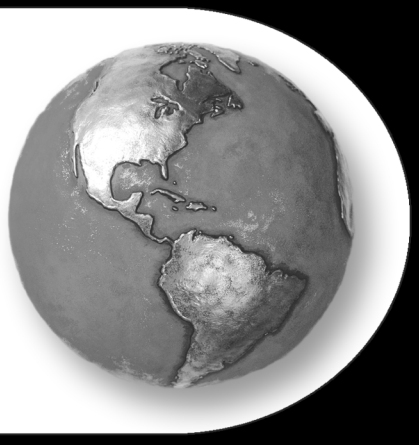
UNIT 5

PEDIATRIC NURSING



Today's pediatric nurse faces an array of challenges in providing care for children and their families. A nurse requires competent skills from a wide spectrum of both technological and psychosocial disciplines. To effectively care for children and families in a variety of settings, the nurse must have a thorough understanding of disease processes, as well as knowledge of emotional, social, cultural, and developmental needs.

To provide this essential knowledge base, this unit begins with a review of growth and development, which is basic to understanding the behavior of children and the influences of illness. The next section, multisystem stressors, emphasizes such topics as fluid, electrolyte, and acid-base imbalance, which are applicable to many pediatric health care problems.

The unit is further divided into specific body systems. For each system, there is an initial review of aspects of anatomy and physiology unique to the child. Each step of the nursing process is then reviewed, followed by discussions of the major health problems of that system.

Throughout the unit, only information specific to children is presented. In many cases, for instance, when lab tests or nursing care do not differ from those for the adult, the content is not repeated. Refer to Unit 4 for additional background information when needed.

UNIT OUTLINE

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Growth and Development

GENERAL PRINCIPLES

Definition of Terms

A. *Growth:* increase in size of a structure. Human growth is orderly and predictable, but not even; it follows a cyclical pattern.
B. *Development:* increased complexity in thought, behavior, skill, or function. Development includes growth and is a process that continues over time.
C. *Maturation:* genetically determined pattern for growth and development.
D. *Gephalocaudal:* head-to-toe progression of growth and development.
E. *Proximodistal:* trunk-to-periphery (fingers and toes) progression of growth and development.
F. *Phylogeny:* development or evolution of a species or group; a pattern of development for a species.
G. *Ontogeny:* development of an individual within a species.
H. *Critical period:* specific time period during which certain environmental events or stimuli have greatest effect on a child's development.
I. *Developmental task:* skill or competency unique to a stage of development.

Rates of Development

Growth and development are not synonymous but are closely interrelated processes directed by both genetic and environmental factors. Although changes in growth and development are more obvious in some periods than others, they are important in all periods.
A. Infancy and adolescence: fast growth periods
B. Toddler through school-age: slow growth periods
C. Fetal period and infancy: the head and neurologic tissue grow faster than other tissues.
D. Toddler and preschool periods: the trunk grows more rapidly than other tissue.
E. The limbs grow most during school-age period.
F. The trunk grows faster than other tissue during adolescence.

Child Development Theorists

Also see Unit 7.

Sigmund Freud (Psychosexual Theory)

See Table 5-1.

Erik Erikson (Psychosocial Theory)

See Table 5-2.

Jean Piaget (Cognitive Theory)

See Table 5-3.

ASSESSMENT

Developmental Tasks

Developmental tasks are skills or competencies normally occurring at one stage and having an effect on the development of subsequent stages; fall into three categories
A. Physical tasks (e.g., learning to sit, crawl, walk; toileting)
B. Psychologic tasks (e.g., learning trust, self-esteem)

Table 5-1 Stages of Freud's Psychosexual Development

Stage	Age	Characteristics
Oral	Birth to 1 year	Receives satisfaction from oral needs being met; attachment to mother important because she usually meets infant's needs
Anal	1 to 3 years	Learns to control bodily functions, especially toileting
Phallic	3 to 6 years	Fascinated with gender differences, childbirth; Oedipus or Electra complex
Latency	6 to 11 years	Sexual drives submerged; appropriate gender roles adopted; learning about society
Genital	12 years and older	Sexual desires directed toward opposite gender; learns how to form loving relationships and manage sexual urges in societally appropriate ways

