism Hyponatremia, hypokalemia Hypocalcemia/osteoporosis Mood swings/violent behaviors Invincibility, depression, potential for suicide attempts Memory loss, cognitive disability	1. Provide supportive therapy appropriate to patient's emotional manifestations. 2. Protect the patient from self-harm/harming others. 3. Encourage the patient to stop use; refer patient for psychiatric evaluation.

	Immunosuppression Used to bulk up muscles, so skeletal muscle hypertrophy is a common manifestation.

→, precedes; CNS, central nervous system; ECG, electrocardiogram; GI, gastrointestinal; HDL, high-density lipoprotein; IM, intramuscular; IV, intravenous; LDL, low-density lipoprotein; NAC, N-acetylcysteine; SSRI, selective serotonin reuptake inhibitor.

[a]Polydrug use at "rave clubs" frequently involves MDMA, alcohol, amphetamines, LSD, and sometimes dextromethorphan. Terms such as "Ecstasy" may refer to flunitrazepam, GHB, ephedrine, and/or caffeine, in addition to MDMA.

Adapted from Emergency Nurses Association (ENA). (2020a). *Sheehy's manual of emergency care* (8th ed.). St. Louis, MO: Mosby; Tintinalli, J. E., Stapczyski, J. S., Ma, O. J., et al. (2020). *Tintinalli's emergency medicine manual* (9th ed.). New York: McGraw-Hill Medical.

If drowsy, the patient should be allowed to sleep off the state of alcoholic intoxication. During this time, maintenance of a patent airway and observation for symptoms of CNS depression are essential. The patient should be kept warm with blankets. On the other hand, if the patient is noisy or belligerent, sedation may be necessary. If sedation is used, the patient should be monitored carefully for hypotension and decreased LOC.

In addition, the patient is examined for alcohol withdrawal delirium and for injuries and organic disease (such as head injury, seizures, pulmonary infections, hypoglycemia, and nutritional deficiencies) that may be masked by alcoholic intoxication. People with alcoholism suffer more injuries than the general population. Acute alcohol intoxication is the cause of trauma for many patients without alcoholism as well. Pulmonary infections are also more common in patients with alcoholism, resulting from respiratory depression, an impaired defense system, and a tendency toward aspiration of gastric contents. The patient may show little increase in temperature or WBC count. The patient may be hospitalized or admitted to a detoxification center in an effort to examine problems underlying SUD (ENA, 2020a).

Alcohol Withdrawal Syndrome

Alcohol withdrawal syndrome is an acute toxic state that occurs as a result of sudden cessation of alcohol intake after a bout of heavy drinking or, more typically, after prolonged intake of alcohol. Severity of symptoms depends on how much alcohol was ingested and for how long. Delirium tremens, the most severe form of alcohol withdrawal syndrome, may be precipitated by acute injury or infection (e.g., pneumonia, pancreatitis, hepatitis). Delirium tremens is a life-threatening condition and carries a high mortality rate if untreated (Moore, Fuehrlein, & Rosenheck, 2017).

Patients with alcohol withdrawal syndrome show signs of anxiety, uncontrollable fear, tremor, irritability, agitation, insomnia, and incontinence. Usually, all vital signs are elevated in the alcoholic toxic state. Approximately 5% of patients with alcohol withdrawal syndrome experience delirium tremens, which manifest with visual, tactile, olfactory, and auditory hallucinations that often are terrifying; the patient exhibits agitation. Autonomic overactivity occurs and is evidenced by tachycardia, hypertension, dilated pupils, hyperthermia, and profuse perspiration. Classically, delirium tremens

commence within approximately 48 to 96 hours after the last drink of alcohol (Hoffman & Weinhouse, 2020).

The goals of management for alcohol withdrawal syndrome are to give adequate sedation and support to allow the patient to rest and recover without danger of injury or peripheral vascular collapse. A physical examination is performed to identify preexisting or contributing illnesses or injuries (e.g., head injury, pneumonia). A drug history is obtained to elicit information that may facilitate adjustment of any sedative requirements. Baseline blood pressure is determined, because the patient's subsequent treatment may depend on blood pressure changes.

Usually, the patient is sedated as directed with a sufficient dosage of benzodiazepines to establish and maintain sedation, which reduces agitation, prevents exhaustion, prevents seizures, and promotes sleep. The patient should be calm, able to respond, and able to maintain an airway safely on their own. A variety of medications and combinations of medications are used (e.g., chlordiazepoxide, lorazepam, and clonidine). Haloperidol, esmolol, or midazolam may be given for delirium tremens. Dosages are adjusted according to the patient's symptoms (agitation, anxiety) and blood pressure response (ENA, 2020a).

The patient is placed in a calm, nonstressful environment (usually a private room) and observed closely. The room remains lighted to minimize the potential for illusions (visual misrepresentations) and hallucinations. Homicidal or suicidal responses may result from hallucinations. Closet and bathroom doors are closed to eliminate shadows. A staff member is designated to stay with the patient as much as possible. The presence of another person has a reassuring and calming effect, which helps the patient maintain contact with reality. To orient the patient to reality, any illusions are explained.

Quality and Safety Nursing Alert

Restraints are used as prescribed, if necessary, if the patient is aggressive or violent, but only when other alternatives have been unsuccessful. The patient who is restrained must be watched continuously on a one-on-one basis by an ED staff member. The least restrictive device that will prevent injury to the patient or others is used. Caution is taken to ensure that restraints are applied properly and that they are not impairing circulation to any part of the patient's body or interfering with respirations. Restraints should be used in tandem with verbal intervention to calm the patient and promote adherence. Restraints must be released according to protocol. Physical observation (e.g., skin integrity, circulatory status, respiratory status) is ongoing, and the patient's response is documented.

Fluid losses may result from GI losses (vomiting), profuse perspiration, and hyperventilation. In addition, the patient may be dehydrated as a result of alcohol's effect of decreasing antidiuretic hormone. The oral or IV route is used to restore fluid and electrolyte balance.

Temperature, pulse, respiration, and blood pressure are recorded frequently (every 30 minutes with delirium tremens) to monitor for peripheral circulatory collapse or hyperthermia (the two most serious complications).

Frequently seen complications include infections (e.g., pneumonia), trauma, hepatic failure, hypoglycemia, and cardiovascular problems. Hypoglycemia may accompany alcohol withdrawal syndrome because alcohol depletes liver glycogen stores and impairs gluconeogenesis; many patients with alcoholism also are malnourished. Parenteral dextrose may be prescribed if the liver glycogen level is depleted. Orange juice, sports drinks, or other sources of carbohydrates are given to stabilize the blood glucose level and counteract tremulousness. Supplemental vitamin therapy and a high-protein diet are provided as prescribed to counteract nutritional deficits. The patient should be referred to an alcoholic treatment center for follow-up care and rehabilitation.

VIOLENCE, ABUSE, AND NEGLECT

EDs are often the first place where victims of family violence, abuse, or neglect go to seek help.

Family Violence, Abuse, and Neglect

In the United States, about 1 in 4 women and nearly 1 in 10 men have experienced sexual violence, physical violence, and/or stalking by an intimate partner during their lifetime. Over 43 million women and 38 million men have experienced psychological aggression by an intimate partner (CDC, 2019c). IPV may include physical violence, sexual violence, stalking, psychological aggression, neglect, financial abuse, or intimidation by a former or intimate partner (ENA, 2018b). It is important to recognize that IPV does occur in all cultures and populations; these may include teenagers, older adults, and heterosexual, transgender, and same sex couples (ENA, 2018b).

Those who have been subjected to IPV have significantly higher rates of visits to the ED than the general population. Because patients subjected to IPV often have contact first with nurses in the health care system, ED nurses must be vigilant in their assessments of both women and men who present with injuries that may be consistent with IPV (Herzog, Maina, & Maposa, 2019). In addition, ED nurses must be aware that men and women with disability are at higher risk of domestic violence and abuse than people without disability and should include questions that screen for IPV in their evaluations (see Chapter 50, Chart 50-3).

Gerontologic Considerations

It is estimated that more than 1 in 10 adults 70 years or older (14%) have been abused or neglected, a type of IPV called *elder abuse* (Rosay & Mulford, 2017). The majority of elder abuse is perpetrated by family members (National Center on Elder Abuse, 2017). Elder abuse takes many forms, including physical, sexual, emotional, and verbal abuse; neglect; violation of personal rights; abandonment; and financial abuse (ENA, 2020a).

Clinical Manifestations

When people who have been abused seek treatment, they may present with physical injuries or health problems such as anxiety, insomnia, or GI symptoms related to stress. The possibility of IPV should be investigated whenever a person presents with multiple injuries that are in various stages of healing, when injuries are unexplained, and when the explanation does not fit the physical picture (see Chart 67-8). The possibility of neglect should be investigated whenever a person who is dependent shows evidence of inattention to hygiene, to nutrition, or to know medical needs (e.g., unfilled medication prescriptions, missed appointments with health care providers). In the ED, the most common physical injuries seen are unexplained bruises, lacerations, abrasions, head injuries, or fractures. The most common clinical manifestations of neglect are malnutrition and dehydration (ENA, 2020a).

Assessment and Diagnostic Findings

Nurses in EDs are in an ideal position to provide early detection and interventions for victims of IPV. This requires an acute awareness of the signs of possible IPV, including abuse, maltreatment, and neglect. Nurses must be skilled in interviewing techniques that are likely to elicit accurate information. A careful history is crucial in the screening process. Asking questions in private—away from others—may be helpful in eliciting information about abuse, maltreatment, and neglect. Nurses need to be aware that women may withhold directly answering questions regarding IPV in fear of retaliation, loss of children, and retribution against the children (Herzog et al., 2019).

Chart 67-8  **ASSESSMENT**

Assessing for Abuse, Maltreatment, and Neglect

The following questions may be helpful when assessing a patient for abuse, maltreatment, and neglect:

- I noticed that you have a number of bruises. Can you tell me how they happened? Has anyone hurt you?
- You seem frightened. Has anyone ever hurt you?
- Patients sometimes tell me that they have been hurt by someone at home or at work. Could this be happening to you?
- Are you afraid of anyone at home or work, or of anyone with whom you come in contact?
- Has anyone failed to help you to take care of yourself when you needed help?
- Has anyone prevented you from seeing friends or other people whom you wish to see?
- Have you signed any papers that you did not understand or did not wish to sign?
- Has anyone forced you to sign papers against your will?
- Has anyone forced you to engage in sexual activities within the past year?
- Has anyone prevented you from using an assistive device (e.g., wheelchair, walker) within the past year?
- Has anyone you depend on refused to help you take your medicine, bathe, groom, or eat within the past year?

Whenever evidence leads the nurse to suspect abuse or neglect, an evaluation with careful documentation of descriptions of events and drawings or photographs of injuries is important, because the medical record may be used as part of a legal proceeding. Assessment of the patient's general appearance and interactions with significant others, an examination of the entire surface area of the body, and a mental status examination are crucial.

Management

The aims of IPV screening include earlier identification of patients who have been abused and prevention of continued abusive events, including homicide (ENA, 2018b). Whenever abuse, maltreatment, or neglect is suspected, the health care provider's main concern should be the safety and welfare of the patient. Treatment focuses on the consequences of the abuse, violence, or neglect and on prevention of further injury. Protocols of most EDs require that a multidisciplinary approach be used. Nurses, physicians, social workers, and community agencies work collaboratively to develop and implement a plan for meeting the patient's needs.

If the patient is in immediate danger, they should be separated from the person who is abusive or neglectful whenever possible. Referral to a shelter may be the most appropriate action, but many shelters are inaccessible to people with mobility limitations.

When abuse or neglect is the result of stress experienced by a caregiver who is no longer able to cope with the burden of caring for an older adult or a person with chronic disease or a disability, respite services may be necessary. Support groups may be helpful

to these caregivers. When mental illness of the person who is abusive or neglectful is responsible for the situation, alternative living arrangements may be required.

Nurses must be mindful that competent adults are free to accept or refuse the help that is offered to them. Some patients insist on remaining in the home environment where the abuse or neglect is occurring. The wishes of patients who are competent and not cognitively impaired should be respected. However, all possible alternatives, available resources, and safety plans should be explored with the patient.

Mandatory reporting laws in most states require health care workers to report suspected abuse of children or older adults to an official agency, usually Child or Adult Protective Services. All that is required for reporting is the suspicion of abuse; the health care worker is not required to prove abuse or neglect. Likewise, health care workers who report suspected abuse are immune from civil or criminal liability if the report is made in good faith. Subsequent home visits resulting from the report of suspected abuse are a part of gathering information about the patient in the home environment. In addition, many states have resource hotlines for use by health care workers and by patients who seek answers to questions about abuse and neglect (ENA, 2020a).

Sexual Assault

The definition of *rape* is forced sexual acts, especially if these acts involve vaginal or anal penetration. Attempted rape may include verbal threats of rape (ENA, 2020a). Perpetrators and victims may be either male or female. Rape crisis centers offer support and education and help people who have been sexually assaulted through the subsequent police investigation and courtroom experience.

The manner in which the patient is received and treated in the ED is important to their future psychological well-being. Crisis intervention should begin when the patient enters the health care facility. The patient should be seen immediately. Most hospitals have a written protocol that addresses the patient's physical and emotional needs as well as collection of forensic evidence.

In many states, the emergency nurse has the opportunity to become trained as a sexual assault nurse examiner (SANE). Preparing for this role requires specific training in forensic evidence collection, history taking, documentation, and ways to approach the patient and family. Specialized training also includes learning proper photographic methods and the use of colposcopy. Colposcopy facilitates assessment by magnifying tissues and looking for evidence of microtrauma. Evidence is collected through photography, videography, and analysis of specimens. Another tool useful to the SANE is the light-staining microscope, which enables the examiner to identify motile and nonmotile sperm and infectious organisms. This tool saves time and also enhances assessment. The SANE complements the ED staff and can spend more time with both the patient and police officers investigating the incident (ENA, 2020a).

Assessment and Diagnostic Findings

The patient's reaction to rape has been termed *rape trauma syndrome* and is seen as an acute stress reaction to a life-threatening situation. The nurse performing the assessment is aware that the patient may go through several phases of psychological reactions, which have been described as follows (ENA, 2020a):

- An acute disorganization phase, which may manifest as an expressed state in which shock, disbelief, fear, guilt, humiliation, anger, and other such emotions are encountered or as a controlled state in which feelings are masked or hidden and the victim appears composed.
- A phase of denial and unwillingness to talk about the incident, followed by a phase of heightened anxiety, fear, flashbacks, sleep disturbances, hyperalertness, and psychosomatic reactions that is consistent with PTSD (see later discussion).
- A phase of reorganization, in which the incident is put into perspective. Some victims never fully recover and go on to develop chronic stress disorders and phobias.

Management

The goals of management are to provide support, to reduce the patient's emotional trauma, and to gather available evidence for possible legal proceedings. All of the interventions are aimed at encouraging the patient to gain a sense of control over their life.

Throughout the patient's stay in the ED, the patient's privacy and sensitivity must be respected. The patient may exhibit a wide range of emotional reactions, such as hysteria, stoicism, or feelings of being overwhelmed. Support and caring are crucial. The patient should be reassured that anxiety is natural and asked whether a person who can provide support may be called. Appropriate support is available from professional and community resources. The National Sexual Assault Hotline (see the Resources section, under the Rape, Abuse, and Incest National Network) will automatically route the patient to the nearest assault or crisis intervention center for services, as needed. The patient should never be left alone.

Physical Examination

A written, witnessed informed consent must be obtained from the patient (or parent or guardian if the patient is a minor) for examination, for taking of photographs, and for release of findings to police. A history is obtained only if the patient has not already talked to a police officer, social worker, or crisis intervention worker. The patient should not be asked to repeat the history. Any history of the event that is obtained should be recorded in the patient's own words. The patient is asked whether they have bathed, douched, brushed their teeth, changed clothes, urinated, or defecated since the attack, because these actions may alter interpretation of subsequent findings. The time of admission, time of examination, date and time of the alleged rape, and the patient's emotional state and general appearance (including any evidence of trauma, such as discoloration, bruises, lacerations, secretions, or torn and bloody clothing) are documented. If the patient has no recollection of the event, drugs that induce retrograde amnesia may have been involved, such as alcohol, ketamine, gamma-hydroxybutyrate, benzodiazepines, or flunitrazepam. Urine drug test must be completed within 96 hours of the event to capture the presence of these drugs. Emesis can also be collected for testing (ENA, 2020a).

For the physical examination, the patient is helped to undress and is draped properly. Each item of clothing is placed in a separate paper bag. As noted previously, plastic bags

are not used in order to avoid possible destruction of evidence from mold or mildew formation. The bags are labeled and given to appropriate law enforcement authorities.

