Pediatric Nursing made Incredibly Easy!

Second Edition

Mikki Meadows-Oliver

Wolters Kluwer

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Foreword

The first edition of *Pediatric Nursing Made Incredibly Easy!* was published in 2005. Since the initial publication, there have been many advances in pediatric health care and within the nursing profession. Much of that knowledge has been captured here in this revised and updated second edition of *Pediatric Nursing Made Incredibly Easy!* Revising this edition required a team of dedicated nurse experts from different regions of the country who worked to ensure that this book contained relevant information that is useful in everyday practice.

In order to provide safe, quality care to the pediatric patient, nurses need to have an understanding of some common pediatric conditions. The primary goal of the second edition of *Pediatric Nursing Made Incredibly Easy!* is to provide the nurse interested in pediatrics with increased knowledge about pediatric health care conditions as they relate to nursing practice. This edition of *Pediatric Nursing Made Incredibly Easy!* provides an introduction to topics essential to pediatrics for nurses with limited pediatric experience and serves as a refresher for nurses already caring for children in a variety of settings. This book is also a valuable resource for students on their pediatric clinical rotations. Students will appreciate the easy-to-read format and the "Advice from the experts." Even the most experienced nurses will find a means to enhance their knowledge.

All 15 chapters have revised, and I am sure that the revisions have significantly enhanced the scope and value of the book. The second edition of *Pediatric Nursing Made Incredibly Easy!* begins with a chapter introducing the reader to pediatric nursing. This chapter defines the role of the pediatric nurse, the philosophy of family-centered care, and standards of care for pediatric nursing. The next chapter reviews factors that influence growth and development, how to assess and manage pain in the pediatric patient, and the needs of the hospitalized and special needs child. The next three chapters review developmental aspects of pediatric care related to infants, early childhood, middle childhood, and adolescence. Chapters 6 to 15 review commonly encountered pediatric conditions relevant to various body systems—for example, cardiovascular, respiratory, and gastrointestinal. Each chapter provides you with an abundance of practical, useful information.

An easy-to-read format and witty artwork are presented to aid and engage the reader. Illustrations are presented to help you visualize the pathophysiology of the condition. "Memory joggers" provide useful tips to help you remember important information. In addition, the second edition of *Pediatric Nursing Made Incredibly Easy!* has several icons to draw your attention to important issues.

Advice from the experts—presents information from skilled practitioners

It's all relative—provides topics for education for patients and their families

Growing pains—offers age and stage description, expectations, and dangers

Cultured pearls—notes unique aspects of care by cultural groups.

After reading each chapter, you can test how much you've learned with the "Quick quiz" at the end of each chapter. You will then realize how valuable a resource this book is and how much this material applies to your pediatric practice!

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1

Introduction to pediatric nursing

Just the facts

In this chapter, you'll learn:

- the role of the pediatric nurse
- the philosophy of family-centered care
- standards of care for pediatric nursing
- types of family structures
- sociocultural influences that affect pediatric health.

Pediatric nursing includes babies and teens and everyone in between!

Role of the pediatric nurse

Pediatric nursing involves providing care for infants, children, and adolescents on a continuum from health to illness to recuperation and, when needed, rehabilitation.

However, providing care to the pediatric population doesn't stop with the pediatric patient; pediatric nursing should incorporate parents and other family members into the child's care. This philosophy is known as *family-centered care*.

Family-centered care

Family-centered care acknowledges the parents as the constant in the child's life and as experts in the care of their child, whether in the hospital or at home. In family-centered care, the family's input is the major driving force behind the development of the child's care plan.

In addition, the needs of the child and his family are taken into account in family-centered care. Interventions are geared toward respecting, supporting, and encouraging the family's ability to participate in the care of their child throughout illness and recovery.

Power to the people

Empowering and enabling are two important concepts in family-centered care. *Empowering* is allowing parents to maintain, or helping them to develop, a sense of control over their child's care. *Enabling* refers to the practices that help family members to acquire the new skills necessary to meet the needs of their child.

These two concepts foster the teamwork between the family and health care professionals that serves to benefit the child, both physically and emotionally. (See *Benefits of family-centered care*.)

Benefits of family-centered care

Family-centered care benefits the child and family as well as the health care professional.

Benefits to families

- Less stress and heightened feelings of confidence and competence in caring for their children
- Less dependence on professional caregivers
- Empowerment to develop new skills and expertise in the care of their children

Benefits to health care professionals

- Greater job satisfaction
- Empowerment to develop new skills and expertise in pediatric nursing

Standards of care

Pediatric nursing care is governed by standards. The American Nurses Association (ANA), the National Association of Pediatric Nurse Practitioners (NAPNAP), and the Society of Pediatric Nurses (SPN) have developed a document which outlines the scope and standards of pediatric nursing practice to ensure that each pediatric patient receives safe and effective care. (See *Standards of pediatric nursing care and professional performance*.)

Room for improvement

In 2010, there were 74.1 million children younger than 18 years old living in the United States. Children younger than 16 years of age compose 24% of the total population. Although children's health has improved dramatically over the last century, there's still work to be done.

Childhood morbidity and mortality rates, key indicators of the health of a population, provide the nurse with essential information about how and where to direct care for individual patients and the community at large.

Childhood morbidity

Morbidity is defined as the number of people in a population who are faced with a specific health problem at a particular point in time. Because these statistics aren't compiled on an annual basis, it's difficult to compare them from year to year. It is important to remember that it is during the middle childhood and early adolescent times that the children are usually healthy, but they develop habits that will influence their health later in life.

Morbidity rates for many illnesses that previously caused severe problems for children, such as poliomyelitis and measles, have been dramatically reduced through immunizations. Other conditions studied in relation to morbidity include obesity, injuries, acute illness, HIV infection, and sexually transmitted infections (STIs).

Acute isn't cute

The most common causes of acute illness in childhood include:
- respiratory illness (50%)
- injuries (15%)
- infections and parasitic disease (11%).

Standards of pediatric nursing care and professional performance

By adhering to these guidelines, jointly developed by the ANA, NAPNAP, and the SPN, the pediatric nurse can serve as an advocate for patients and their families. These guidelines should be upheld to ensure that professional care is provided to all patients.

Scope of practice

The scope of practice section of the document discusses the different areas of pediatric nursing practice and the different settings where pediatric nurses practice. Also discussed in this section are education and certification of pediatric nurses.

The Differentiated Areas of Pediatric Nursing Practice include:
- The Pediatric Nurse: Generalist
- The Advanced Practice Pediatric Nurse
- Pediatric Clinical Nurse Specialist (PCNS)
- Pediatric Nurse Practitioner (PNP)
- Neonatal Nurse Practitioner (NNP)

The Settings for Pediatric Nursing Practice include:
- Inpatient and Acute Care Settings
- Perioperative and Surgical Settings
- Hospice and Palliative Care Settings
- Ambulatory Care Settings
- Community Health and School Settings
- Transport Settings
- Camp Settings

Standards of care

Comprehensive pediatric nursing care focuses on helping children and their families and communities achieve their optimum health potentials. This goal is best achieved within the framework of family-centered care and the pediatric nursing process, including primary, secondary, and tertiary care coordinated across health care and community settings. The jointly published document includes 16 standards that govern the practice of the pediatric nurse.
- Standard 1. Assessment
- Standard 2. Diagnosis
- Standard 3. Outcomes Identification
- Standard 4. Planning
- Standard 5. Implementation
- Standard 5a. Coordination of Care and Case Management
- Standard 5b. Health Teaching and Health Promotion, Restoration, and Maintenance
- Standard 5c. Consultation
- Standard 5d. Prescriptive Authority and Treatment
- Standard 5e. Referral
- Standard 6. Evaluation
- Standard 7. Quality of Practice
- Standard 8. Professional Practice Evaluation
- Standard 9. Education
- Standard 10. Collegiality
- Standard 11. Collaboration
- Standard 12. Ethics
- Standard 13. Research, Evidence-Based Practice, and Clinical Scholarship
- Standard 14. Resource Utilization
- Standard 15. Leadership
- Standard 16. Advocacy

American Nurses Association, National Association of Pediatric Nurse Practitioners, & Society of Pediatric Nurses. (2008). *Pediatric nursing: Scope of practice*. Washington, DC; American Nurses Association.

Risky business

Factors that place children at risk for increased morbidity include:

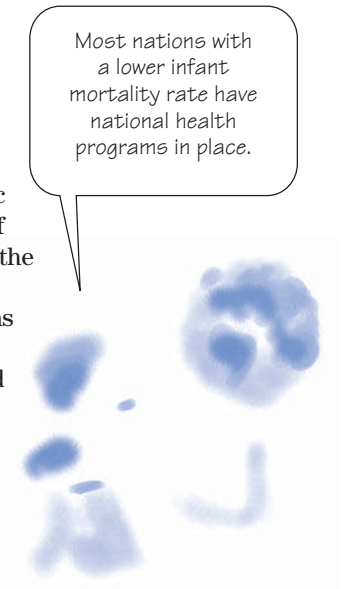
- chronic illness
- homelessness
- low birth weight
- poverty
- adoption from a foreign country
- time spent in day-care centers.

Childhood mortality

Mortality refers to the number of deaths from a specific cause in a given year. Accidents are the leading cause of death in all age-groups of children (older than age 1) in the United States.

Infant mortality rates are the number of infant deaths during the first year of life per 1,000 live births. Infant mortality rates have decreased dramatically in the United States, but the nation still lags behind other developed countries that have even lower infant mortality rates.

Many of the nations with lower infant mortality rates also have national health programs in place. Researchers aim to improve these vital statistics for all populations in the United States.



National health initiatives

The current focus on health promotion and disease prevention has prompted national initiatives, such as *Healthy People 2020*, aimed at improving children's health.

Solid start

For the past three decades, the U.S. Department of Health and Human Services (DHHS) has issued a national health agenda called *Healthy People*, aimed at improving the health of people living in the United States. The *Healthy People* goals were developed to provide evidence-based, 10-year national objectives for improving health. The first set of national targets for health was released in 1979 and was entitled, *Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention*. The target date for the attainment of these goals was 1990. Since then, the goals have been updated every 10 years.

Building on success

Healthy People 2020 (http://www.healthypeople.gov/2020/default.aspx) was released in December 2010, with the stated mission to identify nationwide health improvement priorities by increasing public awareness of determinants of health, disease, and disability; providing measureable goals and objectives to determine progress

in attaining the health improvement priorities; engaging multiple sectors to improve practices based on evidence and knowledge; and identifying critical research, evaluation, and data collection. Thirteen new topics or priority areas were added for *Healthy People 2020* that were not included in *Healthy People 2010*. Of the 13 areas, several are particularly relevant to children and adolescents: adolescent health; early and middle childhood; lesbian, gay, bisexual, and transgender (LGBT) health; and sleep health.

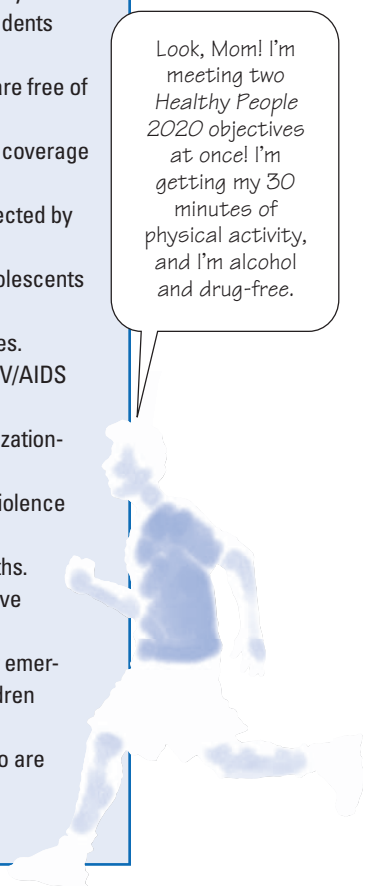
In kids' corner

The *National Vaccine Program* is a health initiative that's especially significant to children's health. National Vaccine Plan serves as a guide to ensure all Americans have access to vaccines so that disease can be prevented.

Healthy People 2020 objectives

Healthy People 2020 aims to have a society where people live longer and healthier lives. There are over 417 objectives related to the pediatric population. Here are some of the *Healthy People 2020* objectives related to the pediatric population:

- Increase the number of individuals going to a single health care provider for care.
- Increase the number of adolescents getting yearly physical, dental, and vision examinations.
- Increase number of adolescents involved in extracurricular activities at school.
- Increase the number of adolescents who have a positive adult role model to talk to.
- Increase number of children with disabilities who receive adequate care.
- Increase the number of schools that have adequate health education for children in schools.
- Increase education related to unintentional injury, use of tobacco products, unplanned pregnancy, STIs, alcohol use or other drugs, inadequate nutrition, and lack of physical activity.
- Increase use of vehicle restraint usage in all age-groups.
- Increase the number of moms breast-feeding and support for them while breast-feeding.
- Increase amount of time children spend in daily physical education and recess at school.
- Increase number of children who limit screen time activities to 2 hours or less per day.
- Increase number of high school students who get sufficient sleep.
- Increase number of students who are free of substance abuse.
- Maintain and increase vaccination coverage for all ages of children.
- Reduce number of adolescents affected by violent crime.
- Reduce number of children and adolescents with high blood pressure.
- Reduce number of otitis media cases.
- Reduce number of new cases of HIV/AIDS cases.
- Reduce number of cases of immunization-preventable diseases.
- Reduce incidence of bullying and violence among all age-groups.
- Reduce rate of fetal and infant deaths.
- Reduce number of children who have dental caries.
- Reduce number of hospital visits or emergency department (ED) visits for children who have asthma.
- Reduce number of adolescents who are binge drinkers.



A closer look at the family

Family is defined as the structure, or the relationship between individuals, that provides the financial and emotional support needed for social functioning. Individuals don't have to have blood relationships in order to be a family. Today, many different family structures exist in our society: the nuclear family, binuclear family, and the blended family. Each type of family may provide a unique set of challenges to the nurses who care for their children. When conducting a pediatric history, remember to ask about who lives in the home.

Nuclear family

A *nuclear family* (also known as a *traditional family*) consists of spouses and their child or children (biological or adopted). The nuclear family serves as a support system for its members, who share roles and responsibilities as well as financial obligations. One disadvantage of some nuclear families is the absence of additional support that may be needed in times of crisis.

A *binuclear family* is becoming more common as more parents remarry and share custody and care of the children. A binuclear family consists of each parent and their new spouses, sharing custody and raising of the child. Each couple has their own household in which the child spends his or her time. The child may have to learn two sets of rules—which can sometimes be quite confusing.

Blended family

A *blended family* consists of parents with a child or children from a previous relationship who marry and live together.

Add two or more children, mix well . . .

A blended family provides emotional support and allows for shared roles within the household. It also provides the opportunity for the family members to learn how to work together and discover new ways of accomplishing tasks.

. . . but don't spread too thin

Financial responsibilities can be shared but can also produce strain if support must be provided to the previous spouse or children of either adult, or both.

Cohabitation family

A *cohabitation family* is one in which two adults and a child or children live together as a nuclear family while the adults remain unmarried. This type of family provides emotional and financial support to its members. However, the risk exists that one individual may feel threatened by the partner's real or perceived lack of commitment.

Extended family

An *extended family* (also called a *multigenerational family*) includes at least one parent; a child or children; and any combination of grandparents, aunts, uncles, or cousins. In this type of family, the group provides the support.

A potential disadvantage of an extended family is the conflict that may arise about roles; confusion may occur about which adult is viewed as the child's mother or father, or who should make decisions regarding the child's care.

Single-parent family

A *single-parent family* is composed of one parent living at home with a child or children. Because of such factors as the rise in divorce rates, the single-parent family is becoming more common.

Bonded . . .

In a single-parent family, the parent and child are each other's source of support. This can create close bonds but can also lead to strain for the single parent in terms of the parental role he or she plays. If a child becomes ill, child care difficulties may arise. There may also be financial constraints related to limited income.

. . . and ready for a nap

The single parent can become exhausted from being responsible for all of the tasks involved in raising children. Single parenting can also lead to low self-esteem, as the parent tries—and sometimes fails—to provide everything for the child that some two-parent families are able to provide.

Communal family

In a *communal family*, adults and their children choose to live with a group of people (not relatives) who become the extended

family. The relationship is usually one of religious beliefs or social values. The parent usually gives up the parental role, and the leader of the group makes decisions for the child. Disadvantages of this family structure include the tendency to provide medical care within the group rather than seeking outside for professional help for health-related matters.

Foster family

A *foster family* is designed to care for a child whose biological or adoptive parents can't do so. Foster parents may or may not be related to the child in foster care. If the foster parents are related to the child, the placement is generally referred to as kinship care. Ideally, foster care is provided on a temporary basis until the biological or adoptive parent can resume his or her role. Unfortunately, the foster child may be shuffled from foster family to foster family, lacking the stability that comes from being with the same family (biological, adoptive, or foster) for an extended period. It can also be difficult to determine who's responsible for making decisions about the foster child's health care.

Sociocultural influences on pediatric health

Sociocultural influences on pediatric health include:

- ethnicity
- socioeconomic factors
- religion
- school
- peers
- the family's health-related beliefs and practices.

Ethnicity

Ethnicity refers to belonging to or believing in a group with the same customs, languages, and characteristics. The United States is known for its ethnic diversity. The pediatric nurse must be aware that different ethnic groups tend to view health care differently.

Father knows best

In some ethnic groups, the adult male is the decision maker. When a child is brought in for treatment, no decisions can be made until he arrives.

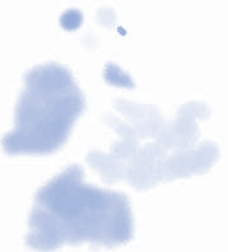
Grin and bear it

Other ethnic groups believe that pain shouldn't be shown. Children from these ethnic groups may be up and walking or conversing, or may appear stoic, despite being in pain. This can make it difficult for the nurse to assess, or even detect, pain.

Hold the pickles, hold the meat

Diet is another area in which ethnic influence can be strong. For instance, caffeine and meat products may be removed from the diet.

The pediatric nurse should do a thorough assessment of the family's beliefs in order to provide the most complete care and avoid offending the family. Remember, not every member of the culture will participate in all aspects of the culture. This is why it is important to do a cultural assessment. (See *Putting cultural care into practice.*)



Socioeconomic factors

Socioeconomic influences on pediatric health result from income levels that don't meet the needs of the child and family. *Poverty* is the lack of money or resources necessary for survival. Approximately 22% of children in the United States, or 16.4 million children, live in families with incomes below the federal poverty level. People who live in areas with low socioeconomic levels have fewer accessible health care facilities available to them.

Planes, trains, and automobiles

The availability of transportation to a health care facility can have a tremendous impact on whether parents or caregivers will seek care for themselves and their children.

Cultured pearls

Putting cultural care into practice

Awareness and knowledge are the first steps toward incorporating cultural care into your daily nursing practice. To facilitate cultural care on your practice setting, develop a cultural reference manual that includes:

- brief descriptions of pertinent cultures
- views on health, illness, diet, and other matters
- lists of interpreters (including American Sign Language interpreters), ethnic community services, and other sources for quick reference.

Calling in sick

Another area of concern arises when both parents work, as is common in today's economy. One or both parents may not be able to afford to take time off from work to bring their child to the health care provider's office or hospital, or may risk their job by doing so. If they can't take time off, and health care isn't available after working hours, the child may not receive the care he or she needs.

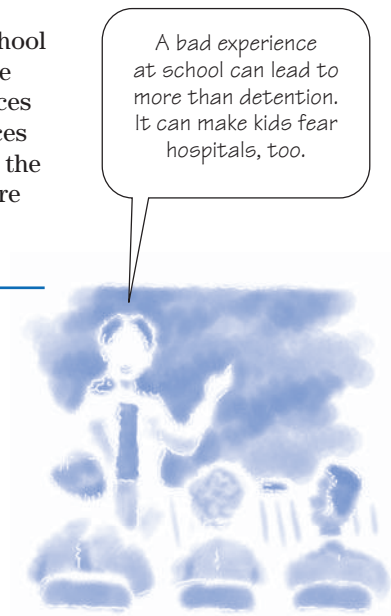
Religion

Religious beliefs can affect when, where, and even if an individual will seek health care. Because religious beliefs guide health care practices for many people, the pediatric nurse must be aware of what beliefs the individual holds and should help ensure that these needs are met in a way that provides the child with the needed care.

School

School typically reinforces the concepts of right and wrong, or moral values. School commonly helps children learn rules and regulations and introduces them to the concept of an authority figure other than their parents.

A child who has a negative experience with school may fear the hospital setting, thinking it will be the same as school. The child whose school experiences are positive will be likely to apply these experiences to the health care environment. It is important for the pediatric nurse to remember that some children are homeschooled.



Peer influences

Peer relationships are the relationships a child has with other individuals in the same age-group. A child's ability to be part of a peer group is influenced by his having the same beliefs or attitudes as the others in his group. With the use of social media and cellular phones, friends are only a screen away. Nurses must remember that with the use of social media, there is a potential for cyberbullying.

A child may try to change his beliefs or behaviors to feel a part of the group or norm. He may partake in behaviors that risk his health to conform to the group. For example, a child's experimentation with smoking, drinking alcohol, or using drugs can be heavily influenced by the behaviors of his peers.

Health-related beliefs and practices

Health-related beliefs and practices of the family have a strong influence on how often they will seek health care for their child. If family members hesitate to seek health care for themselves, they commonly won't seek care for their child until he becomes seriously ill.

Once bitten

Sometimes, a family's health-related beliefs and practices are based on previous experiences with health care. Negative experiences can make family members reluctant to seek care for themselves and for their child.

These experiences may include:

- real or perceived poor quality of care
- real or perceived insensitivity of health care professionals
- physical or emotional pain or trauma
- death of a family member in a health care facility.

The pediatric nurse can help to make a family's health-related beliefs more positive by:

- asking family members about their past health care experiences and acknowledging their concerns
- stressing the ways the current situation differs from past situations
- encouraging family members to participate actively in their child's health care and praising them for the care they're already providing.