Table 5-2 Stages of Erikson's Psychosocial Theory of Development

Stage	Age	Characteristics
Trust versus mistrust	1 month to 1½ years	Learns world is good and can be trusted as basic needs are met
Autonomy versus shame and doubt	1½ to 3 years	Learns independent behaviors regarding toileting, bathing, feeding, dressing; exerts self; exercises choices
Initiative versus guilt	3 to 6 years	Goal directed, competitive, exploratory behavior; imaginative
Industry versus inferiority	6 to 11 years	Learns self-worth as gains mastery of psychosocial, physiological, and cognitive skills; becomes society or peer focused
Identity versus role confusion	12 to 18 years	Develops sense of who I am; gains independence from parents; peers important

Table 5-3 Stages of Piaget's Theory of Cognitive Development

Stage/Phase	Age	Characteristics
Sensiomotor	Birth to 2 years	
Reflexive	Birth to 1 month	Predictable, innate survival reflexes
Primary circular reactions	1 to 4 months	Responds purposefully to stimuli; initiates , respects satisfying behaviors
Secondary circular reactions	4 to 8 months	Learns from intentional behavior; motor skills/ vision coordinated; recognizes familiar objects
Coordination of secondary schemes	8 to 12 months	Develops object permanence; anticipates others' actions; differentiates familiar/unfamiliar
Tertiary circular reactions	12 to 18 months	Interested in novelty, repetition, understands causality; solicits help from others
Mental combinations	18 to 24 months	Simple problem solving; imitates
Preoperational	2 to 7 years	
Preconceptual	2 to 4 years	Egocentric thought; mental imagery; increasing language
Intuitive	4 to 7 years	Sophisticated language; decreasing egocentric thought; reality-based play
Concrete Operations	7 to 11 years	Understands relationships, classification, conservation, seriation, reversibility; logical reasoning limited, less egocentric thought
Formal Operation	11 years and older	Capable of systemic, abstract thought

C. Cognitive tasks (e.g., acquiring concepts of time and space, abstract thought)

See Table 5-4.

Measurement Tools

There are a number of different assessment tools for measuring the progress of growth and development.

A. Chronologic age: assessment of developmental tasks related to birth date

B. Mental age: assessment of cognitive development
   1. Measured by variety of standardized intelligence tests (IQ), such as the *Stanford Binet Intelligence Scale*
   2. Results from at least two separate testing sessions needed before determination of cognitive level is made
   3. Uses toys and language based on mental rather than chronologic age

C. *Denver II* (Revision and restandardized from *Denver Developmental Screening Test (DDST)* and its revision, the *DDST-R*).
   1. Generalized assessment tool; measures gross motor, fine motor, language, and personal-social development from newborn-6 years
   2. Does not measure intelligence

Table 5-4 Stages, Age Ranges, and Characteristics of Human Development Related to Pediatric Nursing

Stage	Age	Characteristics
Infant	Birth to 1 year	Period of rapid growth and change; attachments to family members and other caregivers are formed; trust develops.
Toddler	1 to 3 years	Motor ability, coordination, sensory skills developing; basic feelings, emotions, a sense of self, and being independent becomes important.
Preschooler	3 to 6 years	Continued physiological, psychological, and cognitive growth; better able to care for selves; interested in playing with other children; beginning to develop a concept of who they are.
School age	6 to 12 years	Interested in achievement; ability to read, write, and complete academic work advances; understanding of the world broadens.
Adolescent	12 to 19 years, or later	Transition period between childhood and adulthood; physiological maturation occurs, formal operational thought begins; preparation for becoming an adult takes place.

D. Growth parameters
  1. Bone age: X-ray of tarsals and carpals determines degree of ossification
  2. Growth charts: norms are expressed as percentile of height, weight, head circumference, and body mass index (BMI) for age; any child who crosses over multiple percentile lines or is above the 95th or below the 5th percentile needs further evaluation.

E. Correction for prematurity
  1. Subtract time premature from chronological age
  2. Use corrected age for developmental assessment until age 2

Developmental Stages

Infant (Birth through 12 months)