The patient is examined (from head to toe) for injuries, especially injuries to the head, neck, breasts, thighs, back, and buttocks. Body diagrams and photographs aid in documenting the evidence of trauma. The physical examination focuses on the following:

- External evidence of trauma (bruises, contusions, lacerations, stab wounds)
- Dried semen stains (appearing as crusted, flaking areas) on the patient's body or clothes
- Broken fingernails and body tissue and foreign materials under nails (if found, samples are taken)
- Oral examination, including a specimen of saliva and cultures of gum and tooth areas

Pelvic and rectal examinations are also performed. The perineum and other areas are examined with a Wood lamp or other filtered ultraviolet light. Areas that appear fluorescent may indicate semen stains. The color and consistency of any discharge present is noted. A water-moistened, rather than lubricated, vaginal speculum is used for the examination. Lubricant contains chemicals that may interfere with later forensic testing of specimens and acid phosphatase determinations. The rectum is examined for signs of trauma, blood, and semen. During the examination, the patient should be advised of the nature and necessity of each procedure and given the rationale for each (ENA, 2020a).

Specimen Collection

During the physical examination, numerous laboratory specimens may be collected, including the following:

- Vaginal aspirate, examined for presence or absence of motile and nonmotile sperm.
- Secretions (obtained with a sterile swab) from the vaginal pool for acid phosphatase, blood group antigen of semen, and precipitin test against human sperm and blood.
- Separate smears from the oral, vaginal, and anal areas.
- Culture of body orifices for gonorrhea.
- Blood serum for syphilis and HIV testing and deoxyribonucleic acid (DNA) analysis. A sample of serum for syphilis may be frozen and saved for future testing.
- Pregnancy test if there is a possibility that the female patient may be pregnant.
- Any foreign material (leaves, grass, dirt), which is placed in a clean envelope.
- Pubic hair samples obtained by combing or trimming. Several pubic hairs with follicles are placed in separate containers and identified as the patient's hair.

To preserve the chain of evidence, each specimen is labeled with the name of the patient, the date and time of collection, the body area from which the specimen was obtained, and the names of personnel collecting specimens. The specimens are then given to a designated person (e.g., crime laboratory technician), and an itemized receipt is obtained (ENA, 2020a).

Treating Potential Consequences of Rape

After the initial physical examination is completed and specimens have been obtained, any associated injuries are treated as indicated. The patient is given the option of prophylaxis against sexually transmitted infections (STIs) (also referred to as sexually transmitted disease [STDs]). Ceftriaxone given intramuscularly with 1% lidocaine may be prescribed as prophylaxis for gonorrhea. In addition, a single oral dose of metronidazole and either a single oral dose of azithromycin or a 7-day oral regimen of doxycycline may be prescribed as prophylaxis for syphilis and chlamydia (ENA, 2020a).

Antipregnancy measures may be considered if the patient is a female of childbearing age. A postcoital contraceptive medication, such as an oral contraceptive medication that contains levonorgestrel and ethinyl estradiol, may be prescribed after a pregnancy test. To promote effectiveness, the contraceptive medication should be given within 12 to 24 hours and no later than 72 hours after penile-vaginal intercourse. The 21-day package is prescribed so that the patient does not mistakenly take the inert tablets included in the 28-day package. An antiemetic agent may be given as prescribed to decrease discomfort from side effects. A cleansing douche, mouthwash, and fresh clothing are usually offered.

Follow-Up Care

The patient is informed of counseling services to prevent long-term psychological effects. Counseling services should be made available to both the patient and the family. A referral is made to the National Sexual Assault Hotline (see the Resources section) or directly to a local crisis intervention center. Appointments for follow-up surveillance for pregnancy and for STI and HIV testing also are made (ENA, 2020a).

The patient is encouraged to return to their previous level of functioning as soon as possible. When leaving the ED, the patient should be accompanied by a family member or friend.

Human Trafficking

Human trafficking is a type of modern-day slavery and one of the fastest growing global health issues. Human trafficking is defined as the exploitation of individuals with the use of force, fraud, coercion, or deception (ENA, 2018c; Roney & Villano, 2020). In 2016, an estimated 40.3 million people were trafficked; 1 in 4 of these were children, with nearly 25 million people involved in forced labor (ENA, 2018c). In the United States in 2018, over 23,078 contacts used the National Human Trafficking Hotline, which was a 25% increase compared to 2017 (Polaris Project, National Human Trafficking Hotline, 2018). People subjected to human trafficking have limited access to health care, and the ED may be the only access point to identify their situation (ENA, 2018c).

A victim of trafficking may present to the ED with injury, accompanied by a significantly older boyfriend or travel partner. The victim may have a history of being a chronic runaway, or of homelessness, and of self-mutilation. Common behaviors exhibited by these patients may include cowering or deferring to the person accompanying them, who may appear controlling, and appearing frightened or agitated. The patient may have a special mark/tattoo present, poor dentition, and multiple injuries in various stages of healing. Common physical complaints include injuries, poor healing or poorly healed old injuries, abdominal pain, dizziness, headaches, rashes, or sores.

Patients may demonstrate addiction, panic attacks, impulse control, hostility, and suicidal ideation (Roney & Villano, 2020).

The ED nurse may be well positioned to offer an opportunity for the patient to speak, alone without an accompanying companion, who could be a perpetrator of abuse. Targeted, appropriate questions may include asking patients if they are in control of their own money; whether or not they are able to come and go as they please; and who is the person or persons accompanying them (ENA, 2020a). Patients may decline assistance. The National Human Trafficking Hotline may be tapped into as a resource (see the Resources section).

PSYCHIATRIC EMERGENCIES

A psychiatric emergency is an urgent, serious disturbance of behavior, affect, or thought that makes the patient unable to cope with life situations and interpersonal relationships. A patient presenting with a psychiatric emergency may display overactive or violent, underactive or depressed, or suicidal behaviors.

The most important concern of the ED personnel is determining whether the patient is at risk for injuring self or others. The aim is to try to maintain the patient's self-esteem (and life, if necessary) while providing care. Determining whether the patient is under psychiatric care is important so that contact can be made with the therapist or provider who works with the patient.

Patients Who Are Overactive

Patients who display disturbed, uncooperative, and paranoid behavior and those who feel anxious and panicky may be prone to assaultive and destructive impulses and abnormal social behavior. Intense nervousness, depression, and crying are evident in some patients. Disturbed and noisy behavior may be exacerbated or compounded by alcohol or drug intoxication.

A reliable source for obtaining an accurate history is needed to identify events leading to the crisis. Past mental illness, hospitalizations, injuries, serious illnesses, the use of alcohol or drugs, crises in interpersonal relationships, or intrapsychic conflicts are explored. Because abnormal thoughts and behavior may be manifestations of an underlying physical disorder, such as hypoglycemia, drug or alcohol toxicity, a stroke, a seizure disorder, or head injury, a physical assessment is also performed.

The immediate goal is to gain control of the situation. If the patient is potentially violent, security or police should be nearby. Restraints are used as a last resort and only as prescribed. Approaching the patient with a composed, confident, and firm manner is therapeutic and has a calming effect. Helpful interventions include the following:

- Introduce yourself by name.
- Tell the patient, "I am here to help you."
- Repeat the patient's name from time to time.
- Speak in one-thought sentences, and be consistent.
- Give the patient space and time to slow down.
- Show interest in, listen to, and encourage the patient to talk about personal thoughts and feelings.

- Offer appropriate and honest explanations.

A psychotropic agent (e.g., one that exerts an effect on the mind) may be prescribed for emergency management of functional psychosis. However, a patient with a personality disorder should not be treated with psychotropic medications, and psychotropic medications should not be used if the patient's behavior results from the use of hallucinogens (e.g., lysergic acid diethylamide [LSD]).

Agents such as chlorpromazine and haloperidol act specifically against psychotic symptoms of thought fragmentation and perceptual and behavioral aberrations. The initial dose depends on the patient's body weight and the severity of the symptoms. After administration of the initial dose, the patient is observed closely to determine the degree of change in psychotic behavior. Subsequent doses depend on the patient's response. Typically, after stabilization, the patient is transferred to an inpatient psychiatric unit, or psychiatric outpatient treatment is arranged (ENA, 2020a).

Patients with Posttraumatic Stress Disorder (PTSD)

PTSD is the development of characteristic symptoms after a psychologically stressful event that is considered outside the range of normal human experience (e.g., rape, combat, motor vehicle crash, natural catastrophe, terrorist attack). Symptoms of this disorder include intrusive thoughts and dreams, phobic avoidance reaction (avoidance of activities that arouse recollection of the traumatic event), heightened vigilance, exaggerated startle reaction, generalized anxiety, and societal withdrawal. PTSD may be acute, chronic, or delayed. PTSD often presents as multiple readmissions to the ED for minor or recurring complaints without evidence of injury.

Veterans Considerations

Veterans are known to be at heightened risk of PTSD, particularly if they served in combat situations. It is estimated that between 11% and 20% of veterans who served during Operation Iraqi Freedom (2003–2011) and Operation Enduring Freedom (2001–2014) have had PTSD symptoms in a given year. Furthermore, 12% of veterans who served during the Persian Gulf War (1991) have had PTSD symptoms in a given year, while approximately 30% of veterans who served during the Vietnam War (1962–1973) have had PTSD symptoms at some point in their lifetime. In addition, veterans of any era may have been subjected to sexual assault or sexual harassment during their time in service, which may have resulted in military sexual trauma (MST), a specific type of PTSD. Approximately 23% of female veterans have been sexually assaulted while serving, while 55% of female veterans and 38% of male veterans have been subjected to sexual harassment while serving. In response to these statistics, the U.S. Department of Veterans Affairs (DVA) has sponsored a National Center for PTSD, which provides resources and hotlines to help veterans effectively deal with the effects of PTSD (see the Resources section) (DVA, 2020).

Patients Who Are Underactive or Depressed

In the ED, depression may be seen as the main condition bringing the patient to the health care facility, or it may be masked by anxiety and somatic complaints. The person who is depressed has a mood disturbance. Any patient who is depressed may be at risk for suicide. Most suicide attempts are expressions of extreme distress, not bids for attention (ENA, 2020a).

The patient must be screened regarding any attempts or thoughts of suicide. Questions such as "Have you ever thought about taking your own life?" may be helpful. In general, the patient is relieved to have an opportunity to discuss personal feelings. The emergency nurse's responsibility when caring for a patient with depression is to maintain a high suspicion for the diagnosis, especially for those populations at risk (see following discussion) (ENA, 2020a).

Patients Who Are Suicidal

Attempted suicide is an act that stems from depression (e.g., loss of a loved one, loss of body integrity or status, poor self-image) and can be viewed as a cry for help and intervention. Males are at greater risk of successfully committing suicide than females, who attempt suicide more often (ENA, 2020a). Others at risk are older adults; young adults; people who are enduring unusual loss or stress; those who are unemployed, divorced, widowed, or living alone; those showing signs of significant depression (e.g., weight loss, sleep disturbances, somatic complaints, suicidal preoccupation); and those with a history of a previous suicide attempt, suicide in the family, or psychiatric illness.

Being aware of people at risk and assessing for specific factors that predispose a person to suicide are key management strategies. Specific signs and symptoms of potential suicide include the following:

- Communication of suicidal intent, such as preoccupation with death or speaking of someone else's suicide (e.g., "I'm tired of living." "I've put my affairs in order." "I'm better off dead." "I'm a burden to my family.")
- History of a previous suicide attempt, with risk being much greater in these cases
- Family history of suicide
- Loss of a parent at an early age
- Specific plan for suicide
- A means to carry out the plan

Emergency management focuses on treating the consequences of the suicide attempt (e.g., gunshot wound, drug overdose) and preventing further self-injury. A patient who has made a suicidal attempt may do so again. Crisis intervention is used to determine suicidal potential, to discover areas of depression and conflict, to find out about the patient's support system, and to determine whether hospitalization or psychiatric referral is necessary. Depending on the patient's potential for suicide, the patient may be admitted to the intensive care unit, referred for follow-up care, or admitted to the psychiatric unit.

Unfolding Patient Stories: Carl Shapiro • Part 2

Recall from Chapter 23 Carl Shapiro, who was diagnosed with hypertension and hyperlipidemia during a routine visit to his primary provider. He arrives in the ED with a blood pressure of 210/110. The nurse discovers that he stopped his antihypertensive medication due to erectile dysfunction. How does the nurse maintain patient privacy in the ED during discussion of personal issues? What topics should be included in an individualized discharge plan to address his concerns, educational needs, and continuity of care when the nurse receives orders for an ACE inhibitor, captopril, and discharge home?

Care for Carl and other patients in a realistic virtual environment: *vSim* (**thepoint.lww.com/vSimMedicalSurgical**). Practice documenting these patients' care in DocuCare (**thepoint.lww.com/DocuCareEHR**).

CRITICAL THINKING EXERCISES

1 ebp A 48-year-old male arrived in the ED via ambulance. EMS personnel report that the patient was fishing when his boat overturned in a lake. He was in the water for at least 15 minutes before someone was able to get to him. The patient was initially unresponsive but was resuscitated by EMS en route to the hospital. His current body temperature is 34°C (93°F). What evidence-based interventions, including methods of rewarming, are indicated? What additional supportive care will be required? Explain the rationale and levels of support for these methods of treatment.

2 ipc A 19-year-old female college student arrives in the ED accompanied by her friend. She had just been at a party and states an acquaintance she knew forced her to have intercourse against her will. She is tearful and shaking and she appears to have some visible bruising. What priority nursing actions should be taken? What resources will need to be utilized in her care? Who should be consulted for the patient and what type of consent must she provide? Detail the steps that will be taken as you begin to care for this patient. What follow-up care will this patient need?

3 pq A 32-year-old female was brought to the ED by her fiancé. He states he had been working on a faulty hot water heater in the basement most of the day; when he came upstairs, the patient voiced complaints of a headache that had begun about 2 hours ago. He brought her to the ED when she began to complain of dizziness, palpitations, and she seemed to become increasingly confused. What questions would you include in your assessment? Explain the management of this patient and additional care that would be required. What concerns would you have for her fiancé?

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Resources

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American College of Emergency Physicians (ACEP), www.acep.org
American College of Surgeons (ACS), Injury Prevention and Control, www.facs.org/quality-programs/trauma/ipc
American Heart Association, www.heart.org
American Trauma Society (ATS), www.amtrauma.org/default.aspx
American Red Cross, Prepare for Emergencies, www.redcross.org/get-help/prepare-for-emergencies/types-of-emergencies
Divers Alert Network (DAN), www.diversalertnetwork.org
Emergency Nurses Association (ENA), www.ena.org
National Capital Poison, Poison Control Center, poison.org
National Center on Elder Abuse (NCEA), ncea.acl.gov
National Center for Health Statistics (NCHS), cdc.gov/nchs/
National Human Trafficking Hotline, www.humantraffickinghotline.org
National Institute on Drug Abuse, www.drugabuse.gov
National Safety Council, nsc.org
Rape, Abuse, and Incest National Network (RAINN), National Sexual Assault Hotline, rainn.org
Society of Trauma Nurses (STN), traumanurses.org
United States Department of Veterans Affairs PTSD: National Center for PTSD, www.ptsd.va.gov/understand/common/common_veterans.asp

68 Disaster Nursing

LEARNING OUTCOMES

On completion of this chapter, the learner will be able to:

1. Describe the types of disasters that the nurse may encounter as a member of the health care team.
2. Identify essential components of an emergency operations plan and disaster preparedness including personal protection and decontamination procedures.
3. Discuss how triage in a disaster differs from triage in an emergency department.
4. Explain clinical manifestations and treatment of injuries and illnesses resulting from natural disasters, from outbreaks, epidemics, and pandemics, and from various weapons of terror (blast, biologic, chemical, and radiologic events).

NURSING CONCEPTS

Health Care Systems
Managing Care
Safety

GLOSSARY

biologic weapon: a biologic agent that is used to spread disease among the general population or the military

chemical weapon: a chemical agent that is used to cause disability and mortality in the general population or the military

decontamination: process of removing, or rendering harmless, contaminants that have accumulated on personnel, patients, and equipment

disaster: a sudden disruption or event that interrupts the functioning of a community

disaster nursing: adaptation of nursing knowledge and skills to recognize and meet the health needs of individuals during times of crises

epidemic: a widespread outbreak of a specific infectious disease from a single source within a community or population that exceeds anticipated levels of impact

mass casualty incident (MCI): situation in which the number of casualties exceeds the number of available resources

material safety data sheet (MSDS): provides information to employees and health care providers regarding specific chemical agents; includes chemical name, physical data, chemical ingredients, fire and explosive hazard data, health and reactive data, spill or leak procedures, special protection information, and special precautions (*synonym*: the Workers' Right to Know)

natural disaster: a natural event such as a tornado, hurricane, flood, or earthquake that results in significant damage and loss of life

outbreak: the occurrence of a disease within a population that exceeds normal expectations

pandemic: an epidemic that spreads across multiple countries or continents

personal protective equipment (PPE): equipment beyond standard precautions; may include different levels of equipment to provide complete protection, depending on the nature of the suspected biologic, chemical, or radiologic agent

radiologic weapon: byproducts of radiation contamination that are used to cause morbidity and mortality in the general population or the military

terrorism: unlawful, systematic use of violence or threats of violence against people in order to coerce or intimidate

weapons of mass destruction (WMD): weapons used to cause widespread death and destruction

Health care facilities must be prepared for any type of disaster. A **disaster** is a sudden disruption or event that interrupts the functioning of a community (Veenema, 2019). This chapter focuses on disaster preparedness and the role of the nurse in preparing for and responding to disasters. **Disaster nursing** requires the adaptation of nursing knowledge and skills to recognize and meet the health and emotional needs of individuals during such times of crises known as disasters. Nurses serve on the frontline in providing care during a disaster or health crisis; they are called upon to work through difficult situations, sometimes with limited resources. They must utilize innovative thinking, lead effective coordination efforts, and clearly communicate the needs of their patients as well as their own personal needs (Veenema, 2019). Nursing responsibilities include preparing for and managing patients harmed by the effects of all disasters, including natural disasters, outbreaks, epidemics, and pandemics, as well as injuries and illnesses that can occur after biologic, chemical, and nuclear or radiation incidents, which may result from attacks of terrorism. Information about the process that nurses should follow in order to respond to these emergencies is applicable to other types of disasters as well.

