EMERGENCY CARE OF CHILDREN

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Preface

Most children are born into the world free of disability, disease and malformations. They are normal, healthy, and virtually unflawed. Modern technology has successfully minimized and controlled the disabilities, diseases and deformities of the few children born with them.

In spite of the abundance of scientific knowledge and technology available, children are still victims of illness, injuries and accidents. Currently, there is no device that will render childhood immunity to them. On the contrary, children are more prone to illnesses, injuries and accidents than are adults. Many illnesses leave devastating effects when contracted in the early years. Injuries and accidents often temporarily rob the child of a portion of normal growth and developmental activities. They also may cause disability and deformity.

When illnesses, injuries and accidents do occur, the response they elicit can influence whether an illness leaves sequela, or an injury or accident results in some loss of function. Illnesses, injuries and accidents often develop quickly in children, creating an emergency situation. Since children differ from adults, many of the illnesses and accidental injuries incurred require intervention that differs from that for adults. In addition, children develop illnesses and incur accidental injuries that are either unlike those characteristic of adults or not encountered in adults. Therefore, the health professional working with children needs to be aware of these differences between children and adults and know how to effectively intervene in an emergency.

Health professionals from varied backgrounds, experience and expertise may encounter a child in an emergency situation. The professionals may include a family physician, pediatrician, surgeon, or other specialist of the medical profession; a pediatric nurse or nurse practitioner, emergency room nurse, intensive care unit nurse, operating room nurse, school nurse, community health nurse, or other specialist of the nursing profession; a paramedic; respiratory therapist, medical or laboratory technologist, physical therapist or other hospital personnel specialist; or a student of any above-mentioned health profession. Regardless of experience or background, the professional must be competent to render care for children in an emergency.

In order to effectively do this, health professionals must be able to quickly use learned skills, techniques and interventions, modifying them if necessary for the care of children. They must be aware of developmental considerations that influence assessment and intervention in childhood emergencies. They must know how to provide emotional and psychological support to the child and family. They must be cognizant of those emergency symptoms, illnesses and accidental injuries most likely to occur in children, and they must know how to identify and treat them. Finally, health professionals, regardless of experience or background, must be able to intervene promptly, correctly and competently in order to minimize untoward effects to the child physically, physiologically, emotionally, developmentally and psychologically. The accomplishment of each of the above is the goal of this book. It is intended to provide

the information needed to appropriately care for a child in an emergency.

Chapter 1 focuses on the physical and physiological ways that children differ from adults. The chapter describes appropriate data-gathering techniques for effective history-taking and physical examination of the child. Implications of findings are analyzed. Knowledge of a child's history is necessary for effective triage and intervention in an emergency. Children's body functions differ anatomically and physiologically from adults. How these differences affect assessment and intervention in childhood illnesses and injuries is discussed.

Chapter 2 describes the emotional, intellectual and psychological development of the child; the child's reaction to illness and injury; and the importance of family support and ways to facilitate it. Children are in a constant state of development. The child's reaction to illness and injuries and his or her ability to cope vary with age and developmental level. Children commonly seek parental and family support, but in an emergency illness or injury this dependency is exaggerated. An appreciation of the unique combination of traits, experiences and circumstances characteristic of each child and family encountered in an emergency is necessary in order to intervene appropriately and provide the emotional and psychological support they need.

Chapter 3 presents childhood symptoms that may lead to or become an emergency condition. These symptoms lead to complications and cause harm to the child if intervention is not immediate. These symptoms may also occur as a consequence or complication of an emergency illness or injury. An awareness of these symptoms, their complications and appropriate intervention is necessary to prevent untoward effects on the child. Etiology, pathophysiology, assessment, intervention (with goals and rationale) and evaluation for each emergency symptom are presented. The same format is used in subsequent chapters for topics discussed.

Chapter 4 discusses illnesses that may quickly lead to an emergency situation. Certain clinical conditions and diseases occur suddenly and progress rapidly in children. Some of these illnesses are unique to children, while others, although occurring in adults, have greater potential for damaging the child. All must be discovered and corrected promptly.

Chapter 5 covers trauma and the many injuries children incur in accidents. Accidents are the leading cause of death and injury in children who are more than one year old. Injuries from accidents may temporarily incapacitate the child. Serious crippling or permanent disability also may result. Topics are presented in order of priority in an emergency situation.

Chapter 6 focuses on pediatric social illnesses and sociological emergencies, which frequently have devastating consequences to children. Some aspect of the child's proper progression through normal developmental stages is affected. A discussion of legal responsibilities is also presented.

Tables, figures and illustrations are interspersed throughout the book. These are designed to emphasize and illustrate important information, procedures, techniques and conditions and to enhance presentation of subject matter.