Quick quiz

1. The phrase *infant mortality rates* refers to the:

A. number of children faced with any given health problem.
B. number of infant deaths in any given year.
C. nutritional health of a population of infants.
D. socioeconomic status of a population of infants.

Answer: B. Infant mortality rates refer to the number of infant deaths per 1,000 live births in any given year.

2. A child is admitted for surgery. On your admission assessment, the mother tells you that her family is composed of herself, the patient (her daughter), her new husband, and her stepson. What type of family is this?

A. Nuclear family
B. Cohabitation family
C. Blended family
D. Foster family

Answer: C. A family composed of a mother with children from a previous relationship who marries a father with children from a previous relationship is called a *blended family*.

3. A 5-year-old is in the hospital after having an appendectomy. A full liquid diet is ordered for the child. A carbonated soda, chicken broth, milk, and ice cream are on his food tray. The mother states that the child isn't permitted to have these foods because she doesn't allow him to have foods containing sugar. Which action is the nurse's best response?

A. Explain to the mother that these are the only foods allowed after surgery.
B. Respect the mother's wishes and remove the food.
C. Discuss the nutritional value of these foods after surgery.
D. Review with the mother what foods are allowed and include her in the menu selection.

Answer: D. By allowing the mother to participate in making decisions about the child's care, the nurse is fostering family-centered care.

4. Relationships that a child has with others in his age-group are known as:

A. peer relationships.
B. family relationships.
C. sibling relationships.
D. caregiver relationships.

Answer: A. Peers are those in a person's own age-group. Peers can heavily influence the behavior of a child as he attempts to conform to the norms of the group.

Scoring

☆☆☆ If you answered all four items correctly, congratulations! Your introduction to pediatric nursing is empowering.

☆☆ If you answered three items correctly, good work! Tell your peers you have a well-centered grasp of pediatric nursing.

☆ If you answered fewer than three items correctly, don't get morbid! You have 14 more chapters to create a positive pediatric nursing experience.

2

Concepts in pediatric nursing care

Just the facts

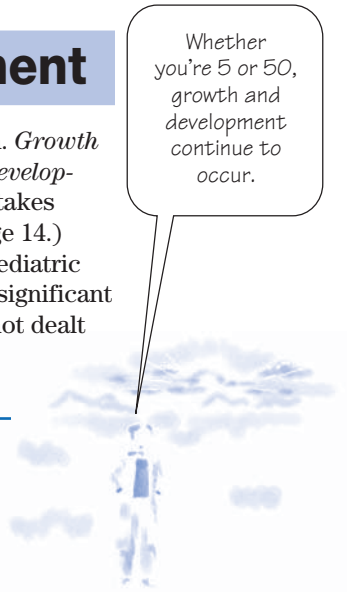
In this chapter, you'll learn:

- factors influencing growth and development
- methods of preparing and administering medications to children
- how to assess and manage pain in the child
- needs of the hospitalized and special needs child.

Principles of growth and development

Growth and development occur throughout the life span. *Growth* implies an increase in size, such as height and weight. *Development* refers to the acquisition of skills and abilities that takes place throughout life. (See *Patterns of development*, page 14.)

Growth and development are essential parts of the pediatric nursing assessment. Problems that may initially seem insignificant might actually have severe consequences in later life if not dealt with early.



Stages of development

There are five stages of development during childhood:

- *Infancy* is the period from birth until age 1.
- The *toddler stage* is the period from ages 1 to 3.
- The *preschool stage* lasts from ages 3 to 6.
- *School-age* refers to children ages 6 to 12.
- *Adolescence* is the period from ages 13 to 19. Some experts now consider the period of adolescence from ages 10 to 25 due to recent research on brain development.

Patterns of development

This chart shows the patterns of development and their progression and gives examples of each.

Pattern	Path of progression	Examples
Cephalocaudal	From head to toe	Head control precedes the ability to walk.
Proximodistal	From the trunk to the tips of the extremities	The neonate can move his arms and legs but can't pick up objects with his fingers.
General to specific	From simple tasks to more complex tasks (mastering simple tasks before advancing to those that are more complex)	The child progresses from crawling to walking to skipping.

Factors that influence growth and development

From birth on, children normally accomplish a series of developmental tasks during the stages of growth. As a child matures, he develops a readiness to master new, age-appropriate tasks.

Task master

A child's ability to master these tasks is affected by environmental, social, cultural, and relational factors. Without the appropriate stimuli or environment, these tasks might not be accomplished, and development may be arrested or may occur in a maladaptive manner.

Family

The family in which a child is raised greatly influences his development. For example, a child who has been abused or neglected may experience delays in learning trust as well as disorders of attachment and problems with feeding and sleeping. Repeated episodes of maltreatment or emotional deprivation have been shown to also have a physical impact, decreasing a child's rate of growth.

Health status

A child's physiologic state can significantly affect his development. Children with chronic health conditions may experience developmental lags in acquiring skills relating to cognition, communication, adaptation, and social and motor functioning. The

extent to which a health condition affects a child's development depends on the severity of the illness.

Socioeconomic status

A family's socioeconomic status can have a significant impact on a child's growth and development.

Ain't got no culture

Parents who must work long hours to provide basic necessities may have little time or money to help their child achieve his highest level of functioning through enriching experiences. Travel as well as cultural and educational outings—to the library, museum, or zoo—may not be possible.

I could have been a contender

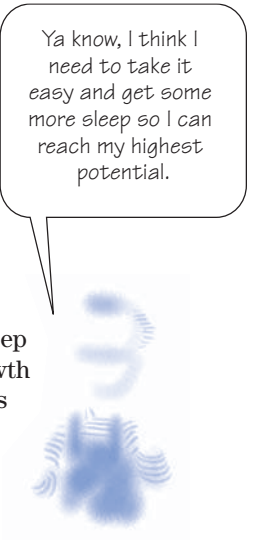
A lack of time and funds can also limit a child's ability to pursue such special interests as art, music, and sports.

Cultural background

A family's cultural beliefs and circumstances also affect a child's growth and development. Culture influences the way children are socialized, learn values, and experience the world. The child's developing beliefs, customs, mode of communication and dress, and actions are influenced by and vary according to culture.

Normal to me, taboo to you

Practices vary from culture to culture; what's acceptable in one culture may be taboo in another. It's extremely important for nurses to become knowledgeable about and respectful of cultural beliefs that differ from their own. This knowledge enables nurses to develop strategies for effective interventions. (See *Cultural influences on developmental assessment*, page 16.)



Basic necessities

A child must have such basic necessities as sleep, rest, and proper nutrition to reach his highest potential.

Children need more sleep than adults, and nurses should keep in mind that sleep deprivation can impact performance on growth and development assessments. Chronic sleep deprivation yields negative physiologic consequences.

Amount of sleep needed for healthy growth and development

(Recognize each child is different and may require more or less depending on circumstances such as illness, body metabolism, etc.)

Age	Number of hours needed	Sleep patterns
Newborns 1 to 4 weeks	15 to 16 hours/day	No recognizable sleep patterns established yet
Infants 1 to 12 months	14 to 15 hours/day	Most babies sleep 4 to 6 hours at a time, eventually taking two to three naps per day.
Toddlers 1 to 3 years	12 to 14 hours/day	8 to 10 hours at night and one long nap per day
Preschoolers 3 to 6 years	10 to 12 hours/day	Most sleep at night. By 5 years old, most children no longer take naps.
School age 6 to 12 years	10 to 11 hours/day	School-age children may still need a nap occasionally.
Teens 13 to 19 years	8 to 10 hours/day	Most teens need additional sleep during growth times.

Cultured pearls

Cultural influences on developmental assessment

Tools for measuring development might not take into account cultural influences. For example, Southeast Asian children may be considered delayed in the area of personal-social development on the Denver II test because of a lack of familiarity with games such as pat-a-cake, a game well-known to other cultures.

No single tool can take into account all the factors that contribute to the patient's development. Variables that will impact assessment of a child's development must be considered when performing developmental screenings.

Brain food

Nutritional deprivation can seriously interfere with brain development. Nutritional guidelines, such as the MyPlate guidelines from the U.S. Food and Drug Administration (FDA), should be taught to children and their parents to help them achieve optimum nutrition needed for normal growth and development. (See *www.ChooseMyPlate.gov*.)

Teach your children well

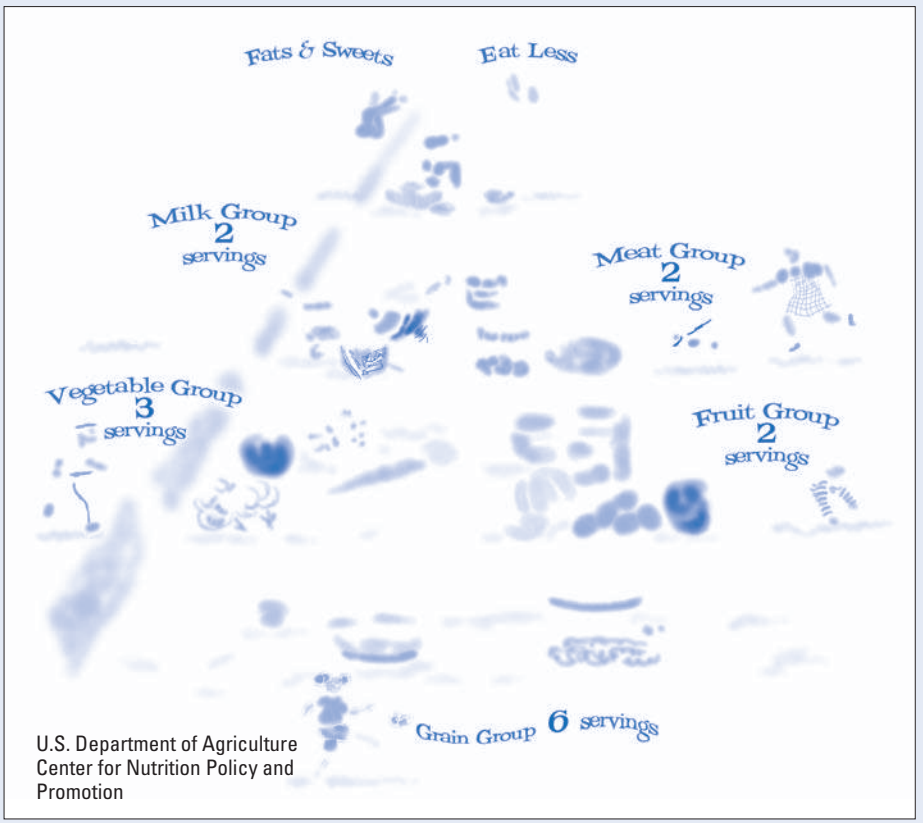
Beginning in infancy and continuing throughout the early years of childhood, the nurse, parents, and other significant people in the child's life can teach habits of healthy eating and living. These healthy habits may prevent serious health problems as the child grows.

Other influences

Other influences on growth and development include genetics and heredity as well as the inborn personality or temperament of the child.

MyPlate food guide for young children

These sample daily food plans from www.ChooseMyPlate.gov were designed specifically for children ages 2 to 5 and 6 to 11 by the U.S. Department of Agriculture.



U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

Theories of development

According to most theories of personality and cognitive development, certain tasks must be mastered before a child can advance to other, more advanced tasks. This process is similar to the patterns of biological development (cephalocaudal, proximodistal, general to specific). (See *Theories of development.*)

Psychosocial development

A developmental framework for the entire life span was first proposed by Erik Erikson in 1959. Erikson's *psychosocial theory* has been further refined but essentially remains the same today.

Erikson believed that the psychosocial development of an individual is a function of *ego* (the conscious part of the personality—and the part that most immediately controls thought

Growing pains

Theories of development

The child development theories discussed in this chart shouldn't be compared directly because they measure different aspects of development. Erik Erikson's psychosocial-based theory is the most commonly accepted model for child development, although it can't be empirically tested.

Age-group	Psychosocial theory	Cognitive theory	Psychosexual theory	Moral development theory
Infancy (birth to age 1)	Trust versus mistrust	Sensorimotor (birth to age 2)	Oral	Not applicable
Toddlerhood (ages 1 to 3)	Autonomy versus shame and doubt	Sensorimotor to preoperational	Anal	Preconventional
Preschool age (ages 3 to 6)	Initiative versus guilt	Preoperational (ages 2 to 7)	Phallic	Preconventional
School age (ages 6 to 12)	Industry versus inferiority	Concrete operational (ages 7 to 11)	Latency	Conventional
Adolescence (ages 13 to 19)	Identity versus role confusion	Formal operational thought (ages 11 to 20)	Genitalia	Postconventional

and behavior) as well as social and biologic processes. At given times in the life cycle, the interaction between these processes cause psychosocial crises by placing a demand on the individual. In order for the person to grow, he must resolve these crises and master the task at hand.

He trusts me, he trusts me not

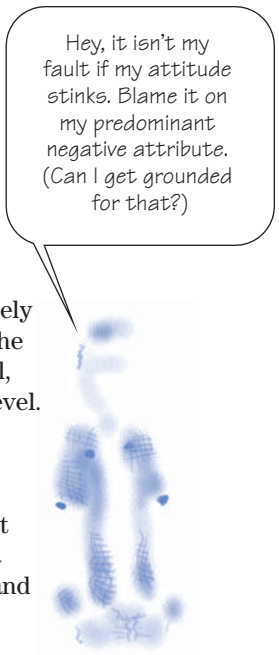
These tasks occur in eight different stages, five of which pertain to childhood. Each stage is characterized by a specific positive identity issue, such as trust in the infancy stage, and a contrasting negative attribute that may emerge from that issue, such as mistrust in the infancy stage. The prominence of either positive or negative attributes determines mastery of the crisis.

Weighing the pros . . .

If the positive attribute emerges, the individual has a better chance of experiencing unimpaired development.

. . . and the cons

If the negative attribute predominates, the individual may have problems with later attitudes and personal strength. Some negative attributes are, however, necessary to completely master the task at hand. As the person deals with each task, he assumes both increased vulnerability and increased potential, which garners new strength and pushes him on to the next level.



Hopeful today, caring tomorrow

Optimal development depends on the proper resolution of each task in the appropriate sequence. For example, the trust developed in infancy leads to a sense of hope, which forms a foundation for the emerging trait of fidelity in adolescence, and an ability to care in adulthood.

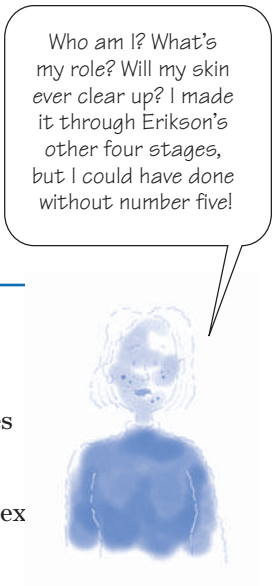
Stages of psychosocial theory

The five childhood stages of psychosocial theory are:

- *trust versus mistrust (birth to age 1)*. The child develops trust as the primary caregiver meets his needs.
- *autonomy versus shame and doubt (ages 1 to 3)*. The child learns to control his body functions and becomes increasingly independent, preferring to do things himself.
- *initiative versus guilt (ages 3 to 6)*. The child learns about the world through play and develops a conscience.
- *industry versus inferiority (ages 6 to 12)*. The child enjoys working on projects and with others and tends to follow rules;

competition with others is keen, and forming social relationships takes on greater importance.

identity versus role confusion (ages 12 to 19). Changes in the child's body are taking place rapidly, and the child is preoccupied with how he looks and how others view him; while trying to meet the expectations of his peers, he's also trying to establish his own identity.



Cognitive development

According to Jean Piaget, cognitive or intellectual acts occur when an individual is adapting to and organizing the perceived environment around him. Piaget thought a child moves through four stages of cognitive development. As he moves through each stage, he builds on structures gained from the previous stages, moving from relatively simple to very complex operations.

Some people never grow up!

Piaget noted that all individuals have the capability to achieve the most advanced levels of functioning, although not all will reach the final stages of development.

No problem too big

It's through experience with the environment that development is pushed ahead. The child incorporates new ideas, skills, and knowledge into familiar patterns of thought and action.

When faced with a problem that's new or too complex to fit into his existing pattern of thought, the child *accommodates* (draws on past experiences that are closest to his current problem to solve it).

Sensorimotor stage

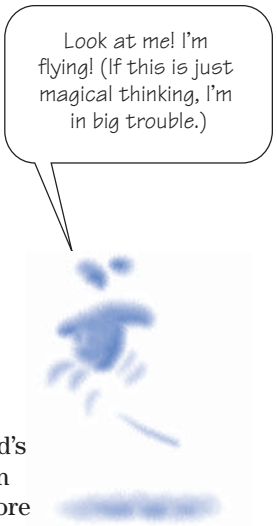
The sensorimotor stage spans birth to age 2. During this stage, the child progresses from reflex activity, through simple repetitive behaviors, to imitative behaviors. Concepts to be mastered include:

- *object permanence*—the understanding that objects and events continue to exist, even when they can't be seen, heard, or touched directly
- *causality*—the relationship between cause and effect
- *spatial relationships*—the recognition of different shapes and the relationships between them (for example, placing a round object in a round hole).

Preoperational stage

The preoperational stage starts at age 2 and ends around age 7. This stage is marked by *egocentricity* (the child can't comprehend a point of view different from his own). It's a time of magical thinking and increased ability to use symbols and language. Concepts to be mastered include:

- *representational language and symbols*—re-presenting a reality into internal knowledge through language acquisition, using symbolic play such as riding a broom like horse
- *transductive reasoning*—generalization to the extent that items that share characteristics are labeled the same.



Concrete operational stage

During the concrete operational stage (ages 7 to 11), the child's thought processes become more logical and coherent. He can use inductive reasoning (using facts gathered from one or more specific experiences to draw a general conclusion about a situation) to solve problems but still can't think abstractly. The child is less self-centered during this stage. Concepts to be mastered include sorting, ordering, and classifying facts to use in problem-solving.

Formal operational thought stage

The formal operational thought stage, which runs from ages 11 to 20, is characterized by adaptability and flexibility. The adolescent can think abstractly, form logical conclusions from his observations, and establish and test hypotheses. Concepts to be mastered include abstract ideas and concepts, possibilities, inductive reasoning, and complex deductive reasoning.

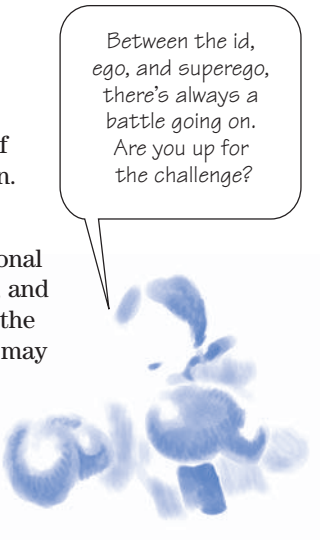
Psychosexual development

Development of human sexuality is influenced by physical, emotional, and cultural aspects in the society in which we live. This sexuality is part of the total person, which develops over time. It's expressed through many avenues, including a person's attitudes, feelings, beliefs, and self-image.

Sexual feelings

Sigmund Freud theorized that sexual feelings are present in some form from the newborn period through adulthood. He felt human nature has two sides: rational intellect and irrational desires. Freud's theory of psychosexual development is fairly controversial, yet it is still used. He focused more on the abnormal mind and function rather than on the normal functioning of children and tied the development of personality to sexual development.

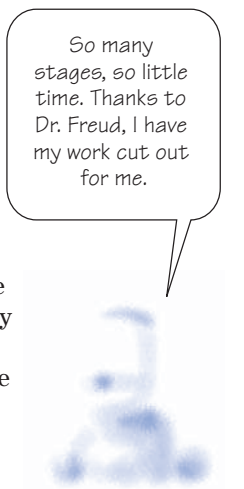
Id, ego, and superego



According to the psychosexual theory, personality is composed of three entities:

- The *id*, the largest portion of the mind, is the center of our primitive instincts and requires immediate gratification. (The neonate is the epitome of the id.)
- The *ego* develops in infancy and is the conscious, rational part of the personality; it's less inward seeking than the id, and recognizes the larger picture. (The ego acts as a censor to the id; if there's conflict between the id and the ego, neuroses may develop.)
- The *superego* represents the person's conscience and ideals; therefore, it's in continuous battle with the id.

Five stages of development



Freud proposed five stages of development; these stages center around the early years of the person's life and the parent-child relationship. At each stage, sexual energy, what Freud called *instinctual libido*, is focused on a different area of the body.

Each stage also centers on a conflict that must be resolved before the child can progress to the next stage. If the conflict isn't resolved, the child becomes fixated in that stage and development is arrested.

I can't get no . . . satisfaction

Satisfaction must be achieved before a person can move on to the next stage. If he isn't fully satisfied, it's possible he may never fully complete the stage.

How the individual responds to others depends on which stage he's in. This was a hallmark theory in the field of psychology, although it's relatively limited in its scope.

Oral stage

In the oral stage (birth to age 1), the child seeks pleasure through sucking, biting, and other oral activities. Oral stimulation reduces tension and provides sensual satisfaction.

Anal stage

The anal and urethral areas are of great interest in the anal stage (ages 1 to 3). The child goes through toilet training and learns to control his excreta.

Phallic stage

During the phallic stage (ages 3 to 6), the child is interested in his genitalia and various sensations and discovers the difference

between boys and girls. The child may love the opposite-sex parent and consider the parent of the same sex a rival. This is known as the *Oedipal* (boys) or *Electra* (girls) *complex*.

Latency period

In the latency period (ages 6 to 12), the child expands on traits developed in earlier stages and concentrates on playing and learning. The child doesn't focus on a particular area of the body during this stage.

The Oedipal or Electra complex resolves, and the child forms close relationships with other children of the same age and gender. Energy is directed toward physical and intellectual quests.

Genitalia stage

The production of sex hormones becomes intense during the genitalia stage (ages 12 and older), and the reproductive system reaches maturation. During this stage, the adolescent develops the capacity for object love and maturity.

Moral development

Lawrence Kohlberg's ideas of moral reasoning (the basis for ethical behavior) are based on the work of Piaget and the American philosopher John Dewey.