Disaster Planning

The possibility and reality of mass casualties associated with disasters is not new to human history. Historically, communities that anticipated and devised plans to deal with the effects of disasters had better morbidity and mortality rates than those that did not. Within the United States, a plan that adheres to guidelines devised by the National Incident Management System (NIMS), which is directed by the U.S. Department of Homeland Security Federal Emergency Management Agency (FEMA), is essential for every community and facility. The preparation based on the NIMS guidelines is effective for terrorist events; **terrorism** is the unlawful, systematic use of violence or threats of violence against people in order to coerce or intimidate. NIMS guidelines are also followed for any other disaster situation, including natural disasters, outbreaks, epidemics, and pandemics. **Natural disasters** are caused by environmental forces including storms, floods, fires, earthquakes, and similar forces of nature

that result in significant damage or loss of life (Veenema, 2019). Airplane crashes, train crashes, and toxic substance spills are other disasters that can result in mass casualties and tax the resources of health care facilities and their communities.

Federal, State, and Local Responses to Disasters

Many resources are available at the federal, state, and local levels to assist in the management of disasters, mass casualty incidents, public health crises, and emergencies. A **mass casualty incident (MCI)** is defined as any incident that causes a large number of casualties to the extent that necessary resources become too scarce (Veenema, 2019). When resources to care for casualties become scarce, the greatest good for the greatest number of patients becomes the mode of operation. Local communities must be prepared to act in isolation (i.e., called *sustainability planning*) and provide competent care for up to 5 days before federal or other state resources may become available (FEMA, 2019).

Disasters are categorized by type based upon anticipated use of resources and incident duration. A list of local resources with specific instructions about how and when to contact these agencies or organizations should be readily available to local disaster planning committees and frequently reviewed by those committees for necessary updates.

A disaster response strategy cannot succeed without appropriate physical assets and staff trained and prepared to carry out the plan. Assets such as increased security; stockpiles of equipment and medications; and planning, drills, and training are essential (Veenema, 2019). Hazard vulnerability assessments should be performed to identify potential and actual threats that involve a particular facility or community. Mutual aid agreements among various communities must take these vulnerabilities into account. Successful execution of a response plan is based on knowledge, confidence, and readiness.

Federal Agencies

The National Health Security Strategy was designed to protect the health of all citizens of the United States in the event of any large-scale MCI or disaster (Veenema, 2019). This national strategy aims to prioritize the use of limited resources and to ensure a rapid coordinated response by the entire affected community so that the maximum number of lives are

saved, property is preserved and protected, and basic health care needs are met in the aftermath of any incident that results in mass casualties (FEMA, 2019). State authorities must request federal assistance with resources through appropriate government channels. A request for federal resources generally is made when local resources have become or are expected to become depleted.

Federal agencies that may provide resources in response to an MCI or a disaster include the Department of Health and Human Service (HHS), the Department of Defense, and the Department of Homeland Security (see Table 68-1). Each of these federal departments oversees hundreds of agencies that may respond to MCIs.

Nurses may be called upon to volunteer to provide support to select agencies or programs set up to respond to an MCI or a disaster. For example, Disaster Medical Assistance Teams (DMATs) organize voluntary medical personnel who can set up and staff a field hospital; DMATs are located across the country. Teams deploy with enough personnel, supplies, and equipment to be self-sufficient for 72 hours at a fixed or temporary medical site. During MCIs, team responsibilities may include triage, providing medical care despite adverse conditions, and preparing patients for evacuation (Veenema, 2019).

The Department of Homeland Security, through the National Terrorism Advisory System (NTAS), designates a level of security threat that is intended to alert the country to credible threats of terrorism. The NTAS notes two levels of terrorism threats, which include *bulletins* and *alerts*. An NTAS bulletin describes trends and developments in threats of terrorism; whereas, an NTAS alert more fully warns of a credible threat of terrorism within the United States. The NTAS alerts may be more specifically designated as an *elevated alert*, meaning that there is indeed a credible alert posted, or an *imminent alert,* meaning that there is a specific pending threat of terrorism within the United States (Department of Homeland Security [NTAS], 2019).

Additional support during disasters is available from the American Red Cross, which provides support systems and shelters as needed. A nongovernment, nonprofit agency, the American Red Cross mobilizes support for those in need because of the effects of disasters through training and mobilizing volunteers.

TABLE 68-1 Select U.S. Federal Agencies Involved in Disaster Response

Agency and Website	Responsibilities
Centers for Disease Control and Prevention (CDC) www.cdc.gov	Primary agency for disease prevention; controls activities and provides backup support to state and local health departments.
Department of Health and Human Service (HHS) www.hhs.gov	Primary agency for coordinating health, medical, and health-related social services under the federal emergency response plan.
Department of Defense (DoD) www.defense.gov	The armed service branches of DoD including the Army, Air Force, Coast Guard, Marine Corps, Navy, and National Guard, are the frontline military defense against acts of war and terrorist threats.
Department of Homeland Security www.dhs.gov	Develops and coordinates a comprehensive national strategy to strengthen federal, state, and local counterterrorism efforts.
Food and Drug Administration (FDA) www.fda.gov/home	Responsible for protecting the

	public health by ensuring the safety, efficacy, and security of human and veterinary drugs, biologic products, and medical devices; and by ensuring the safety of the food supply, cosmetics, and products that emit radiation
National Disaster Medical System (NDMS) www/phe.gov/Preparedness/responders/ndms/Pages/default.aspx	A multiagency system that supports and manages the coordination of medical responses to major emergencies and federally declared disasters that works in collaboration with public and private entities. NDMS is designed to care for victims of any incident that exceeds the capability of the state, regional, or federal health care system. Includes teams such as: • Disaster Medical Assistance

	Teams (DMATs) • Disaster Mortuary Operational Response Team (DMORTs) • Veterinary Medical Assistance Teams (VMATs) • National Medical Response Teams for Weapons of Mass Destruction (NMRTs)
U.S. Public Health Service (USPHS) www.usphs.gov/	A division of HHS that works to preserve and protect the public health of the nation. The USPHS consists of physicians, nurses, dentists, veterinarians, scientists, engineers, and other professionals who work in a variety of governmental agencies that promote the safety of the nation.

COVID-19 Considerations

In response to the coronavirus disease 2019 (COVID-19) pandemic, the Centers for Disease Control and Prevention (CDC) has provided an abundance of education addressing safety measures to combat the virus and precautions for populations at risk and offered regulatory guidance. These important regulations have informed government decisions enacted to ensure the safety of individuals during the pandemic (CDC, 2020a).

In addition to these measures, the Food and Drug Administration (FDA) accelerated the review of diagnostic tests to mitigate the spread of the virus. The FDA was responsible for ensuring that testing methods would provide both accurate and reliable results (FDA, 2020). Congress enacted an Emergency Use Authorization (EUA) that relaxed regulations and ultimately increased the availability of tests. The FDA then revised their standard procedures to allow for laboratory testing prior to FDA validation assessment, an unprecedented policy change that also allowed for increased testing capabilities (FDA, 2020).

State and Local Agencies

State and local resources that might be mobilized in response to a disaster may include branches of the CDC or American Red Cross, poison control centers, and other local volunteer organizations. The Metropolitan Medical Response Team Systems are local teams of health care providers located in cities considered possible terrorist targets who are funded for specialty responses. Many state and federal task forces have been developed to assist in the development and improvement of civilian medical response to chemical and biologic terrorism.

Most cities and all states have an Office of Emergency Management (OEM) or Office of Emergency Services (OES). The OEM/OES coordinates the disaster relief efforts at the state and local levels. The OEM/OES is responsible for providing interagency coordination during an emergency. It maintains a corps of emergency management personnel, including a leader, responders, planners, and administrative and support staff (Toner, 2017).

State and local governments play the primary role in the management of public health emergencies, such as the COVID-19 pandemic, until a request is made by a state that federal assistance is needed (Veenema, 2019). The Public Health Service (PHS) and FEMA are the two federal agencies that coordinate these efforts. In response to the COVID-19 pandemic, FEMA partnered with HHS to ensure adequacy of medical supplies and testing sites (FEMA, 2020a).

The Incident Command System

The Incident Command System (ICS) is a federally mandated command structure that coordinates personnel, facilities, equipment, and communication in any emergency situation. The ICS is the center of operations for organization, planning, and transport of patients in the event of a specific local MCI. Successful incident management requires equipment compatibility, effective communication, adequate distribution of resources, and clear differentiation of members' roles. The ICS ensures that any hazardous substances used during an MCI are identified promptly and that appropriate **personal protective equipment (PPE)** is distributed. PPE describes the use of equipment beyond standard precautions and may include different levels of protection, depending on the nature of the suspected biologic, chemical, or radiologic event (see later discussion). In addition to these responsibilities, the ICS is also responsible for determining when an MCI has ended (Veenema, 2019).

The Hospital Incident Command System (HICS) is a modification of the ICS that is used by both hospitals and law enforcement agencies. The HICS incident commander is the hospital emergency preparedness coordinator who oversees and coordinates all efforts surrounding the event. The HICS team includes a safety officer, public information officer, liaison officer, operations chief, logistics chief, planning chief, and finance chief. Each team member has a specific responsibility and communicates directly back to the incident commander (Veenema, 2019).

Hospital Emergency Preparedness Plans

Health care facilities are required by the Joint Commission to create a plan for emergency preparedness and to practice this plan with all employees at least twice a year. In general, these plans are developed by the facility's safety/disaster management committee and are overseen by an administrative liaison (California Hospital Association, 2017).

Before the basic emergency operations plan (EOP) can be developed, the planning committee of the health care facility evaluates characteristics of the community to identify the likely types of natural and man-made disasters that might occur. This hazard vulnerability analysis process is the responsibility of the local health care facility and its safety committee, safety officer, or emergency department (ED) manager. This information can be gathered by questioning local law enforcement, fire departments, and emergency medical systems and assessing the patterns of local train

traffic, automobile traffic, and flood, earthquake, tornado, or hurricane activity. Consideration is also given to possible MCIs that could arise because of the community's proximity to chemical plants, nuclear facilities, or military bases. Federal, judicial, or financial buildings, schools, and any places where large groups of people gather can be considered high-risk areas (Veenema, 2019).

The emergency preparedness planning committee must have a realistic understanding of its resources. The goal of each health care institution is to remain self-sufficient to provide and sustain core services without the support of external assistance for at least 96 hours from the inception of the incident; ideally, this self-sufficiency should last for 7 days (Veenema, 2019). The committee might also outline how staff would triage and assign priority to patients when resources are limited (e.g., when ventilators are in short supply). Multiple factors influence a facility's ability to respond effectively to a sudden influx of patients who are injured or sick, and the committee must anticipate various scenarios to improve its preparedness.

COVID-19 Considerations

As the incidence of COVID-19 cases in the United States continued to rise at a rapid pace during the early phases of this pandemic, political leaders began to encourage physical distancing among individuals to slow the rate of transmission; this practice became known as social distancing. The goal of social distancing was to attempt to flatten the curve of new infections, thereby avoiding a surge of demand on the health care system. However, the effects of social distancing were not enough to decrease the burden experienced by many U.S. hospitals in key geographic areas, such as New York City and New Orleans. Hospitals in these areas reported shortages of key equipment needed to care for patients who were critically ill, including ventilators and PPE for medical staff (Ranney, Griffeth, & Jha, 2020).

Insufficient PPE (e.g., respirators, face shields, gowns, hand and equipment sanitizer) for frontline health care workers resulted not only in exposures to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), but also in the deaths of health care workers from COVID-19. In response to these shortages, health care providers made pleas to government officials to try to secure adequate PPE for their frontline workers (Ranney et al., 2020). On February 4, 2020, the HHS Secretary declared the EUA of respiratory protective devices, which authorized the

use of additional respiratory protective devices. During this time, the FDA provided frequent updates to manufacturers, facilities, and local and state jurisdictions to increase the production of respirators and additional PPE (CDC, 2020a).

On April 8, 2020, the FEMA COVID-19 Supply Chain Task Force developed a four-step plan to preserve critical resources for medical use. The four steps included preservation, acceleration, expansion, and allocation (FEMA, 2020b). The shortage of critical medical supplies became a global crisis. In the United States, the Defense Production Act (DPA) allowed the president to direct private companies to produce equipment needed for a national emergency. A crucial role for the government is to coordinate efforts to ensure that areas that have been impacted the most are receiving needed equipment and supplies. As U.S. health care facilities continued to care for the growing number of patients hospitalized and critically ill with COVID-19, government officials worked to secure essential equipment needed to care for patients and ensure the safety of their workforce (Ranney et al., 2020).

Components of the Emergency Operations Plan

The principles of emergency management must be a part of the EOP design and include a comprehensive plan for tackling all potential and actual hazards. The main goal is the protection of the community. The EOP should be integrated with local, state, and federal government plans and coordinated with the private sector and volunteers. It must be coordinated in advance to achieve a single common purpose; yet the plan must be flexible enough to adapt to any potential disaster. Essential components of the EOP include the following (California Hospital Association, 2017):

- *Activation response:* The EOP activation response of a health care facility defines where, how, and when the response is initiated.
- *Internal/external communication plan:* Communication is critical for all parties involved, including communication to and from the prehospital arena.
- *Plan for coordinated patient care:* A response is planned for organized patient care into and out of the facility, including transfers from within the hospital to other facilities. The site of the disaster can determine where the greater number of patients may self-refer.

- *Security plans:* A coordinated security plan involving facility and community agencies is key to the control of an otherwise chaotic situation.
- *Identification of external resources:* Resources outside the facility are identified, including local, state, and federal resources and information about how to activate these resources.
- *Plan for people management and traffic flow:* "People management" includes strategies to manage the patients, the public, the media, and the personnel. Specific areas are assigned, and a designated person is delegated to manage each of these groups.
- *Data management strategy:* A data management plan for every aspect of the disaster will save time at every step. A backup system for documenting, tracking, and staffing is developed if the facility utilizes an electronic health record.
- *Demobilization response:* Deactivation of the response is as important as activation; resources should not be unnecessarily exhausted. The person who decides when the facility resumes daily activities is clearly identified. Any possible residual effects of a disaster must be considered before this decision is made.
- *After action report or corrective plan:* Facilities often see increased volumes of patients 3 months or more after an incident. Postincident response must include a critique and a debriefing for all parties involved, immediately and again at a later date.
- *Plan for practice drills:* Practice drills that include community participation allow for troubleshooting any issues before a real-life incident occurs.
- *Anticipated resources:* Food and water must be available for staff, families, and others who may be at the facility for an extended period.
- *MCI planning:* MCI planning includes such issues as planning for mass fatalities and morgue readiness.
- *Education plan for all of the above:* A strong education plan for all personnel regarding each step of the plan allows for improved readiness and additional input for fine-tuning the EOP.

As noted previously, hospitals are required to periodically hold disaster drills. Results from these drills can identify flaws within the EOP as well as unanticipated needs prior to any real disaster situation. Evidence

indicates that full-scale regional exercises that coordinate responses from both hospitals and emergency medical services (EMS) are the most effective drills because they clearly identify breakdowns in communication (FEMA, 2019).

Initiating the Emergency Operations Plan

Notification of a disaster situation to a health care facility varies with each situation. In general, the notification to the facility comes from outside sources unless the initial incident occurred at the facility. The disaster activation plan should clearly state how the EOP is to be initiated. If communication is functioning, field incident command will give notice of the approximate number of patients who are arriving, although the number of patients who are self-referring will not be known (Tintinalli, Ma, Yealy, et al., 2020).

 COVID-19 Considerations

In response to the COVID-19 pandemic, the CDC provided evidence-based guidance for maintaining the EOP for all health care facilities, which provided guidance for staff, patients, and visitors. The guidelines were developed to minimize the spread of the virus within the community and to ensure all hospital staff were trained, equipped, and capable of executing these mitigation practices (CDC, 2020b).