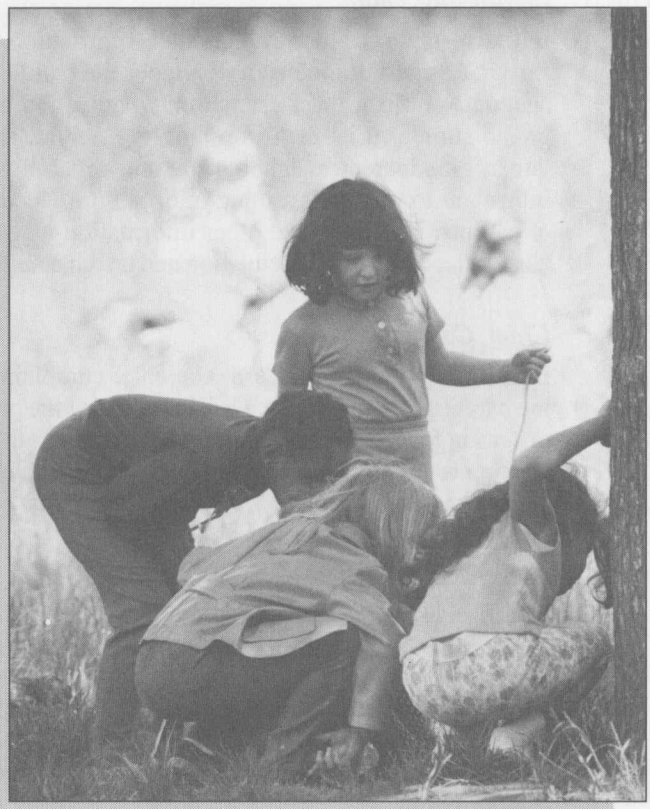
Chapters are designed in sequence so that information presented in the first half of the book provides a foundation and background for discussion of topics in the second half of the book. The chapters build upon each other, limiting repetition. However, adequate information for each topic is provided throughout the book to help caregivers cope quickly with emergencies.

Finally, there are Patient Education Aids reprinted from the physician's journal *Patient Care*. These doctor–to–patient instructions cover care of the child in the event of many of the symptoms, conditions and injuries discussed in the text.

Contents

1

Developmental Considerations Influencing Assessment and Intervention



When screening the pediatric patient in an emergency, the health care professional must rely on initial impression and whether or not the child appears in distress. Initial impression and assessment of the child in an emergency should be based on an ability to distinguish normal from abnormal in a child. With overwhelming increases in numbers of children utilizing emergency department facilities (most for injuries and illnesses that are noncritical in nature), this skill is especially important to ensure that immediate care is given to seriously ill or injured children. Most emergency departments have a triage system for determining which patients should be treated first and where the treatment should take place. In addition, initial treatment may be rendered by various health professionals according to established protocols.

While various forms of triage have proven effective (e.g., algorithm-directed, triage by nurses, doctors, nonprofessionals), its basic purpose is to accurately assess the child to determine severity of the child's condition, establish priorities for therapeutic intervention, render care

and/or assign the child to an acceptable place for treatment (1, 2, 3, 4, 5, 6). To determine if the child is in distress or not, the health care professional should obtain a brief history of events antecedent to the emergency situation and perform a physical assessment. To adequately accomplish this, the health care professional needs to be cognizant of appropriate data-collecting techniques, general physical assessment and normal physiological and psychological reactions in the child.

Appropriate data-gathering techniques for effective history taking, general physical assessment of the child and implications of findings will be discussed. Physiological developmental considerations, including similarities and differences between children and adults, will also be presented. Emotional and psychological development considerations are discussed in Chapter 2.

Taking a History

Obtaining a history is vital to assessment of the child in an emergency situation. It provides information that aids the health professional in determining the immediate problem and necessary intervention. While a complete health history may not be possible in an emergency, as much information as possible should be obtained, particularly as it relates to the emergency condition. The history may be completed in the triage or treatment area.

While taking a history, the health professional needs to observe the child and parents and listen actively. Special consideration should be given to vocabulary used, type of questions asked and verbal and nonverbal aids to communication. Vocabulary should be worded at the level of understanding of both child and parents. Ability to communicate and use language varies with age. (See "Communication and Language" in Chapter 2). Words also may mean different things to children of different ages (e.g., grass).

Questions may be direct, open-ended or leading. Direct questions are quick and useful in yielding specific facts (e.g., name, age). Open-ended questions allow more freedom in answering (e.g., Has Susie been vomiting?) Leading questions may be helpful in some situations (e.g., How many times has Susie vomited in the past twenty-four hours?). Caution should be exercised when using leading questions because they may bias the child or parents into providing false information to please the health professional.