Born free . . . of morals, that is!

Kohlberg's theory is based on the premise that, at birth, all beings are devoid of morals, ethics, and honesty. Then, through different stages, the family, and then the larger society, instills values, morality, and a sense of right and wrong. As the child's intelligence and ability to interact with others mature, his patterns of moral behavior mature as well.

Kohlberg, along with Piaget, believed that most moral development occurs through social interaction; he felt that development could be promoted through formal education.

Can we talk?

According to Kohlberg, it's important to present a person with moral dilemmas for discussion, which helps him see the reasonableness of the next higher stage and progress toward it. Kohlberg based this discussion approach on the insight that a person develops as a result of cognitive conflicts in his current stage.

Three levels of moral development

Kohlberg proposed three levels of moral development through which the person must pass. As the child comprehends and understands a stage, he can then progress to the next stage.

Preconventional level of morality

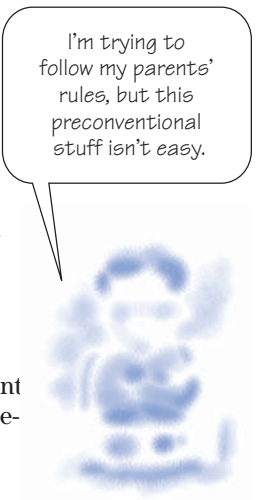
At the preconventional level (ages 2 to 7), the child attempts to follow rules set by those in authority. He tries to adjust his behavior according to good and bad and to right and wrong.

Conventional level of morality

At the conventional level (ages 7 to 12), the child seeks conformity and loyalty. He attempts to justify, support, and maintain the social order, and he follows fixed rules.

Postconventional autonomous level of morality

At the postconventional level (ages 12 and older), the adolescent strives to construct a personal and functional value system independent of authority figures and his peers.



Caring for the hospitalized child

Hospitalization is a major stressor for any individual, but especially for a child. The child is in an unfamiliar surrounding, with unfamiliar people. His routine is disrupted, and he isn't able to do things he normally does.

Added to these stressors are the fear, pain, and discomfort associated with the child's illness or injury and, in many cases, the diagnostic and therapeutic interventions used to treat the child. What's more, even a minor illness may be perceived by the family as life-threatening. This perception can trigger fears that may overwhelm the family's coping skills and lead to crisis.

Developmentally appropriate interventions should be geared toward helping the child and his family cope with this very stressful time.

No place like home

Separation of the child from his parents, siblings, and usual support systems further adds to the emotional stress and discomfort a child feels when hospitalized. Parents (and siblings) should be encouraged and allowed to spend as much time as possible with the hospitalized child. When policy permits, arrangements should be made for a parent to spend the night in the child's room or close by.

Minimizing the trauma of hospitalization

Preparing a child for hospitalization and any interventions will help the child cope more effectively and make it easier for him to trust the health care professionals responsible for his care.

Always be prepared

When possible, it's ideal to prepare the child for admission to the hospital. The timing of the preparation and the amount of teaching given depend on the child's age, developmental stage, personality, and the length of the procedure or treatment.

Young children may need only a few hours of preparation, whereas the older child may benefit from several days of preparation. The use of developmentally appropriate activities will also help the child cope with the stress of hospitalization. (See *The importance of play*.)

Specialist on the job

Many hospitals have a *child life specialist* on staff, who can arrange a preadmission visit for the child and his parents. During these visits, the child and his parents tour the pediatric unit, helping to familiarize the child with the sights, sounds, and smells of the hospital. The child life specialist, an expert in child development, then explains, step-by-step, what the child can expect—especially relating to any planned procedures—and can also stay with the child during those procedures.

Keep it in the family

To reduce the fear that accompanies hospitalization, the nurse can help the child and family cope by:

- explaining procedures
- answering questions openly and honestly
- minimizing separation from the parents
- structuring the environment to allow the child to retain as much control as possible.

Patient- and family-centered care is an approach to health care that recognizes that the child patient and the family are integral members of the health care team. It allows the family to remain as involved as possible and helps give the child and his family a sense of control in a difficult and unfamiliar situation. It may also help

The importance of play

One of the most important aspects of a child's life is play. Play can become even more important to a child who's hospitalized. It can serve several functions:

- Play is an excellent stress reducer and tension reliever. It allows the child freedom of expression to act out his fears, concerns, and anxieties.
- Play provides a source of diversional activity, alleviating separation anxiety.
- Play provides the child with a sense of safety and security because, while he's engaging in play, he knows that no painful procedures will occur.
- Developmentally appropriate play fosters the child's normal growth and development, especially for children who are repeatedly hospitalized for chronic conditions.
- Play puts the child in the driver's seat, allowing him to make choices and giving him a sense of control.

alleviate separation anxiety and reassure the child that all care is intended to help him get better. The child needs reassurance that the illness isn't his fault and that fear is a normal response. All children should be encouraged to express their feelings.

Caring for the special needs child

All children go through times in their lives when parents, family, and others need to adapt to certain outside influences. How the child copes with these influences, either positive or negative, is determined by his strengths, personality, developmental stage, and support systems.

Chronic illness and disability

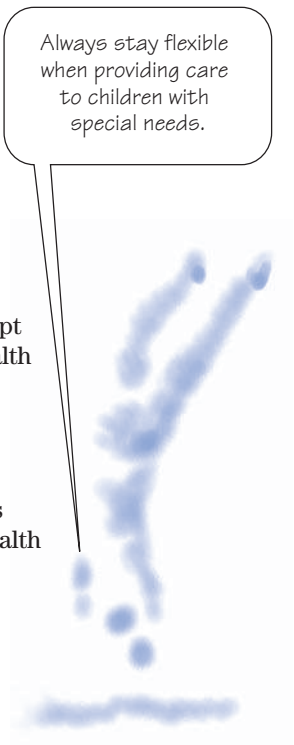
When a child has a chronic illness or is disabled, family members experience additional stress that has lasting implications for the child, his parents, and his siblings.

Flexibility required

Chronic or terminal illnesses, disabilities, or acute conditions that impact daily living require the family and the child to adapt their normal process of living and being; they also require health care professionals to adapt their usual way of providing care.

On the rise

Almost 20% of the pediatric population has a condition that would qualify them as having a special health care need. This percentage is increasing because of improved technology, health care, and treatments that increase survival rates.



Barriers to optimal care level

Children with special needs commonly require continuous and complex care. Oversight of care is usually provided by specialists who may or may not take into account alterations in development or the child's response to the illness. Occasionally, this may mean that the child doesn't receive preventive health services. Other barriers to optimal health care in the special needs child include financial, health care system, and knowledge barriers. For these reasons, it's especially important for the nurse to help ensure that the child is up-to-date on immunizations, well-child checkups, and routine health care.

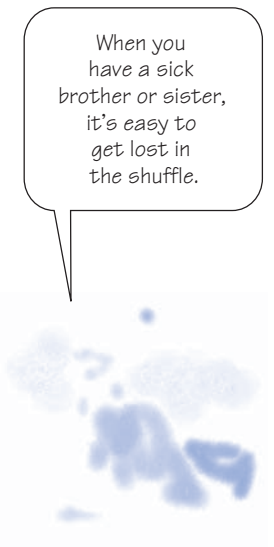
Impact on the family

The diagnosis of a chronic condition may cause extreme distress in the family. Parents grieve over the loss of their "healthy" child

and may perceive him as vulnerable. This view may hinder the child in meeting the tasks required for him to grow and develop as normally as possible. Helping the family understand the condition and its impact on normal growth and development will help the child achieve his highest level of functioning. The complexity of care that a special needs child may have also increases the burden of care on the family or may further isolate a family from outside support systems. This added stress may increase the risk for child abuse and other forms of victimization to the child.

Hey, what about me?

Having a sibling with a chronic condition may elicit feelings of stress, helplessness, guilt, or depression. Siblings should be included in the family assessment of coping and should be provided with appropriate support. Older siblings commonly participate in providing care to a special needs child at home as much as the parents do. They must be included when providing care and teaching to the child.



Nursing strategies

Care and nursing interventions should be adapted to the child's level of development.

Consult the experts

Parents and families are the people that know the most about their child. When planning interventions, the nurse should take into consideration the family's expertise in providing care for their child; the parents should be consulted for advice about the child's routine, care preferences, and special needs.

Be all that you can be

The child should receive special needs care, as appropriate, and interventions aimed at promoting the child's ability to reach his maximum potential.

A little help, please

It's important to remember that a child with a disability or chronic illness faces many challenges. Encouraging the use of such resources as support groups will help the child and family interact with others who are experiencing, or who have managed, the same issues.

Understanding that the child's condition realigns the hopes and expectations of the family and the assigned roles within that family, the nurse can help provide interventions to help the child and family cope. To this end, the nurse can show respect and caring by:

- supporting family coping strategies
- providing education in a forthright, honest manner
- brokering access to health services
- promoting preventive health measures.

Caring for the terminally ill child

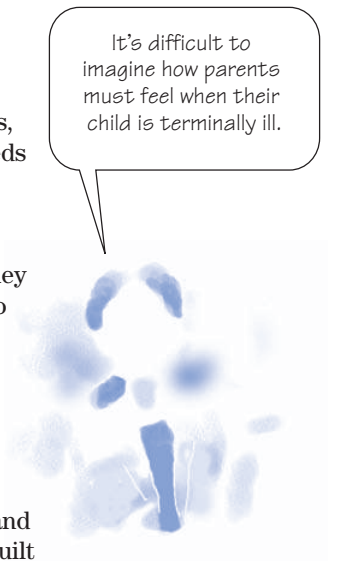
The dying child elicits many different emotions in the child, family, and nurse. A perception exists in our society that children aren't supposed to die. For the nurse, this can be a painful and awkward situation.

Dealing with a terminal illness

An understanding of how the child and his family have managed health and illness in the past may provide the nurse with clues about how the family will cope with having a dying child.

Impact on the family

The death of a child is viewed by most people as the worst possible thing that can happen to a parent. Family members of a terminally ill child must deal with a range of emotions while still trying to deal with everyday needs, such as those related to jobs, the household, and the needs of their other children.



To stay or to go—that is the question

These stressors can bring families closer together, but they can also tear families apart. It isn't unusual for parents to have marital stress after the death of a child, at a time when they need each other's support more than ever. Recent statistics show less than one-third of marriages end in divorce after the death of a child.

It's a roller coaster ride

Parents may experience a range of emotions, from fear and anger (sometimes directed at health care providers) to guilt and disabling grief even before their child dies. Siblings may feel unloved or forgotten, as their parents focus their attention on the dying child. They may then feel guilty about having those feelings.

Nursing strategies

The child who's dying has the same emotional and developmental needs as any other child of the same age—as well as other needs related to his poor prognosis. The nurse should develop care plans based on family input to meet these needs at the child's developmental level—realizing that the ill child may have some regression in his or her developmental level. Adaptations in care must be made and must be based on the child's physiologic and psychological status.

Growing pains

Concepts of death in childhood

A child's concept of death depends on his developmental stage.

Developmental stage	Concept of death	Nursing considerations
Infancy	• None	• Help parents understand that the infant or very young child may react to the emotions of others and may show changes in behavior, sleeping, or feeding patterns. • Be aware that the older infant will experience separation anxiety and may express fear through crying. • Help the family cope with death so they can be available to the infant or young child.
Early childhood	• Knows the words "dead" and "death" but the concept of forever may not have value • Reactions are influenced by the attitudes of parents	• Help the family members (including siblings) cope with their feelings. • Reassure the child and siblings that the illness is not their fault nor is it a punishment. • Allow the child to express his own feelings in an open and honest manner. • Help parents deal with potential aggressive or regressive behaviors if the child is unable to verbalize his feelings.
Middle childhood	• Understands universality and irreversibility of death • May have a fear of parents dying	• Use play to facilitate the child's understanding of death. • Ask questions to help facilitate a discussion with the child. Address any distortions or erroneous views of death. • Allow siblings to express their feelings.
Late childhood	• Begins to incorporate family and cultural beliefs about death • Explores views of an afterlife • Faces the reality of own mortality	• Provide opportunities for the child to verbalize his fears. • Help the child discuss his concerns with his family.
Adolescence	• Adult perception of death, but still focused on the "here and now"	• Use opportunities to open discussion about death. • Allow expression of feelings of guilt, confusion, and anxiety. Encourage the youth to not repress emotions. • Support and maintain self-esteem.

Tell me no lies

Communication should be honest. Understanding the developmental level of the child in relation to his concept of death will help foster appropriate communication techniques. (See *Concepts of death in childhood.*)

A positive and helpful approach should be maintained, and the family should be included in all aspects of care. All procedures and therapies should be explained before carrying them out.

Maximum control

Pain control is an essential component in the management of a terminally ill child. The nurse should serve as the child's advocate to ensure that the child receives the most effective pain management possible.

Helping families cope

The nurse can help the family cope during this very difficult time by:

- encouraging all family members to express their feelings, even though they might be difficult to hear
- allowing families to spend as much time as possible with the dying child (including overnight stays)
- allowing and encouraging parents to continue to take an active role in their child's care.

Strong like a bull? Not always!

The nurse can also help the family cope by:

- reminding parents that they don't always have to be strong and that asking for help is a sign of strength, not weakness
- helping parents to talk with their child about dying in a developmentally appropriate manner if he's ready to do so
- providing parents and siblings with information about support groups and professionals who can help them with their grief
- contacting other health care professionals (social workers, child life specialists, play therapists, art and music or pet therapists) and volunteers who may be able to help the child, his siblings, and his parents with coping and with concrete daily needs (such as transportation, sibling care, and special arrangements)
- reassuring parents that you understand how difficult this must be but avoiding such phrases as "I know how you feel"
- remaining as accessible and available as possible and facilitating contact and communication with other individuals on the child's health care team.

Nurses have the unique opportunity to impact the child in every stage of life. Using the principles of caring for the whole person will help the child and his family deal with the most difficult stage, that of the dying child.

Pain in the pediatric patient

Pain is a subjective experience; for infants and children, it's possibly the most bewildering and frightening occurrence in their young lives. Until age 3 or so, children can't grasp abstract concepts, such as time, cause and effect, and quantification. Consequently, it's impossible for them to understand why pain occurs or that relief is just around the corner. They know only that something hurts right now.

My kingdom for a word

What makes the experience particularly distressing is that infants and young children lack the language skills needed to tell someone that they're in pain, where it hurts, and how much, or to ask for help.

In this respect, infants and children are uniquely dependent on the ability of their parents and health care providers to recognize the physiologic and behavioral signs of pain and to react by relieving their pain. Similarly, children could reasonably expect these same caregivers to anticipate and prevent or minimize painful experiences whenever possible.

Assessing pain

A growing number of health professionals who work with children talk about pain as a fifth vital sign, one that should be assessed early and often to ensure prompt, effective relief.

Assessing pain in infants and young children requires the cooperation of the parents and the use of age-specific assessment tools. If the child can communicate verbally, he can also aid the process.

Health history and physical examination

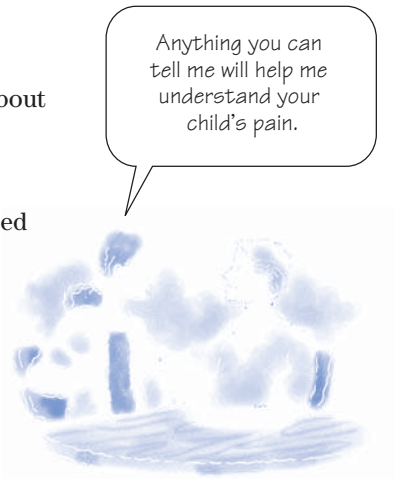
Normal clinical assessment involves a health history that includes a description of any pain and palliative measures and a comprehensive physical examination. When assessing infants and children, you must rely on parents for the health history and background on experience with pain.

Wanna play 20 questions?

To help you better understand the child's pain, ask the parents these questions:

- What kinds of pain has your child had in the past?
- How does your child usually respond to pain?
- How do you know your child is in pain?
- What do you do when he's hurting?

- What does your child do when he's hurting?
- What works best to relieve your child's pain?
- Is there anything special you'd like me to know about your child and pain?



No wonder they call 'em vital

The child's vital signs can be pain indicators. Elevated pulse, blood pressure, or respirations can be signs of pain and stress. However, findings here must be viewed in conjunction with other assessment data because nonpainful stimuli can elicit changes in vital signs as well. For example, just touching an infant can speed or calm the child's pulse rate.

Assessment tools

A number of proven assessment tools have been designed for a young patient. Many of these tools seek to quantify the child's pain, one of the harder things to accomplish during assessment and observation. Using an assessment tool will help, but quantifying pain in the infant or preverbal child will still be difficult.

Where's that toolbox?

Pain assessment tools are described as being *unidimensional* (measuring or assessing one indicator) or *multidimensional* (measuring or assessing multiple indicators). Composite measures of pain include physiologic, behavioral, sensory, and cognitive indicators. These tools tend to be especially useful when assessing children under age 3 or older children with cognitive deficits.

Painful measures

Because of the complexity of assessing pain in infants, there's no single pain measurement tool that works well for all patients. However, four multidimensional tools for measuring pain in infants have proved to be quite effective. These four tools are the:

- CRIES Neonatal Postoperative Pain Measurement Scale
- Neonatal Infant Pain Scale
- Premature Infant Pain Profile (See *Measuring pain in infants.*)
- COMFORT Scale.

The CRIES inventory is one of the easier tools to use. Five separate factors are scored on a scale of 0 to 2. Infants with a score of 0 would be pain-free. A total score of 10 would indicate extreme pain.

All of the assessment tools for infants and young children were developed to help assess acute pain. Currently, no tools exist to help measure chronic pain in infants and young children. The

Memory jogger

To help you stay focused when assessing pain in the young patient, remember the mnemonic **QUEST**:

Q—Question the child's parents (and the child, too, if he's old enough to respond).

U—Use appropriate pain assessment tools.

E—Evaluate the child's behavior.

S—Secure the parents' active participation in treatment.

T—Take the cause of the pain into consideration.

Measuring pain in infants

Assessing pain in infants and young children can be challenging for health care providers. This chart describes four assessment tools that can help you meet this challenge.

Assessment tool	Factors measured
CRIES Neonatal Postoperative Pain Measurement Scale	• Crying (C) • Oxygen saturation (R—requires oxygen to maintain saturation above 95%) • Heart rate and blood pressure (I—increased) • Expression (E) • Sleeplessness (S)
Neonatal Infant Pain Scale	• Facial expression • Crying • Breathing patterns • State of arousal • Movement of arms and legs
Premature Infant Pain Profile	• Gestational age • Heart rate • Oxygen saturation • Behavioral state • Brow bulge • Eye squeeze • Nasolabial furrow
COMFORT Scale	• Alertness • Calmness • Respiratory distress • Crying • Physical movement • Muscle tone • Facial tension • Blood pressure (mean arterial pressure [MAP]) baseline • Heart rate baseline

variability of pain response and the pathology of chronic pain in infants and young children make measurement very difficult.

Speaking of pain

For the child capable of speaking, typically age 3, the task is somewhat easier. Several simple and effective pain-measuring scales can help the child identify a level of pain. These include a:

- faces pain-measuring scale
- visual analog scale
- chip pain-measuring tool. (See *Measuring pain in young children*, page 34.)

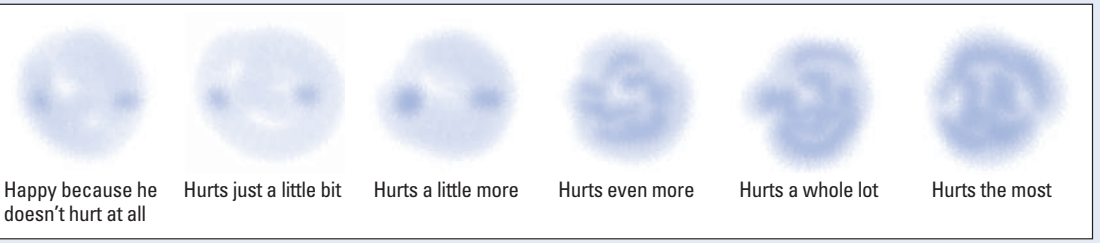
Measuring pain in young children

For children who are old enough to speak and understand sufficiently, three useful tools can help them communicate information for measuring their pain. Here's how to use each one:

Faces scale (examples: Faces Pain Scale, Wong-Baker FACES® Pain Rating Scale, etc.)

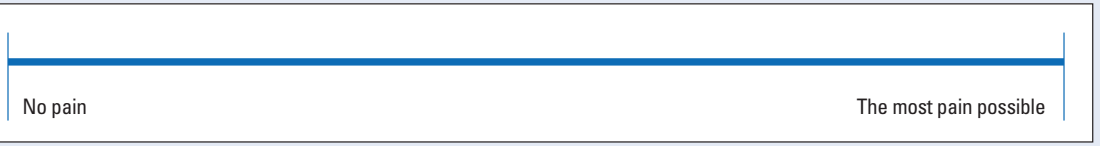
The child age 3 and older can use any of the faces scales to rate his pain. When using this tool, make sure he can see and point to each face and then describe the amount of pain each face is experiencing. If he's able, the child can read the text under the picture; otherwise, you or his parent can read it to him.

Avoid saying anything that might prompt the child to choose a certain face. Then, ask the child to choose the face that shows how he's feeling right now. Record his response in your assessment notes.



Visual analog scale

A visual analog pain scale is simply a straight line with the phrase "no pain" at one end and the phrase "the most pain possible" at the other. Children who understand the concept of a continuum can mark the spot on the line that corresponds to the level of pain they feel.