Identifying Patients and Documenting Patient Information

Patient tracking is a critical component of casualty management. Disaster tags, which are numbered and include triage priority, name, address, age, location and description of injuries, and treatments or medications given, are used to communicate patient information. The tag should be securely placed on the patient and remain with the patient at all times. The tag number and the patient's name, if known, are recorded in a disaster log. The log is used by the command center to track patients, assign beds, and provide families with information.

Triage

Triage is the sorting of patients to determine the priority of their health care needs and the proper site for treatment. In nondisaster situations, health care workers assign a high priority and allocate the most resources

to those who are the most critically ill (see Chapter 67). For example, under ordinary circumstances, a young adult who has a chest injury and is in cardiac arrest would receive advanced cardiopulmonary resuscitation, including medications, chest tubes, intravenous (IV) fluids, blood, and possibly emergency surgery in an effort to restore life. However, in a disaster, when health care providers are faced with a large number of casualties, the fundamental principle guiding resource allocation is to do the greatest good for the greatest number of people. Decisions are based on the likelihood of survival and consumption of available resources. Therefore, this same patient, and others with conditions associated with a high mortality rate, will be assigned as a low triage priority in a disaster situation, even if the person is conscious. Although this may sound uncaring, from an ethical standpoint the expenditure of limited resources on people with a low chance of survival, and denial of those resources to others with serious but treatable conditions, cannot be justified.

The triage officer rapidly assesses those injured at the disaster scene. Patients are immediately tagged and transported or given lifesaving interventions. One person performs the initial triage while other EMS personnel perform immediate lifesaving measures (e.g., intubation) and transport patients. Although EMS personnel carry out initial field triage, secondary and continuous triage at all subsequent levels of care is essential (Tintinalli et al., 2020).

TABLE 68-2 Triage Categories During a Mass Casualty Incident

Triage Category	Priority	Color	Typical Conditions
Immediate: Injuries are life-threatening but survivable with minimal intervention. Individuals in this group can progress rapidly to expectant if treatment is delayed.	1	Red	Sucking chest wound, airway obstruction secondary to mechanical cause, shock, hemothorax, tension pneumothorax, asphyxia, unstable chest and abdominal wounds, incomplete amputations, open fractures of long bones, and second/third-degree burns of 15–40% total body surface area
Delayed: Injuries are significant and require medical care but can wait hours without threat to life or limb. Individuals in this group receive treatment only after immediate casualties are treated.	2	Yellow	Stable abdominal wounds without evidence of significant hemorrhage; soft tissue injuries; maxillofacial wounds without airway compromise; vascular injuries with adequate collateral circulation; genitourinary tract disruption; fractures requiring open reduction, débridement, and external fixation; most eye and central nervous system injuries
Minimal: Injuries are minor, and treatment can be delayed hours to days. Individuals in this group should be moved away from the main triage area.	3	Green	Upper extremity fractures, minor burns, sprains, small lacerations without significant bleeding, behavioral disorders or psychological disturbances
Expectant: Injuries are extensive, and chances of survival are unlikely even with definitive care. Persons in this group should be separated from other casualties, but not abandoned. Comfort measures should be provided when possible.	4	Black	Patients who are unresponsive with penetrating head wounds, high spinal cord injuries, wounds involving multiple anatomic sites and organs, second/third-degree burns in excess of 60% of body surface area, seizures or vomiting within 24 h after radiation exposure, profound shock with multiple injuries, agonal respirations, no pulse, no blood pressure, pupils fixed and dilated

It is important that an experienced ED provider is positioned at the entrance to provide primary triage at the acute care facility. Traffic control within the facility is one of the most important components of managing the disaster and resources (Veenema, 2019). The triage area may be outside the entry or just at the door of the ED. This facilitates the triage of all patients—those arriving by medical transport and those who walk into the ED. Some patients who have already been seen in the field may be reclassified in the triage area based on their current presentation.

Triage categories separate patients according to the severity of injury. A common triage method is the use of a special color-coded tagging system so that the triage category is immediately obvious. This system consists of four colors: red, yellow, green, and black. Each color signifies a different level of priority. Table 68-2 describes each category and gives examples of how different injuries would be classified (see Chapter 67). Alternative triage systems exclusively for MCI have also been designed. One triage system that has gained support in the United States and is used for mass casualty transport is the SALT (*S*ort, *A*ssess, *L*ifesaving interventions, *T*reatment/*T*ransport) system. It instructs the providers to quickly "*S*ort" casualties by assessing a patient's ability to follow commands, then to individually "*A*ssess" casualties to rapidly apply "*L*ifesaving interventions," and assign a priority for "*T*reatment and/or *T*ransport." SALT triage was developed to allow for rapid evaluation and sorting of patients of any age, injured in any type of event (Veenema, 2019).

Managing Internal Problems

The American Red Cross has developed a basic survival/shelter resource kit; however, each facility must determine its supply lists based on its own needs assessment. The EOP committee should determine the top 10 critical medications used during normal day-to-day operations and then anticipate which other medications may be required in a disaster or in an MCI. For example, the health care facility might plan to have available a stockpile of antidotes (e.g., cyanide kits) or antibiotics used in treating biologic agents. Information should be available about stocking or restocking any of the basic and special supplies, how those supplies are requested, and the time required to receive those supplies.

Communicating with the Media and Family

Communication is a key component of disaster management. Communication within the vast team of disaster responders is paramount; however, effective, informative communication with the media and worried family members is also crucial.

Managing Media Requests for Information

Although the media have an obligation to report the news and can play a positive role in communication, reporters and newscasters and their support teams can compromise operations and patient confidentiality. The disaster plan should include a clearly defined process for managing all media requests, including social media, and include a designated spokesperson, the public information officer, a site for the dissemination of information (away from patient care areas), and a regular schedule for providing updates.

The EOP helps prevent the release of contradictory or inaccurate information. Initial statements should focus on current efforts and what is being done to better understand the scope and impact of the situation. Information about casualties should not be released. Security staff should not allow media personnel access to patient care areas. However, media resources may be mobilized to notify the general population when disease containment is needed in case of an epidemic or the potential for one, including the location of shelters, necessity of quarantines, and point of dispensing units in the case of bioterrorism (Veenema, 2019).

Caring for Families

Friends and family members converging on the scene must be cared for by the facility. The public information officer's role is to provide direction for the families and provide them with information as it becomes available. They may be feeling intense anxiety, shock, or grief and should be provided with information and updates about their loved ones as soon as possible and regularly thereafter. They should not be in the triage or treatment areas but in a designated area staffed by available social workers, counselors, therapists, or clergy. Access to this area should be controlled to prevent families from being disturbed. Information regarding loved ones can also be obtained at this time, which assists in identification of both the injured and the deceased.

There may be times during a disaster situation such as an outbreak, epidemic, or pandemic that health care facilities must restrict visitation or access to the hospital. Health care organizations and nurses who typically

pride themselves on providing patient- and family-centered care may be forced to prohibit visitors from accompanying loved ones to the hospital in order to reduce the spread of a virus or other infectious diseases which could be potentially fatal to visitors who are living with chronic health conditions. The health care team, which may be organized by the nurse, is responsible for developing a clear communication plan that designates a primary point of contact and eliminates barriers to communication (Hart, Turnbull, Oppenheim, et al., 2020). To keep families informed and encourage interactions among patients and their support network, hospitals have relied heavily on using technology during these disaster situations (e.g., FaceTime™, Google Hangouts™, Skype™, Zoom™). Some patients and their families may come from socioeconomically disadvantaged backgrounds and not have access to computer systems and associated software that can facilitate remote conversations. An adequate plan addresses the needs of families who may be socioeconomically disadvantaged and puts into effect plans that can meet their needs (Hart et al., 2020).

COVID-19 Considerations

In response to the COVID-19 pandemic, many U.S. hospitals restricted visitors and family members from entering the hospitals for the health and safety of visitors, patients, and employees. The CDC provided strict visitation guidelines for health care facilities in order to reduce the risk of transmission and combat the lack of PPE. Many hospitals restricted visitors in all inpatient locations, behavioral health units, EDs, and ambulatory procedure units. Many elective procedures were cancelled (see Chapter 52, Chart 52-4). One support person was permitted to be with the obstetric patient during labor, delivery, and postpartum care. When possible, the identified support person was to remain with the patient for the duration of the admission. Temporary visitation may have been granted for patients in extenuating circumstances (e.g., imminent death), or for specific populations who required extra support, including patients with developmental disability or cognitive impairment. Facilities were encouraged to identify alternative methods for patients and families to communicate and interact, including the use of technology as described previously (CDC, 2020c).

Chart 68-1 discusses cultural variables to consider when coping with disaster-related injuries and death.

The Nurse's Role in Disaster Response Plans

Nurses make up the largest component of the health care workforce across the globe (Veenema, 2019). The role of the nurse during a disaster varies. Nurses may be asked to perform duties outside their areas of expertise and may take on responsibilities normally held by physicians or advanced practice nurses. For example, a critical care nurse may intubate a patient or even insert a chest tube. A nurse may perform wound débridement or suturing. A nurse may serve as the triage officer. In these situations, it is imperative that nurses strive to maximize patient safety and be aware of state regulations related to nursing practice (American Nurses Association [ANA], 2017; Casey, 2017).

Chart 68-1

Cultural Considerations

Any disaster or mass casualty incident can be expected to involve members of diverse religious, ethnic, and cultural groups or may be targeted at and predominately affect a specific religious or ethnic group. Health care providers likewise include members of all religious, ethnic, and cultural backgrounds and should bear in mind that victims may have needs relating to the following:

- Family roles and extended family importance
- Language difficulties that increase fears and frustrations
- Privacy
- Rituals about handling the dead
- Specific religious practices related to medical treatment, hygiene, or diet
- Specific places/times for prayer
- Timing of funeral services
- Travel and visa restrictions limiting access to one's country of origin, family, work, or educational opportunities.

Some religious communities have plans for emergencies and disasters, and local hospitals should integrate these plans to the extent possible into their emergency operations plans.

Although the exact role of a nurse in disaster management depends on the specific needs of the facility at the time, it should be clear which nurse or physician is in charge of a given patient care area and which procedures each individual nurse may or may not perform. Assistance can

be obtained through the HICS, and nonmedical personnel can provide services where possible. Nurses may be asked to delegate care to others, including students, staff assisting from other institutions, or volunteers. This process requires the nurse to rapidly assess the skills of those who are available to assist in patient care. Nurses must continue to emphasize patient safety and delegate appropriately. As the availability of coworkers, clinical experts, or support services may be limited, nurses may need to rely more upon their own competence or the collective competence of a new team (ANA, 2020).

During a disaster, nurses may feel a tension between maintaining traditional patient-centered approaches to care, which aim to achieve the maximum good for individual patients, and the need for public-focused approaches, which prioritize fair resource allocation during crisis conditions. A public health approach to ethics can provide nurses guidance in balancing this tension. "Public health emergencies require clinicians to change their practice, including in some situations, acting to prioritize the community above the individual in fairly allocating scarce resources" (Berlinger, Wynia, Powell, et al., 2020, p. 1). Nurses should remember that nursing care in a disaster focuses on essential care from a perspective of what is best for all patients (see Chart 68-2). In addition, acquiring knowledge of the hospital disaster plan, participating in drills, and honing competencies related to disaster management are essential (Casey, 2017). Nurse leaders and administrators should be cognizant of potential security issues and assess and plan for surge capacity capability and inhouse resources such as water, supplies, pharmaceuticals, and generator power. They also should predetermine means to evacuate the hospital if necessary, including identifying an ultimate destination or destinations. The hospital must plan for shortages of all kinds—staff, medications, water/food, and equipment (Veenema, 2019).

New settings and atypical roles for nurses arise during a disaster—for example, the nurse may provide shelter care in a temporary housing area or bereavement support and assistance with identification of deceased loved ones. People may require crisis intervention, or the nurse may participate in counseling other staff members and in critical incident stress management (CISM). Special care may be warranted for at-risk populations during a disaster (see Chart 68-3).

Chart 68-2  **ETHICAL DILEMMA**

Who Receives a Mechanical Ventilator When They Are Scarce Commodities During a Pandemic?

Case Scenario

You are a staff nurse who works in an emergency department (ED) in a university-affiliated hospital. Your community is in the midst of a surge of positive cases of coronavirus disease 2019 (COVID-19), and all ICU beds are filled with patients with COVID-19. For the past 12 hours, there have been no mechanical ventilators available for patients who are admitted and who are in severe respiratory distress until a patient who is intubated dies in the ICU, freeing up a ventilator. Currently, there are two patients waiting in the ED who would be intubated and mechanically ventilated if ventilators were available. Both patients have no significant medical or surgical history, are of normal weight, are nonsmokers, and take no prescription medications. One of these patients is T.C., a 55-year-old woman who is a cashier at a supermarket. The other patient is E.W., a 22-year-old female nursing student. Since both T.C. and E.W. are considered to be equivalent in terms of purported benefits of mechanical ventilation, the hospital's predetermined randomization protocol is implemented to determine who receives the ventilator. T.C. is selected to receive ventilatory support. As E.W.'s primary nurse, you question why T.C. is selected over E.W. and wonder if E.W.'s younger age and presumably longer lifespan and her chosen field of work as a future nurse should have given her preferential advantages over T.C. in receiving ventilatory support.

Discussion

During times of crises with scarcity of critical resources, protocols must be devised to assure that scarce resources are allocated in a fair and just manner. Most hospitals in the United States devised such contingency protocols in response to the COVID-19 pandemic. These protocols were devised to maximize potential benefits to society and ensure fair and equitable access to needed resources. In order to ensure fairness, patients eligible to receive resources may not face discrimination because of ethnic origin or race, socioeconomic status, sexual orientation, gender, or age.

Analysis

- Describe the ethical principles that are in conflict in this case (see Chapter 1, Chart 1-7). Patient autonomy is typically the preeminent ethical principle in all but crises situations. How can you ensure that E.W.'s dignity may be preserved despite these

trying circumstances? Presumably, E.W.'s age can mean that she has more years of life ahead of her than T.C. Should this give her an advantage over T.C.? Should purported benefits to therapy be quantified by projecting years of productive life?

- Frontline health care workers are triaged to receive some benefits before others during pandemics (e.g., priority for vaccinations). E.W. is not a frontline worker. However, she is a nursing student and could be a future frontline worker. There are some who may argue that while E.W. could be a future frontline worker, that T.C., as a supermarket cashier, is already functioning as an essential worker. Should either one of them be given preferential consideration for receiving ventilatory support due to their current or potential designation as frontline workers? Why or why not?
- What resources may be available to assist you in reconciling this distressing rationing situation in your ED? How can you ensure that just and fair decisions are being made for your patients and for the people you serve within your community?

References

Baumrucker, S. J., Carter, G., Adkins, R. W., et al. (2020). Ethics roundtable: Distribution of critical care resources in the setting of a COVID-19 surge. *American Journal of Hospice and Palliative Care Medicine*, *37*(12), 1096–1101.

Resources

See Chapter 1, Chart 1-10 for Steps of an Ethical Analysis and Ethics Resources.

Chart 68-3

Caring for People with Disability During a Disaster

When a disaster occurs, the multiple agencies involved attempt to provide food, water, and shelter to all those affected. People with disability have specific needs that require attention. It is recommended that people with disability have a personal support network to check on them after a disaster and to provide needed assistance. They should also have a backup system and an evacuation plan. Agencies need to be aware that service animals are also affected during a disaster and may be brought to shelters with their companions.

Evacuation assistance is imperative for people with disability. Directions to personal equipment (e.g., communication aids, medications, oxygen) should be available to rescue personnel. In a rapid evacuation, mobility devices, oxygen, suction, and medications will be needed at the shelters. Special efforts to keep those with vision or hearing impairment informed should be implemented. People skilled in sign language are also valuable resources during a disaster. The American Red Cross and the National Organization on Disability provide information on their websites for disaster preparedness for people with disability (see the Resources section).

Adapted from Centers for Disease Control and Prevention (CDC). (2018a). *Preparedness and safety messaging for hurricanes, flooding, and similar disasters*. Retrieved on 3/1/2020 at: www.cdc.gov/cpr/readiness/00_docs/CDC_Hurricanes_PreparednessSafetyMessaging_July2018_508.pdf

Considering Ethical Conflicts

Disasters can present a disparity between the resources of the health care agency and the needs of those affected by the disaster (Leider, DeBruin, Reynolds, et al., 2017). This generates ethical dilemmas for nurses and other health care providers. Issues include conflicts related to the following:

- Assisted suicide
- Confidentiality
- Consent
- Duty
- Futile therapy
- Rationing care
- Resuscitation

Nurses may find it difficult to not provide care to the dying or to withhold information to avoid spreading fear and panic. Clinical scenarios that are unimaginable in normal circumstances confront the nurse in extreme instances. Other ethical dilemmas may arise out of health care providers' instincts for self-protection and protection of their families.