Make eye contact with the child and parents when eliciting information. This not only shows your interest but also may increase the amount of information you obtain. Be careful not to hinder communication nonverbally, by showing distress over an answer, or verbally, by offering advice during history taking.

Record the history in an orderly, systematic way, using the established format of the facility. This is necessary for clarity of understanding among health professionals regarding the child's condition.

While a complete health history of a child consists of many components (see Table 1.1, "Components of a Child's Health History"), the focus of the history interview in an emergency should be directed at the chief complaint. Identifying data, present illness, immunization status and past medical history should also be included. These components will be discussed. Other components of the health history (i.e., prenatal, neonatal, developmental, nutritional, family, personality, social history, and habits) are usually deferred in an emergency. They are summarized in Table 1.1, as is review of system information, which, in an emergency, is usually limited to symptoms of the organ system affected and included in the physical examination.

Identifying Data

Initially obtain the identifying data. Information necessary in this part of the history includes the child's name, age, date of birth, race, sex, parents' name, address and phone number. List the informant (e.g., child, mother, father, grandparent, neighbor) and note reliability of the informant to provide accurate information. Occupation of parents, insurance and other information may be obtained, depending on the situation and health care facility.

Chief Complaint

Direct history-taking towards the chief complaint. Ask the parents or child to give a brief account of the problem or reason for seeking emergency care. Listen as the child or parents tell you what is wrong. Record the chief complain as it is described in a brief statement.

Present Illness

A history of the present illness is a chronological account of what has happened to the child since the illness or injury occurred (or the child was well). Include influencing factors, duration, symptom chronology, related symptoms, limitations to activity, location of pain or discomfort, and what, if anything, has been done about the symptoms.

Immunization Status

Ask the parents which immunizations the child has had and when. Identify any deficiencies for future referral.

TABLE 1.1 *Components of a Child's Health History*

Identifying data: name, age data of birth, sex, race, parent's name, address, phone number, occupation and insurance, name of informant

Chief complaint: brief account of problem or reason for seeking medical attention

Present illness: chronological account of occurrences antecedent to illness or injury including influencing factors, duration, symptom chronology, related symptoms, limitations to activity or lifestyle, onset (e.g., sudden, gradual, previous episodes), location, intensity, and degree of pain or discomfort, action taken to relieve symptoms

Immunization status: record of immunizations child has had and dates

Past medical history: past illnesses, accidents, injuries, operations and hospitalizations, allergies, current medications (prescribed and unprescribed), allergies, primary source of health care

Prenatal and neonatal history: length of gestation, maternal health (kidney infection, hypertension, diabetes, excess or inadequate weight gain, swelling of extremities, diet, trauma, surgery, amniocentesis, ultrasound), complications, disease and x-ray exposure, drug ingestion, duration and complications of labor, complications, anesthesia used for delivery, birth weight, need for resuscitation, incubator or respirator, Apgar score, neonatal problems (e.g., jaundice, apnea, cyanosis, seizures), feeding patterns

Developmental history: age-related achievement, age of developmental milestones such as smiling, holding head steady, rolling over, sitting alone, crawling, walking, babbling, talking, vocabulary, sentences, riding tricycle, bicycle, ability to feed self, weaning, toilet training, writing, coloring, tying shoes, using scissors, toleration of strangers and separation

Nutritional history: bottle- or breast-fed, vitamin intake, fluoridation of water, age of solid food introduction, frequency of meals, dietary intake, food likes and dislikes

Family history: parental age, health and marital status, health of siblings and immediate relatives, cause of death in close relatives, family illness and conditions (e.g., heart disease, stroke, hypertension, rheumatic fever, anemia, leukemia, tumors or other cancer, diabetes, tuberculosis, asthma, hay fever, emphysema, kidney stones or disease, bladder infection, ulcers, colitis, arthritis, multiple sclerosis, muscular dystrophy, congenital dislocated hip, clubfoot, seizures, epilepsy, mental retardation, learning disorders, congenital anomalies, deafness, blindness, glaucoma, cataracts, myopia, strabismus, epistaxis, other illnesses or medical problems)

Personality history: child's relationship with parents, siblings, and peers, affect, disposition (e.g., extrovert, introvert, shy, outgoing, aggressive, assertive, talkative, calm, tense, anxious, hyperactive)

Social history: family income, home size and number of rooms, sleeping facilities, heating, sewerage and water facilities, education and occupation of parents, religious affiliation, racial or ethnic background

Habits: eating (frequency of meals, amount of food eaten, likes and dislikes), sleeping (amount, daytime naps, nightmares, difficulty going to sleep), toileting (urine stream, frequency, color and odor, bowel frequency, character and color), age of toilet training, toileting accidents, enuresis, encopresis, masturbation, fears, thumb sucking, nail biting, temper tantrums, breath-holding spells, pica, substance abuse