A. Physical tasks
  1. Neonate (Birth to 1 month)
    a. Weight: 6–8 lb (2750–3629 g); gains 5–7 oz (142–198 g) weekly for first 6 months
    b. Length: 20 inches (50 cm); grows 1 inch (2.5 cm) monthly for first 6 months
    c. Head growth
      1) Head circumference 33–35.5 cm (13–14 inches)
      2) Head circumference slightly larger than chest
      3) Increases by ½ inch (1.25 cm) monthly for first 6 months
      4) Brain growth related to myelinization of nerve fibers; increase in size of brain reflects this process, reaches ⅔ adult size at 1 year; 90% adult size at 2 years
      5) Weak neck muscles result in poor head control
    d. Vital signs
      1) Pulse: 110–160 and irregular; count for a full minute apically
      2) Respirations: 32–60 and irregular; count for full minute; neonates are abdominal breathers and obligate nose breathers
      3) Blood pressure: 75/49 mm Hg
      4) Poor development of sweating and shivering mechanisms; impaired temperature control
    e. Motor development
      1) Behavior is reflex controlled
      2) Flexed extremities
      3) Can lift head slightly off bed when prone
    f. Sensory development
      1) Hearing and touch well developed at birth
      2) Sight not fully developed until 6 years
        a) Differentiates light and dark at birth
        b) Rapidly develops clarity of vision within 1 foot
        c) Fixates on moving objects
        d) Strabismus due to lack of binocular vision
  2. 1–4 months
    a. Head growth: posterior fontanel closes
    b. Motor development
      1) Reflexes begin to fade (e.g., Moro, tonic neck)
      2) Gains head control; balances head in sitting position
      3) Rolls from back to side
      4) Begins voluntary hand-to-mouth activity

c. Sensory development
1) Begins to be able to coordinate stimuli from various sense organs
2) Hearing: locates sounds by turning head and visually searching
3) Vision
a) Binocular vision developing; less strabismus
b) Beginning hand-eye coordination
c) Prefers human face
d) Follows objects 180°
e) Ability to accommodate is equal to adult

3. 5–6 months
a. Weight: birth weight doubles; gains 3–5 oz (84–140 g) weekly for next 6 months
b. Length: gains ½ inch (1.25 cm) for next 6 months
c. Eruption of teeth begins
1) Lower incisors first
2) Causes increased saliva and drooling
3) Enzyme released with teething causes mild diarrhea, facial skin irritation
4) Slight fever may be associated with teething, but not a high fever or seizures
d. Motor development
1) Intentional rolling over
2) Supports weight on arms
3) Creeping; pushes backward with hands
4) Can grasp and let go voluntarily
5) Transfers toys from one hand to another
6) Sits with support
e. Sensory development
1) Hearing: can localize sounds above and below ear
2) Vision: smiles at own mirror image and responds to facial expressions of others
3) Taste: sucking needs have decreased and cup weaning can begin; chewing, biting, and taste preferences begin to develop

4. 7–9 months
a. Teething continues
1) 7 months: upper central incisors
2) 9 months: upper lateral incisors
b. Motor development
1) Sits unsupported; goes from prone to sitting upright
2) Crawls; may go backwards initially
3) Pulls self to standing position
4) Develops finger-thumb opposition (pincer grasp)
5) Preference for dominant hand evident
c. Sensory development: vision
1) Can fixate on small objects
2) Beginning to develop depth perception

5. 10–12 months
a. Weight: birth weight tripled
b. Length: 50% increase over birth length
c. Head and chest circumference equal
d. Teething
1) Lower lateral incisors erupt
2) Average of eight deciduous teeth
e. Motor development
1) Creeps with abdomen off floor
2) Walks with help or cruises
3) May attempt to stand alone
4) Can sit down from upright position
5) Weans from bottle to cup
f. Sensory development: vision
1) Able to discriminate simple geometric forms
2) Able to follow rapidly moving objects
3) Visual acuity 20/50 or better
4) Binocularity well established; if not, amblyopia may develop

B. Psychosocial tasks
1. Neonatal period
a. Cries to express displeasure
b. Smiles indiscriminately
c. Receives gratification through sucking
d. Makes throaty sounds

2. 1–4 months
a. Crying becomes differentiated at 1 month
1) Decreases during awake periods
2) Ceases when parent in view
b. Vocalization distinct from crying at 1 month
1) Squeals to show pleasure at 3 months
2) Coos, babbles, laughs; vocalizes when smiling
c. Socialization
1) Stares at parents' faces when talking at 1 month
2) Smiles socially at 2 months
3) Shows excitement when happy at 4 months
4) Demands attention, enjoys social interaction with people at 4 months

3. 5–6 months
a. Vocalization: begins to imitate sounds
b. Socialization: recognizes parents, stranger anxiety begins to develop; comfort habits begin

4. 7–9 months
a. Vocalization: verbalizes all vowels and most consonants
b. Socialization
1) Shows increased stranger anxiety and anxiety over separation from parent
2) Exhibits aggressiveness by biting at times
3) Understands the word "no"