Nurses can plan for the ethical dilemmas they will face during disasters by establishing a framework for evaluating ethical questions before they arise and by identifying and exploring possible responses to difficult clinical situations. They can consider how the fundamental ethical principles of autonomy, nonmaleficence, beneficence, and distributive justice will influence their decisions and care in disaster response (Ram-Tiktin, 2017) (see Chapter 1).

COVID-19 Considerations

The COVID-19 crisis has created unprecedented challenges and ethical issues for frontline health care professionals, including insufficient supplies of PPE, shortages of lifesaving equipment, compromised standards of care, and conflicts between professional duties and personal health and safety concerns. As a result, many nurses and other health care providers have been at risk for or experienced moral distress (Altman, 2020). Examples of ethical issues related to COVID-19 included:

- Strictly limited hospital visitation policies that hampered nurses from involving families in care decisions
- Isolation measures that resulted in patients dying without family physically present
- Dire situations in which patients could have been denied potentially lifesaving therapies due to shortages and triaged care

The Code of Ethics for Nurses highlights the importance of providing safe, quality patient care. However, nurses also have an obligation to self-care and to providing support to their own families. Nurses may worry that they will cause harm to a loved one and struggle with how to balance their professional responsibilities with their personal commitments (Johns Hopkins University [JHU], 2020). These equally important obligations contribute to conflicts during pandemics when nurses must care for critically ill infectious patients, often under extreme circumstances that may include an insufficiency and inadequacy of resources and uncontained contagion. During pandemics, nurses must decide how much care they can provide to others while also taking care of themselves. They must be supported in these crucial decisions by the systems in which they

provide care and by society (ANA, 2020). Nurses may struggle with the call to volunteer and respond in a pandemic. According to a policy statement drafted by the ANA (2020) in response to the COVID-19 pandemic, nurses may choose not to respond for the following reasons:

- Being a member of a vulnerable group
- Safety concerns related to a lack of PPE or inadequate testing
- Inadequate support to meet personal or family needs
- Concerns regarding professional and legal protection for providing nursing care

Organizational support for the nurse must be assured. Nurses must continue to advocate for systems and protocols that protect their ethical obligations as nurses, as well as ensure equity and fairness to all concerned in times of pandemics (ANA, 2020) (see Ethical Dilemmas in Chart 68-2, and in Chapter 19, Chart 19-7, and Chapter 48, Chart 48-9).

Managing Behavioral Issues

Disasters by nature are stressful and life-changing experiences which may cause adverse psychological effects, social disruption, and increased risks for vulnerable populations, including violence and abuse (Sloand, Killion, Yarandi, et al., 2017). Although most individuals function well during a disaster, both people and communities suffer immediate and sometimes long-term psychological trauma that most often relates to fear and anxiety (Veenema, 2019). Common responses to disaster include:

- Anxiety
- Compassion fatigue
- Depression
- Impaired performance
- Interpersonal conflicts
- Posttraumatic stress disorder
- Somatization (fatigue, general malaise, headaches, gastrointestinal disturbances, skin rashes)
- Substance use disorder (SUD)

Factors that influence a person's response to disaster include the degree and nature of the exposure to the disaster; loss of friends, family members, and pets; existing coping strategies; available resources and support; and the personal meaning attached to the event. Other factors, such as loss of home and valued possessions, extended exposure to danger, and exposure to toxic contamination, also influence response and increase the risk of adjustment problems. Those exposed to the dead and

injured, those endangered by the event, older adults, children, emergency first responders, and health care personnel caring for victims are considered to be at higher risk for emotional sequelae. A person's normal response to stress and bereavement will also affect their response after a disaster (Emergency Nurses Association [ENA], 2020).

Nurses can assist victims of disaster through active listening and providing emotional support, giving information, and referring patients to therapists or social workers. Experience has shown that few victims of disaster seek these services, and early intervention minimizes psychological consequences. Nurses can also discourage victims from subjecting themselves to repeated exposure to the event through media replays and news articles, as well as encourage them to return to normal activities and social roles when appropriate (ENA, 2020).

Critical Incident Stress Management

CISM is an approach to preventing and treating the emotional trauma that can affect emergency responders as a consequence of their jobs and that can also occur to anyone involved in a disaster or MCI. CISM is handled by teams, which are available to the OEM. There are 350 such teams in the United States. All branches of emergency services have CISM teams, as do the military and civilian industries (e.g., airline industry).

Components of a management plan include education (preparedness) before an incident occurs about critical incident stress and coping strategies; field support (ensuring that staff get adequate rest, food, and fluids, and rotating workloads) during an incident; and defusings, debriefings, demobilization, supportive services to the family and follow-up care after the incident (Kalanlar, 2019; Veenema, 2019) (see Chapter 67 for further discussion on CISM).

Preparedness and Response

Preparedness and response planning are essential to identify risks of disasters and minimize the negative impact of potential disasters on individuals and communities.

Recognition and Awareness

Preparedness for disasters includes devising specific community contingency plans that prepare residents, particularly those who are

vulnerable (e.g., older adults, people with disability) for access to necessary life-sustaining resources and for evacuation, as necessary. Preparedness also includes an awareness of the potential for covert use of **weapons of mass destruction (WMD)** (i.e., weapons used to cause widespread death and destruction), self-protection, and early detection, containment, or decontamination of substances and agents that may affect others by secondary exposure. The strength of many toxins, mobility of many members of society, and long incubation periods for some organisms and diseases can result in an epidemic that can quickly and silently spread across the entire country. For example, a formerly healthy person with a rapid onset of pneumonia and respiratory failure can have an ominous illness, such as COVID-19.

Nurses should have a heightened awareness of trends that may suggest deliberate dispersal of toxic or infectious agents or the onset of an outbreak, epidemic, or pandemic that may include the following:

- An unusual increase in the number of people seeking care for fever, respiratory, or gastrointestinal symptoms
- Clusters of patients who present with the same unusual illness from a single location. For example, clusters can be from a specific geographic location, such as a city, or from a single sporting or entertainment event or social gathering (e.g., wedding, funeral)
- A large number of fatalities, especially when death occurs within 72 hours after hospital admission
- Any increase in disease incidence in a normally healthy population. These cases should be reported to the state health department and to the CDC

If any of these trends are noted, a targeted patient history is taken in an attempt to identify the possible agent involved. This history includes an occupational, work, and environmental assessment, in addition to the regular admission history. An exposure history contains, at a minimum, information about current and past exposures to possible hazards and an assessment of the patient's typical day and any deviations in routines. The work history includes, at a minimum, a description of all previous jobs, including short-term, seasonal, and part-time employment and any military service. The environmental history includes an assessment of present and previous home locations, water supply, and any hobbies, to name a few factors. The admission history should include such information as recent travel, especially international travel, and contact with others who have been ill or have recently died of a fatal illness. This

is just a brief review of the history that may need to be obtained to identify an exposure agent (Veenema, 2019).

In all cases, unusual trends, suspicions, or findings are reported to the appropriate resources in the facility and to proper authorities in the community. Resources can include the infection control department, the state health department, the CDC, the local poison control center, various internet sites, and **material safety data sheets (MSDS)** (see the Resources section). The MSDS provides information to employees and health care providers regarding specific chemical agents; it includes the chemical name, physical data, chemical ingredients, fire and explosive hazard data, health and reactive data, spill or leak procedures, special protection information, and special precautions. Reporting furnishes data elements to those agencies responsible for epidemiology and response. Reporting also allows for sharing of information among facilities and jurisdictions and can help determine the source of infections or exposure and prevent further exposures and even deaths (Occupational Safety and Health Administration [OSHA], 2012).

COVID-19 Considerations

Patterns of illness can continue to evolve during outbreaks, epidemics, and pandemics that involve novel pathogens. For instance, at the beginning of the COVID-19 pandemic, it was thought that children could not become infected with SARS-CoV-2; however, as the virus continued to spread, it became clear that the number of children infected was, in fact, equivalent to the rate of infection in adults. The majority of children who were infected, however, experienced much milder symptoms. It was only after cases in New York City peaked and began to decline that pediatricians began to see a new pattern in which dozens of children exposed to COVID-19 were becoming extremely ill, yet presented with different symptoms than adults. The CDC (2020d) began to warn of multisystem inflammatory syndrome in children (MIS-C), a condition which causes inflammatory changes to a variety of organs, including the heart, lungs, kidneys, brain, skin, eyes, or gastrointestinal organs. The cause remains unknown, but many of the children with MIS-C had been infected with SARS-CoV-2 or had been exposed to someone who had the virus. MIS-C can be serious and even deadly without prompt medical care (CDC, 2020d).

Personal Protective Equipment (PPE)

Another component of preparedness and response involves the protection of the health care provider by additional PPE. Chemical or biologic agents and radiation are silent killers and are generally colorless and odorless. The purpose of PPE is to shield health care workers from the chemical, physical, biologic, and radiologic hazards that may exist when caring for patients who have been contaminated or who can spread contagion. The U.S. Environmental Protection Agency (EPA) has divided protective clothing and respiratory protection into the following four categories, levels A through D:

- *Level A* protection is worn when the highest level of respiratory, skin, eye, and mucous membrane protection is required. This includes a self-contained breathing apparatus (SCBA) and a fully encapsulating, vapor-tight, chemical-resistant suit with chemical-resistant gloves and boots.
- *Level B* protection requires the highest level of respiratory protection but a lesser level of skin and eye protection than with level A situations. This level of protection includes the SCBA and a chemical-resistant suit, but the suit is not vapor tight.
- *Level C* protection requires an air-purified respirator, which uses filters or sorbent materials to remove harmful substances from the air. A chemical-resistant coverall with splash hood, chemical-resistant gloves, and boots are included in level C protection.
- *Level D* protection is the typical work uniform and is used for nuisance contamination only; it does not provide adequate protection in cases in which respiratory or skin threats are present. Other PPE such as gloves or mask may be required based on the situation.

Levels C and D PPE are the levels most often used in hospital facilities. Protective equipment must be donned before contact with a patient who has been contaminated. The acute care facility's standard precaution PPE (level D) generally is not adequate for protection from a patient who has been chemically, biologically, or radiologically contaminated. Level C PPE is adequate for the average patient exposure. The health care provider must use equipment that is capable of providing protection against the agent involved. This may mean using a splash suit along with a full-face positive- or negative-pressure respirator (a filter-type gas mask) or even an SCBA for medical personnel in the field.

Chart 68-4  NURSING RESEARCH PROFILE

Whole-Process Training to Improve Use of Personal Protective Equipment

Tan, W., Ye, Y., Yang, Y., et al. (2020). Whole-process emergency training of personal protective equipment helps healthcare workers against COVID-19. *Journal of Occupational and Environmental Medicine, 62*(6). 420–423.

Purpose

Health care workers are at increased risk of exposure to the pathogen that causes coronavirus disease 2019 (COVID-19). Without proper knowledge of the donning and doffing of personal protective equipment (PPE), health care professionals are more susceptible to infection, illness, and possibly death. The purpose of this study was to evaluate the effectiveness of a three-phase training program on the proper use of PPE for health care workers in China.

Design

This study was developed in a hospital system in Beijing, China, where health care workers were caring for patients who had a known or suspected diagnosis of COVID-19. Qualified instructors and training assistants developed an educational program on appropriate use of PPE (e.g., hats, N95 respirators, goggles, face shields, shoe covers, and protective coveralls) across various areas of workflow (e.g., clean, possibly contaminated, contaminated). Teaching strategies included lecture and demonstration by faculty, followed by simulation, which allowed participants to practice what they had learned prior to being evaluated in phase three. Program developers established scoring criteria to evaluate the effectiveness of participants' performance. Two researchers independently scored participants on a variety of predetermined outcomes (e.g., proficiency levels) before and after the training sessions. Paired *t* tests were used to analyze differences in scores before and after the educational session. Prior to conducting large-scale training and evaluation, researchers conducted an experimental or pilot study using a smaller number of participants.

Findings

Thirty-eight health care workers participated in the initial experimental training, including 31 nurses. Significant differences were found between pre- and posttest scores. Almost three quarters of the participants (73.68%) did not pass the pretest. However, 100% were successful following the educational program. Subsequently, 263 health care workers participated in the large-scale training, including 225 nurses; posttest scores were also significantly improved in this sample.

Participants struggled the most with the use of N95 respirators and protective coveralls.

Nursing Implications

Multimodal educational programs, which include simulation have the potential to provide critical educational experiences for nurses that assist in keeping them safe and reducing the transmission of life-threatening viruses. Simulation enables experts to guide health care workers during an extremely stressful time and allows learners to practice the skills they need to protect themselves, their coworkers, and their patients. Such programs are essential in preparing an educated workforce to be ready to face the next pandemic or crisis.

No single PPE is capable of protecting against all hazards. Under no circumstances should responders wear any PPE without proper training, practice, and fit testing of respirator masks as necessary (OSHA, 2017). See the Nursing Research Profile in Chart 68-4.

N95 respirator masks are used to reduce the nurse's exposure to particles, which include small-particle aerosols and large droplets (see Fig. 68-1). The mask filters out at least 95% of airborne particles and, in ideal situations, should be discarded after each patient encounter or aerosol-generating procedure. The mask should be discarded when it becomes damaged or deformed, no longer forms an effective seal to the face, becomes wet or visibly dirty, breathing becomes difficult, or it becomes contaminated with blood, respiratory or nasal secretions, or other bodily fluid (CDC, 2020e). Alternatively, a regular surgical mask provides the nurse protection against large droplets, splashes or sprays, bodily or other hazardous fluids, and protects the patient from the nurse's respiratory emissions. This mask does not require a tight seal, does not provide the wearer with a reliable level of protection from inhaling smaller airborne particles, and is not considered respiratory protection. Ideally, surgical masks should also be discarded after each patient encounter (CDC, 2020e). The CDC provides guidance to health care facilities regarding when it is appropriate to wear an N95 respirator mask versus a regular surgical mask during patient encounters. The N95 respirator mask must be evaluated, tested, and approved for the individual prior to wearing per facility policy and procedures.

Figure 68-1 • N95 respirator. Courtesy of 3M Health Care.

Decontamination

Decontamination, the process of removing accumulated contaminants or rendering them harmless, is critical to the health and safety of health care providers by preventing secondary contamination. The decontamination plan should establish procedures and educate employees about decontamination procedures, identify the equipment needed and methods to be used, and establish methods for disposal of contaminated materials (Veenema, 2019).

Although many principles and theories surround decontamination of a patient, authorities agree that to be effective, decontamination must include a minimum of two steps. First step is the removal of the patient's clothing and jewelry and then rinsing the patient with water. Depending on the type of exposure, this step alone can remove a large amount of the contamination and decrease secondary contamination. The second step consists of a thorough soap-and-water wash and rinse. The hospital must be prepared to perform additional decontamination prior to entry into the facility. The hospital personnel may also treat "walking wounded" who did not receive any decontamination at the scene (Tintinalli et al., 2020).

Quality and Safety Nursing Alert

When patients arrive at the facility after being assessed and treated by a prehospital provider, it should not be assumed that they have been thoroughly decontaminated.

Natural Disasters

Natural disasters may result in mass casualties. Natural disasters can occur anywhere at any time and include events such as tornadoes, hurricanes, floods, avalanches, tidal waves (e.g., tsunamis), earthquakes, and volcanic eruptions (see Table 68-3). In the event of a natural disaster, loss of communications, potable water, and electricity is usually the greatest obstacle to a well-coordinated emergency response, and preparatory planning is essential. Wireless technology (e.g., cellular phones, computers, other communication devices) may not be functional (Tintinalli et al., 2020).

The majority of the immediate casualties are trauma related. These mass casualties require the trauma system to provide triage, transport of patients (in poor weather and road conditions), and management within the trauma centers. Most patients usually begin arriving within an hour of the event. However, the "walking wounded" may not seek care for 5 days to 2 weeks after the event or may seek care for injuries received during cleanup activities. Casualties arrive at hospitals in three waves. The first wave consists of people who are minimally (generally) injured who arrive of their own accord. The second wave consists of patients who are severely injured. The third wave consists of patients who are injured and who arrive after they are discovered by rescuers. For example, in the event of earthquakes, rescuers may find injured patients in collapsed buildings; the majority of fatalities from injuries in this case primarily involve the head and chest (Veenema, 2019).

TABLE 68-3 Select Natural Disasters

Event	Issues and Injuries
Earthquakes	Associated with multiple aftershocks, tsunamis Buildings require tethering in earthquake-prone areas *Injuries:* Physical injury; dehydration; pulmonary problems
Flooding	Can accompany other natural disasters Results in home and community destruction *Injuries:* Nonfatal drowning/drowning (e.g., people swept away in currents); waterborne and vector-borne diseases (e.g., shigellosis, *Escherichia coli* infection, hepatitis A, giardiasis, leptospirosis, malaria, plague, dengue fever); physical injury from debris
Hurricanes	Cause flooding (see previous discussion) and tornadoes (see later discussion) Failure to evacuate Food and water safety *Injuries:* From recovery activities (e.g., chainsaws), stress-related disorders, and GI and other vector-borne diseases; physical injury; bites from traumatized pets
Tornadoes	Minimal warning, fast moving (approximately 30 mph and travel approximately 20 km) Massive destruction, shelter loss *Injuries:* Physical injury; blastlike effects from pressure (see discussion of blast injuries in text)
Tsunamis	As with flooding (see above) but with much more rapid onset resulting in immediate large volume of water on land *Injuries:* Physical injury from debris; vector-borne diseases (see the Flooding section); cholera
Volcanic eruptions	Hazards from lava, openings in ground, gases, ash up to a 20-mile radius *Injuries:* Acid rain; toxic gases result in inhalation injury; physical injury

GI, gastrointestinal.