Review of systems (ROS): general (overall state of health, ability to perform normal activities of daily living, recent weight gain or loss, fatigue, exercise tolerance, fever, infection), integument (color, rashes, bruises, petechiae, pruritus, hair loss, acne, dryness, texture), head (size, presence of fontanelles, headaches, dizziness), eyes (visual acuity, problems, redness, drainage, tearing, unusual movements, cataracts, photophobia, strabismus, infections, diplopia, myopia, glasses or contacts), ears (infections, drainage, exudate, hearing acuity, earaches, ringing), nose (stuffiness, congestion, drainage, epistaxis, postnasal drip, frequent colds, smelling ability), mouth (number and condition of teeth, toothaches, lesions, ulcers, mouth breathing, bleeding of gums, odor, palate), throat (soreness, tonsils, difficulty swallowing, hoarseness), neck (stiffness, pain, masses, enlarged nodes, tenderness, movement, thyroid enlargement), chest (breast enlargement, discharge, masses, pain, self-examination), respiratory (dyspnea, cyanosis, wheezing, stridor, cough, shortness of breath, sputum, hemoptysis), cardiovascular (pain, exercise intolerance, murmurs, syncope, anemia, cyanosis) gastrointestinal (appetite, anorexia, feeding problems, nausea, vomiting, belching, flatulence, diarrhea, constipation, encopresis, hemorrhoids, abdominal pain, jaundice), genitourinary (dysuria, enuresis, frequency, urgency, hesitancy, dribbling, urinary tract infection, hematuria, nocturia, polyuria, urine odor, vaginal or penile discharge, menses, sexually transmitted diseases, musculoskeletal (fractures, joint swelling or stiffness, limitation of movement, edema, pain, deformity, muscle cramps or spasms, weakness, clumsiness), neurologic (seizures, unsteadiness, ataxia, frequent falls, loss of consciousness, nervousness, tremors, twitches, unusual movements, loss of sensation, memory loss, vertigo)

Past Medical History

Pertinent past medical history includes information about allergies, current medications (both prescription and nonprescription), past illnesses, accidents and injuries, operations and hospitalizations and primary source of health care. Allergic history includes questions related to asthma, hay fever, eczema and drug reactions. In the medication history, past significant medications should be recorded. Get a history of infectious diseases, convulsions or any severe illnesses, injuries and operations for which the child required hospitalization. Also include any permanent effects of illnesses, injuries or operations.

Take down information related to the other components of the health history as necessary, depending on the child's condition. Data appropriate to each component is summarized in Table 1.1.

Physical Examination

While a good history will give valuable information concerning the child's condition, the physical examination remains important to the adequate assessment and evaluation of the child in an emergency. Abbreviate the physical examination to fit the situation and the child's condition. The health professional must use a great deal of judgment and skill to determine what physical information is appropriate and should be sought, and what does not need to be evaluated under the circumstances. With life-threatening emergencies, the main priority is to recognize them and collect enough data for optimal treatment.

In order to perform a physical examination rapidly and interpret abnormal findings quickly and accurately, the health professional needs to be cognizant of normal findings in a child. Normal physical assessment findings will be discussed. A more detailed assessment of illnesses, injuries and conditions ascertained from the history and physical examination is presented under the specific topic in Chapters 3–6.

Prior to the examination, establish rapport with the child and parents and have equipment necessary for examination ready (i.e., thermometer, stethoscope, sphygmomanometer, scales, tape measure, flashlight, watch with second hand, tongue blade, reflex hammer, otoscope, opthalmoscope). Provide a quiet, nondisruptive area for examination. Approach the child gently and explain what you are doing before doing it. The severity of the child's condition, his or her age and developmental level, and the emotional state of the parents will affect the cooperativeness of the child during physical examination. (See Chapter 2: "Emotional and Psychological Support of the Child and Family.")

The typical head-to-toe sequence for examination is often not feasible with children, especially in an emergency. Perform the examination in the order best suited to the child and circumstances, but record and document findings according to the head-to-toe format.

MEASUREMENTS

Growth

Growth measurements are key indicators of the child's health status because children grow rapidly. Measurements of height, weight, chest and head circumference are important. Failure or delay in any one area of growth may indicate a serious problem and should be noted. Delays or lags in one area eventually affect the others. Body growth measurements should be compared with those of the child's peers, utilizing standardized growth charts in order to determine whether or not the child is growing well. Comparison should also be made with the child's own measurements taken at various intervals to document changes from previous examinations (i.e., at well-child examinations).