5. 10–12 months
a. Vocalization: imitates animal sounds, can say only 4–5 words but understands many more (ma, da)

b. Socialization
1) Begins to explore surroundings
2) Plays games such as pat-a-cake, peek-a-boo
3) Shows emotions such as jealousy, affection, anger, fear (especially in new situations)

C. Cognitive tasks
1. Neonatal period: reflexive behavior only
2. 1–4 months
a. Recognizes familiar faces
b. Is interested in surroundings
c. Discovers own body parts
3. 5–6 months
a. Begins to imitate
b. Can find partially hidden objects
4. 7–9 months
a. Begins to understand object permanence; searches for dropped objects
b. Reacts to adult anger; cries when scolded
c. Imitates simple acts and noises
d. Responds to simple commands
5. 10–12 months
a. Recognizes objects by name
b. Looks at and follows pictures in book
c. Shows more goal-directed actions

D. Nutrition
1. Birth to 6 months
a. Breast milk is a complete and healthful diet; supplementation may include 0.25 mg fluoride, 400 International Units vitamin D, and iron after 4 months.
b. Commercial iron-fortified formula is acceptable alternative; supplementation may include 0.25 mg fluoride if water supply is not fluoridated.
c. No solid foods before 5 months; too early exposure may lead to food allergies, and extrusion reflex will cause food to be pushed out of mouth.
d. Juices may be introduced at 5–6 months, diluted 1:1 and preferably given by cup.
2. 6–12 months
a. Breast milk or formula continues to be primary source of nutrition.
b. Introduction of solid foods starts with cereal (usually rice cereal), which is continued until 18 months.
c. Introduction of other food is arbitrary; most common sequence is fruits, vegetables, meats.
1) Introduce only one new food at a time.
2) Separate new foods by minimum of 3–4 days.
3) Decrease amount of formula to about 30 oz. as foods are added.
d. Iron supplementation can be stopped.
e. Finger foods such as cheese, meat, carrots can be started around 10 months.
f. Chopped table food or junior food can be introduced by 12 months.
g. Weaning from breast or bottle to cup should be gradual during second 6 months.
h. Breastfeeding can continue beyond 12 months.
i. No honey, nuts, egg whites until 12 months.

E. Safety
1. Birth to 4 months
a. Use car seat properly. Infants up to 9 kg (20 lb) and younger than 1 year should face rear.
b. Ensure crib mattress fits snugly; do not use a pillow or comforters in the crib.
c. Keep side rails of crib up.
d. Position infant supine for sleep until infant is able to turn over. Prone position may increase risk for sudden infant death syndrome (SIDS).
e. Do not leave infant unattended on bed, couch, table.
f. Do not tie pacifier on string around infant's neck; remove bib before sleep.
g. Remove small objects that infant could choke on.
h. Check temperature of bath water and warmed formula or food.
i. Use cool mist vaporizer.
2. 5–7 months
a. Restrain in high chair or infant seat.
b. Do not feed hard candy, nuts, food with pits.
c. Inspect toys for small removable parts.
d. Be sure paint on furniture does not contain lead.
e. Keep phone number of Poison Control Center readily available.
3. 8–12 months
a. Keep crib away from other furniture and windows.
b. Keep gates across stairways.
c. Keep safety plugs in electrical outlets.
d. Remove hanging electrical wires and tablecloths.
e. Use child protective caps and cabinet locks.
f. Place cleaning solutions and medications out of reach.
g. Do not let child use fork to self-feed.
h. Do not leave alone in bathtub.

F. Play (Solitary)
1. Birth to 4 months
a. Provide variety of brightly colored objects, different sizes and textures.
b. Hang mobiles within 8–10 inches of infant's face.
c. Expose to various environmental sounds; use rattles, musical toys.
2. 5–7 months
a. Provide brightly colored toys to hold and squeeze.

b. Allow infant to splash in bath.
c. Provide crib mirror.

3. 8–12 months
a. Provide toys with movable parts and noisemakers; stack toys, blocks; pots, pans, drums to bang on; stationary activity center and push-pull toys.
b. Plays games: hide and seek, pat-a-cake.

G. Fears
1. Separation from parents
a. Searches for parents with eyes.
b. Shows preference for parents.
c. Develops stranger anxiety around 6 months.

2. Pain
a. Reacts with generalized body movement and loud crying.
b. Can be distracted with talking, sucking opportunities.