Adapted from Veenema, T. G. (2019). *Disaster nursing and emergency preparedness* (4th ed.). New York: Springer.

Excessive exposure to the natural elements and the need for food and water (by both patients and emergency responders) are critical issues. Without cover (e.g., buildings may be unsafe or destroyed) or potable water (e.g., water may be either contaminated or unavailable), injuries from exposure to heat, cold, or contaminated food or water can occur. Safety equipment that protects rescue workers from injury, exposure, and potentially dangerous animals (e.g., snakes, alligators, spiders) must be

readily available. Rescue workers may also injure themselves in the process of extrication or cleanup (e.g., chain saws, building collapse). Hypothermia can occur rapidly in workers who are exposed to water at temperatures of 23.9°C (75°F) or less. As is true during all disasters, mental health workers and shelters are needed throughout the community. Veterinary assistance is also essential because pets are frequently abandoned and injured. In addition, emergency response workers must be prepared to treat the most common ailments experienced after exposure to a specific natural disaster. For instance, pulmonary problems peak with earthquakes and volcanic eruptions because of the increased particulate matter in the air (Veenema, 2019).

In some instances, early warning systems have assisted in decreasing the number of deaths from tornadoes and hurricanes. Even with the advent of early warning systems, some people are unable or unwilling to leave prior to the occurrence of the natural disaster.

When buildings collapse, rapid response to identify and remove trapped victims is the only means of improving survivability. Water-damaged buildings are not safe and require extensive examination before experts can ensure safe occupancy. Larger-scale issues that can cause significant later morbidity and mortality include the absence of water purification, waste removal, removal of human and animal remains, and vector control. Removal or disposal of biologic, chemical, and nuclear agents must also be considered (Tintinalli et al., 2020).

Outbreaks, Epidemics, and Pandemics

An **outbreak** is the occurrence of a disease within a population that exceeds normal expectations. Outbreaks can be classified as communicable disease outbreaks, outbreaks caused by exposure to chemicals or toxins, and outbreaks from unknown sources. An outbreak may be transmitted via persons, animals, or from the environment (WHO, 2020b).

An **epidemic** is a widespread outbreak of a specific infectious disease from a single source within a community or population that exceeds anticipated levels of impact. An epidemic exists when new cases exceed the expected incidence of that disease. The rate and transmission of the infectious disease is dependent on multiple factors which include preexisting levels of the disease in the community, environmental changes that occurred as a result of the disease, population density and displacement, disruption of utilities, interruption of health services, and

public sanitation. In order for a true epidemic to occur, there must be a vulnerable population, the presence of a disease agent, and a mechanism that supports large-scale transmission (Veenema, 2019). During an epidemic, there is a need to respond quickly and intentionally as catastrophic loss of human life and economic devastation may occur. Epidemics may be deemed an emergency if any of the following characteristics are present (Veenema, 2019):

- Large number of cases projected to occur
- Disease leads to serious disability or death
- Disease threatens to cause social or economic disruption
- Officials are unable to manage resources adequately due to the surge in cases. This includes sufficient number of trained personnel, necessary supplies and equipment (e.g., vaccines, medications, testing equipment, etc.)
- Risk to transmit the disease internationally

A **pandemic** is an epidemic that spreads across multiple countries or continents. There are many more individuals affected and greater number of deaths associated with pandemics than epidemics. In March 2020, the World Health Organization (WHO) characterized COVID-19 as a pandemic (WHO, 2020a).

Communicable disease outbreaks, which may eventually lead to epidemics or pandemics, are investigated through public health surveillance and the monitoring of clusters of illnesses. Interviews, questionnaires, and home visits may be beneficial when people are experiencing the same symptoms of illness (CDC, 2018b). It is imperative to identify the source of the illness and institute measures for the containment of the outbreak. An outbreak is over when the numbers of new cases fall below the number of normally expected cases (CDC, 2018b).

Weapons of Terror

Geopolitical forces and interests and the availability of destructive technology have brought the possibility of more terrorist events to our doorstep. Terrorism involves the systematic use of violence to create feelings of fear. Examples include the destruction of the World Trade Center towers and the damage to the Pentagon on September 11, 2001; the Boston Marathon bombing on April 15, 2013; and the coordinated series of terrorist attacks in Paris on November 13, 2015; in Brussels on

March 22, 2016; and the London attacks on Westminster Bridge and Parliament on June 3, 2017. Over 26,445 deaths had occurred in 2017 from terrorism-related violence; over the last decade, deaths across the world from terrorism ranged from a low of 7827 in 2010 to a high of 44,490, in 2014 (Ritchie, Hasell, Appel, et al., 2020). Terrorists have become increasingly sophisticated, organized, and therefore effective. It is no longer a question of *whether* a terrorist event will again lead to mass casualties, but *when* such an event will occur. The U.S. Department of Homeland Security was created after the attacks of September 11, 2001, to coordinate federal and state efforts to combat terrorist activity.

Terrorists preferentially use WMD which may leverage the use of blasts or biologic, chemical, or radiologic agents. Although terrorist events are not everyday events, they can occur at any facility, and every nurse needs to know the basics of caring for patients who have been affected.

Blast Injury

A blast may result from terrorism but can also occur anywhere at any time if the right (or wrong) circumstances come together (e.g., welding inside of a tank that formerly contained tar but was not properly cleaned can result in an explosion as well as severe tar burns to the worker).

Types of Explosive Devices

The bomb most commonly utilized by terrorists is the pipe bomb, which contains low-velocity explosives and may also contain nails or other implements that cause more damage when the explosive ignites. Another type of commonly used explosive device is the Molotov cocktail, which uses a common flammable liquid such as gasoline in a glass bottle and a source of ignition, such as a rag. This forms a simple yet effective incendiary device. Other types of explosive devices include fertilizer bombs and dirty bombs, which include a radioactive source that spreads radiation after the initial blast (Durakovic, 2017).

Hazards following a bombing include secondary devices (set to explode at a predetermined time, typically after the arrival of rescue personnel); building collapse; contamination from biologic, chemical, or radiologic weapons; and the presence of terrorists among the patients and bystanders. The entire scene of the bombing is a crime scene and is treated as such. Triage of patients involved in a bombing is the same as

for all other disasters, with a heightened awareness that serious internal injuries from the blast wave may not be immediately evident.

Physical Injuries

Distance from the blast, whether the blast space was enclosed, composition of the explosive, whether a building collapsed, and the efficiency of medical resources available after the blast all affect patient outcomes after a blast injury. The actual blast that occurs during the initial seconds of the bombing or explosion causes a pressure wave or primary blast wave. Injuries can result from the impact of the explosion, the primary blast wave, or shrapnel (i.e., debris from the bomb). The majority of injuries are caused by the primary blast wave (Tintinalli et al., 2020). A blast wave has four effects. These include spalling, which refers to the pressure wave itself; implosion, which refers to rupture of organs from entrapped gases; shearing, which refers to the blast response of different body tissues, dependent on their density; and irreversible work, which refers to the presence of forces that exceed the tensile strength of an organ or tissue. If the blast occurs in an enclosed space, the wave has the opportunity to be reflected and thus amplified (Veenema, 2019). The various phases of blasts and related injuries are detailed in Table 68-4.

Blast Lung

Blast lung results from the blast wave as it passes through air-filled lungs. The result is hemorrhage and tearing of the lung, ventilation–perfusion mismatch, and possible air emboli. Typical signs and symptoms include dyspnea, hypoxia, tachypnea or apnea (depending on severity), cough, chest pain, and hemodynamic instability. Management involves providing respiratory support that includes administration of supplemental oxygen with nonrebreathing mask but may also require endotracheal intubation and mechanical ventilation. If a hemothorax or pneumothorax is present, a chest tube must be inserted to re-expand the lung. In the event of an air embolus, the patient should be immediately placed in the prone, left lateral position to prevent migration of the embolus and will require emergent treatment in a hyperbaric chamber (Tintinalli et al., 2020). Complications following blast lung can include respiratory failure as well as acute respiratory distress syndrome (ARDS) (see Chapter 19).

Tympanic Membrane Rupture

Tympanic membrane (TM) rupture is the most frequent injury after subjection to a pressure wave because TM is the body's most sensitive

organ to pressure. There is an increased incidence of TM rupture when a blast occurs in close proximity to the patient and when it occurs in an enclosed space. Signs and symptoms include hearing loss, tinnitus, pain, dizziness, and otorrhea (Jorolemon, Lopez, & Krywko, 2019). The majority of TM ruptures heal spontaneously. Approximately 5% of patients with TM rupture from a blast will require hearing aids, whereas the majority will suffer only mild high-frequency hearing loss (ENA, 2019). Other ear injuries may include ossicular disruption and impaction of foreign bodies.

TABLE 68-4 Phases of Blasts and Associated Common Injuries

Phase of Blast Injury	Common Injuries
Primary: Results from initial blast or air wave.	Affects primarily air-filled organs: Tympanic membrane rupture, middle ear injury—permanent deafness may occur Pulmonary—pneumothorax, pulmonary contusions, air embolus Head injuries, including concussion, other severe brain injuries Abdominal hollow organ perforation, hemorrhage
Secondary: Results from debris from the scene or shrapnel from the bomb that act as projectiles	Penetrating trunk, skin, and soft tissue injuries Fractures, traumatic amputations
Tertiary: Results from pressure wave that causes the victim to be thrown	Head injuries Fractures, including skull
Quaternary: Results from preexisting conditions exacerbated by the force of the blast or by postblast injury complications	Severe injuries with complex injury patterns—burns, crush injuries, head injuries Common preexisting conditions that become exacerbated—COPD, asthma, cardiac conditions, diabetes, and hypertension

COPD, chronic obstructive pulmonary disease.

Adapted from Jorolemon, M. R., Lopez, R. A., & Krywko, D. M. (2019). Blast injuries. In *StatPearls [Internet]*. Treasure Island, FL: StatPearls Publishing. Retrieved on 3/27/2020 at: www.ncbi.nlm.nih.gov/books/NBK430914/

Abdominal and Head Injuries

Blast abdomen may be evidenced by abdominal hemorrhage and internal organ injury. The typical signs and symptoms of internal abdominal injury

can include pain, guarding, rebound tenderness, rectal bleeding, nausea, and vomiting (Jorolemon et al., 2019) (see Chapter 67).

Head injuries are typically minor, but those that are severe result in the majority of postblast deaths. These injuries can occur without a direct blow to the head and may result from the blast itself, building collapse, or flying debris. Concussions commonly occur post blast, and the usual follow-up evaluation and treatment for postconcussive syndrome is indicated (see Chapter 63). Approximately 30% of head injuries involve vascular structures (e.g., arteriovenous fistula, pseudoaneurysm, or dissection) (Veenema, 2019).

Special Populations

Special populations may have different blast-associated risks. For instance, older adults are particularly susceptible to bone fractures because they tend to have decreased bone density. They also tend to have more preexisting morbid conditions that may be exacerbated by the explosion. Patients who are pregnant are particularly susceptible to placental shear forces that may result in abruptio placentae. People with mobility disability may have difficulty extricating themselves from the site of the blast (CDC, 2018a).

Biologic Weapons

Biologic weapons are weapons that spread disease among the general population or the military. They can be used for sabotage, such as food or water contamination with a small target area or may be used by global terrorists with intentions to spread fear and disruption of daily life (Tintinalli et al., 2020).

Effects of Biologic Weapons

Biologic weapons are easily obtained and easily disseminated and can result in significant mortality and morbidity (see Table 68-5). The potential use of biologic weapons calls for continuous increased surveillance by health departments and an increased index of suspicion by clinicians. Many biologic weapons result in signs and symptoms similar to those of common disease processes. Appropriate management of a biologic threat includes rapid recognition of the potential weapon; the use of proper PPE; decontamination, isolation, or quarantine of patients who are infected when appropriate; and the administration of appropriate vaccinations, antidotes, or medications to people at risk.

Biologic weapons are delivered in either a liquid or a dry state, applied to foods or water, or vaporized for inhalation or direct contact. Vaporization may be accomplished through spray or explosives loaded with the weapon. Because of increase in travel by people in industrialized nations, a biologic weapon could be released in one city and affect people in other cities thousands of miles away. The vector can be an insect, animal, or person, or there may be direct contact with the weapon itself.

Two of the biologic agents most likely to be used or weaponized are discussed in the next section. Table 68-6 describes other easily weaponized biologic agents.

TABLE 68-5 Categories of Biologic Weapons

Category	Mortality and Morbidity	Examples of Biologic Agents That May Be Weaponized
Category A	High mortality	*Bacillus anthracis* (anthrax) *Clostridium botulinum* (botulism) *Francisella tularensis* (tularemia) Viral hemorrhagic fevers (e.g., dengue, Ebola) Variola (i.e., smallpox) *Yersinia pestis* (plague)
Category B	Low mortality, moderate morbidity	*Brucella* species (brucellosis) *Coxiella burnetii* (Q fever) *Staphylococcus aureus, Vibrio* species (food poisoning) *Rickettsia typhi* (typhus) Arboviruses (viral encephalitis) *Cryptosporidium parvum* (cryptosporidiosis)
Category C	Low mortality, low morbidity	Hantavirus

Adapted from Veenema, T. G. (2019). *Disaster nursing and emergency preparedness* (4th ed.). New York: Springer.

Types of Biologic Weapons

Anthrax

Anthrax is recognized as the most likely weaponized biologic agent available and has been recognized as a highly debilitating agent for centuries. *Bacillus anthracis* is a naturally occurring gram-positive, encapsulated rod-shaped bacterium that lives in the soil in the spore state throughout the world. The bacterium sporulates (i.e., is liberated) when exposed to air and is infective only in the spore form. Contact with

infected animal products (raw meat) or inhalation of the spores results in infection. Cattle and other herbivores are vaccinated against anthrax to prevent transmission through contaminated meat. As an aerosol, anthrax is odorless and invisible and can travel a great distance before disseminating; hence, the site of release and the site of infection can be miles apart (ENA, 2020).

Clinical Manifestations

Anthrax is caused by replicating bacteria that release toxin, resulting in hemorrhage, edema, and necrosis. There are three main methods of infection: skin contact, gastrointestinal ingestion, and inhalation. Approximate incubation periods are 5 to 7 days (cutaneous), 1 to 6 days (gastrointestinal), and 1 to 43 days (inhalation). Skin lesions (the most common infection) cause edema with pruritus and macule or papule formation, resulting in ulceration with 1- to 3-mm vesicles. A painless eschar develops, which falls off in 1 to 2 weeks (ENA, 2020).