Height. Measurements of height are obtained in the infant and young child by lying him or her on a paper-covered surface and drawing two lines: one at the top of the head and one at the heel of the feet. Knees should be together and pushed down firmly, with legs fully extended and flat. The distance between these two points is then measured and recorded (Figure 1.1).

Children able to stand alone can be measured standing with bare feet flat on the floor and with their backs, shoulders, buttocks and heels touching a wall. Then the distance from the top of the child's head to the floor is measured. Slow growth in height may indicate chronic illness since chronically ill children usually do not grow well.

Weight. Measurements of weight are obtained in infants and young children by placing them unclothed on an appropriate-sized paper-covered beam-balanced scale. Infants should be protected from falling out and should not extend beyond the scale's length.

Children able to stand alone can be weighed on an adult standing scale with their shoes removed. Weight decrease in young infants may be due to dehydration, acute infection or failure to thrive. Other causes of weight loss in children are chronic disease, diabetes, and emotional problems.

Head and Chest Circumference. Head and chest circumference measurements are important during the first year of life, when the head is growing at its fastest rate. Head circumference should be at least equal to chest circumference at birth. They remain equal until about one

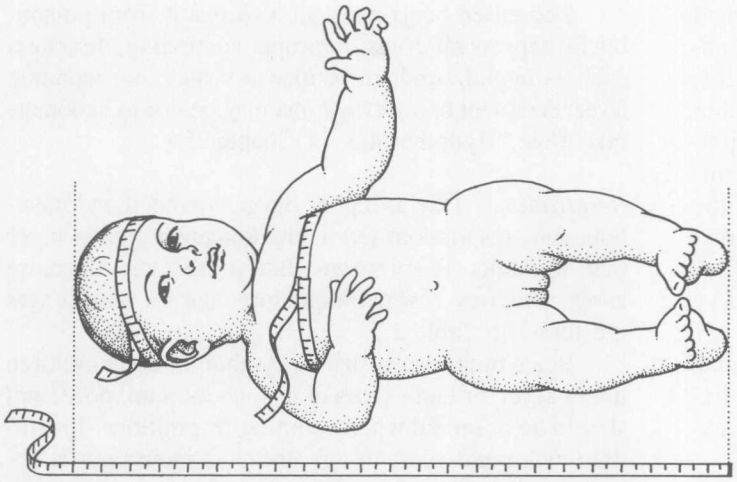


FIGURE 1.1
Measure an infant's length by drawing a line at the top of head and bottom of infant's feet that are held extended. Measure chest circumference with a paper tape at the level of the nipple line. Measure head circumference at its greatest diameter around the infant's forehead and occipital protuberance, slightly above the eyebrows and over the ears.

to two years of age. Chest circumference exceeds head size by two to three inches during childhood.

Measure chest circumference with a paper tape at the level of the nipple line (Figure 1.1). Head circumference is measured at its greatest diameter around the infant's forehead and occipital protuberance, slightly above the eyebrows and over the ears (Figure 1.1). Increases in head size may indicate hydrocephalus or increased intracranial pressure.

Vital Signs

Vital signs are well known to health professionals. They are an important measure of the child's status just as they are of an adult's. However, certain differences should be kept in mind.

Temperature. Temperature (T) control in children is less effective than in adults due to the inability of the hypothalamus, the temperature control mechanism, to regulate it. Children are apt to react with fever to any intrusion. A sore throat, for example, can precipitate a high fever in a child, but may not raise the temperature of an adult.

Rectal temperatures are most accurate in young children (under four) and temperatures under 100.5° F rectally are not considered fever. Children under two years of age have a higher rectal temperature than adults. However, rectal temperatures are not popular with children. Temperatures are usually taken orally (when the child can hold a thermometer in his or her mouth properly—usually around four or five years of age) or by the axillary method (when the child cannot). Rectal temperature is indicated when axillary temperature is elevated. IVAC themometers permit more rapid measurement of temperature with less trauma to the child.

Children have the ability to elevate their body temperature with relative ease, creating a temperature of 100° F or higher by crying or increasing activity. Core temperatures may rise to 100.4° F in late afternoon. Vigorous exercise may raise the temperature as high as 103° F (7). Thus, when assessing temperature in a child, age and activity level should be noted.

Temperature variations in children are usually in the form of elevations, with the fever due to an infection. A child in a state of low metabolism, such as low cardiac output from shock or one suffering from near-drowning or exposure to cold, may have a subnormal body temperature. Assessment and interventions to prevent complications from fever and hypothermia are discussed in Chapters 3 ("Fever") and 5 ("Hypothermia").

Pulse. Pulse (P) rates decrease in children as age increases. Normal pulse rates for various ages are found in Table 1.2.