Chip tool

The chip tool uses four identical chips to signify levels of pain and can be used for the child who understands the basic concept of adding one thing to another to get more. If available, you can use poker chips. If not, simply cut four uniform circles from a sheet of paper. Here's how to present the chips:

- First say, "I want to talk with you about the hurt you might be having right now."
- Next, align the chips horizontally on the bedside table, a clipboard, or other firm surface where the child can easily see and reach them.
- Point to the chip at the child's far left and say, "This chip is just a little bit of hurt."
- Point to the second chip and say, "This next chip is a little more hurt."
- Point to the third chip and say, "This next chip is a lot of hurt."
- Point to the last chip and say, "This last chip is the most hurt you can have."
- Ask the child, "How many pieces of hurt do you have right now?" (You won't need to offer the option of "no hurt at all" because the child will tell you if he doesn't hurt.)
- Record the number of chips. If the child's answer isn't clear, talk to him about his answer; then record your findings.

Behavioral responses to pain

Behavior is the language infants and children rely on to convey information about their pain. Areas of behavior that change because of pain include body positioning, facial expression, patterns of eating and sleeping, attention level, and vocalization.

Look at that face!

In an infant, facial expression is the most common and consistent behavioral response to all stimuli, painful or pleasurable, and may be the single best indicator of pain for the provider and the parent. Studies indicate that facial expression is a more reliable pain indicator than crying, heart rate, or body position and movement.

Facial expressions that tend to indicate that the infant is in pain include:

- mouth stretched open
- eyes tightly shut
- brows and forehead knitted (as they are in a grimace)
- cheeks raised high enough to form a wrinkle on the nose.

Older signs

In young children, facial expression is joined by other behaviors to convey pain. In these patients, look for such signs as:

- narrowing of the eyes
- grimace or fearful appearance
- frequent and longer lasting bouts of crying, with a tone that's higher and louder than normal
- less receptiveness to comforting by parents or other caregivers
- holding or protecting the painful area.

Hush-a-bye, why do you cry?

Enlist the parents' help in interpreting the child's crying. Pain may be the cause, but hunger, anger, fear, or a wet diaper can also elicit crying. Typically, parents can distinguish among the different cries of their child and help narrow down the possible causes.

Crying associated with pain is distinguished by frequency, duration, pitch, and intensity. Cries of pain are usually short, sharp, higher in pitch, tense, harsh, nonmelodious, and loud.

Silent cry

On the other hand, some infants don't cry in response to pain, even pain associated with an invasive procedure. Also, some treatments make crying impossible. Intubated infants, for example, can't produce an audible cry because the endotracheal tube passes through their vocal cords. However, these infants still exhibit the facial expressions that accompany crying—mouth opened wide and eyes tightly closed, insinuating crying.

Looks can be deceiving

It's a mistake to rely too heavily on observed behavior alone when assessing pain in young patients. Some children will suffer pain rather than report it or allow others to see that they're in pain. Others are adept at distracting themselves and may appear pain-free. Some children may have been conditioned to not show pain because of negative consequences if they do. Some children will sleep soundly, not because they have no pain, but because they're physically and emotionally exhausted.

Translation needed

A child who has mastered the rudiments of language can provide some useful information. However, keep in mind that his language skills are very basic and that he may not understand words you use; you may call it pain, but he may think of it as a hurt or boo-boo. Find the words that work best by talking with his parents and with the child himself.

Check the mirror

Remember that children who are just learning to talk have a great deal more skill in reading the facial expressions and body language of their parents and caregivers. After all, they've been reading this language since birth.

Be sure your expression and body posture are conveying a message consistent with your words. If you or his parents appear concerned, he may feel there's something to fear, and this may color his description of the pain he's feeling.

Managing pain

Infants and young children may experience acute pain, cancer pain, or chronic pain associated with an underlying disorder. Pain management is most effective when it prevents, limits, or avoids noxious stimuli and involves administering analgesics.

Regardless of the underlying cause, pain management for these young patients seeks to:

- identify and relieve existing pain
- anticipate and prevent or minimize pain related to hospitalization, procedures, and treatments
- optimize pharmacologic and nonpharmacologic interventions to reduce stress, increase comfort, and enhance healing.

Pharmacologic intervention

Pharmacologic therapy is the mainstay of pain management for an infant or a child. Selection of the medications, dosages, and administration routes depends on the specific needs of the patient.

Opioid analgesics

Opioid analgesics are highly effective pain relievers and constitute the core of most pharmacologic interventions to manage acute pain (especially postoperative pain) in infants and children.

Choose your weapon . . .

Tramadol (Ultram), morphine (MS Contin), and fentanyl (Duragesic) are among the opioids used most commonly in these patients. While they're thought to be equivalent, morphine may provide better sedation and a lower risk of chest wall rigidity than fentanyl. Tramadol has less respiratory depression than morphine but is not quite as strong.

. . . and pick a route

Opioid analgesics are available in oral, sublingual, rectal, nasal, subcutaneous, transdermal, intravenous (I.V.), and intraspinal forms, which makes it relatively easy to find an acceptable route.

Although we've learned much about the pharmacodynamics and pharmacokinetics of opioids in young children, many practitioners still resist prescribing them.

Hip hooray for PCA!

Patient-controlled analgesia (PCA) can be useful in managing pain in the young patient, provided the parents are involved and they (and, if appropriate, the child) are trained in the theory and proper use of this equipment. PCA allows the patient to maintain a therapeutic level of the prescribed opioid analgesic at all times. It has proven effective in children ages 5 and older.

Parent-controlled analgesia is an effective way to allow the use of I.V. PCA for children younger than age 5 and for those with a developmental delay.

Nonopioid analgesics

Nonopioid analgesics, which include acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs), are prescribed to manage mild to moderate pain. In instances of severe pain, nonopioid analgesics can be used in conjunction with opioid analgesics to reduce the required dosage of the opioid drug.

Infants and children metabolize nonopioid analgesics in a similar manner and rate as adults; consequently, the selection criteria, effects, and possible adverse effects are comparable to adults.

Acetaminophen anyone?

Acetaminophen is the drug of choice for treating mild pain. It has the added benefit of helping reduce fever and is very safe, even for neonates. Acetaminophen has few adverse effects or contraindications. However, long-term use can increase the risk of liver

damage, and overdosing can be lethal. It's also possible to reach a point at which additional doses no longer provide an analgesic effect. On the plus side, acetaminophen is available in suppository, liquid, and chewable tablet form, making it easy to administer and appropriate for most situations. Caution the parents to not use combination medications (such as cough and cold remedies that may also contain acetaminophen) to prevent the risk of overdose.

Who said NSAIDs?

NSAIDs relieve mild to moderate pain, reduce fever and also act as anti-inflammatory agents. Commonly prescribed NSAIDs, such as ibuprofen (Advil or Motrin), naproxen (Naprosyn), tolmetin (Tolectin), indomethacin (Indocin), and ketorolac (Toradol), are approved for use in children. Possible adverse effects of NSAIDs include inhibition of platelet aggregation and GI irritation.

Combining or alternating therapy

Although alternating ibuprofen and acetaminophen is a very common practice, it is not recommended. Current studies looking at fever management have not found any significant advantage for alternating medications versus using a single medication. Studies of alternating the two for pain management in children are limited. The American Academy of Pediatrics does not recommend combining or alternating medications due to the risk of confusion causing an inappropriate or over dose to be given.

Adjuvant therapy

Adjuvant therapy is defined as a pharmacologic agent that is added to another medication to increase its effect. Although there are very few studies of the effectiveness of adjuvant therapy in infants and children, doctors prescribe a range of medications as adjuvant therapy, usually when treating cancer pain in infants and children. Positive results from such therapy have made adjuvant therapy more acceptable as a constructive facet of pain management in other chronic conditions as well, such as neuropathies, headache, myofascial pain, and recurrent abdominal pain.

Types of drugs used for adjuvant therapy, and their therapeutic effects, include:

- antianxiety medications, such as lorazepam (Ativan), diazepam (Valium), and midazolam (Versed), which are used to enhance the effect of opioids
- anticonvulsants, such as phenytoin (Dilantin), carbamazepine (Tegretol), and gabapentin (Neurontin), which are used to treat neuropathies caused by certain diseases or trauma
- corticosteroids, which help alleviate severe inflammation and bone pain
- neuroleptic drugs, which are antipsychotic, tranquilizing, sedative, and analgesic, to help relieve pain associated with cancer, certain neuralgias, phantom limb, and muscular discomfort

- tricyclic antidepressants, such as amitriptyline (Elavil), which are sometimes used to manage headache and chronic pain
- topical or local anesthetics, which are given before procedures, such as I.V. insertion, to reduce procedural pain.

Many of the previously mentioned medications can have serious side effects or even a paradoxical response. Make sure you help the parents understand the importance of using the medication properly and to report any adverse effects right away.

Nonpharmacologic interventions

For the infant, child, or youth, nonpharmacologic interventions pick up where drug therapies stop—by reducing stress and anxiety and increasing comfort and security. Typically, these measures are just as critical to the patient's well-being as pain relief.

Nonpharmacologic interventions cause no adverse effects, require no special equipment, and can be used at any time. These interventions have another benefit: They can give the parents an opportunity to shine in the care of their child.

Cognitive-behavioral therapies

Cognitive-behavioral interventions for the infant include positioning, containment or swaddling, distraction, touching, and gentle massage.

Wrap 'em up

Placing an infant in a midline or supine position has a calming effect, as does wrapping him snugly in a soft blanket. Providing distraction—for example, with a bedside mobile or a safe, colorful toy or stuffed animal—helps the infant focus on something enjoyable rather than his pain.

You're getting sleepy—very sleepy

For a toddler, distraction, hypnosis, guided imagery, gentle massage, snuggling with Mom and Dad, and curling up in bed listening to a story are all methods of moving the child's focus away from his pain toward more serene, safe, and comforting thoughts.

Physical therapy

Thermotherapy is the most common form of physical therapy used with infants. Applying warm and cold to painful areas can make them feel better. Heat promotes circulation, and cold helps reduce swelling and provides a limited amount of numbing.

Complementary therapies

Complementary therapies, such as music or aromatherapy, are gaining acceptance because of the influence music and aromas can have on emotions and state of mind.

Charms to soothe

For the infant or child, soothing music has a calming effect and can help him drift off to sleep at nap time. More lively music can stimulate memories or encourage singing, which distract the child for a time. Smells that remind him of Mom, Dad, or Grandma's house can be comforting as well.

Sucking on sucrose

For the infant, nonnutritive sucking using a pacifier, a pacifier dipped in sucrose, or a small bottle of water containing sucrose is effective in reducing pain associated with procedures. Nonnutritive sucking with or without sucrose can be used to calm the infant before the procedure as well as afterward.

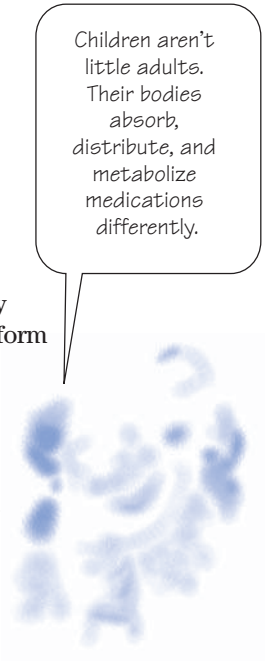
Preparing pediatric medications

Medications are used throughout the life span to treat health problems (including pain), combat disease, and promote health. Many health care professionals have expressed concerns about medication use in infants and children. These concerns are gradually beginning to fade, primarily because our understanding of medications' pharmacokinetics and pharmacodynamics in infants and young children has significantly improved in recent years.

Pharmacokinetics and pharmacodynamics

The *pharmacokinetic* (how a drug acts and how it moves through the body) and *pharmacodynamic* (study of drug mechanisms that produce biochemical or physiologic changes in the body) properties of medications include:

- absorption—how the drug is absorbed or moved into the bloodstream
- distribution—how the drug is distributed or transferred to another site
- protein-binding capacity—a measure of the drug's efficiency
- metabolism—the process of converting the drug into a useful form
- elimination—the removal of the drug from the body.



Medication metabolism in young children

It's important to understand how the unique physiology of young children affects pharmacokinetics and pharmacodynamics. Infants and young children are still developing physiologically, which affects the way their bodies absorb, distribute, and metabolize drugs. The metabolism of an infant or young child differs significantly from that of an older patient.

Acid, protein, and water . . . oh my!

A better understanding of how medications are used and metabolized in children will lead to safer medication administration in the pediatric population:

- Because gastric acidity doesn't stabilize until approximately age 3, the absorption and concentration of drugs that require an acid environment to be fully assimilated may be affected.
- Protein-binding, which aids in the distribution of drugs in the body, is lower in infants and children than in older patients.
- Compared to adults, infants have proportionately more water weight and extracellular water, less fat, and less muscle tissue. In infants, hepatic (liver) metabolism is slower and renal clearance is delayed. These factors can increase the potential for drug toxicity.

Dosage calculations

To calculate and verify the safety of pediatric drug dosages, use either the *dosage per kilogram of body weight* method or the *body surface area (BSA)* method. Other methods, such as those based on age, are less accurate and typically aren't used.

Whichever method you use, remember that, as a nurse, you're professionally and legally responsible for checking the safety of a prescribed dose before administration. (See *Trio of timesaving tips*.)

Dosage per kilogram of body weight

Many pharmaceutical companies provide information about safe drug dosages for pediatric patients in milligrams per kilogram of body weight. This measurement is the most accurate and common way to calculate pediatric dosages.

Pediatric dosages are usually expressed as *mg/kg/day* or *mg/kg/dose*. Based on this information, you can determine the pediatric dose by multiplying the child's weight in kilograms by the required number of milligrams of drug per kilogram.

Shifting weight

Most pediatric patients' weights are measured in kilograms. If you must convert from pounds to kilograms before calculating the dosage per kilogram of body weight, remember that 1 kg equals 2.2 lb.

Real world problems

The following example shows how to use proportions to convert pounds to kilograms, how to calculate a *mg/kg/dose* for one-time or as-needed (p.r.n.) medications, and how to

Advice from the experts

Trio of timesaving tips

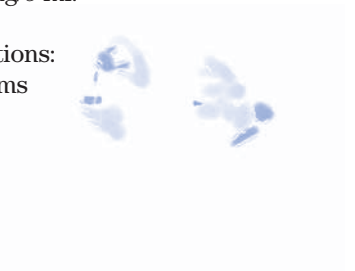
When calculating safe pediatric dosages, save time and prevent errors by following these three suggestions:

- Carry a calculator for use when solving equations.
- Consult a formulary or drug handbook to verify a drug dose. (When in doubt, call the pharmacist.)
- Keep your patient's weight in kilograms at his bedside so you won't have to estimate it or weigh him in a rush.

calculate *mg/kg/day* for doses given around the clock to maintain a continuous drug effect.

Penicillin problem

The doctor orders penicillin V potassium oral suspension 56 mg/kg/day in four divided doses for a patient who weighs 55 lb. The suspension that's available is penicillin V potassium 125 mg/5 ml. What volume should you administer for each dose?



Here's how to solve this problem using ratios and fractions:

- First, convert the child's weight from pounds to kilograms by setting up this proportion:

$$X : 55 \text{ lb} :: 1 \text{ kg} : 2.2 \text{ lb}$$

- Multiply the extremes and the means:

$$X \times 2.2 \text{ lb} = 1 \text{ kg} \times 55 \text{ lb}$$

- Solve for X by dividing each side of the equation by 2.2 lb and canceling units that appear in both the numerator and the denominator.

$$\frac{X \times \cancel{2.2 \text{ lb}}}{\cancel{2.2 \text{ lb}}} = \frac{1 \text{ kg} \times 55 \cancel{\text{ lb}}}{2.2 \cancel{\text{ lb}}}$$

$$X = \frac{55 \text{ kg}}{2.2}$$

$$X = 25 \text{ kg}$$

The child weighs 25 kg.

- Next, determine the total daily dosage by setting up a proportion with the patient's weight and the unknown dosage on one side and the ordered dosage on the other side:

$$\frac{25 \text{ kg}}{X} = \frac{1 \text{ kg}}{56 \text{ mg}}$$

- Cross-multiply the fractions:

$$X \times 1 \text{ kg} = 56 \text{ mg} \times 25 \text{ kg}$$

- Solve for X by dividing each side of the equation by 1 kg and canceling units that appear in both the numerator and the denominator:

$$\frac{X \times \cancel{1 \text{ kg}}}{\cancel{1 \text{ kg}}} = \frac{56 \text{ mg} \times 25 \cancel{\text{ kg}}}{1 \cancel{\text{ kg}}}$$

$$X = \frac{56 \text{ mg} \times 25}{1}$$

$$X = 1{,}400 \text{ mg}$$

• The child's daily dosage is 1,400 mg. Now, divide the daily dosage by four doses to determine the dose to administer every 6 hours:

$$X = \frac{1{,}400 \text{ mg}}{4 \text{ doses}}$$

$$X = 350 \text{ mg/dose}$$

The child should receive 350 mg every 6 hours.

• Lastly, calculate the volume to give for each dose by setting up a proportion with the unknown volume and the amount in one dose on one side and the available dose on the other side:

$$\frac{X}{350 \text{ mg}} = \frac{5 \text{ ml}}{125 \text{ mg}}$$

• Cross-multiply the fractions:

$$X \times 125 \text{ mg} = 5 \text{ ml} \times 350 \text{ mg}$$

• Solve for X by dividing each side of the equation by 125 mg and canceling units that appear in both the numerator and denominator:

$$\frac{X \times \cancel{125 \text{ mg}}}{\cancel{125 \text{ mg}}} = \frac{5 \text{ ml} \times 350 \cancel{\text{mg}}}{125 \cancel{\text{mg}}}$$

$$X = \frac{5 \text{ ml} \times 350}{125}$$

$$X = \frac{1{,}750 \text{ ml}}{125}$$

$$X = 14 \text{ ml}$$

You should administer 14 ml of the drug at each dose.

Dosage by BSA

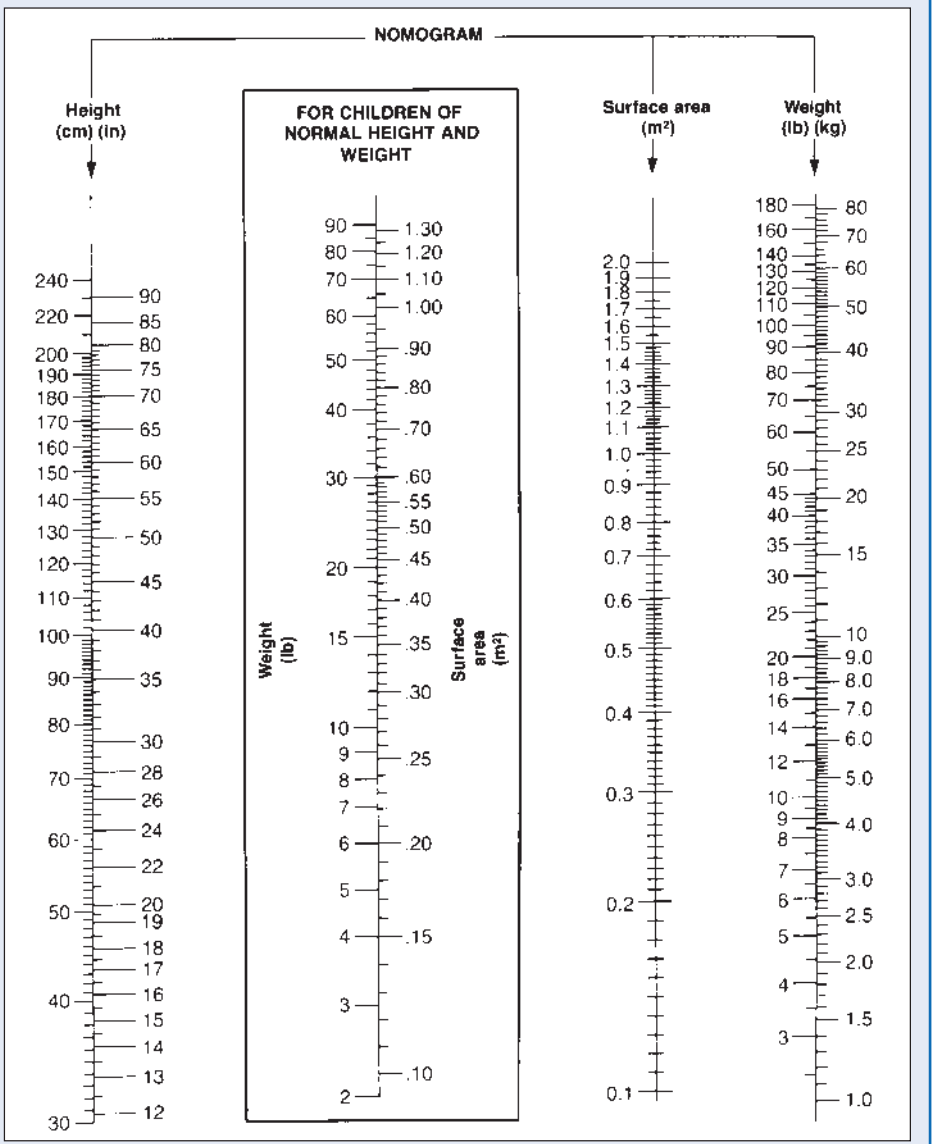
The BSA method is used to calculate safe pediatric dosages for a limited number of drugs. (It's also used to calculate safe dosages for adult patients receiving extremely potent drugs that need to be administered with absolute precision, such as antineoplastic or chemotherapeutic agents.)

Advice from the experts

What's in a nomogram?

BSA is critical when calculating dosages for pediatric patients or for drugs that are extremely potent and need to be given in precise amounts. The nomogram shown here lets you plot the patient's height and weight to determine the BSA. Here's how it works:

- Locate the patient's height in the left column of the nomogram and his weight in the right column.
- Use a ruler to draw a straight line connecting the two points. (The point where the line intersects the surface area column indicates the patient's BSA in square meters.)
- For an average-sized child, use the simplified nomogram in the box. Just find the child's weight in pounds on the left side of the scale and then read the corresponding BSA on the right side.



The plot thickens

Calculating dosages by BSA is done in two steps:

- Plot the patient's height and weight on a chart (called a *nomogram*) to determine the BSA in square meters (m^2). (See *What's in a nomogram?*)
- Multiply the BSA by the prescribed pediatric dose in $mg/m^2/day$.