Toddler (12 months to 3 years)

A. Physical tasks: this is a period of slow growth
1. Weight: gain of approximately 11 lb (5 kg) during this time; birth weight quadrupled by 2½ years
2. Height: grows 20.3 cm (8 inches); adult height about 2 times height at 2 years
3. Head circumference: 19½–20 inches (49–50 cm) by 2 years; anterior fontanel closes by 18 months
4. Pulse 110; respirations 26; blood pressure 99/64
5. Primary dentition (20 teeth) completed by 2½ years
6. Develops sphincter control necessary for bowel and bladder control
7. Mobility
a. Walks alone by 18 months.
b. Climbs stairs and furniture by 18 months.
c. Runs fairly well by 2 years.
d. Jumps from chair or step by 2½ years.
e. Balances on one foot momentarily by 2½ years.
f. Rides tricycle by 3 years.

B. Psychosocial tasks
1. Increases independence; better able to tolerate separation from primary caregiver.
2. Less likely to fear strangers.
3. Able to help with dressing/undressing at 18 months; dresses self at 24 months.
4. Has sustained attention span.
5. May have temper tantrums during this period; should decrease by 2½ years.
6. Vocabulary increases from about 10–20 words to over 900 words by 3 years.
7. Has beginning awareness of ownership (my, mine) at 18 months; shows proper use of pronouns (I, me, you) by 3 years.
8. Moves from hoarding and possessiveness at 18 months to sharing with peers by 3 years.
9. Toilet training usually completed by 3 years.
a. Demonstrates readiness for toilet training between 18 and 24 months
b. Indicators of readiness: walks, sits, and squats well, has voluntary control of bowel and urinary function, regular bowel movements, can communicate wetness or bowel movement, can remove clothes, wants to please caregivers, imitates
c. Daytime bladder control by 2–3 years
d. Nighttime bladder control by 3–4 years

C. Cognitive tasks
1. Follows simple directions by 2 years.
2. Begins to use short sentences at 18 months to 2 years.
3. Can remember and repeat 3 numbers by 3 years.
4. Knows own name by 12 months; refers to self, gives first name by 24 months; gives full name by 3 years.
5. Able to identify geometric forms by 18 months.
6. Achieves object permanence; is aware that objects exist even if not in view.
7. Uses "magical" thinking; believes own feelings affect events (e.g., anger causes rain).
8. Uses ritualistic behavior; repeats skills to master them and to decrease anxiety.
9. May develop dependency on "transitional object" such as blanket or stuffed animal.

D. Nutrition
1. Caloric requirement is approximately 100 calories/kg/day.
2. Increased need for calcium, iron, and phosphorus.
3. Needs 16–24 oz milk/day.
4. Appetite decreases.
5. Able to feed self.
6. Negativism may interfere with eating.
7. Initial dental examination at 3 years.

E. Safety
1. Turn pot handles toward back of stove.
2. Teach swimming and water safety; supervise near water.
3. Supervise play outdoors.
4. Avoid large chunks of meat, particularly hot dogs.
5. Do not allow child to walk around with objects such as lollipops in mouth.
6. Know when and how to use ipecac.
7. Car seat safety: children sit in forward facing car seat only after age is greater than 1 year and weight is greater than 20 lb. All car seats placed in rear seat of car. No car seats should be placed in front of the passenger side air bag.

F. Play
1. Predominantly "parallel play" period.
2. Imitation of adults often part of play.
3. Begins imaginative and make-believe play.
4. Provide toys appropriate for increased locomotive skills: push toys, rocking horse, riding toys or tricycles; swings and slide.

5. Give toys to provide outlet for aggressive feelings: work bench, toy hammer and nails, drums, pots, pans.
6. Provide toys to help develop fine motor skills, problem-solving abilities: puzzles, blocks; finger paints, crayons.

G. Fears: separation anxiety
1. Learning to tolerate and master brief periods of separation is important developmental task.
2. Increasing understanding of object permanence helps toddler overcome this fear.
3. Potential patterns of response to separation
a. Protest: screams and cries when mother leaves; attempts to call her back.
b. Despair: whimpers, clutches transitional object, curls up in bed, decreased activity, rocking.
c. Denial: resumes normal activity but does not form psychosocial relationships; when mother returns, child ignores her.
4. Bedtime may represent desertion.