TABLE 68-6 Select Examples of Biologic Agents That Can Be Used as Weapons

Agent/Organism	Contagion	Decontamination and Protective Equipment	Signs and Symptoms	Treatment (Mortality Rate)
Botulism—*Clostridium botulinum:* Botulinum blocks acetylcholine-containing vesicles from fusing with the terminal membranes of the motor neuron end plate, resulting in a flaccid paralysis.	Direct contact Not contagious through human-to-human contact	Any skin exposure to the botulinum toxin can be treated with soap and water or a 0.1% hypochlorite solution. Standard precautions are used when treating patients with botulism.	*Gastrointestinal botulism:* Abdominal cramps, nausea, vomiting, and diarrhea *Inhalation botulism:* Fever; symmetric descending flaccid paralysis with multiple cranial nerve palsies. *Classic signs and symptoms include* diplopia, dysphagia, dry mouth, lack of fever, and alert mental status. *Other possible symptoms include* ptosis of the eyelids, blurred vision, enlarged sluggish pupils, dysarthria, and dysphonia. *Mortality secondary to:* Airway obstruction and inadequate tidal volume.	Supportive ventilatory therapy is necessary if respiratory infection occurs. Aminoglycosides and clindamycin are contraindicated because they exacerbate neuromuscular blockage. Equine antitoxin is used to minimize subsequent nerve damage. There is a 2% rate of anaphylaxis to the antitoxin; therefore, diphenhydramine and epinephrine must be immediately available for use. Supportive care—mechanical ventilation, nutrition, fluids, prevention of complications. (Mortality rate = 5%)
Plague—*Yersinia pestis:* nonsporulating, gram-negative coccobacillus. The bacterium causes destruction and necrosis of the lymph nodes.	Contagious *Bubonic plague:* Transmitted through flea bites with no person-to-person transmission *Pneumonic plague:* Transmitted through respiratory droplet contact	Isolation barrier precautions with full-face respirators; the patient should wear a mask. Rooms should receive a terminal cleaning. Clothing and linens with body fluids on them should be cleaned with the usual disinfectant. Routine precautions should be used in the case of death.	*Bubonic plague:* Sudden fever and chills, weakness, a swollen and tender lymph node (bubo) in the groin, axilla, or cervical area. The resultant bacteremia progresses to septicemia from the endotoxin and, finally, shock and death. *Primary septicemic plague:* Disseminated intravascular coagulation, necrosis of small vessels, purpura, and gangrene of the digits and nose (black death). *Pneumonic plague:* Severe bronchospasm, chest pain, dyspnea, cough, and hemoptysis. There is a 100% mortality associated with pneumonic plague if not treated within the first 24 h.	Streptomycin or gentamicin for 10–14 days. Start within 12–24 h. Tetracycline or doxycycline is an acceptable alternative if an aminoglycoside cannot be given. People with close contact exposure (<2 m) require prophylaxis with doxycycline for 7 days. (Mortality rate = 50%)
Tularemia—*Francisella tularensis:* Gram-negative, coccobacillus, one of the most infectious bacteria known.	Direct contact with infected animals or aerosolized as a bioterror weapon; bites Not contagious through human-to-human contact Found in Oklahoma, Missouri, Arkansas	Standard barrier precautions. Clothing and linens should be laundered under the usual hospital protocol.	*Initial:* Abrupt onset of fever, fatigue, chills, headache, lower backache, malaise, rigor, coryza, dry cough, and sore throat without adenopathy. Nausea and vomiting or diarrhea possible. *As disease progresses:* Sweating, fever, progressive weakness, anorexia, and weight loss demonstrate continued illness. *Mortality secondary to:* Pneumonitis (if inhalation is the source) with copious watery or purulent sputum, hemoptysis, respiratory insufficiency, sepsis, and shock.	Streptomycin or gentamicin/aminoglycoside for 10–14 days. Inhalation tularemia must be treated within 48 h of onset. In mass casualty situations, doxycycline or ciprofloxacin is recommended. For persons exposed to tularemia, tetracycline or doxycycline is recommended for 14 days. (Mortality rate = 2%)

Adapted from Emergency Nurses Association. (2020). *Sheehy's emergency nursing: Principles and practice* (7th ed.). St. Louis, MO: Elsevier Mosby; Emergency Nurses Association. (2019). *Trauma nursing core course* (8th ed.). Chicago: Author; and Veenema, T. G. (2019). *Disaster nursing and emergency preparedness* (4th ed.). New York: Springer.

Ingestion of anthrax results in fever, nausea and vomiting, abdominal pain, bloody diarrhea, and occasionally ascites. If severe diarrhea develops, decreased intravascular volume becomes the major treatment concern. The bacterium targets the terminal ileum and cecum. Sepsis can occur (ENA, 2020).

Inhaling anthrax results in severe clinical manifestations. Its symptoms mimic those of the flu, and usually treatment is sought only when the

second stage of severe respiratory distress occurs. Antibiotic therapy does not halt the progress of the disease. Inhaled anthrax can incubate for up to 60 days, making it difficult to identify its source. Initial signs and symptoms include cough, headache, fever, vomiting, chills, weakness, mild chest discomfort, dyspnea, and syncope without rhinorrhea or nasal congestion. Most patients have a brief recovery period followed by the second stage within 1 to 3 days, characterized by fever, severe respiratory distress, stridor, hypoxia, cyanosis, diaphoresis, hypotension, and shock. These patients require optimization of oxygenation, correction of electrolyte imbalances, and ventilatory and hemodynamic support. More than 50% of these patients have hemorrhagic mediastinitis on a chest x-ray (a hallmark sign). Inhalation anthrax may progress to include meningitis with subarachnoid hemorrhage. Death results approximately 24 to 36 hours after the onset of severe respiratory distress. The mortality rate approaches 100% (ENA, 2020).

Management

At present, anthrax is penicillin sensitive; however, strains of penicillin-resistant anthrax are thought to exist. Recommended treatment includes penicillin, ciprofloxacin, levofloxacin, and doxycycline (ENA, 2020). If antibiotic treatment begins within 24 hours after exposure, death can be prevented. In a mass casualty situation, treatment with ciprofloxacin or doxycycline is recommended, because these easily given oral antibiotic agents are stockpiled and there should be sufficient dosages to fully treat many patients who have been anthrax-exposed. Treatment is continued for 60 days. For patients who have been directly exposed to anthrax but have no signs and symptoms of disease, ciprofloxacin or doxycycline is used for prophylaxis for 60 days (U.S. Department of Health and Human Services, 2018).

Standard precautions are needed when caring for a patient infected with anthrax. The patient is not contagious, and the disease cannot spread from person to person. Equipment should be cleaned using standard hospital disinfectant. After death, cremation is recommended because the spores can survive for decades and represent a threat to morticians and forensic medicine personnel. A vaccination, which includes six doses is available for the Department of Defense, and the CDC is in the process of developing a civilian vaccination protocol (ENA, 2020).

Smallpox

Smallpox (variola) is classified as a deoxyribonucleic acid (DNA) virus. It has an incubation period that ranges from 7 to 17 days. It is extremely

contagious and spread by direct contact, by contact with clothing or linens, or by droplets from person to person only after the fever has decreased and the rash phase has begun (ENA, 2020). Aerosolization of the virus would result in widespread dissemination.

The WHO declared eradication of smallpox in 1977 and stopped worldwide vaccination in 1980. In the United States, the last child was vaccinated in 1972. Therefore, a large portion of the current population has no immunity to the virus. A smallpox vaccination plan, introduced in 2003, proposed that a designated number of ED staff receive the first vaccinations to ensure that ED staff would be immunized in the event of a smallpox outbreak. The government estimated that 0.1% of those people receiving the vaccine would have serious side effects. Of these, approximately 4% would have life-threatening complications, and 0.1% would die. Currently, only people with a high likelihood of exposure to smallpox are encouraged to receive the vaccination (CDC, 2017).

Clinical Manifestations

Signs and symptoms of smallpox infection include high fever, malaise, headache, backache, and prostration. After 1 to 2 days, a maculopapular rash appears, evolving at the same rate, beginning on the face, mouth, pharynx, and forearms. Only then does the rash progress to the trunk and become vesicular to pustular (Veenema, 2019). There is a large amount of virus in the saliva and pustules. The person remains contagious until the rash crusts over and falls off (ENA, 2020). There are two forms of smallpox: variola major and variola minor. Variola major is more common, results in a higher fever and more extensive rash, and has a 30% case fatality rate (i.e., the likelihood of fatality per case diagnosed). Hemorrhagic smallpox, a subtype of variola major, includes all of the above signs and symptoms plus a dusky erythema and petechiae leading to frank hemorrhage of the skin and mucous membranes, and it results in death by day 5 or 6 (Veenema, 2019).

Management

Treatment includes supportive care with antibiotic agents for any additional infection. Antivirals and immune globulin may aid in treatment; however, vaccination remains the most effective method of prevention (ENA, 2020). The patient should be isolated in a negative-pressure environment, using strict airborne and contact precautions. Laundry and biologic wastes should be autoclaved before being washed with hot water and bleach. Standard decontamination of the room is effective. All people who have household or face-to-face contact with the

patient after the fever begins should be vaccinated within 4 days to prevent infection and death. A patient with a temperature of 38°C (101°F) or higher within 17 days after exposure must be placed in isolation. Cremation is preferred for all deaths, because the virus can survive in scabs for up to 13 years (Veenema, 2019).

Chemical Weapons

Chemical weapons may be used as agents in warfare or for terrorist purposes. These are overt agents whose effects are more apparent and occur more quickly than those caused by biologic weapons (see Table 68-7). Poisonous exposure to everyday chemicals also may occur; the same management principles discussed later apply when patients are exposed to these chemical agents when not used as weapons. Typical exposures in these instances include industrial chemicals, gasoline, turpentine, kerosene, and insecticides (ENA, 2019).

Characteristics of Chemicals

Volatility

Volatility is the tendency for a chemical to become vapor. The most common volatile agents are phosgene and cyanide. Most chemicals are heavier than air, except for hydrogen cyanide. Therefore, in the presence of most chemicals, people should stand up to avoid heavy exposure (because the chemical will sink toward the floor or ground).

TABLE 68-7 Common Chemical Agents

Agent	Action	Signs and Symptoms	Decontamination and Treatment
Nerve Agents			
Sarin Soman	Inhibition of cholinesterase	Increased secretions (salivation, lacrimation, emesis, urination), gastrointestinal motility, diarrhea, bronchospasm	Soap and water Supportive care Benzodiazepines Pralidoxime Atropine
Blood Agent			
Cyanide	Inhibition of aerobic metabolism	Inhalation—tachypnea, tachycardia, coma, seizures; bright red skin; can progress to respiratory arrest, respiratory failure, cardiac arrest, death	Soap and water Sodium nitrite Sodium thiocyanate Amyl nitrate Hydroxocobalamin
Vesicant Agents			
Lewisite Sulfur mustard Nitrogen mustard Phosgene	Blistering agents	Superficial to partial-thickness burn with vesicles that coalesce; conjunctivitis, nasal irritation	Soap and water Blot; do not rub dry
Pulmonary Agents			
Phosgene Chlorine	Separation of alveoli from capillary bed	Pulmonary edema, bronchospasm, chest tightness, burning sensation, blurry vision; phosgene can result in pain then blisters followed by partial to full-thickness burn	Copious flushing Move to fresh air—away from gases Airway management Ventilatory support Bronchoscopy

Adapted from Emergency Nurses Association. (2020). *Sheehy's manual of emergency care: Principles and practice* (7th ed.). St. Louis, MO: Elsevier Mosby; Emergency Nurses Association. (2019). *Trauma nursing core course* (8th ed.). Chicago: Author; and Veenema, T. G. (2019). *Disaster nursing and emergency preparedness* (4th ed.). New York: Springer.

Persistence

Persistence means that the chemical is less likely to vaporize and disperse. More volatile chemicals do not evaporate very quickly. Most industrial chemicals (e.g., cyanide) are not very persistent. Weaponized agents (chemicals developed as weapons by the military or terrorists [e.g.,

mustard gas]) are more likely than industrial chemicals to penetrate the skin and mucous membranes and cause secondary exposure.

Toxicity

Toxicity is the potential of an agent to cause injury to the body. The median lethal dose (LD_{50}) is the amount of the chemical that will cause death in 50% of those who are exposed. For example, cyanogen chloride has the highest LD_{50}, twice that of hydrogen cyanide and eight times higher than sulfur mustard (OSHA, 2012). The median effective dose (ED_{50}) is the amount of the chemical that will cause signs and symptoms in 50% of those who are exposed. The concentration time (CT) is the concentration released multiplied by the time exposed (in milligrams per minute). For example, if 1000 mg of a chemical is released and the time a person is exposed to this amount of chemical is 10 minutes, then the CT would be 10,000 mg/min.

Latency

Latency is the time from absorption to the appearance of signs and symptoms. Sulfur mustards and pulmonary agents have the longest latency, whereas other vesicants, nerve agents, and cyanide produce signs and symptoms within seconds.

Limiting Exposure

Evacuation is essential, as is removal of the person's clothing and decontamination as close to the scene as possible and before transport of the person who has been exposed. Soap and water are effective means of decontamination in most cases. Staff involved in decontamination efforts must wear PPE and contain and dispose of the runoff after decontamination procedures (ENA, 2020).

Types of Chemicals

Vesicants

Vesicants are chemicals that cause blistering and result in burning, conjunctivitis, bronchitis, pneumonia, hematopoietic suppression, and death. Examples of vesicants include lewisite, phosgene, nitrogen mustard, and sulfur mustard. In World War I and in the Iran–Iraq conflict of 1980 to 1988, vesicants were used to disable opponents. Vesicants were the main incapacitating agents, resulting in minimal (less than 5%)

death but large numbers of injuries (Veenema, 2019). Liquid sulfur mustard was the most frequently used vesicant in these conflicts.

Clinical Manifestations

The initial presentation after exposure to a vesicant is similar to that of a large superficial to partial-thickness burn in the warm and moist areas of the body (i.e., perineum, axillae, antecubital spaces). There is stinging and erythema for approximately 24 hours, followed by pruritus, painful burning, and small vesicle formation after 2 to 18 hours. These vesicles can coalesce into large, fluid-filled bullae. Lewisite and phosgene result in immediate pain after exposure. Tissue damage occurs within minutes (Veenema, 2019).

If the eyes are exposed, there will be pain, photophobia, lacrimation, and decreased vision. This progresses to conjunctivitis, blepharospasm, corneal ulcer, and corneal edema.

Respiratory effects are more serious and often are the cause of mortality with vesicant exposure. Manifestations may include dyspnea, necrosis of large airway mucosa with sloughing, chemical pneumonitis, pulmonary edema, and ARDS which may lead to respiratory failure and death (Veenema, 2019). Gastrointestinal exposure may cause nausea and vomiting, leukopenia, and upper gastrointestinal bleeding.

Management

Appropriate decontamination includes soap and water. Scrubbing and the use of hypochlorite solutions should be avoided because they increase penetration. Once the substance has penetrated, it cannot be removed. Eye exposure requires copious irrigation. For respiratory exposure, intubation and bronchoscopy to remove necrotic tissue are essential. With lewisite exposure, dimercaprol is administered IV for systemic toxicity and topically for skin lesions. All persons with sulfur mustard exposures should be monitored for 24 hours for latent (delayed) effects (ENA, 2020).

Nerve Agents

The most toxic agents in existence are the nerve agents such as sarin, soman, tabun, and VX. They are inexpensive, effective in small quantities, and easily dispersed. In the liquid form, nerve agents evaporate into a colorless, odorless vapor. Organophosphates (pesticides) are similar in nature to the nerve agents used in warfare and are readily available in the farming industry (ENA, 2020).

Nerve agents can be inhaled or absorbed percutaneously or subcutaneously. These agents bond with acetylcholinesterase so that acetylcholine is not inactivated; the adverse result is hyperstimulation (continuous stimulation) of the nerve endings. Carbamates, which are insecticides originally extracted from the Calabar bean, are derivatives of carbamic acid; they are nerve agents that specifically inhibit acetylcholinesterase for several hours and then spontaneously become unbound from the acetylcholinesterase. However, organophosphates require the formation of new enzyme (acetylcholinesterase) before nervous system function can be restored.

A very small drop of a nerve agent is enough to result in sweating and twitching at the site of exposure. A larger amount results in more systemic symptoms. Effects can begin anywhere from 30 minutes up to 18 hours after exposure. The more common organophosphates and carbamates (e.g., sevin, malathion) that are used in agriculture result in less severe symptoms than do those used in warfare or in terrorist attacks. In an ordinary situation (e.g., nonwarfare, nonterrorist attack situation), a patient could arrive at the ED having been unintentionally exposed to organophosphates or intentionally exposed to these agents in a suicidal attempt (ENA, 2020).

Clinical Manifestations

Signs and symptoms of nerve gas exposure are those of cholinergic crisis and include bilateral miosis, visual disturbances, increased gastrointestinal motility, nausea and vomiting, diarrhea, substernal spasm, indigestion, bradycardia and atrioventricular block, bronchoconstriction, laryngeal spasm, weakness, fasciculations, and incontinence. The patient must be examined in a dark area to truly identify miosis. Neurologic responses include insomnia, forgetfulness, impaired judgment, depression, and irritability. A lethal dose results in loss of consciousness, seizures, copious secretions, fasciculations, flaccid muscles, and apnea (ENA, 2019).

Management

Decontamination with copious amounts of soap and water or saline solution for 8 to 20 minutes is essential. The water is blotted off, not wiped off, the skin. Wiping may have the unintended effect of rubbing more of the agent into the skin. Fresh 0.5% hypochlorite solution (bleach) can also be used. The airway is maintained, and suctioning is frequently required. Plastic airway equipment should not be used, because plastic will absorb sarin gas and may result in continued exposure to the agent.

Atropine 2 to 4 mg is administered by IV, followed by 2 mg every 3 to 8 minutes for up to 24 hours of treatment. Alternatively, IV atropine 1 to 2 mg per hour may be given until clear signs of anticholinergic activity have returned (decreased secretions, tachycardia, and decreased gastrointestinal motility). Another medication that may serve as an antidote is pralidoxime, which allows cholinesterase to become active against acetylcholine. Pralidoxime 1 to 2 g in 100 to 150 mL of normal saline solution is given over 15 to 30 minutes. Pralidoxime has no effect on secretions and may have any of the following side effects: hypertension, tachycardia, weakness, dizziness, blurred vision, and diplopia. Diazepam or other benzodiazepines are used to control seizures, to decrease fasciculations, and to alleviate apprehension and agitation (ENA, 2020).