Here's the formula:

$$\text{child's dose in mg} = \text{child's BSA in } m^2 \times \frac{\text{pediatric dose in mg}}{m^2/\text{day}}$$

The BSA method is also used to calculate a child's dose based on the average adult BSA—1.73 m^2—and an average adult dose.

The formula looks like this:

$$\text{child's dose (mg)} = \frac{\text{child's BSA in } m^2}{\text{average adult BSA (1.73 } m^2\text{)}} \times \text{average adult dose}$$

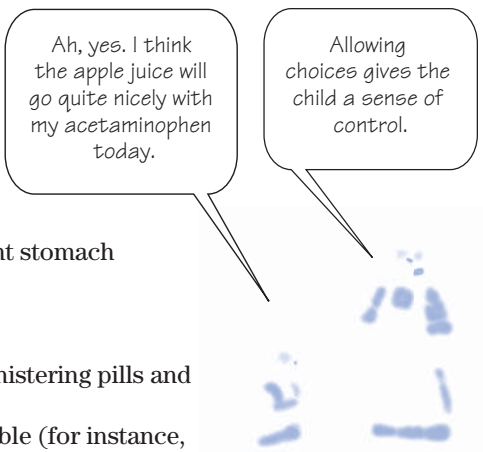
Administering pediatric medications

The methods used to prepare drugs and administer them to pediatric patients differ from the methods used for adults, depending on which route is used. There are specific administration guidelines and precautions for each route as well. (See *Giving medications to children*, page 46.)

Oral route

Infants and young children who can't swallow tablets or capsules are given oral drugs in liquid form. When a liquid preparation isn't available, you may, generally, crush a tablet and mix it with a small amount of liquid. However, it's important that you don't:

- mix crushed tablets in essential fluids, such as infant formula, because this could lead to feeding refusal
- crush enteric-coated drugs or timed-release capsules or tablets because crushing destroys the coating that causes drugs to release at the right time or prevent stomach irritation.



A spoonful of sugar

These suggestions will help to make administering pills and liquids easier for the child and the nurse:

- Allow the child as much choice as possible (for instance, which pill to take first or which beverage to drink).

• If the liquid drug is prepared as a suspension or as an insoluble drug in a liquid base, mix it thoroughly before you measure and administer it to ensure that none of the drug remains settled out of the solution.
• If the child can drink from a cup, measure and give liquid medications in a cup that's calibrated in metric and household units.
• If the child is very young or can't drink from a cup, use a medication dropper, syringe, or hollow-handle spoon.
• For the infant, slowly instill liquid medication by dropper along the side of his tongue, or offer it through a nipple. Hold the infant with his head elevated to prevent aspiration.

Nasal route

Administering a nasal medication to a child may not be as difficult as it sounds. Parents can also be instructed in giving nose drops and giving medication with a nasal inhaler.

Drop in the bucket?

To administer nose drops:
• Warm the medication to room temperature and warn the child that he may taste the medication.
• Wash your hands.
• Draw up the proper amount of medication into the dropper.
• Have the child gently blow his nose if he's able, or clean away secretions with a washcloth.
• Tilt the child's head back. (In small children, this can be accomplished by having the child lie on his back with a small pillow placed between the shoulders and tilting his head back over the top of the pillow.)
• Push up gently on the child's nose.
• Instruct the child to breathe through his mouth while the medication is being placed in the nose. (For infants, be sure to instill the drops in one naris at a time because infants are obligate nose breathers.)
• Without touching the dropper to the nose, aim the dropper toward the back of the nostril and place the correct number of drops in each side of the nose.
• Keep the head tilted back for at least 1 minute (count to 60) and then allow the child to spit out any medication that has run down the back of his throat.

The nose knows

To give medication with a nasal inhaler:
• Wash your hands.
• Place the tip of the inhaler inside the child's nostril.
• Have the child inhale; then administer the medication.

Advice from the experts

Giving medications to children

When giving oral and parenteral medications to children, safety is essential. Keep these points in mind:
• Check the child's mouth to make sure he has swallowed the oral medication.
• Carefully mix oral drugs that come in suspension form.
• Give intramuscular (I.M.) injections in the vastus lateralis muscle of infants who haven't started walking.
• Don't inject more than 1 ml into I.M. or subcutaneous sites.
• Rotate injection sites.

- Have the child hold his breath for a few seconds and then exhale through his mouth.
- Don't allow the child to blow his nose for at least 3 minutes.

Up your nose with a . . . sprayer

To administer a nasal spray:

- Wash your hands.
- Plug one nostril and place the tip of the sprayer a short distance into the opposite nostril.
- Have the child hold his breath; then administer the medication.
- Tell the child to hold his breath for a few more seconds and then exhale through his mouth.
- Make sure the child keeps his head tilted back for at least 1 minute, and don't allow him to blow his nose.

Optic route

The administration of eye drops or eye ointment can be difficult for the child because of his natural instinct to blink. Tell the child and parents that eye ointment may cause blurred vision for a short time.

Always prepare the child and the parent for blurred vision before instilling eye ointment. Knowing what to expect makes interventions less frightening.

The eyes have it

To administer eye drops or ointments:

- Warm the medication to room temperature.
- Wash your hands.
- Clean the eye of all secretions and residual medication.
- Tilt the child's head back and have the child look at the ceiling.
- Using your thumb and index finger, gently pull back the lower lid to expose the conjunctival sac.
- Without touching the dropper or bottle to the eye, administer the drops into the conjunctival sac, not directly into the eye. When administering an eye ointment, apply the ointment from the inner canthus to the outer canthus of the eye.
- Have the child close his eyes for a few minutes; then wipe away excess ointment.
- If a second type of eye drop or an eye ointment is required, wait 5 minutes before administering the second medication.

Otic route

Because younger children are more prone to developing ear infections than older children or adolescents, eardrops may be used frequently in young children. Medications that are cold may cause dizziness and nausea when placed into the ear; therefore, always

warm the medication to body temperature by placing it between your hands for several minutes.

In one ear . . .

To administer eardrops:
- Wash your hands.
- Place the child on his side, with the affected ear facing up.
- Clean away secretions or residual medication.
- Straighten the ear canal. (In children younger than age 3, hold the ear and gently pull down and back. In children older than 3, gently pull the pinna up and back.)
- Instill the correct number of drops into the ear without touching the dropper to the ear. (Try to let the drops run down the side of the canal rather than dropping into the center of the canal.)
- Have the child lie on his side for at least 1 minute.

Take special care of how you hold a baby's ear when administering eardrops.

Rectal route

Rectal suppositories may be needed for a child who has been vomiting or who can't receive his medications orally. The rectal suppository should be firm. If it isn't, run it under cold water before unwrapping it.

How it's supposed to go

To administer a suppository:
- Wash your hands.
- Remove the suppository from its wrapper.
- Assist the child into the Sims' position (on his left side with his right knee flexed and close to his chest).
- Dip the suppository into water or a water-soluble lubricant such as K-Y jelly.
- Wearing gloves, gently separate the buttocks to expose the anus.
- Gently insert the smooth, rounded end of the suppository into the anal orifice.
- Push the suppository into the rectum (approximately 1″ [2.5 cm]) until there's no resistance. (Use your smallest finger in a child younger than age 3.)
- Remove your finger, ensuring the suppository remains in place.
- Hold the child's buttocks together for 5 minutes to prevent expulsion of the medication.
- Keep the child in the Sims' position for approximately 20 minutes.

NG, OG, or gastrostomy route

Administration of nasogastric (NG), orogastric (OG), and gastrostomy medications or feedings follows the same principles. Tube placement is checked by inserting 5 cc of air into the tube while

simultaneously listening for a "whoosh" sound over the stomach. This sound ensures that the tube hasn't slipped out of place before administering the medication or feeding. Alternatively, you may check for stomach contents, using pH paper. The medication or formula should be warmed to room temperature to decrease the likelihood of discomfort.

Past the lips, past the gums . . .

To administer NG, OG, or gastrostomy medications or feedings:

- Wash your hands.
- Aspirate and measure stomach contents to determine the amount of residual stomach contents and then return the contents to the stomach to prevent an electrolyte imbalance.
- Pinch or clamp the tubing closed to prevent air from entering the stomach.
- Remove the plunger from the barrel of the syringe and attach the barrel to the gastric tube.
- Fill the tube with the medication or formula.
- Allow the medication or formula to infuse slowly, holding the tube no more than approximately 6″ (15.2 cm) above the stomach.
- Flush with water (use a minimal amount, no more than 30 cc) to clean the tubing and prevent obstruction.
- Clamp the end of the tubing when finished.

Inhalation route

Aerosol medications are commonly used in treating respiratory illnesses such as asthma or bronchiolitis. Advantages of using this route include delivering the medication directly to the site of action, a faster onset of action, and less systemic side effects. The most commonly used methods of giving aerosolized medications are via a metered-dose inhaler or through a nebulizer.

Using an inhaler

Most children are not able to coordinate the steps required to use a metered-dose inhaler properly and therefore need to use a spacer with the inhaler. Teach the parents and the child the steps for ensuring all the medication is delivered to the airways. Many inhalers have a counter attached so it is easy to know how many doses are available. To use an inhaler with a spacer:

- Take off the protective caps of both the inhaler and the spacer.
- Shake the inhaler to ensure the medication is mixed.
- Place the inhaler into the open end of the spacer, opposite the spacer mouthpiece or mask.
- Have the child completely exhale by blowing out all his breath.
- Put the spacer mouthpiece in the child's mouth and have him seal his lips around it (or place the mask around the mouth and nose).

- Push the inhaler canister once to release the medication into the spacer.
- Have the child breathe in slowly through his mouth, inhaling the medication that is trapped in the spacer. Some spacers will make a sound if the child breathes in too fast.
- If the child is able, tell the child to hold his breath for 10 seconds.
- Take the spacer out of the child's mouth (or the mask away from the face) and have him breathe out slowly.
- Wait at least 1 full minute before taking any additional puffs that may be ordered.
- If using a steroid inhaler, teach the child to rinse his mouth after finishing the dose.
- Replace the caps. Rinse the spacer and inhaler canister routinely to prevent a buildup of medication.

If using a mask spacer for an infant or young child, have the parent place the inhaler in the soft ring opposite the mask and then place the mask securely over the child's nose and mouth to form a good seal. Keep the mask firmly in place while the child takes six breaths. Wait 1 minute between each puff ordered.

Using a nebulizer

Nebulizers work by turning the medication into an aerosol mist that is easily breathed in. In many cases, nebulizers are not needed if an inhaler is used properly. To use a nebulizer, teach the parent or older child how to use the machine properly.

- Hook up the hose to the air compressor.
- Fill the medication cup with the proper dose of medication.
- Attach both the hose and the mouthpiece to the medication cup.
- Place the mouthpiece in the child's mouth.
- Have the child breathe in through his mouth until all the medication is gone. This can take approximately 10 to 15 minutes.

A mask may be used for smaller children. Nose clips may also be used if it is hard for the child to remember to only breathe through his mouth. Also teach the parents and child to rinse out the medication cup and mouthpiece and let them air dry after each use.

I.M. and S.C. routes

I.M. and subcutaneous (S.C.) routes are commonly used when medications are better absorbed outside of the gastric system. Children commonly fear needles and need reassurance when receiving parenteral medications. Help the child cope by explaining how he can help, applying ice on the injection site, or teaching distraction techniques.

Allowing the parents to hold and comfort the child may make the job easier for you and less traumatic for the child. If time

Needle and syringe selection

This chart will help you select the most appropriate needle and syringe size to use when administering medications by the I.M. or S.C. route to children. Children usually require the smallest gauge possible.

Route	Needle size	Syringe size
S.C.	• 25G to 29G • ⅜″ to ⅝″	1 ml to 3 ml
I.M.	• 23G to 25G • ⅝″ to 1″	1 ml to 5 ml

permits, consider using a topical skin anesthetic (such as EMLA cream) to numb the skin. (See *Needle and syringe selection.*)

S.C. P's and Q's

To administer an S.C. injection:
- Wash your hands.
- Select the site for administration; the typical areas used are the abdomen, the lateral and posterior aspects of the upper arm or thigh, the scapular area of the back, and the upper ventrodorsal gluteal areas. (For frequent S.C. administration, plan rotation sites before the injections are given.)
- Clean the area with alcohol.
- Grasp subcutaneous tissue between the thumb and forefinger.
- Insert the needle at a 45-degree angle. (If using a prepackaged syringe with a short needle, a 90-degree angle may be used.)
- Aspirate for blood; if none is seen, slowly inject the medication, limiting the volume to 0.5 ml.
- Withdraw the needle and massage the area to increase absorption.

I.M.-formation

To administer an I.M. injection:
- Wash your hands.
- Select the muscle for injection. (Don't inject into the gluteus muscle until the child learns to walk, at which point the muscle will be fully developed.) (See *I.M. injection sites in children*, page 52.)
- Spread the skin taut between your thumb and forefinger. (In smaller children, grasp the muscle to increase muscle mass and prevent striking the bone.)
- Insert the needle at a 90-degree angle, using a quick, darting action to reduce puncture pain.
- Inject the medication slowly.
- Withdraw the needle quickly and massage the area.

I.M. injection sites in children

When selecting the best site for a child's I.M. injection, consider the child's age, weight, and muscle development; the amount of subcutaneous fat over the injection site; the type of drug you're administering; and the drug's absorption rate.

Vastus lateralis and rectus femoris

For a child younger than age 3, you'll typically use the vastus lateralis or rectus femoris muscle for an I.M. injection. Constituting the largest muscle mass in this age-group, the vastus lateralis and rectus femoris have fewer major blood vessels and nerves.

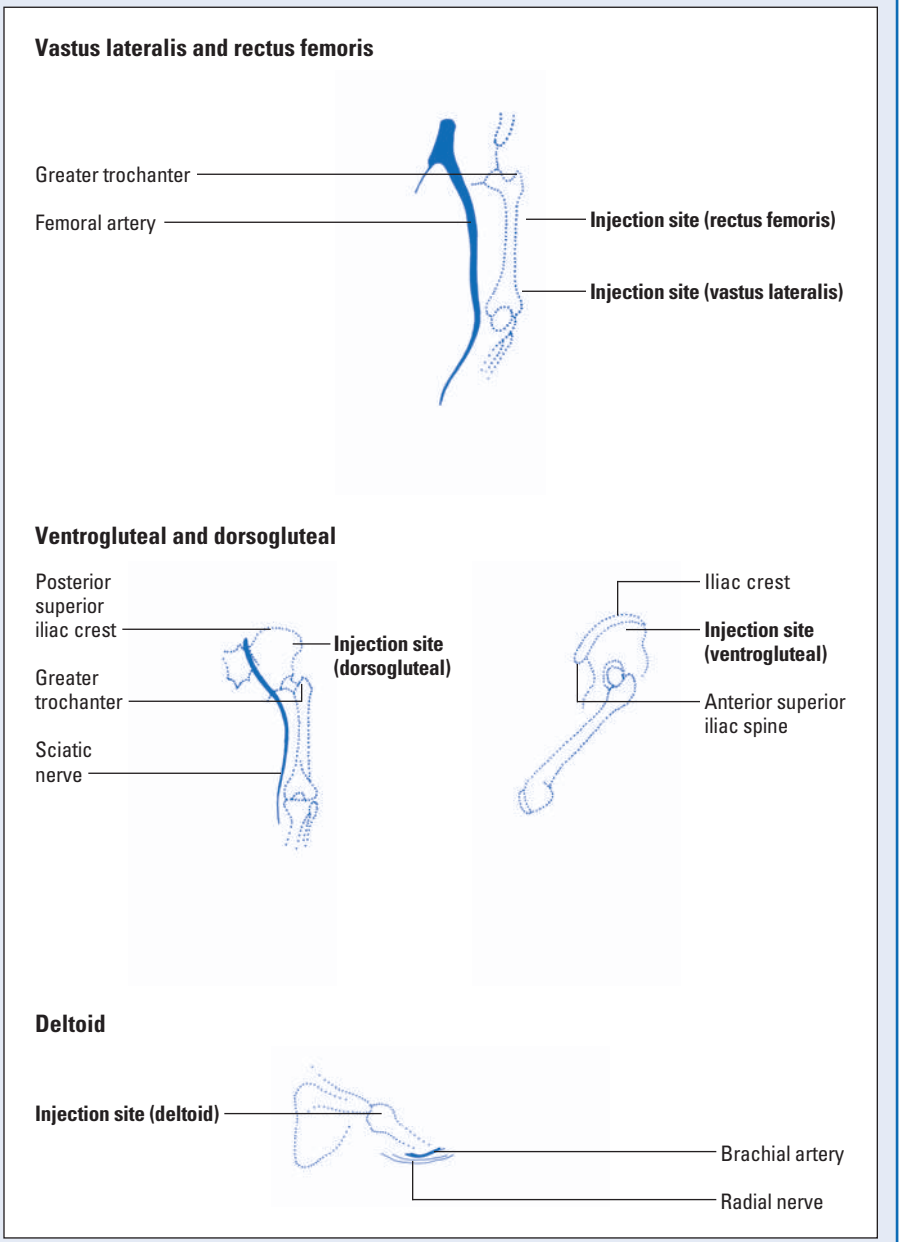
Ventrogluteal and dorsogluteal

For a child who can walk and is older than age 3, use the ventrogluteal and dorsogluteal muscles. Like the vastus lateralis, the ventrogluteal site is relatively free of major blood vessels and nerves. Before you select either site, make sure that the child has been walking for at least 1 year to ensure sufficient muscle development.

Deltoid

For a child older than 18 months who needs rapid medication results, consider using the deltoid muscle. Because blood flows faster in the deltoid muscle than in other muscles, drug absorption should be faster.

Be careful if you use this site because the deltoid doesn't develop fully until adolescence. In a younger child, it's small and close to the radial nerve, which could be injured during needle insertion.

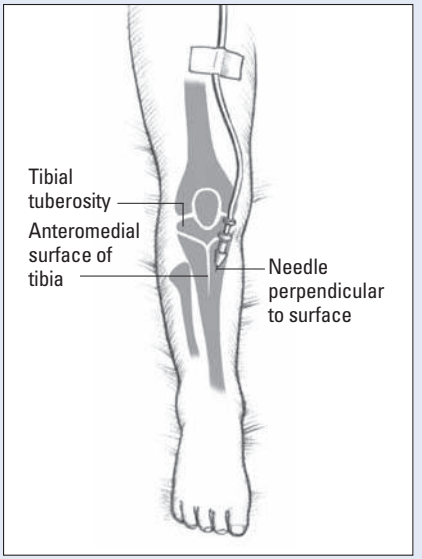


Performing intraosseous administration

In an emergency, intraosseous drug administration may be used for a critically ill child younger than age 6. Insert a bone marrow needle (or spinal needle with stylette, trephine, or standard 16G to 18G hypodermic needle) into the anteromedial surface of the proximal tibia ⅜" to 1¼" (1 to 3 cm) below the tibial tuberosity. To avoid the epiphyseal plate, direct the needle at a perpendicular or slightly inferior angle.

After penetrating the bony cortex and inserting the needle into the marrow cavity, you'll feel no resistance, you'll be able to aspirate bone marrow, the needle will remain upright without support, and the infusion will flow freely without subcutaneous infiltration. If bone or marrow obstructs the needle, replace the needle by passing a second one through the cannula.

When the needle is properly inserted, stabilize and secure it with gauze dressing and tape. Discontinue when a secure I.V. line is established.



Intraosseous route

At times, venous access in a child may be a challenge. For the critically ill child in cardiac arrest or shock, the administration of fluids and medications may be lifesaving. For the child in whom venous access can't be quickly established, intraosseous infusion may be necessary. (This occurs most commonly in children younger than age 5.) Fluids and medications that are infused into the medullary space of the long bones quickly enter the venous circulation. (See *Performing intraosseous administration.*)

The most common site for intraosseous infusion is the medial surface of the proximal tibia. Other sites include the distal tibia and the distal femur.

When the needle has been placed into the bone, fluid resuscitation should be instituted by injecting fluid under pressure via a syringe. Standard I.V. pumps and tubing may be used to deliver the fluids. Gravity may help infuse the fluid if the patient is hemodynamically stable. It's important to remember that extravasation is common around the site, especially with prolonged placement and pressure infusion.

I.V. therapy

I.V. therapy commonly is used to give both fluids and medications to an ill child. Extreme caution and care must be taken in giving

the prescribed amounts of fluids and medications. The rate of flow should be checked frequently, and a pump system is recommended. Because extravasation of fluid or phlebitis may develop quickly, the site must be checked frequently.

Access granted

The venous system may be accessed either peripherally or centrally. After the access device is in place, the site must be kept secure and protected to provide the necessary fluids and medications.

On a short leash

The nurse must consider the sensitivity of the child's skin and limit the use of tape. The nurse should also consider the child's developmental needs, such as the desire to explore, and take steps to ensure his safety while giving him as much freedom as possible after the I.V. is in place.

A mobile child is a happy child. Most kids can become experts at getting around with an I.V. pole. It just takes a little teaching and some supervision.

Venous access devices

Commonly used peripheral I.V. sites include the hands and arms; however, in some children, these might not be the most readily accessible peripheral sites.

By foot or by scalp . . . we shall prevail

The feet (greater saphenous vein) or even a scalp vein in the neonate may be used. Always use the smallest needle size possible. For children, this is typically a 24G or 25G needle.

Have no fear—no tourniquet here

Smaller children may be fearful of a tourniquet. In this instance, venous distention may be obtained simply by grasping and applying pressure to the area proximal to the vein.

Long-term I.V. therapy

Long-term I.V. therapy is best accomplished with a vascular access device. Such devices include infusion ports, catheters, and cannulas. The type that's most appropriate in a particular situation depends on the type and length of treatment as well as the diagnosis. Children with cancer who require chemotherapy, blood transfusions, fluids, and nutrition are usually given an implantable device such as a port. This type of device allows for frequent access to the venous system with venipuncture and multiple I.V. lines.

Check, check, and check again

Such devices as central venous catheters also provide access for drawing blood. These catheters may remain in place for months. The nurse must check the site frequently for signs and symptoms of infection, patency, proper functioning, and placement.