Preschooler (3 to 5 years)

A. Physical tasks
1. Slower growth rate continues
a. Weight: increases 4–6 lb (1.8–2.7 kg) a year
b. Height: increases 2½ inches (5–6.25 cm) a year
c. Birth length doubled by 4 years
2. Vital signs decrease slightly
a. Pulse 90–100
b. Respirations 24–25/minute
c. Blood pressure: systolic 85–100 mm Hg: diastolic 60–70 mm Hg
3. Permanent teeth may appear late in preschool period; first permanent teeth are molars, behind last temporary teeth.
4. Gross motor development
a. Walks up stairs using alternate feet by 3 years.
b. Walks down stairs using alternate feet by 4 years.
c. Rides tricycle by 3 years.
d. Stands on 1 foot by 3 years.
e. Hops on 1 foot by 4 years.
f. Skips and hops on alternate feet by 5 years.
g. Balances on 1 foot with eyes closed by 5 years.
h. Throws and catches ball by 5 years.
i. Jumps off 1 step by 3 years.
j. Jumps rope by 5 years.
5. Fine motor development
a. Hand dominance is established by 5 years.
b. Builds a tower of blocks by 3 years.
c. Ties shoes by 5 years.
d. Ability to draw changes over this time
1) Copies circles, may add facial features by 3 years.
2) Copies a square, traces a diamond by 4 years.
3) Copies a diamond and triangle, prints letters and numbers by 5 years.
e. Handles scissors well by 5 years.

B. Psychosocial tasks
1. Becomes independent
a. Feeds self completely.
b. Dresses self.
c. Takes increased responsibility for actions.
2. Aggressiveness and impatience peak at 4 years then abate; by 5 years child is eager to please and manners become more evident.
3. Gender-specific behavior is evident by 5 years.
4. Egocentricity changes to awareness of others; rules become important; understands sharing.

C. Cognitive development
1. Focuses on one idea at a time; cannot look at entire perspective.
2. Awareness of racial and sexual differences begins.
a. Prejudice may develop based on values of parents.
b. Manifests sexual curiosity.
c. Sexual education begins.
d. Beginning body awareness.
3. Has beginning concept of causality.
4. Understanding of time develops during this period.
a. Learns sequence of daily events.
b. Is able to understand meaning of some time-oriented words (day of week, month, etc.) by 5 years.
5. Has 2000-word vocabulary by 5 years.
6. Can name four or more colors by 5 years.
7. Is very inquisitive.

D. Nutrition
1. Caloric requirement is approximately 90 calories/kg/day.
2. May demonstrate strong taste preferences.
3. More likely to taste new foods if child can assist in the preparation.

E. Safety
1. Safety issues similar to toddler
2. Education of children concerning potential dangers important during this period
3. Car safety: children 20–40 lb and younger than age 4 should ride in car safety seat. Children over 40 lb and between ages 4 and 8 should ride in a booster seat in the rear of the car.

F. Play
1. Predominantly "associative play" period.
2. Enjoys imitative and dramatic play.
a. Imitates same-sex role functions in play.
b. Enjoys dressing up, dollhouses, trucks, cars, telephones, doctor and nurse kits.
3. Provide toys to help develop gross motor skills: tricycles, wagons, outdoor gym; sandbox, wading pool.
4. Provide toys to encourage fine motor skills, self-expression, and cognitive development: construction sets, blocks, carpentry tools; flash cards, illustrated books, puzzles; paints, crayons, clay, simple sewing sets.

5. Television, when supervised, can provide a quiet activity; some programs have educational content.
6. Imaginary playmates common during this period.
   a. More prevalent in bright children
   b. Help child deal with loneliness and fears
   c. Abandoned by school age

G. Fears
1. Greatest number of imagined and real fears of childhood during this period.
2. Fears concerning body integrity are common.
   a. Child is able to imagine an event without experiencing it.
   b. Observing injuries or pain in others can precipitate fear.
   c. Magical and animistic thinking allows children to develop many illogical fears (fear of inanimate objects, the dark, ghosts).
3. Exposing child to feared object in a safe situation may provide a degree of conditioning; child should progress at own rate.

School-Age (6 to 12 years)

A. Physical tasks
1. Slow growth continues.
   a. Height: 2 inches (5 cm) per year
   b. Weight: doubles over this period
   c. At age 9, both sexes same size; age 12, girls bigger than boys
2. Dentition
   a. Loses first primary teeth at about 6 years.
   b. By 12 years, has all permanent teeth except final molars.
3. Bone growth faster than muscle and ligament development; very limber but susceptible to bone fractures during this time.
4. Vision is completely mature; hand-eye coordination develops completely.
5. Gross motor skills: predominantly involving large muscles; children are very energetic, develop greater strength, coordination, and stamina.
6. Develops smoothness and speed in fine motor control.