TABLE 1.2 *Normal Pulse Rates per Minute for Various Ages*

Age	Pulse Rate
Newborn	130–170
1 month–1 year	120–150
1–3 years	110–130
3–8 years	90–110
8–12 years	85–90

While the pulse rate in a young child can be counted by palpating the precordium, it is probably most accurately assessed by apical auscultation. Apical auscultation permits easier detection of rate and rhythm disturbances, which may be difficult to discern by palpation when the rate is rapid. The point of maximal impulse for apical auscultation is located just outside the nipple line in infants and just inside the nipple line at the fifth intercostal space after one year of age. (See Figure 1.2.) Pulse rate in older children is obtained by palpation at the wrist, as in adults.

Disturbance of heart rate and rhythm may mean poisoning by medications or plants. Many contain cardiotoxic substances. Atropine found in nightshade, for example, can cause tachycardia.

Tachycardia in children, however, just as in adults, is usually caused by hypoxia, fever, acute infection, or shock. Each degree of fever raises the heart rate eight to ten beats per minute. Fear and apprehension can also increase the child's pulse rate and should be considered. Tachycardia is the child's most efficient method of increasing cardiac output and is an early indicator of low cardiac output or poor systemic perfusion.

Bradycardia may also occur in children. Athletes in training, seen mainly in the adolescent age group, sometimes show bradycardia. Bradycardia (along with an elevated blood pressure) may be a sign of serious head injury or other cause of increased intracranial pressure. (See "Increased Intracranial Pressure" in Chapter 3 and "Head Trauma" in Chapter 5.)

Decreased heart rate can also result from poisoning by depressant drugs, improper suctioning, disorders such as hypothyroidism or diseases such as rheumatic fever. Persistent bradyarrhythmia may be due to hypothermia. (See "Hypothermia" in Chapter 5.)

Respiration. Due to higher oxygen demand and metabolic rate, respirations (R) in children are normally faster than in adults. Respirations, like pulse rates, decrease as age increases. Normal respiratory rates for various ages are found in Table 1.3.

Since breathing is primarily abdominal in children under seven or eight years of age, abdominal movement should be observed when counting respirations. In children over eight years of age, thoracic movement is observed. Accessory muscles of respiration are poorly developed in young children and do not contribute to chest-wall movement (8).

When assessing respirations, the ease and depth should be noted as well as the rate. Early signs of labored respirations are detected by an increase in rate as well as nasal flaring and retractions. Retractions occur because the infant and young child's thoracic cage is pliant. When inspiration is difficult, intercostal, supraclavicular and subxyphoid retractions are usually present. With difficult exhalation, intercostal bulging may be observed.

Skin color is not a good indicator of tissue oxygenation in infants and children, since considerable hemoglobin must be desaturated before cyanosis is apparent. Hypoxemia and desaturation of arterial blood with

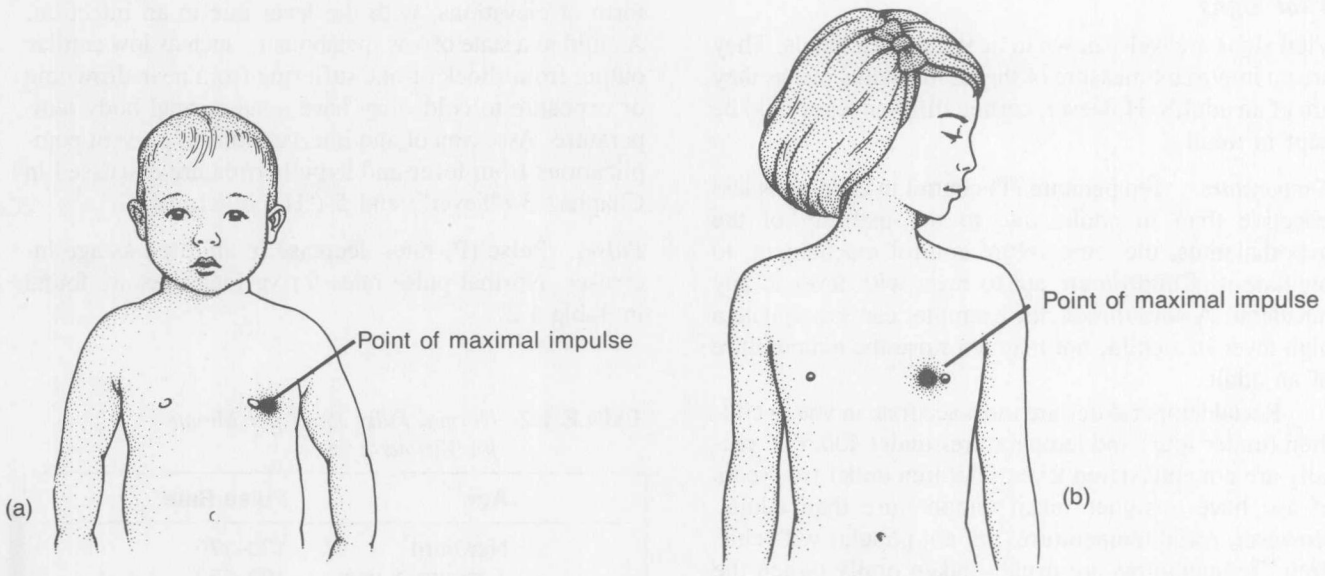


FIGURE 1.2
Infant's point of maximal impulse is just outside the nipple line (a). After infancy the point of maximal impulse is just inside the nipple line at the fifth intercostal space (b).