Infusion pumps

Infusion pumps are commonly used in pediatric patients. The pump doesn't depend on gravity for flow; instead, it maintains a preselected volume delivery by adding pressure to the system when necessary. If the pressure required to deliver the fluid exceeds a maximum pressure limit, an alarm sounds.

Infiltrate and irritate

Unfortunately, the use of pumps carries the danger of infiltration or vein irritation caused by the medication or solution administered under pressure. When the pump has delivered the exact volume prescribed, an alarm sounds. Many facility policies dictate the time lapse allowed for checking the pump, the I.V. site, and the volume of solution infused.

Calculating pediatric fluid needs

Children's fluid needs are proportionally greater than those of adults, so children are more vulnerable to changes in fluid and electrolyte balance. Because their extracellular fluid has a higher percentage of water, children's fluid exchange rates are two to three times greater than those of adults, leaving them more susceptible to dehydration.

Calculation trio

Determining and meeting the fluid needs of children are important nursing responsibilities. You can calculate the number of milliliters of fluid a child needs based on:

- weight in kilograms
- metabolism (calories required)
- BSA in square meters.

Although results may vary slightly, all three methods are appropriate. Keep in mind that fluid replacement can also be affected by clinical conditions that cause fluid retention or loss. Children with these conditions should receive fluids based on their individual needs.

Fluid needs based on weight

You may use three different formulas to calculate a child's fluid needs based on his weight.

Fluid formula for tiny tots . . .

A child who weighs less than 10 kg requires 100 ml of fluid per kilogram of body weight per day. To determine this child's fluid needs, first convert his weight from pounds to kilograms. Then multiply the results by 100 ml/kg/day.

Here's the formula:

weight in kg × 100 ml/kg/day = fluid needs in ml/day

. . . middleweights . . .

A child weighing 10 to 20 kg requires 1,000 ml of fluid per day for the first 10 kg plus 50 ml for every kilogram over 10. To determine this child's fluid needs, follow these steps:

- Convert his weight from pounds to kilograms.
- Subtract 10 kg from the child's total weight and then multiply the result by 50 ml/kg/day to find the child's additional fluid needs. Here's the formula:

(total kg − 10 kg) × 50 ml/kg/day = additional fluid need in ml/day

- Add the additional daily fluid need to the 1,000 ml/day required for the first 10 kg. The total is the child's daily fluid requirement:

1,000 ml/day + additional fluid need = fluid needs in ml/day

. . . and bigger kids too

A child weighing more than 20 kg requires 1,500 ml of fluid for the first 20 kg plus 20 ml for each additional kilogram. To determine this child's fluid needs, follow these steps:

- Convert the child's weight from pounds to kilograms.
- Subtract 20 kg from the child's total weight and then multiply the result by 20 ml/kg to find the child's additional fluid needs. Here's the formula:

(total kg − 20 kg) × 20 ml/kg/day = additional fluid need in ml/day

- Because the child needs 1,500 ml of fluid per day for the first 20 kg, add the additional fluid need to 1,500 ml. The total is the child's daily fluid requirement:

1,500 ml/day + additional fluid need = fluid needs in ml/day

Real-world problem

This problem will give you some real-world experience with calculating fluid needs based on weight.

Maintenance mystery

How much fluid should you give a 44-lb patient over 24 hours to meet his maintenance needs?

- First, convert 44 lb to kilograms by setting up a proportion with fractions. (Remember that 1 kg equals 2.2 lb.)

$$\frac{44 \text{ lb}}{X} = \frac{2.2 \text{ lb}}{1 \text{ kg}}$$

- Cross-multiply the fractions and then solve for X by dividing both sides of the equation by 2.2 lb and canceling units that appear in both the numerator and denominator.

$$X \times 2.2 \text{ lb} = 44 \text{ lb} \times 1 \text{ kg}$$

$$\frac{X \times \cancel{2.2 \text{ lb}}}{\cancel{2.2 \text{ lb}}} = \frac{44 \cancel{\text{lb}} \times 1 \text{ kg}}{2.2 \cancel{\text{lb}}}$$

$$X = \frac{44 \text{ kg}}{2.2}$$

$$X = 20 \text{ kg}$$

- The child weighs 20 kg. Now, subtract 10 kg from the child's weight and multiply the result by 50 ml/kg/day to find the child's additional fluid need:

$$X = (20 \text{ kg} - 10 \text{ kg}) \times 50 \text{ ml/kg/day}$$

$$X = 10 \cancel{\text{kg}} \times 50 \text{ ml/}\cancel{\text{kg}}\text{/day}$$

$$X = 500 \text{ ml/day additional fluid need}$$

- Next, add the additional fluid need to the 1,000 ml/day required for the first 10 kg (because the child weighs between 10 and 20 kg).

$$X = 1{,}000 \text{ ml/day} + 500 \text{ ml/day}$$

$$X = 1{,}500 \text{ ml/day}$$

The child should receive 1,500 ml of fluid in 24 hours to meet his fluid maintenance needs.

Fluid needs based on calories

You can calculate fluid needs based on calories because water is needed for metabolism. A child should receive 120 ml of fluid for every 100 kilocalories (kcal; also called *calories*) of metabolism.

Calorie-conscious calculation

To calculate fluid requirements based on calorie requirements, follow these steps:

- Find the child's calorie requirements. You can take this from a table of recommended dietary allowances for children, or you can have a dietitian calculate it.
- Divide the calorie requirements by 100 kcal because fluid requirements are determined for every 100 calories.
- Multiply the results by 120 ml (the amount of fluid required for every 100 kcal). Here's the formula:

$$\text{fluid requirements in ml/day} = \frac{\text{calorie requirements}}{100 \text{ kcal}} \times 120 \text{ ml}$$

Real-world problem

This problem will help sharpen your skills for calculating fluid needs based on calories. Use the preceding information to solve it.

Daily dilemma

Your pediatric patient uses 900 calories/day. What are his daily fluid requirements?

- Set up the formula inserting the appropriate numbers and substituting X for the unknown amount of fluid:

$$X = \frac{900 \cancel{\text{kcal}}}{100 \cancel{\text{kcal}}} \times 120 \text{ ml}$$

$$X = 9 \times 120 \text{ ml}$$

$$X = 1{,}080 \text{ ml}$$

The patient needs 1,080 ml of fluid per day.

Fluid needs based on BSA

Another method for determining pediatric maintenance fluid requirements is based on the child's BSA.

To calculate the daily fluid needs of a child who isn't dehydrated, multiply the BSA by 1,500, as shown in this formula:

$$\text{fluid maintenance needs in ml/day} = \text{BSA in } m^2 \times 1{,}500 \text{ ml/day/}m^2$$

Real-world problem

This problem gives you a taste of the process used to calculate fluid needs based on BSA. Use the preceding formula to solve it.

Your patient is 36″ tall and weighs 40 lb. If his BSA is 0.72 m^2, how much fluid does he need each day?

- Set up the equation, inserting the appropriate numbers and substituting X for the unknown amount of fluid. Then solve for X:

$$X = 0.72 \ \cancel{m^2} \times 1{,}500 \text{ ml/day}/\cancel{m^2}$$

$$X = 1{,}080 \text{ ml/day}$$

The child needs 1,080 ml of fluid per day.

Quick quiz

1. A 2-year-old can be expected to sleep:

A. 12 to 14 hours a day with most of it during the night and one long nap during the day.
B. 14 to 15 hours a day, usually 4 to 6 hours at a time and two to three naps during the day.
C. 10 to 12 hours a day with no naps.
D. 8 to 10 hours a day with one nap during the day.

Answer: A. A toddler can be expected to sleep 8 to 10 hours a night with a long nap during the day to equal 12 to 14 hours. Infants sleep more total hours throughout the day but in shorter time frames. By the time a child reaches kindergarten, he sleeps a long time at night and typically does not need a nap. Teens require 8 to 10 hours of sleep daily but may need a nap during periods of growth.

2. According to Erikson's theory of psychosocial development, a 7-year-old who enjoys working with others and helping his parents on weekend projects is in what stage?

A. Autonomy versus shame and doubt
B. Initiative versus guilt
C. Industry versus inferiority
D. Identity versus role confusion

Answer: C. Industry versus inferiority occurs from approximately ages 6 to 12. During this time, the child enjoys being helpful and relationships become more important. Autonomy versus shame and doubt occur through toddlerhood. Initiative versus guilt happens in 3- to 6-year-olds, and identity versus role confusion occurs during adolescence.

3. The nurse is caring for a 6-year-old who is terminally ill. She recognizes at this age, the child:

A. has no concept of death whatsoever.
B. knows the words "dead" and "death" but the concept of forever has no value.
C. understands the universality and irreversibility of death.
D. has an adult perception of death but is focused on the here and now.

Answer: B. A 6-year-old is in early childhood and cannot grasp the concept of forever but does know words relating to death. As he matures, the more concrete the concept of death becomes. It isn't until adolescence that the child has an adult perception of death yet he remains focused on the present.

Scoring

☆☆☆ If you answered all three items correctly, bravo! You've mastered the complex tasks in this chapter.

☆☆ If you answered two items correctly, good for you! You're on your way to a higher stage of functioning in pediatric nursing.

☆ If you answered fewer than two items correctly, there's no need for a bruised ego! A second look at the chapter will be less painful.

3

Infancy

Just the facts

In this chapter, you'll learn:

- progression of system, physical, and psychological development in infancy
- nutrition and sleep guidelines for infancy
- injury prevention strategies
- common infant health issues.

A closer look at the infant

Infancy, the period from birth to age 1 year, is a time of many changes. During the first year of life, the infant progresses from a neonate, totally dependent on the world around him, to a baby who can interact with and process change within his surroundings. Tremendous physiologic, cognitive, and emotional development also occurs.

System development

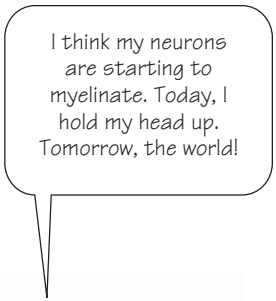
From birth to age 1 year, remarkable changes occur in the infant's neurologic, cardiovascular, respiratory, and immune systems.

Neurologic system

The central nervous system (CNS) is the fastest growing system during the infancy stage, as brain cells continue to develop in both size and number. The effects of a poor environment, including nutritional deprivation, can't be reversed when experienced during this early stage.

Hold your head up!

Myelinization refers to the development of a myelin sheath around nerve fibers. Myelin enables quick, efficient transmission of nerve impulses. Myelinization of the neurons occurs in a cephalocaudal (head-to-toe) direction, although it takes up to 2 years for the entire process to be completed. An infant progresses from being unable to hold up his head to being able to hold himself in an upright position, sit, and keep his head erect.

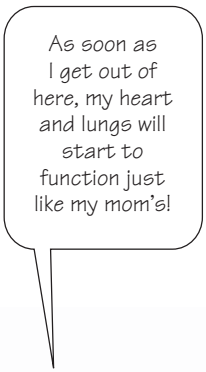


Extreme CNS makeover

As myelinization reaches the extremities, the infant can put weight on his legs and use them to stand up. As the brain and CNS develop, more sophisticated cognitive and behavioral skills follow.

Converge, stare, and search

Vision development is also tremendous. At birth, the newborn prefers facial features, but by 8 weeks, the baby is alert to moving objects and is attracted to bright colors and lighted objects, such as toys with flashing lights and an otoscope light. Convergence and following with the eyes are jerky and inexact. By ages 4 to 6 months, the baby has bifocal vision and can stare and search. By age 1 year, distance vision and depth perception have markedly improved.



Cardiovascular and respiratory systems

The cardiovascular and respiratory systems undergo dramatic changes at birth. Because of placental oxygenation, the fetus shunts a majority of blood away from the lungs while in utero.

Cardiopulmonary drama

At birth, a cascade of physiologic changes occur, and deoxygenated blood begins to circulate to the lungs, where it receives oxygen and is then pumped out to the rest of the body through the left ventricle of the heart. Within moments, the cardiovascular and respiratory systems are functioning at essentially the same way as those of an adult.

Immune system

The immune system develops over the first year of life. The neonate depends on maternal antibodies received in utero or via breast milk for immunologic protection. By ages 6 to 8 weeks, an antigen-antibody response is maturing and can be triggered, for example, by immunizations, and by age 9 months, the infant is developing his own immunity.

Physical development

The physical growth and development that take place during infancy are astounding. Although patterns of growth and development will occur in a predictable order, it's important to remember that the rate at which they occur may vary among children of the same age. Also remember that the most reliable way to interpret growth measurements is to follow their trend over time using growth charts. Pediatric growth charts have been used in the United States since 1977. Growth charts consist of a series of percentile curves that depict the distribution of selected body measurements in infants and children. Many infants have their length, weight, and head circumferences measured and plotted on standardized growth charts. Centers for Disease Control and Prevention (CDC) recommends that nurses and other pediatric health care providers use the World Health Organization's (WHO) growth standards to monitor growth for infants and children ages 0 to 2 years in the United States and use the CDC growth charts for children age 2 years and older in the United States.

Height, weight, and head circumference

Intrauterine growth is assessed by measuring height, weight, and head circumference. These parameters are also the basis of growth evaluation for the rest of the infant and toddler period.

Height

Until the child is age 24 months, height, or length, is measured in the supine position, from the top of the head to the bottom of the heel. When measuring the infant, it's important to keep his body as straight as possible to achieve an accurate measurement. An infant's length is best measured using a stadiometer.

Trunk first, legs to follow

At the end of the first year, the infant's birth length has increased by 50%, with growth of approximately 1″ (2.5 cm) per month for the first 6 months, followed by about ½″ (1.3 cm) per month for the second 6 months. Most of this growth occurs in the trunk rather than in the legs.

Weight

Weight ideally is measured on an infant scale with a bucket-type area in which the infant can lie down or sit. Weight is the primary indicator of nutritional status; changes in weight can also be used to assess hydration status. The average infant will double his birth weight by age 5 months, and triple it by age 1 year.

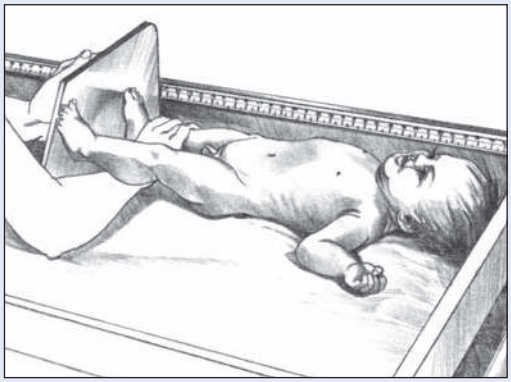
Head circumference

Head circumference, or occipital frontal circumference, is measured by placing a measuring tape around the largest diameter of

Advice from the experts

Measuring height and head circumference

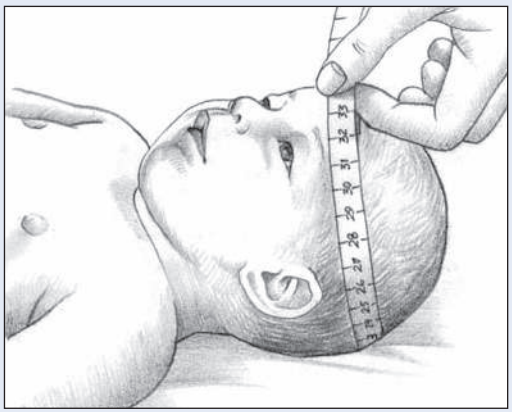
These illustrations show the correct (supine) positioning for measuring length and the proper location for measuring head circumference.



Measuring height

Because of an infant's tendency to be flexed and curled up, these tips will help make assessing an infant's height (length) both easy and accurate:

- Using one hand, hold the infant's head in the midline position.
- Hold the knees together with your other hand and gently press them down toward the table until they're fully extended.
- Using an infant stadiometer, measure the length from the top of the infant's head to his heels.



Measuring head circumference

To obtain an accurate head circumference measurement:

- Use a paper measuring tape to avoid stretching (as can happen with a cloth tape).
- Use landmarks—typically, place the tape just above the infant's eyebrows, and around the occipital prominence at the back of the head to measure the largest diameter of the head.
- Take into consideration the shape of the infant's head and make adjustments as needed to measure the largest diameter.

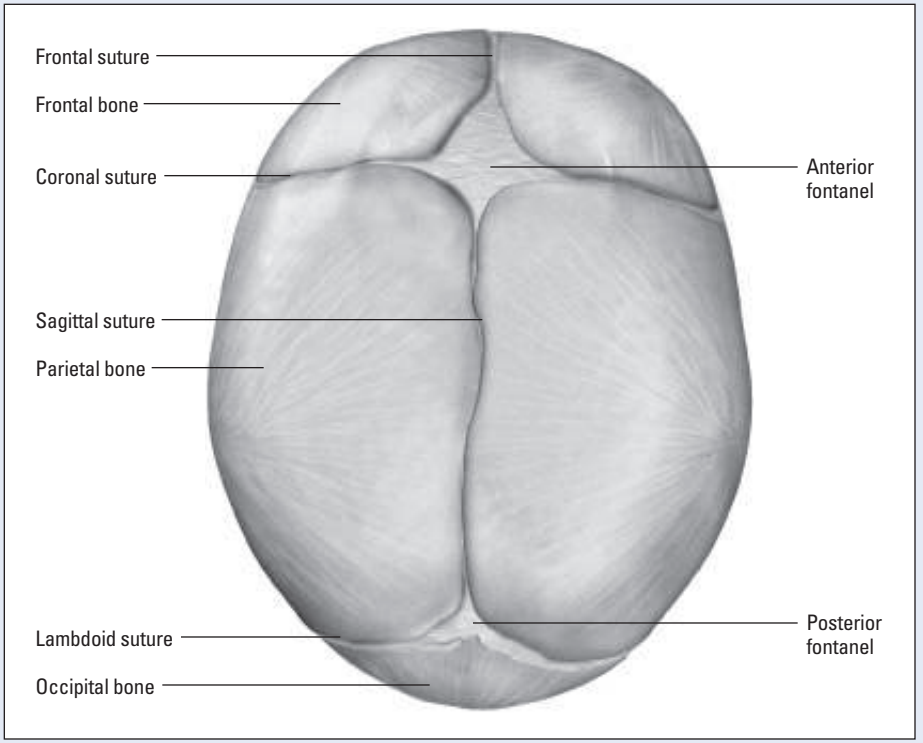
the head, from the frontal bone of the forehead to the occipital prominence at the back of the head.

Don't get a big head

A head circumference that's smaller, or lags behind the height and weight of an infant, may indicate inadequate brain growth. A head circumference that increases rapidly may indicate an increase in ventricular fluid and intracranial pressure (hydrocephalus). (See *Measuring height and head circumference.*)

Locating the fontanels

The locations of the anterior and posterior fontanels are depicted in this illustration of the top of a neonatal skull.



Fontanel changes

Fontanels are the two openings between the bones in the neonate's skull. (See *Locating the fontanels*.)

The *anterior fontanel* is formed at the intersection of the sagittal, frontal, and coronal suture lines. The average size of the anterior fontanel is 2 cm by 2 cm at birth. It remains open for up to 18 months and gradually closes as the head grows.

The *posterior fontanel* is formed at the intersection of the sagittal and lambdoid suture lines. The average size of the posterior fontanel is 1 cm by 1 cm at birth. It's usually closed by age 2 months.

Growing pains

Sequence of tooth eruption

A child's primary teeth typically erupt in a predictable order, as described here:

Age	Tooth eruption
6 to 10 months	Central lower incisors
8 to 10 months	Central upper incisors
9 to 13 months	Lateral upper incisors
10 to 16 months	Lateral lower incisors

Palpation and pulsation

In infancy, the fontanels are assessed by palpation. The fontanel should feel soft and flat. You may be able to see pulsations at the anterior fontanel; this is a normal finding. A bulging or tense fontanel may indicate increased intracranial pressure. A sunken fontanel indicates dehydration. The nurse may auscultate the fontanel to assess for bruits.

Teeth

Most neonates don't have teeth. Occasionally, a "natal tooth" will be present at birth and should be evaluated by a pediatric dentist because they may become loose and pose a risk of aspiration. Neonatal teeth are teeth that erupt within the first 28 days of life.

A little drool, a big eruption

The average age at first tooth eruption is 8 months. Most infants start drooling and mouthing hard objects months beforehand. (See *Sequence of tooth eruption*.)

Gross motor development

Gross motor skills refer to the child's development of skills that require the use of large muscle groups. (See *Developmental milestones*.) They include:

- posture
- head control

Growing pains

Developmental milestones

This chart shows the major gross and fine motor skills the infant should master as he progresses through the first year of life.

Age	Gross motor skills	Fine motor skills
1 month	• Can hold head parallel momentarily but still has marked head lag • Back is rounded in sitting position, with no head control	• Strong grasp reflex • Hands remain mostly closed in a fist
2 months	• In prone position, can lift head 45 degrees off table • In sitting position, back is still rounded but with more head control	• Diminishing grasp reflex • Hands open more often
3 months	• Displays only slight head lag when pulled to a seated position • In prone position, can use forearms to lift head and shoulders 45 to 90 degrees off table • Can bear slight amount of weight on legs in standing position	• Grasp reflex now absent • Hands remain open • Can hold a rattle and clutch own hand
4 months	• No head lag • Holds head erect in sitting position, back less rounded • In prone position, can lift head and chest 90 degrees off table • Can roll from back to side	• Regards own hand • Can grasp objects with both hands • May try to reach for an object without success • Can move objects toward mouth
5 months	• No head lag • Holds head erect and steady when sitting • Back is straight • Can put feet to mouth when supine • Can roll from stomach to back	• Can voluntarily grasp objects • Can move objects directly to mouth
6 months	• Can lift chest and upper abdomen off table, bearing weight on hands • Can roll from back to stomach • Can bear almost all of weight on feet when held in standing position • Sits with support	• Can hold bottle • Can voluntarily grasp and release objects
7 months	• Can sit, leaning forward on hands for support • When in standing position, can bear full weight on legs and bounce	• Transfers objects from hand to hand • Rakes at objects • Can bang objects on table
8 months	• Can sit alone without assistance • Can move from sitting to kneeling position	• Has beginning pincer grasp • Reaches for objects out of reach
9 months	• Creeps on hands and knees with belly off floor • Pulls to standing position • Can stand, holding on to furniture	• Refining pincer grasp • Use of dominant hand may become evident

(continued)

Developmental milestones *(continued)*

Age	Gross motor skills	Fine motor skills
10 months	• Can move from prone to sitting position • Stands with support; may lift a foot as if to take a step	• Refining pincer grasp
11 months	• Can cruise (take side steps while holding on to furniture) or walk with both hands held	• Can move objects into containers • Deliberately drops object to have it picked up • Neat pincer grasp
12 months	• Cruises well, may walk with one hand held • May try to stand alone	• May attempt to build a two-block tower • Can crudely turn pages of a book • Uses cup alone

- sitting
- creeping/crawling
- standing
- walking.