B. Psychosocial tasks
1. School occupies half of waking hours; has cognitive and social impact.
   a. Readiness includes emotional (attention span), physical (hearing and vision), and intellectual components.
   b. Teacher may be parent substitute, causing parents to lose some authority.
2. Morality develops
   a. Before age 9 moral realism predominates: strict superego, rule dominance; things are black or white, right or wrong.
   b. After age 9 autonomous morality develops: recognizes differing points of view, sees "gray" areas.
3. Peer relationships
   a. Child makes first real friends during this period.
   b. Is able to understand concepts of cooperation and compromise (assist in acquiring attitudes and values); learns fair play vs competition.
   c. Help child develop self-concept.
   d. Provide feeling of belonging.
4. Enjoys family activities.
5. Has some ability to evaluate own strengths and weaknesses.
6. Has increased self-direction.
7. Is aware of own body; compares self to others; modesty develops.

C. Cognitive development
1. Period of industry
   a. Is interested in exploration and adventure.
   b. Likes to accomplish or produce.
   c. Develops confidence.
2. Concept of time and space develops.
   a. Understands causality.
   b. Masters concept of conservation: permanence of mass and volume; concept of reversibility.
   c. Develops classification skills: understands relational terms; may collect things.
   d. Masters arithmetic and reading.

D. Nutrition
1. Caloric needs diminish in relation to body size: 85 kcal/kg/day.
2. "Junk" food may become a problem; excess sugar, starches, fat.
3. Obesity is a risk in this age group.
4. Nutrition education should be integrated into school program.

E. Safety
1. Incidence of accidents is decreased when compared with younger children.
2. Motor vehicle accidents most common cause of severe injury and death.
3. Other common activities associated with injuries include sports (skateboarding, rollerskating, etc.).
4. Education and supervision are key elements in prevention.
   a. Proper use of equipment
   b. Risk-taking behavior
5. Car safety: children weighing over 40 lb and younger than age 8 should ride in a booster seat placed in the rear of the car. Children over age 8 can use shoulder/lap belt combination in rear seat of the car. Children younger than age 12 should not sit in the front passenger seat or in front of an air bag.

F. Play
1. Rules and ritual dominate play; individuality not tolerated by peers; knowing rules provides sense of belonging; "cooperative play."

2. Team play: games or sports
   a. Help learn value of individual skills and team accomplishments.
   b. Help learn nature of competition.
3. Quiet games and activities: board games, collections, books, television, painting
4. Athletic activities: swimming, hiking, bicycling, skating

G. Fears: more realistic fears than younger children; include death, disease or bodily injury, punishment; school phobia may develop, resulting in psychosomatic illness.

Adolescent (12 to 19 years)

A. Physical tasks
1. Fast period of growth
2. Vital signs approach adult norms
3. Puberty
   a. Follows same pattern for all races and cultures.
   b. Is related to hormonal changes.
   c. Results in growth spurt, change in body structure, development of secondary sex characteristics, and reproductive maturity.
   d. Girls: height increases approximately 3 inches/year; slows at menarche; stops around age 16.
   e. Boys: growth spurt starts around age 13; height increases 4 inches/year; slows in late teens.
   f. Boys double weight between 12 and 18, related to increased muscle mass.
   g. Body shape changes
      1) Boys become leaner with broader chest.
      2) Girls have fat deposited in thighs, hips, and breasts; pelvis broadens.
   h. Apocrine glands cause increased body odor.
   i. Increased production of sebum and plugging of sebaceous ducts causes acne
4. Sexual development: girls
   a. Menarche
      1) Onset about 2 years after first of pubescent changes
      2) Average age 12½ years
      3) First 1–2 years: menses irregular, infertile
   b. Menstrual cycle: controlled by complex interaction of hormones
   c. Development of secondary sex characteristics and sexual functioning under hormonal control (see Table 4-24).
   d. Breast development is first visible sign of puberty.
      1) Bud stage: areola around nipple is protuberant.
      2) Breast development is complete around the time of first menses.
5. Sexual development: boys
   a. Development of secondary sex characteristics, sex organs and function under hormonal control (see Table 4-24).
   b. Enlargement of testes is first sign of sexual maturation; occurs at approximately age 13, about 1 year before growth spurt.
   c. Scrotum and penis increase in size until age 18.
   d. Reaches reproductive maturity about age 17, with viable sperm.
   e. Nocturnal emission: a physiologic reflex to ejaculate buildup of semen; natural and normal; occurs during sleep (child should not be made to feel guilty; needs to understand that this is not enuresis).
   f. Masturbation increases (also a normal way to release semen).
   g. Pubic hair continues to grow and spread until mid 20s.
   h. Facial hair; appears first on upper lip.
   i. Voice changes due to growth of laryngeal cartilage.
   j. Gynecomastia: slight hypertrophy of breasts due to estrogen production; will pass within months but causes embarrassment.