Blood Agents

Blood agents such as hydrogen cyanide and cyanogen chloride have a direct effect on cellular metabolism, resulting in asphyxiation through alterations in hemoglobin. Cyanide is an agent that has profound systemic effects. It is commonly used in the mining of gold and silver and in the plastics and dye industries.

A cyanide release is often associated with the odor of bitter almonds. In house fires, cyanide is released during the combustion of plastics, rugs, silk, furniture, and other construction materials. There is a significant correlation between blood cyanide and carbon monoxide levels in patients who survive fires, and in some cases, the cause of death is cyanide poisoning (Veenema, 2019).

Clinical Manifestations

Cyanide can be ingested, inhaled, or absorbed through the skin and mucous membranes. Cyanide is protein bound and inhibits aerobic metabolism, leading to respiratory muscle failure, respiratory arrest, cardiac arrest, and death. Its inhalation results in flushing, tachypnea, tachycardia, nonspecific neurologic symptoms, stupor, coma, and seizure preceding respiratory arrest (ENA, 2019).

Management

Rapid administration of amyl nitrate, sodium nitrite, and sodium thiosulfate is essential to the successful management of cyanide exposure. First, the patient is intubated and placed on a ventilator. Next, amyl nitrate pearls are crushed and placed in the ventilator reservoir to induce methemoglobinemia. Cyanide has a 20% to 25% higher affinity for

methemoglobin than it does for hemoglobin; it binds methemoglobin to form either cyanomethemoglobin or sulfmethemoglobin. The cyanomethemoglobin is then detoxified in the liver by the enzyme rhodanese. Next, IV sodium nitrite is given to induce the rapid formation of methemoglobin. IV sodium thiosulfate is then given; it has a higher affinity for cyanide than methemoglobin and stimulates the conversion of cyanide to sodium thiocyanate, which can be excreted by the kidneys (ENA, 2019). Although they may be lifesaving, these emergency medications do have side effects—sodium nitrite can result in severe hypotension, and thiocyanate can cause vomiting, psychosis, arthralgia, and myalgia.

The production of methemoglobin is contraindicated in patients with smoke inhalation, because they already have decreased oxygen-carrying capacity secondary to the carboxyhemoglobin produced by smoke inhalation. In facilities where a hyperbaric chamber is available, it may be used to provide oxygenation while the previously discussed therapies are initiated. An alternative suggested treatment for cyanide poisoning is hydroxocobalamin (vitamin B_{12a}). Hydroxocobalamin binds with cyanide to form cyanocobalamin (vitamin B_{12}). It must be administered IV in large doses (Tintinalli et al., 2020). Administration of hydroxocobalamin can result in a transient pink discoloration of mucous membranes, skin, and urine. In high doses, tachycardia and hypertension can occur, but they usually resolve within 48 hours.

Pulmonary Agents

Pulmonary agents such as phosgene and chlorine destroy the pulmonary membrane that separates the alveolus from the capillary bed, disrupting alveolar–capillary oxygen transport mechanisms. Capillary leakage results in fluid-filled alveoli. Phosgene and chlorine both vaporize rapidly causing this pulmonary injury. Phosgene has the odor of freshly mown hay.

Signs and symptoms include pulmonary edema with shortness of breath, especially during exertion. An initial hacking cough is followed by frothy sputum production. A particulate air filter mask is the only protection required to protect health care personnel. Phosgene does not injure the eyes. In a review of a chlorine spill in South Carolina that exposed 155 patients, the most useful tool for identifying worsening symptoms was the pulse oximeter. Ordinary triage systems did not predict the severity of exposure (Veenema, 2019).

Nuclear Radiation Exposure

The threat of nuclear warfare or exposure to a radiologic weapon is very real with the availability of nuclear material and easily concealed simple devices, such as the so-called dirty bomb, for dispersal. A dirty bomb is a conventional explosive (e.g., dynamite) that is packaged with radioactive material that scatters when the bomb is detonated. It disperses radioactive material and may be called a **radiologic weapon**, but it is not a *nuclear* weapon, which uses a complex nuclear fission reaction that is thousands of times more devastating than the dirty bomb (Durakovic, 2017).

Sources of radioactive material include not only nuclear weapons but also reactors and simple radioactive samples, such as weapons-grade plutonium or uranium, freshly spent nuclear fuel, or medical supplies (e.g., radium, certain cesium isotopes) used in cancer treatments and radiology. Exposure to a large number of people can be accomplished by placing a radioactive sample in a public place. Thousands may be exposed this way; some may be immediately affected, and others may require health monitoring for many years to assess long-term effects (Durakovic, 2017).

Any terrorist act or unintentional radiation release can be sizable and may require the entire hospital and prehospital staff to be prepared, recognize signs and symptoms of exposure, and rapidly treat victims without contamination of personnel, visitors, patients, or the facility itself.

Types of Radiation

Atoms consist of protons, neutrons, and electrons. The protons and neutrons are in balance in the nucleus. The protons repel each other because they are all positively charged. The number of protons is specific for each element in the periodic table. There is a specific ratio of protons and neutrons for each different atom, and the result is element stability. When an element is radioactive, there is an imbalance in the nucleus, resulting from an excess of neutrons.

To achieve stability, a radioactive nuclide can eject particles until the most stable number (an even number) of protons and neutrons exists. A proton can become a neutron by ejecting a positron; conversely, a neutron can become a proton by ejecting a negative electron. An alpha particle is released when two protons and two electrons are ejected (beta particles are electrons).

Alpha particles cannot penetrate the skin. A thin layer of paper or clothing is all that is necessary to protect the skin from alpha radiation.

However, this low-level radiation can enter the body through inhalation, ingestion, or injection (open wound). Only localized damage occurs.

Beta particles have the ability to moderately penetrate the skin to the layer in which skin cells are being produced. This high-energy radiation can cause skin damage if the skin is exposed for a prolonged period and can cause injury if beta particles penetrate the skin.

Gamma radiation is a short-wavelength electromagnetic energy that is emitted when there is excess core nucleus energy. Gamma particles are penetrating. Therefore, it is difficult to shield against gamma radiation. X-rays are an example of gamma radiation. Gamma radiation often accompanies both alpha particle and beta particle emission (Tintinalli et al., 2020).

Measurement and Detection

Radiation is measured in several different units. The *rad* is the basic unit of measurement. A rad is equivalent to 0.01 J of energy per kilogram of tissue. To determine the damaging effect of the rad, a conversion to the *rem* (roentgen equivalents man) is necessary. The rem reflects the type of radiation absorbed and the potential for damage. For example, 200,000 mrem results in mild radiation sickness (1 rem = 1000 mrem) (Tintinalli et al., 2020). Typical natural yearly exposure for a person is 360 mrem. Another important concept is *half-life*. The half-life of a radioactive product is the time it takes to lose half of its radioactivity.

The only way to detect radiation is through a device that determines the exposure per minute. There are various devices for this purpose. The Geiger counter (or Geiger–Müller survey meter) can measure background radiation quickly through detection of gamma radiation and some beta radiation. With high-level radiation, the Geiger counter may underestimate exposure. Other devices include the ionization chamber survey meter, alpha monitors, and dose rate meters (ENA, 2020). Personal dosimeters are simple tools that identify radiation exposure and are worn by radiology personnel every day.

Exposure

Exposure is affected by time, distance, and shielding. The longer a person is within the radiation area, the higher the exposure. In addition, the larger the amount of radioactive material in the area, the greater the exposure. The farther away the person is from the radiation source, the lower the exposure. Shielding from the radiation source also decreases exposure.

Three types of radiation-induced injury can occur: external irradiation, contamination with radioactive materials, and incorporation of radioactive material into body cells, tissues, or organs (ENA, 2020):

- *External irradiation* exposure occurs when all or part of the body is exposed to radiation that penetrates or passes completely through the body. In this type of exposure, the person is not radioactive and does not require special isolation or decontamination measures. Irradiation does not necessarily constitute a medical emergency.
- *Contamination* occurs when the body is exposed to radioactive gases, liquids, or solids either externally or internally. If internal, the contaminant can be deposited within the body. Contamination requires immediate medical management to prevent incorporation.
- *Incorporation* is the actual uptake of radioactive material into the cells, tissues, and susceptible organs. The organs involved are usually the kidneys, bones, liver, and thyroid.

Sequelae of contamination and incorporation can occur days to years later. The thyroid gland can be largely protected from radiation exposure by administration of stable iodine (potassium iodide) before or promptly after the intake of radioactive iodine. Priorities in the treatment of any type of radiation exposure are always treatment for life-threatening injuries and illnesses first, followed by measures to limit exposure, contamination control, and finally decontamination (Tintinalli et al., 2020).

Decontamination

Hospital and community disaster plans should be in effect when managing a radiation disaster. Access restriction is essential to prevent contamination of other areas of the hospital. Triage outside the hospital is the most effective means of preventing contamination of the facility itself. Floors are covered to prevent tracking of contaminants throughout the treatment areas. Strict isolation precautions should be in effect. All air ducts and vents must be sealed to prevent spread. Waste is controlled through double-bagging and the use of plastic-lined containers outside of the facility. All radiation-contaminated waste must be disposed of in appropriate color-coded yellow and magenta canisters.

Staff are required to wear protective clothing, such as water-resistant gowns, two pairs of gloves, masks, caps, goggles, and booties. Dosimetry

devices should be worn by all staff members participating in patient care. The radiation safety officer in the hospital should be notified immediately to assist with surveys (using a radiation survey meter) of the incoming patients and to provide dosimeters to all staff personnel involved in direct care of patients who have been exposed. There is minimal risk to staff if the patients are properly surveyed and decontaminated.

Each patient arriving at the hospital should first be surveyed with the radiation survey meter for external contamination and then directed toward the decontamination area as needed. The majority of patients can be safely decontaminated with soap and water. Decontamination occurs outside of the ED with a shower, collection pool, tarp, and collection containers for patient belongings, as well as soap, towels, and disposable paper gowns for patients. Water runoff needs to be contained. Patients who are uninjured can perform self-decontamination with handheld showers. After the patient has showered, a resurvey is conducted to determine whether the radioactive contaminants have been removed. Additional washings should occur until the patient is free of contamination. It is important to ensure that during showers, previously clean areas are not contaminated with runoff from the washed contaminated areas (e.g., hair should be washed in a position that protects the body from contamination). Wounds are irrigated and then covered with a water-resistant dressing prior to total body decontamination.

Internal contamination or incorporation requires decontamination through catharsis, gastric lavage with chelating agents (agents that bind with radioactive substances and are then excreted), or both. Samples of urine, feces, and vomitus are surveyed to determine internal contamination levels. Biologic samples are taken through nasal and throat swabs, and a complete blood count with differential is obtained (Tintinalli et al., 2020).

Acute Radiation Syndrome

Acute radiation syndrome (ARS) can occur after exposure to radiation. It is the dose, rather than the source, that determines whether ARS develops. Factors that determine whether the patient's response to exposure will result in ARS include a high dose (minimum 100 rad) and rate of radiation with total body exposure and penetrating-type radiation. Age, medical history, and genetics also affect the outcome after exposure. The course is predictable. Table 68-8 identifies the phases of ARS.

Each body system is affected differently in ARS. Systems with cells that rapidly reproduce are most commonly affected. The hematopoietic

system is the first system affected and serves as an indicator of the severity of radiation exposure (Veenema, 2019). A predictor of outcome is the absolute lymphocyte count at 48 hours after exposure. A significant exposure would be indicated by blood lymphocyte counts of 300 to 1200/mm^3. Barrier precautions should be implemented to protect the patient from infection. Neutrophils decrease within 1 week, platelets decrease within 2 weeks, and red blood cells decrease within 3 weeks. Hemorrhagic complications including fever and sepsis are common.

TABLE 68-8 Phases of Effects of Acute Radiation Syndrome

Phase	Time of Occurrence	Signs and Symptoms
Prodromal phase (presenting symptoms)	48–72 h after exposure	Nausea, vomiting, loss of appetite, diarrhea, fatigue High-dose radiation—fever, respiratory distress, and increased excitability
Latent phase (a symptom-free period)	After resolution of prodromal phase; can last up to 3 wks With high-dose radiation, latent period is shorter	Decreasing lymphocytes, leukocytes, thrombocytes, red blood cells
Manifest illness phase	After latent period phase	Infection, fluid and electrolyte imbalance, bleeding, diarrhea, shock, and altered level of consciousness
Recovery phase OR	After manifest illness phase	Can take weeks to months for full recovery
Death	After manifest illness phase	Increased intracranial pressure is a sign of impending death

Adapted from Centers for Disease Control and Prevention (CDC). (2018c). *Acute radiation syndrome: A fact sheet for clinicians*. Retrieved on 3/1/2020 at: www.emergency.cdc.gov/radiation/arsphysicianfactsheet.asp

The gastrointestinal system, with its rapidly reproducing cells, is also readily affected by radiation. Doses of radiation required to produce symptoms are approximately 600 rad or higher. The gastrointestinal symptoms usually occur at the same time as the changes in the hematopoietic system. Nausea and vomiting occur within 2 hours after exposure. Sepsis, fluid and electrolyte imbalance, and opportunistic infections can occur as complications. An ominous sign is the presence of high fever and bloody diarrhea; these typically appear on day 10 after exposure (ENA, 2019).

The central nervous system is affected when the dose exceeds 1000 rad (ENA, 2019). The symptoms occur when damage to the blood vessels of the brain results in fluid leakage. Signs and symptoms include cerebral edema; nausea; vomiting; headache; and increased intracranial pressure, which heralds a poor outcome and imminent death. Central nervous system injury with this amount of exposure is irreversible and occurs before hematopoietic or gastrointestinal system symptoms appear. Cardiovascular collapse is usually seen in conjunction with these injuries.

Skin effects can also indicate the dose of radiation exposure. With an exposure of 600 to 1000 rad, erythema occurs; it can disappear within hours and then reappear. The patient who has been exposed must be evaluated hourly for the presence of erythema. With exposures greater than 1000 rad, desquamation (radiation dermatitis) of the skin occurs. Necrosis becomes evident within a few days to months at doses greater than 5000 rad (CDC, 2018c).

Secondary injury can occur when the radiation exposure occurs during a traumatic event such as a blast or burn. Trauma in addition to radiation exposure increases patient mortality. Attention must first be directed toward the primary assessment for trauma. Airway, breathing, circulation, and fracture reduction require immediate attention. All definitive treatments must occur within the first 48 hours. Thereafter, all surgical procedures should be delayed for 2 to 3 months because of the potential for delayed wound healing and the possible development of opportunistic infections several weeks after exposure (Veenema, 2019).

Survival

There are three categories of predicted survival after radiation exposure: probable, possible, and improbable. Triage of victims at the scene, after decontamination, is conducted using the routine system for disaster triage. Presenting signs and symptoms determine the potential for survival and therefore the category of predicted survival during triage.

Probable survivors have either no initial symptoms or only minimal symptoms (e.g., nausea and vomiting), or these symptoms resolve within a few hours. These patients should have a complete blood count drawn and may be discharged with instructions to return if any symptoms recur.

Possible survivors present with nausea and vomiting that persist for 24 to 48 hours. They experience a latent period, during which leukopenia, thrombocytopenia, and lymphocytopenia occur. Barrier precautions and protective isolation are implemented if the patient's lymphocyte count is less than 1200/mm^3. Supportive treatment includes administration of

blood products, prevention of infection, and provision of enhanced nutrition.

Improbable survivors have received more than 800 rad of total-body penetrating irradiation. People in this group demonstrate an acute onset of vomiting, bloody diarrhea, and shock. Any neurologic symptoms suggest a lethal dose of radiation (ENA, 2019). These patients still require decontamination to prevent further contamination of the area and of others. Personal protection is essential, because it is virtually impossible to fully decontaminate these patients; all of their internal organs have been irradiated. The survival time is variable; however, death usually occurs swiftly due to shock. If there are no neurologic symptoms, patients may be alert and oriented, similar to a patient with extensive burns. In a mass casualty situation, these patients would be triaged into the black category, where they will receive comfort measures and emotional support. If it is not a mass casualty situation, aggressive fluid and electrolyte therapies are essential.

CRITICAL THINKING EXERCISES

1 pq You are one of the several nurses volunteering at a music festival. You suddenly hear a loud explosion and hundreds of attendees are screaming and scattering in all directions. You see people are bleeding and notice that some individuals are on the ground not moving. You know you need to organize efforts and provide care. What are the priority actions you should take in order to ensure the safety of yourself and others on the scene? How will information be communicated to the community? What strategies will you utilize in this situation to triage those who have been impacted? As EMS arrive, who will have priority to be transported to the hospital?

2 ebp You are working in the emergency department and caring for a patient who complains of a fever for the past 2 days, cough, shortness of breath, severe fatigue, and loss of appetite. You are concerned that this patient may have COVID-19. Identify the immediate precautions that you will need to implement when providing care for this patient. When conducting an assessment, what questions will you ask this patient? Discuss the education you will provide the patient and family to reduce the potential transmission of SARS-CoV-2 and the evidence-based resources you will use to support this education.

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