TABLE 1.3 *Normal Respiration Rates per Minute for Various Ages*

Age	Respiration Rate
Birth–1 month	35–50
1–6 months	25–40
6 months–2 years	25–35
2–6 years	20–25
6–12 years	14–20
Adult	12–18

ischemic damage to the heart, brain and kidneys occurs long before cyanosis is evident. Cyanosis, therefore, is a late sign of respiratory failure in children.

An infant's oxygen consumption is three times greater per kilogram of body weight than an adult's because of a large volume of dead space in the infant's respiratory passages (9). Any compromise to the respiratory system (i.e., infection, foreign body) further increases oxygen needs. Infants are obligatory nose breathers the first few months of life. Nasal congestion which would be only a minor irritation in an adult can lead to serious airway obstruction in an infant.

When the child's strength is concentrated on breathing, full use of the respiratory muscles requires a great deal of oxygen—between 30% to 50% to drive the overworked respiratory apparatus. Therefore, intervention must be aimed at preventing exhaustion from respiratory distress. (See "Respiratory Disorders" in Chapter 4.)

There are many anatomical differences between the respiratory tract of the child and that of an adult. (See Figure 1.3.) The child's airways are smaller in diameter and shorter in length than an adult's, creating earlier and more severe airway obstruction. The tongue is larger in proportion to the mouth, increasing the potential for airway obstruction. The likelihood of airway edema is greater in an infant, because there is a larger proportion of soft tissue in the airway and the mucous membranes lining the airway are more loosely attached. There is less cartilaginous support of the airway until twelve years of age because the airway is encircled with cricoid cartilage. The infant's soft palate is larger than an adult's and the larynx is two to three cervical vertebrae higher (10). This makes the infant more susceptible to aspiration than an adult.

Hyperventilation in children may be due to hypoxia, fever, diabetic acidosis or salicylate intoxication. For each degree of fever, the respiratory rate increases by four breaths per minute. An infant with an increased respiratory rate along with an elevated pulse and distended liver may be suffering from left ventricular failure.

Hypoventilation in children may be the result of a head injury, increased intracranial pressure, or swallowing depressant poisons. Abnormally slow respiration may also occur when a child is exhausted from the struggle to breathe. Respiratory distress may result from respiratory infection (e.g., asthma, croup) or obstruction. Lethargy with depressed respirations warrants immediate intervention and respiratory support. (See "Respiratory Disorders" in Chapter 4.)

Blood Pressure. Blood pressure (B/P) in children increases with age. Blood pressure ranges for various ages are found in Table 1.4.

A child under one year of age will have a slightly higher blood pressure in the arms than in the legs. Children over one year of age should have a blood pressure in the arms lower than that in the legs—an average 20 mm Hg higher thigh pressure. Systolic pressure from radial palpation is approximately 10 mm Hg lower than pressure in the arms. (No diastolic pressure reading is possible from palpation.)

Blood pressure in children should be checked with the correct sized cuff. Too wide a cuff tends to give a falsely low reading, while too narrow a cuff may give a falsely high reading. The blood pressure cuff should

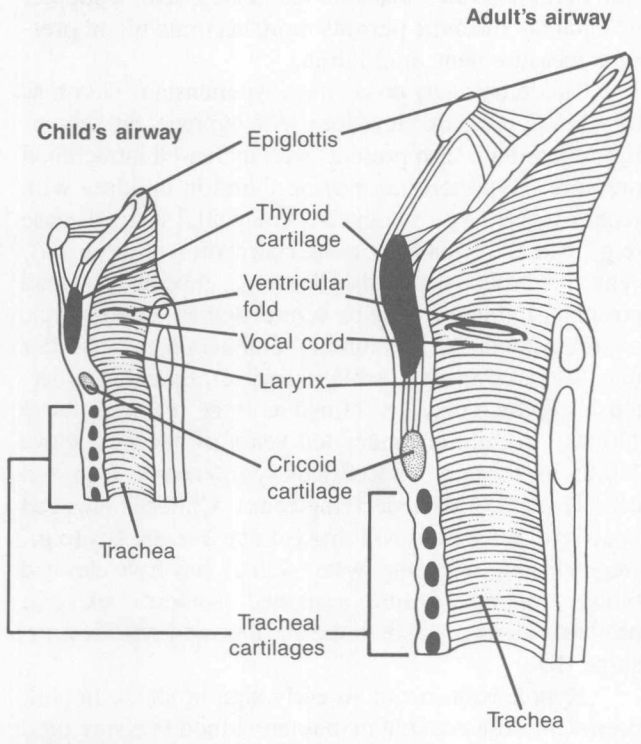


FIGURE 1.3
Anatomical differences in the respiratory tract.