The infant will attain gross motor control in a cephalocaudal manner, progressing from the head to the toes. He can lift the head, then sit, stand, and, eventually, walk.

Fine motor development

Fine motor skills refer to the infant's ability to use his hands and fingers to grasp an object. As the infant grows, he begins to refine his fine motor skills to grab small objects and feed himself.

Normal infant reflexes

Much of a neonate's behavior is controlled by reflexes. At ages 4 to 8 weeks old, many of these reflexes reach their peak—especially the sucking reflex, which affords nutrition (and, therefore, survival) and psychological pleasure.

At age 3 months, the most primitive reflexes begin to disappear, except for the protective and postural reflexes (blink, parachute, cough, swallow, and gag), which remain for life. (See *Infant reflexes*.)

Infant reflexes

This chart lists normal infant reflexes, how they're elicited, and the age at which they disappear.

Reflex	How to elicit	Age at disappearance
Trunk incurvature	When a finger is run laterally down the neonate's spine, the trunk flexes and the pelvis swings toward the stimulated side.	2 months
Tonic neck (fencing position)	When the neonate's head is turned while he's lying supine, the extremities on the same side extend outward while those on the opposite side flex.	2 to 3 months
Grasping	When a finger is placed in each of the neonate's hands, the neonate's fingers grasp tightly enough to be pulled to a sitting position.	3 to 4 months
Rooting	When the cheek is stroked, the neonate turns his head in the direction of the stroke.	3 to 4 months
Moro (startle reflex)	When lifted above the crib and suddenly lowered (or in response to a loud noise), the arms and legs symmetrically extend and then abduct while the fingers spread to form a "C."	4 to 6 months
Sucking	Sucking motion begins when a nipple or gloved finger is placed in the neonate's mouth.	6 months
Babinski's	When the sole on the side of the small toe is stroked, the neonate's toes fan upward.	2 years
Stepping	When held upright with the feet touching a flat surface, the neonate exhibits dancing or stepping movements.	Variable

I cry, therefore I am . . . expressing my needs; trying to get attention; or feeling frustrated, afraid, or just plain cranky.

Psychological development

Psychological development involves language development and socialization as well as play and cognitive development.

Language development and socialization

Language development and socialization begin as soon as the neonate is born. Initially, the neonate communicates primarily through crying and socializes through some of the reflexive behaviors such as the grasp reflex. However, he'll make tremendous strides in these areas during his first year of life.

Cry me a river

The infant cries to express needs. During the first 3 months, crying usually signals a physiologic need such as hunger. As the

infant grows, he may cry for attention, from fear, or from frustration during the trials of mastering new skills. Parents usually become adept at translating their child's cry.

Infants who cry frequently and are difficult to console may be at increased risk for abuse. To help parents prepare for and effectively deal with crying infants, the pediatric nurse should:

- reinforce that there are times when infants cry for no reason at all
- assess how parents cope with fussy periods and offer support as needed
- teach parents comforting techniques, such as holding, swaddling, and massaging.

Smile and say "eh"

An infant's vocalization develops from cries. By age 2 months, the infant can produce single-vowel sounds, such as "ah" and "eh," and he begins to develop a social smile. The social smile is the infant's first social response; it initiates social relationships, signals the beginning of thought processes, and further strengthens the bond between parent and child. By ages 3 to 4 months, the infant can coo and gurgle and laugh in response to his environment.

Stranger danger

By age 6 months, the infant begins to experiment with sounds and attempts to imitate others. He can discern one face from another and exhibits stranger anxiety—he's wary of strangers and clings to or clutches his parents. Separation anxiety may also develop at this period and peaks around 9 months.

I'd like to buy a vowel

By ages 7 to 9 months, the infant can verbalize all vowels and most consonants but speaks no intelligible words. He'll focus intently on the mouth of someone speaking to him. He can also understand simple commands such as the word "no." He may imitate the expressions of others and may be able to play pat-a-cake. He can recognize and respond to his own name.

Infant of few words

By ages 10 to 12 months, the infant can say about 5 words but can understand up to 100 words. He can wave good-bye and enjoys rhythm games. If the child experiences delays in vocalization, he should be evaluated for hearing loss. (See *Language and social development.*)

Growing pains

Language and social development

This chart highlights the language and social development of an infant from birth to age 1 year.

Age	Behaviors
0 to 2 months	• Listens to voices; quiets to soft music, singing, or talking • Distinguishes mother's voice after 1 week, father or other primary caregiver by 2 weeks • Prefers human voices to other sounds • Produces vowel sounds "ah," "eh," and "oh" • Begins to smile socially
3 to 4 months	• Coos and gurgles • Babbles in response to someone talking to him • Babbles for own pleasure with giggles, shrieks, and laughs • Says "da," "ba," "ma," "pa," and "ga" • Vocalizes more to a real person than to a picture • Responds to caregiver with social smile by 3 months
5 to 6 months	• Notices how his speech influences actions of others • Makes "raspberries" and smacks lips • Begins learning to take turns in conversation • Talks to toys and self in mirror • Recognizes names and familiar sounds
7 to 9 months	• Tries to imitate more sounds; makes several sounds in one breath • Begins learning the meaning of "no" by tone of voice and actions • Experiences early literacy; enjoys listening to simple books being read • Enjoys pat-a-cake • Recognizes and responds to his name and names of familiar objects
10 to 12 months	• May have a few word approximations, such as "bye-bye" and "hi" • Follows one-step instructions such as "go to daddy" • Recognizes words as symbols for objects • Says "ma-ma-ma" and "da-da-da"

Play

Play is an integral part of the socialization process. From birth to age 3 months, infants enjoy having their body parts touched and moved and looking at objects with contrasting colors. They develop the ability to grasp objects and move them, so rattles are great toys at this time.

Growing pains

Cognitive development and play

This chart shows the infant's development of two cognitive skills, object permanence and causality. It includes play, an integral part of infant development.

Age	Object permanence	Causality	Play
0 to 4 months	• Objects out of sight are out of mind • Continues to look at hand after object is dropped out of it	• Creates bodily sensations by actions (for example, thumbsucking)	• Grasps and moves objects such as a rattle • Looks at contrasting colors
4 to 8 months	• Can locate a partially hidden object • Visually tracks objects when dropped	• Uses causal behaviors to recreate accidentally discovered interesting effects (for example, kicking the bed after the chance discovery that this will set in motion a mobile above the bed)	• Reaches and grasps an object and then will mouth, shake, bang, and drop the object (usually in this order)
9 to 12 months	• Object permanence develops • Can find an object when hidden but can't retrieve an object that's moved in plain view from one hiding place to another • Knows parent still exists when out of view but can't imagine where they might be (separation anxiety may arise)	• Understanding of cause and effect leads to intentional behavior aimed at getting specific results	• Manipulates objects to inspect with eyes and hands • Has ability to process information simultaneously instead of sequentially • Ability to play peek-a-boo demonstrates object permanence

Mimicking Mommy

From ages 4 to 9 months, infants explore the world by using their senses: looking and touching. They tend to put everything within reach in their mouths. They enjoy being read to and will display more reciprocal play, such as talking back to and mimicking adult vocalizations.

Social butterfly

By ages 9 to 12 months, increased mobility allows infants to seek out new stimuli, including people, for interaction. They enjoy social games, such as peek-a-boo, tickling, and swinging.

Cognitive development

Cognitive development refers to the intellectual abilities of a child—his thinking, reasoning, and ability to problem-solve and understand. Cognitively, the infant develops the ability to perform very sophisticated mental operations. Even the neonate can process and react to stimuli in the environment around him.

Over time, he develops social skills and a sense of *object permanence* (the realization that objects continue to exist even when they can't be seen) and *causality* (understanding that a particular action, or cause, leads to an effect). (See *Cognitive development and play*.)

Trust begins to develop during this stage. Temperament emerges as the infant displays the inborn characteristics that influence activity level, response to new people and situations, and adaptability to change.

On stage with Piaget

According to Jean Piaget's stages of early cognitive development, infants are in the sensorimotor stage, which lasts from birth to age 2 years. In this stage, infants are discovering relationships between their bodies and the environment. They rely on their senses to learn about the world around them, and they learn that the external world isn't an extension of themselves.

Maintaining health

Keeping an infant healthy involves:
- providing proper nutrition
- ensuring adequate sleep and rest
- providing a safe environment.

Nutrition guidelines

Breast milk or iron-fortified infant formula is recommended for the first 12 months of life. Human milk consumed through breast-feeding is considered optimal for neonates. Even so, not all mothers can or choose to breast-feed. Medical conditions, cultural background, anxiety, use of certain medications, drug abuse, and other factors can prevent a woman from breast-feeding. In these cases, bottle-feeding with iron-fortified infant formula is an acceptable alternative.

Breast-feeding

Breast-feeding is widely supported in the medical community. The American Academy of Pediatrics (AAP) and the American Dietetic Association recommend breast-feeding exclusively for the first 6 months and then in combination with infant foods until at least age 1 year. (See *Advantages of breast-feeding.*)

I demand my 10 to 15!

How long a breast-fed infant nurses at each feeding is very individual. In general, a neonate should nurse on demand, approximately 8 to 10 times per day for at least 10 to 15 minutes at each breast. The duration of feeding may increase and the frequency may decrease as the infant gets older and after solid foods are introduced.

Parents should be assured that they can feel confident their infant is receiving enough breast milk if he's growing appropriately. Keep in mind that intake is adequate if:

- weight loss after birth is normal (less than 10% of birth weight)
- the infant regains the weight lost after birth by age 2 weeks
- the infant has six to eight wet diapers or more per day
- there's a minimum weight gain of 15 g (0.5 oz) per day in the first 2 months of life.

Advantages of breast-feeding

It's a well-known fact that breast-feeding is best for an infant. Here are some of the reasons.

Passive immunity
Human milk provides passive immunity from mother to infant. *Colostrum* is the first fluid secreted from the breast (within the first few days after delivery) and provides immune factor and protein to the neonate. Many components of breast milk protect against infection—it contains antibodies (especially immunoglobulin A) and white blood cells that protect the infant from some forms of infection. Breast-fed babies also experience fewer allergies and food intolerances as well as a lower risk for obesity in childhood.

Digestibility
Breast milk provides essential nutrients in an easily digestible form. It contains *lipase,* which breaks down dietary fat, making it easily available to the infant's system.

Brain development
The lipids in breast milk are high in linoleic acid and cholesterol, which are needed for brain development.

Low protein content
Cow's milk contains proportionally higher concentrations of electrolytes and protein than are needed by human infants. It must be cleared by the immature kidneys and thus isn't recommended until a baby is at least 12 months old.

Convenient and cost-free
The woman who breast-feeds saves the money and time that would be needed to buy and prepare formula.

It's all relative

Tips for preparing formula

Provide parents with these tips for properly preparing infant formula:

- Wash your hands before preparing formula.
- If your water source is safe, mix formula with room temperature tap water.

If your water source is not safe or you are unsure, use fluoridated bottled water or boil water for no longer than 1 minute then let it cool for 30 minutes to room temperature.

- Wash utensils in warm, soapy water and rinse them well to ensure they're safe to use.
- Avoid using microwave ovens to warm formula; they fail to sanitize utensils and cause uneven heating, which increases the risk of burns.
- Discard a prepared bottle of formula after it's been offered to the infant or has sat at room temperature for longer than 1 hour.
- Cover and store opened cans of liquid formula in the refrigerator; discard after 48 hours.

Recommended vitamin supplements

Breast-fed infants should receive oral supplementation of vitamin D, 400 units per day. At 4 months of age, exclusively breast-fed infants should also be supplemented with 1 mg/kg per day of oral iron until iron-containing complementary foods are introduced.

Formula feeding

Formula feedings can provide adequate nutrition when the mother shouldn't or can't breast-feed her infant. Some mothers may feel guilty about being unable to breast-feed or about making the decision not to breast-feed. The pediatric nurse should support, and never judge, the mother who can't or who chooses not to breast-feed and should reassure her about the nutritional value of infant formulas.

Infant formulas are constituted to provide the proper variety and amount of carbohydrates, protein, fats, and micronutrients needed for healthy growth and development. The U.S. Food and Drug Administration regulates the composition, labeling, and inspection of infant formula to ensure infant safety. (See *Tips for preparing formula.*)

No moo cows, please

Women are strongly urged to use commercially prepared formulas rather than regular cow's milk because cow's milk:

- doesn't meet all of an infant's nutritional needs
- can be difficult to digest
- can strain the infant's renal system.

Unlocking the secret formula

Most formulas are based on cow's milk proteins, although preparations based on soy proteins and casein hydroxylate are available for infants who can't tolerate cow's milk–based preparations. There are also special formulas for infants with such diseases as phenylketonuria and other metabolic disorders.

Formula comes in powder form, concentrated liquid, and ready-to-feed forms. Ready-to-feed formulas are convenient and prevent problems based on incorrect dilution and preparation but are more expensive.

Special care should be used so that formula isn't improperly mixed or stored, which can be hazardous to the infant.

Weaning

The American Academy of Pediatrics and the American Dental Association recommend that infants be weaned from the bottle to the cup by age 1 year. In preparation for weaning, and to promote the developmental step toward independent feeding, the cup should be introduced by age 9 months in all infants. This is usually done gradually, by omitting one bottle at a time and replacing it with a cup over a period of several days to weeks.

Slow and steady to bottle-ready

How long a mother continues to breast-feed is an individual choice; if a mother chooses or needs to switch from breast to bottle, it is accomplished similarly to the weaning from bottle to cup. One breast-feeding session per day is replaced with a bottle-feeding until, over a period of days to weeks, the transition occurs.

This gradual weaning approach helps prevent engorgement in the mother and decreases her risk of mastitis. An infant can also be weaned from breast-feeding to a cup, eliminating the need for bottles.

Introducing solid foods

The age at which solid foods are introduced into an infant's diet depends on such factors as the nutritional need for iron, the infant's physiologic capability to digest starch, and his physical ability to chew and swallow.

Rice is nice

By age 4 to 6 months, an infant should be mature enough to begin eating iron-fortified cereal mixed with formula or breast milk. Rice cereal is the best to begin with because it's least likely to cause allergies. (See *Solid foods and infant age.*)

Solid foods and infant age

This table gives an overview of solid foods that are appropriate for the developing infant.

Age	Type of food	Rationale
4 to 6 months	Rice cereal mixed with breast milk or formula is a traditional choice; however, strained vegetables (offered first) and fruits are just as good.	Rice cereal is easy to digest and less likely than wheat to cause an allergic reaction. Vegetables are offered first because they may be more readily accepted than if introduced after sweet fruits.
7 to 8 months	Strained meats, cheese, yogurt, rice, noodles, pudding	Provide an important source of iron and add variety to the diet
8 to 9 months	Finger foods (bananas, soft crackers)	Promote self-feeding
10 months	Mashed egg yolk (no whites until age 1); bite-size cooked food (no foods that may cause choking)	Use of bite-size pieces to decrease risk of choking (Avoiding foods that may cause choking is the safest option, even though the infant chews well.)
12 months	Foods from the adult table (chopped or mashed according to the infant's ability to chew foods)	Provide a nutritious and varied diet that should meet the infant's nutritional needs

Fingers before forks

By about age 8 or 9 months, the infant should be able to sit up and grasp objects, so introducing finger foods at this time can help promote self-feeding. (See *Teaching points for feeding and nutrition*.)

Sleep and rest guidelines

The AAP recommends that all infants be positioned on their backs for every sleep (including naps) until they can roll over and determine their own sleeping position. Since its inception, this simple maneuver has significantly decreased the incidence of sudden infant death syndrome (SIDS). In addition to providing safe sleep guidelines for the prevention of SIDS, the AAP recommendations focus on safe sleeping environments to prevent sudden unexpected infant deaths (SUIDs)

It's all relative

Teaching points for feeding and nutrition

Stress these feeding and nutrition points to the parents of an infant:

- Watch for behaviors that indicate feeding preferences. If the infant rejects a food initially, offer it again later and many more times as tastes change!
- Keep the infant in an upright feeding position.
- Don't try to make the infant eat more to finish the serving or portion.
- Initially, offer iron-fortified rice cereal.
- Introduce new foods one at a time, waiting 5 to 7 days between them so that if a food allergy develops, it will be apparent which food triggered the allergic reaction.
- Avoid grapes and grape halves and cut up hot dogs until the infant has adequate chewing and swallowing skills.
- Limit 100% pure fruit juice to no more than 4 oz per day.
- Avoid other sweetened beverages.
- If the infant has a history of food allergies, delay offering eggs, wheat-based products, peanut and tree nuts–based products, and citrus fruits.
- Avoid honey and other unpasteurized products because they may put infants at risk for infantile botulism.

caused by entrapment, suffocation, and asphyxiation. Soft materials, even if covered by a sheet, should not be placed in the crib under a sleeping infant. Objects such as quilts, bumper pads, comforters, and blankets should be kept out of infant's sleeping environment. Clothing designed to keep infant warm without covering the head (such as a sleep sac) can be used. There is no evidence that wedges, positioners, special mattresses, and special sleep surfaces reduce the risk of SIDS or that they are safe.

Because of an increased risk of entrapment or suffocation, infants should not be placed to sleep on beds. Room sharing without bed sharing is recommended to decrease the risk of SIDS. Bed rails should not be used due to a risk of strangulation. The sleep area should be kept free from dangling cords, window-covering cords, or electrical wires. Sitting devices such as car seats, strollers, and swings are not recommended for routine sleep. If a baby is being carried in a sling, it is essential that the head and face be visible and that the infant's nose and mouth are clear of obstructions.

To sleep, per chance to . . . wake up and eat!

Certain expectations for sleeping through the night can be made for each age-group in infancy:

- From birth to age 4 months, an infant will wake to feed at night from 0 to 3 times. Because breast milk is digested faster than formula, breast-fed infants commonly will wake up to feed more frequently than bottle-fed infants.
- At ages 4 to 6 months, infants are beginning to be physiologically capable of sleeping (without feeding) for 6 to 8 hours at night. Infants may awaken during this sleep period but should be able to calm themselves and return to sleep. (See *Sleep requirements in infancy*.)

Napping

From birth to age 3 months, infants may take many naps per day. However, an infant shouldn't be allowed to sleep longer than 4 hours at a time during the day because this will lead to more nighttime awakenings to feed.

From ages 4 to 9 months, the infant will have transitioned to two naps per day (one in the morning and one in the afternoon). Total naptime should add up to about 2 to 3 hours. By ages 9 to 12 months, most infants will have transitioned to only one nap, for a total of 1 to 2 hours of napping time.

Growing pains

Sleep requirements in infancy

This chart shows the amount of sleep per 24 hours (including nighttime and naps) needed by infants from ages 1 week to 12 months.

Age	Hours of sleep per day
1 week	16½
1 month	15½
3 months	15
6 months	14½
9 months	14
12 months	13¾

Dental hygiene

Gentle care can be given to the infant's gums and new teeth. Wiping the teeth and gums with a soft washcloth and water alone provides adequate cleaning when the infant has only a few teeth.

Hold the paste

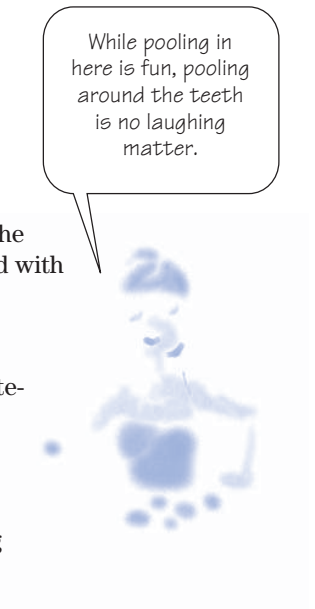
Once teeth have erupted, they can be cleaned with a small, soft-bristled toothbrush and water. Toothpaste shouldn't be used because the infant would swallow it. Ingesting fluoridated toothpaste can cause nausea and fluorosis, a gray discoloration of the permanent teeth.

A dental home should be established by 12 months of age, but dental care begins with the first tooth eruption. Fluoride supplements may be needed in areas where the water supply contains inadequate fluoride (less than 0.3 ppm) or none at all. The American Academy of Pediatric Dentistry recommends that fluoride supplements be given to infants who need them beginning at age 6 months.

Preventing dental caries during infancy

In addition to being a condition associated with dietary factors, early childhood caries can be transmitted from mother to baby by the bacteria *Streptococcus mutans*. To keep an infant's smile healthy, teach the parents how to avoid dental caries with these tips:

- Don't put an infant to bed with a bottle at night or at naptime because pooling of carbohydrate-rich fluids (including breast milk and formula) or other sweetened liquid around the infant's teeth can cause decay. If an infant must be put to bed with a bottle, fill the bottle with water only.
- Don't allow the infant to carry a bottle filled with milk, formula, juice, or other sweetened liquid to use as a pacifier throughout the day. Again, frequent exposure to carbohydrate-rich liquids to the teeth can occur, leading to decay. Bottles that contain liquids other than water should be offered only at mealtimes.
- Transition the infant to a cup beginning around 9 months and completed by the time of his first birthday. Cup-drinking doesn't permit pooling of liquids around the teeth.
- Don't offer the infant a pacifier dipped in sugar or honey.
- Provide regular care of the infant's teeth and gums.
- Encourage mothers to chew gum or mints with xylitol listed as the first ingredient (3 to 5 times daily) because xylitol has been shown to inhibit the growth of *S. mutans*.