TABLE 1.4 *Normal Blood Pressure Ranges for Various Ages*

Age	Systolic	Diastolic
Newborn	64–96	30–62
6 months to 1 year	60–118	42–80
1 year	66–126	41–91
2 years	74–124	39–89
3 years	75–125	44–90
4 years	79–119	45–85
5 years	80–108	46–64
6 years	85–115	48–64
7 years	87–117	48–64
8 years	89–121	48–66
9 years	91–123	48–66
10 years	93–125	48–68
11 years	94–128	49–69
12 years	95–130	49–69
13 years	96–134	50–70
14 years	99–138	51–71
15 years	102–140	51–71

cover one-half to two-thirds of the arm or thigh. When checking blood pressure in the arm, place it at heart level and support it. If it is below heart level, gravity can add to brachial artery pressure and produce falsely high readings. If the arm is not supported, increased muscle tension may cause high diastolic readings. Use of a doppler or dinamap machine permits more accurate blood pressure measurement in children.

Children usually do not have hypertension. They may have blood pressure elevations with hypoxia, anxiety or, if bradycardia is also present, with increased intracranial pressure. Hypertension may be found in children with renal disease (e.g., nephritis), congenital heart disease (e.g., patent ductus arteriosus, coarctation of the aorta), central nervous system disorder (e.g., encephalitis, lead poisoning), trauma to the back or abdomen, tumor, (e.g., neuroblastoma, Wilm's tumor), and endocrine disorder (e.g., aldosteronism, Cushings disease). Essential hypertension (which may be defined as three readings above 120/80 for children under ten years of age and above 140/85 for those of ten to fifteen years) can be seen, but usually there is an underlying cause. Children engaged in athletic activities involving isometric exercises (e.g., weight lifting, wrestling, water skiing) may have elevated blood pressure because sustained isometric exercise produces increases in both the diastolic and systolic pressures (11).

Hypotension is not an early sign of shock in children. Children are able to maintain blood pressure until a large volume of blood has been lost. While the child's circulating blood volume is larger per unit of body weight than an adult's, children have less blood than adults. The child's absolute blood volume is relatively small. This is because blood volume is bassed on weight. Blood loss from even a minor wound can be significant.

Early signs of low cardiac output are tachycardia, cool skin and decreased level of consciousness. Extremities may appear mottled in young children as a cold response. This is due to immature functioning of the temperature control mechanism rather than poor circulation, however (10).

Checking vital signs in children is important for assessing their condition and evaluating changes in that condition. An understanding of how children's measurements differ from adults' and of potential causes of vital sign variations will make interventions aimed at reversing the child's condition more effective.

GENERAL APPEARANCE

The general appearance of the child is an overall assessment of the child's physical appearance, behavior, nutritional status and developmental level. It is also a summary of the severity of the child's condition.

In describing the child's physical appearance, note facial expression, body movement and positioning and hygiene. Facial expressions reveal the child's state of well-being. In the child's facial expressions, pain, respiratory difficulty, anxiety and contentment can be observed.

Watch body movement to determine appropriateness and hugging or rubbing of a body part, which may denote pain. Posture, the position the child assumes, symmetry and coordination of body movement should be assessed. Note if body movement is stiff or awkward.

The child's hygienic state should be observed. Check for cleanliness of body and clothing, hair, teeth, nails and feet. Note any unusual body odor. This will give clues as to the adequacy of parenting skills, possible neglect and financial status of the parents.

In assessing the child's behavior, observe activity level, reaction to and interaction with others, degree of alertness and response to stimuli. Note if the child's activity is normal or hyperactive, fidgety or restless. Look for elements of the child's personality in his or her relationships with others (e.g., calm, talkative, shy, outgoing, aggressive). Note if the child is irritable or lethargic, alert or comatose, confused or irrational. Assess the child's response to commands, willingness to follow requests, ability to follow directions, coperativeness, and interest in surroundings.

Establish the child's state of nutrition. Estimate the quality as well as the quantity of nutritional intake. Note whether the child appears well-nourished, thin, emaciated, fat or obese.