Injury prevention

Injury prevention during infancy centers around automobile safety, preventing aspiration and falls, and childproofing the infant's environment.

Child passenger safety

The use of child restraints in automobiles has reduced the risk of injury by 71% to 82% compared to just using a seat belt for the same-age child. Infants and toddlers should always ride in a rear-facing car safety seat until age 2 years or until the child achieves the highest weight or height allowed by the manufacturer of the car seat.

Aspiration

Because infants become adept at placing objects in their mouths for exploration, they're at risk for aspiration. To prevent aspiration:

- Feed infants in a slightly upright position.
- Burp infants in an upright or prone position.
- Cut solid foods into very small pieces when the infant starts eating solids.
- Avoid foods and other things that can be choking hazards. (See *Choking hazards*.)

Choking hazards

These foods can easily cause choking and should be avoided during infancy:

- hot dogs
- nuts
- popcorn
- hard candy
- ice cubes
- grapes
- uncooked vegetable chunks
- lumps of peanut butter.

Falls

Even a neonate is at risk for falling. As the child becomes mobile, the risk of falls increases. To prevent falls, encourage parents to:

- never leave an infant unattended, especially on a changing table, bed, sofa, or counter
- place gates at the top and bottom of staircases
- put up window guards or other window safety devices on windows above the first floor level
- avoid placing infants in walkers because they can tumble over an uneven surface or the leg of a chair or table or fall down stairs.

Here's a great strategy for childproofing. Get down on your hands and knees, crawl around a bit, and see how much trouble you could get into!

Childproofing

After an infant is mobile, it's too late to childproof. Here are some tips for childproofing, based on the infant's age.

At birth:

- Turn down the thermostat on the water heater to 120° F (48.9° C) or lower. (See *Dangers of high temperature water*.)

Dangers of high temperature water

Teach your patients' parents to cool it—the water heater thermostat, that is!

When the hot water temperature is set at 150° F (65.6° C), it takes only 2 seconds of exposure for an adult to suffer a full-thickness burn. Because infants have thin skin, it takes even less time for them to suffer a full-thickness burn.

By turning the water temperature down to a maximum of 120° F (48.9° C), parents can drastically reduce the risk of injury; at 120° F, it takes 10 minutes for a burn to occur.

- To prevent an accidental scalding burn, never drink hot liquids while holding the infant.
- To prevent drowning, never leave the infant alone in the bath.
- Install smoke detectors.
- Install a carbon monoxide monitor outside the infant's room.
- Use flame-retardant pajamas.
- Remove firearms from the home. (If this isn't an option, use trigger locks or lock the firearm and ammunition in separate areas.)

By age 4 months:

- Cover all electrical outlets.
- Tape down all electrical cords (or place them behind furniture).
- Install childproof locks on all cabinets.
- Place all medicines and cleaning agents in high cabinets with locks to prevent accidental ingestions.
- Remove all breakable items from tabletops and shelves within the infant's reach.
- Keep small toys and other small items off the floor.

Accidental ingestions

Although not a common cause of death in infancy (16 deaths in 2011), accidental ingestions are easily preventable by placing all toxic substances such as cleaning supplies and medications in upper or locked cabinets. In addition, the American Association of Poison Control Centers has a national poison emergency hotline that can be called toll-free 24 hours a day: 1-800-222-1222. Every household should have this number in an easy to find location or already entered into the phone so that it can be accessed quickly.

Health problems

Health concerns during infancy include:

- colic
- failure to thrive
- regurgitation
- SIDS.

Colic

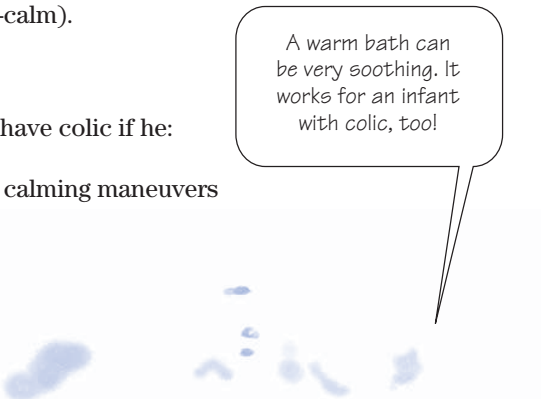
Time spent crying per day increased from birth and peaks for all infant around 6 weeks of age and then starts to decline. Some infants cry more than others. *Colic* is defined as a daily period of crying for 3 hours or longer, during which the infant is virtually inconsolable. These episodes usually occur in the late afternoon or evening. About 10% to 20% of infants suffer from colic.

What causes it

No one knows for sure what causes this behavior.

How it happens

Although long thought to be related to the gastrointestinal (GI) tract, current theories about the origins of colic lean toward CNS maturation. The process of CNS maturation can cause difficulties with the infant's ability to self-regulate (especially relating to overstimulation and an inability to self-calm).



What to look for

In an otherwise healthy infant, he may have colic if he:

- cries and is inconsolable
- fails to calm in response to normally calming maneuvers (holding, rocking)
- isn't hungry (refuses the breast or bottle)
- doesn't need changing (has a dry diaper)
- has no fever or other medical reason for crying.

Complications

Colic produces no complications unless a caregiver gets so frustrated that she harms the infant. Fussy infants who are difficult to care for are at increased risk for abuse.

How it's treated

Colic is a clinical diagnosis, meaning no tests exist to help diagnose colic. There's no medical cure for colic, except time. Most infants "outgrow" it or sufficiently mature so that symptoms disappear or markedly improve by age 3 months.

What to do

Because of the potential for abuse when caregivers become frustrated with an inconsolable infant, the pediatric nurse should make every effort to help parents deal effectively with an infant with colic.

Decreasing rapidly changing stimulation seems to be the most effective intervention for an infant with colic. Any strategy might work, but the key is to keep the stimulation consistent for at least 5 minutes so the infant can adjust to it. Rapidly trying different "fixes" only increases stimulation and makes matters worse. (See *Tips for reducing colic*.)

When all else fails and parents are at their wits' end, suggest that they place the infant on his back in the bassinet or crib, shut the door, leave the room, and do something to calm down (for example, meditation, listening to music). The parents should be encouraged to call a family member, friend, or the infant's health care provider if help is needed to cope with the crying. The parent should not return to the infant's room until he or she is calm enough to care for the infant.

It's all relative

Tips for reducing colic

Providing parents with these tips may help them relieve their infant's colic behavior.

Provide rhythmic movement
- Front-carrying sling
- Infant swing
- Car ride in approved safety seat
- Walking with the infant on your shoulder

Try alternative positioning
- Swaddling
- Prone position over parent's knees

Reduce environmental stimuli
- Quiet, soothing music
- No sudden, loud noises
- No smoking

Provide tactile stimuli
- Pacifier
- Warm bath
- Massage

Failure to thrive

Failure to thrive (FTT) is a state of undernutrition diagnosed when an infant isn't growing at the expected rate. FTT is characterized by failure to maintain weight for length above the 5th percentile on age-appropriate growth charts. It can also be detected from a deviation in an already established growth curve.

What causes it

The cause of FTT is often multifactorial including medical, psychosocial, and environmental factors.

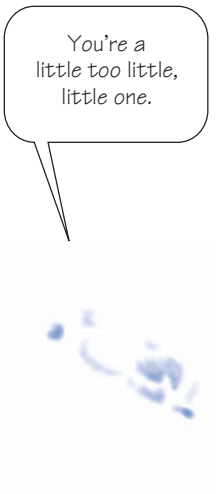
How it happens

If caloric intake is less than that required for nutritional needs, growth and development suffer. Inadequate calorie intake is often caused by problems with feeding. Family issues such as a parent with mental health problems, lack of knowledge or poverty, as well as neglect or abuse can also be associated with FTT.

FTT caused by inadequate calorie absorption may be due to malabsorptive pathology or metabolic disorders. Excessive use of calories can occur with chronic illness such as congenital heart disease or chronic pulmonary disease of prematurity.

What to look for

An absence of weight gain or a loss of weight is the first growth parameter to be affected; a drop in height percentile is the next sign, followed by a drop in head circumference. A drop in percentile over time or between visits warrants further investigation.



What tests tell you

No definitive tests for FTT exist. However, after taking a history and performing a comprehensive exam, you should be able to determine whether medical causes are a possibility. All possible medical or pathologic causes should be ruled out.

Complications

Complications of FTT can include developmental delay, growth retardation, impaired bonding, and altered family relationships.

How it's treated

All factors impacting the infant's nutrition should be addressed. If a pathologic cause is determined, treatment focuses on the underlying disease process. If indicated, treatment is also directed toward changing the surroundings. A change in the infant's environment might be as drastic as removing him from the home or as simple as educating a caregiver on breast-feeding or proper mixing of formula or reading the infant's cues more accurately.

What to do

When providing care to an infant hospitalized with FTT, the nurse should:

- weigh the child on admission to determine baseline weight and continue to weigh daily during treatment
- properly feed and interact with the child to promote nutrition and growth and development
- provide the infant with visual and auditory stimulation to promote normal sensory development
- teach the parents effective parenting skills to increase their knowledge of routine child care practices, such as comfort measures, age-appropriate developmental tasks, and play activities
- praise the parents for positive interactions with the infant and avoid judgmental statements and actions.

Regurgitation

Regurgitation, also referred to as *spitting up* or a *wet burp*, is considered normal infant behavior. Most infants will spit up at least occasionally.

What causes it

Regurgitation in infants is most commonly caused by swallowing air or by overfeeding. However, it can also be caused by gastroesophageal reflux disease or pyloric stenosis.

How it happens

A wet burp involves either dribbling of undigested liquids from the mouth and esophagus, or the expulsion of those liquids with the force of a burp.

What to look for

Spitting up in infancy may be characterized by:

- white, curdled liquid plopping or running out of the corners of the mouth or, occasionally, coming from the nose
- a "burp" of air that sometimes precedes the regurgitation.

The infant with regurgitation may:

- be fussy during feedings
- grimace, cry, and pull away from the bottle or breast
- occasionally refuse to eat.

What tests tell you

Testing can rule out gastroesophageal reflux disease and pyloric stenosis, two common causes of regurgitation in infants.

Probing the problem

The definitive test for gastroesophageal reflux is called a *pH probe*. Because the pH of the stomach is so acidic (pH of 1 to 3), a probe placed in the esophagus will demonstrate the presence of stomach acid if reflux if present.

Slow stomach

If projectile vomiting is reported, pyloric stenosis may be suspected. An ultrasound of the area may demonstrate delayed or slowed stomach emptying, a thickened sphincter, or complete closure of the sphincter. Surgical treatment is necessary.

Complications

Complications of regurgitation are rare but it may include aspiration pneumonia and failure to gain weight.

How it's treated

If an infant is growing well, is generally happy, and isn't bothered by spitting up, regurgitation can be left to improve with time.

Memory jogger

When caring for an infant with regurgitation, remember to *BERP* him:

B—Burp the infant frequently.

E—Evaluate feeding.

R—Reassure caregivers that the condition will improve with time.

P—Prevent aspiration.

If the infant isn't growing well, is refusing to feed, is unhappy, or has been diagnosed with gastroesophageal reflux or pyloric stenosis, drug therapy or even surgery may be necessary.

What to do

When providing care to an infant with regurgitation:
- Evaluate feeding methods (amount of burping, air in nipple with formula feeding).
- Burp the infant frequently; feed smaller amounts more frequently and don't overfeed.
- Place or hold infant in an upright position after feeding to help food stay down.
- Reassure caregivers that spitting up may improve with time.

Sudden infant death syndrome and sleep-related infant deaths

SIDS is the sudden death of a previously healthy infant when the cause of death isn't confirmed by a postmortem examination. It's the most common cause of death between ages 1 month and 1 year. However, the incidence of SIDS has declined dramatically by more than 50% since 1990, which is mostly attributed to the 1992 initiative to put babies on their backs, called the "Back to Sleep Campaign" now relabeled the "Safe Sleep Campaign." The safe sleep campaign focuses on a safe sleeping environment that reduces the risk of all sleep-related deaths including SIDS.

What causes it

Although the exact cause of SIDS is unknown, currently a triple-risk model includes development, vulnerabilities, and environmental stressors. Several factors, including exposure to tobacco smoke and long QT syndrome, have been shown to be associated with an increased risk of SIDS. (See *Risk factors for SIDS*.)

How it happens

Current theories focus on neurologic immaturity related to the infant's inability to sense and regulate oxygenation status, ultimately leading to respiratory arrest. The syndrome can't be prevented or explained; the infant usually dies during sleep without noise or struggle.

What to look for

Autopsy findings may show pulmonary edema, intrathoracic petechiae, and other minor changes suggesting chronic hypoxia.

Risk factors for SIDS

- Prematurity
- Low birth weight
- Twin or triplet
- Race/ethnicity (Native Americans and African-Americans are at highest risk—possibly related to infant sleep position preferences)
- Male gender
- In utero exposure to nicotine or alcohol
- Age between 1 and 4 months
- Passive smoke exposure
- History of respiratory compromise

What tests tell you

There are no tests to diagnose SIDS. A thorough postmortem investigation must rule out all other causes of death.

Complications

Sudden death is the sole medical complication of SIDS. However, SIDS affects the family members of the infant who dies of SIDS. Parents may need counseling or some other form of help to cope with their loss.

How it's treated

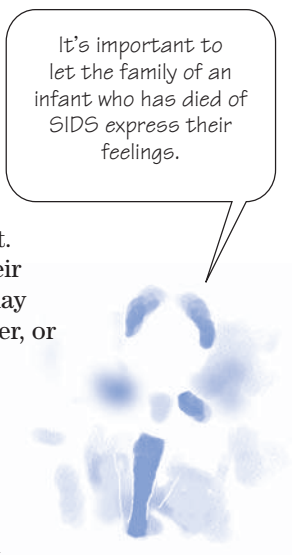
There is, of course, no way to treat a condition that, by its definition, is sudden death without warning. There are, however, measures that can be taken to decrease the risk of SIDS and other sleep-related infant deaths including:

- putting the infant on his back to sleep for every sleep; side sleeping is not advised
- using a firm sleep surface
- room sharing without bed sharing
- removing pillows, quilts, stuffed toys, or any other soft surfaces from the infant's crib or sleeping environment
- keeping the infant warm while sleeping, but not overheated
- not smoking, drinking alcohol, and using illicit drugs
- breast-feeding
- considering offering a pacifier at nap and bedtime
- immunizing per recommendations.

What to do

When dealing with a family whose infant has just died of suspected SIDS in the emergency room:

- Be aware that assessment, planning, and implementation related to the parents' needs should begin as soon as they arrive in the emergency department.
- Provide the family with a room (for privacy) and a staff member who can stay with them and provide support.
- Stay calm and let the parents express their feelings. (In their need to blame someone or something for the tragedy, they may express anger at emergency department personnel, each other, or anyone involved with the infant's care.)
- Prepare the family for how the infant will look and feel.
- Let the parents touch, hold, and rock the infant, if desired. Allow them to say good-bye.
- Contact spiritual advisors, significant others, or other support systems
- Provide literature on sudden unexplained infant death and support groups.



Quick quiz

1. A social milestone that infants should acquire by ages 2 to 3 months is:

A. grasping at objects.
B. smiling.
C. stranger anxiety.
D. vocalizing "mama."

Answer: B. Smiling is a social communication milestone that should be reached by ages 2 to 3 months.

2. Which finger food is appropriate for an 8-month-old infant?

A. Cheerios
B. Grapes
C. Mixed nuts
D. Raw carrot slice

Answer: A. Infants are developmentally ready to eat solids by age 6 months, when they can maintain their posture in an upright position to decrease the risk of choking.

3. The best assessment of whether an infant is receiving enough formula or breast milk is if he:

A. burps well.
B. doesn't cry after feeding.
C. has six or more wet diapers per day.
D. sleeps all night.

Answer: C. Infants receiving adequate formula or breast milk for hydration and growth will void and wet six to eight diapers daily.

4. Which of these interventions decreases the risk of SIDS?

A. Feeding the infant in an upright position
B. Not giving a bottle in bed at night
C. Putting an infant on his back to sleep
D. Raising the head of the crib

Answer: C. Putting the infant on his back to sleep has decreased the prevalence of SIDS and will decrease the individual infant's risk as well.

Scoring

☆☆☆ If you answered all four items correctly, terrific! You've developed a strong sense of infant development.

☆☆ If you answered three items correctly, good job! Treat yourself to a play break and then read on.

☆ If you answered fewer than three items correctly, don't cry over spilled milk! Take a nap and review the chapter again.

4

Early childhood

Just the facts

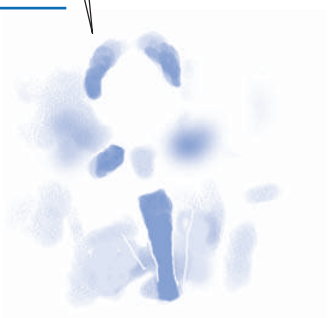
In this chapter, you'll learn:

- physical, psychological, and cognitive development of toddlers and preschoolers
- developmental theories in the toddler and preschool years
- common concerns of parents of toddlers and preschoolers
- injury prevention for toddlers and preschoolers
- health problems of toddlers and preschoolers.

Toddlerhood

Toddlerhood, from ages 1 to 3 years, is the stage in which children start displaying independence and pride in their accomplishments. They intensely explore their environment, trying to figure out how things work. It's also the time when they begin to display negativism and have temper tantrums.

The "terrible two's" don't have to be terrible. "No" may be a toddler's favorite word, but he'll also take pride in every little accomplishment.



Physical development

During the toddler stage, physical growth is characterized by:

- growth rate that slows during the second year of life
- possible limited food intake, which may concern parents, so they need to be reassured this is normal
- steady growth on a growth curve that's more steplike than linear, demonstrating growth "spurts."

Height, weight, and head circumference

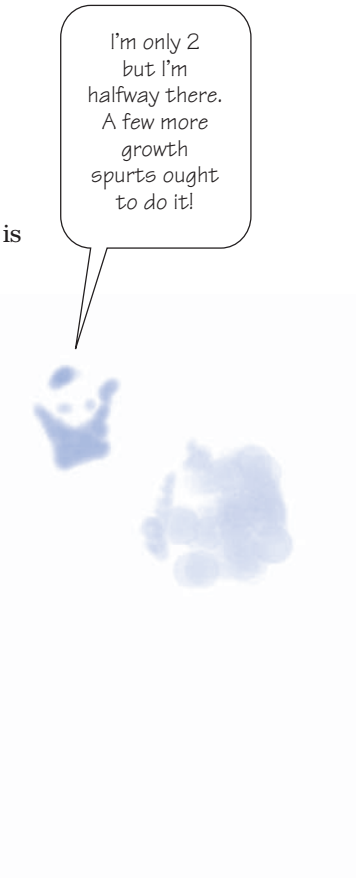
From ages 1 to 2:

- Toddlers grow approximately 3½″ to 5″ (9 to 12.5 cm) per year (with growth mostly in the legs, rather than in the trunk, like infants).
- Toddlers gain about 8 oz (227 g) per month.
- Head circumference increases about 1″ (2.5 cm) per year.
- Anterior fontanel usually closes (between 12 and 18 months).

Two's take off

By age 2:

- Birth weight has usually quadrupled; average weight is 27 lb (12.3 kg).
- Head circumference is usually equal to chest circumference.
- The child is about half of adult height, with an average height of 34″ (86.4 cm).



Three's relax

From ages 2 to 3, toddlers:

- grow 2″ to 2½″ (5 to 6.5 cm)
- gain about 3 to 5 lb (1.5 to 2.5 kg)
- show slowed increases in head circumference (less than ½″ [1.3 cm] per year).

Teeth

By approximately 33 months, all deciduous teeth have erupted and the child has about 20 teeth. The child should already be brushing with a small, soft-bristled toothbrush (with parental supervision) and may use a scant amount of fluoride toothpaste or, if needed, fluoride supplements.

Gross motor development

Gross motor activity develops rapidly in toddlers. One-year-olds can:

- walk alone using a wide stance
- begin to run but fall easily.

By age 2, the toddler can:

- run without falling most of the time
- throw a ball overhand without losing his balance
- jump with both feet
- walk up and down stairs
- use push and pull toys.

Fine motor development

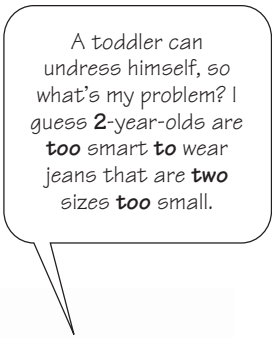
Fine motor development begins slowly; however, by age 2, the toddler has generally mastered some fairly complex fine motor skills.

A 1-year-old can:

- grasp a very small object.

A 2-year-old can:

- build a tower of four blocks
- scribble on paper
- drop a small pellet into a small, narrow container
- use a spoon well and drink well from a covered cup
- undress himself.



Psychological development

A child develops a more elaborate vocabulary, a sense of autonomy, and socially acceptable play skills during the toddler stage.

Language development and socialization

As the toddler learns to understand and, ultimately, communicate with the spoken word, he develops the social skills that will allow him to interact more effectively with others.

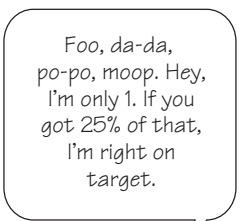
Language

During toddlerhood, the ability to understand speech is much more developed than the ability to speak.

Now we're talking

By age 1:

- The child uses one-word sentences or *holophrases* (real words that are meant to represent entire phrases or ideas).
- The toddler has learned about four words.
- Twenty-five percent of the 1-year-old's vocalization is understandable.



Talk about progress!

By age 2:

- The number of words learned has increased from about four (at age 1) to approximately 300.
- The child uses multiword (two- to three-word) sentences.
- Sixty-five percent of speech is understandable.
- Frequent, repetitive naming of objects helps toddlers to learn appropriate words for objects.