B. Psychosocial tasks
1. Early adolescence: ages 12–14 years
   a. Starts with puberty.
   b. Physical body changes result in an altered self-concept.
   c. Tends to compare own body to others.
   d. Early and late developers have anxiety regarding fear of rejection.
   e. Fantasy life, daydreams, crushes are all normal, help in role play of varying social situations.
   f. Is prone to mood swings.
   g. Needs limits and consistent discipline.
2. Middle adolescence: ages 15–16 years
   a. Is separate from parents (except financially).
   b. Can identify own values.
   c. Can define self (self-concept, strengths and weaknesses).
   d. Involved with peer group; conforms to values/fads.
   e. Has increased heterosexual interest; communicates with opposite sex; may form "love" relationship.
   f. Sex education continues.
3. Late adolescence: ages 17–19 years
   a. Achieves greater independence.
   b. Chooses a vocation.
   c. Participates in society.
   d. Finds an identity.
   e. Finds a mate.
   f. Develops own morality.
   g. Completes physical and emotional maturity.

C. Cognitive development
   1. Develops abstract thinking abilities.
   2. Is often unrealistic.
   3. Is capable of scientific reasoning and formal logic.
   4. Enjoys intellectual abilities.
   5. Is able to view problems comprehensively.

D. Nutrition
   1. Nutritional requirements peak during years of maximum growth: age 10–12 in girls, 2 years later in boys.
   2. Appetite increases.
   3. Inadequate diet can retard growth and delay sexual maturation.
   4. Food intake needs to be balanced with energy expenditure.
   5. Increased needs include calcium for skeletal growth; iron for increased muscle mass and blood cell development; zinc for development of skeletal and muscle tissue and sexual maturation.

E. Safety
   1. Accidents are leading cause of death: motor vehicle accidents, sports injuries, firearms accidents.
   2. Safety measures include education about proper use of equipment and caution concerning risk taking.
   3. Drug and alcohol use may be a serious problem during this period.
   4. Adolescent characteristics of poor impulse control and recklessness make prevention complex.

F. Activities: group activities predominate (sports are important); activities involving opposite sex by middle adolescence.

G. Fears
   1. Threats to body image: acne, obesity
   2. Injury or death
   3. The unknown

ANALYSIS

Nursing diagnoses for problems of growth and development may include:

A. Altered family process
B. Altered health maintenance
C. Altered parenting
D. Altered thought processes
E. Delayed growth and development
F. Disturbance in self-esteem
G. Disturbed body image
H. High risk for violence
I. Impaired dentition
J. Ineffective family coping
K. Knowledge deficit (specify)
L. Risk for delayed development
M. Risk for disproportionate growth
N. Social isolation

PLANNING AND IMPLEMENTATION

Goals

A. Child will achieve appropriate developmental level for age.
B. Family/child will adapt successfully to developmental changes.
C. Family/child will cope successfully with crises of illness and hospitalization.
D. Family/child will cope successfully with issues related to death and dying.

Interventions for the Ill or Hospitalized Child

Communicating with Children

A. Speak in quiet, pleasant tones.
B. Bend down to meet child on own level.
C. Use words appropriate to age/communication ability; do not use clichès.
D. Do not explain more than is necessary.
E. Always explain what you are going to do and give the reason for it.
F. Be honest; do not lie about whether something will hurt.
G. Do not make a promise you know you cannot keep.
H. Observe nonverbal behavior for clues to level of understanding.
I. Do not threaten; and when necessary, punish the act, not the child ("I like you, but not what you did.").
J. Never shame a child by using terms like baby or sissy.
K. Allow child to show feelings (hurt and anger); provide therapeutic play, pounding or throwing toys; allow child to cry; encourage drawing and creative writing.
L. Provide time to talk; encourage a trusting environment where the child can talk without embarrassment and confide without fear.
M. Provide support to child and parents/family.
N. Teach parents to anticipate next stage of development.
O. If teaching with a child is interrupted, start over from the beginning.
P. Promote independence; allow the child to perform as many self-care activities as possible.
Q. Do not compare child's progress to that of anyone else.
R. Provide praise at every opportunity.
S. Instead of asking what something is, ask child to give it a name or tell you about it.
T. Allow choices where possible, but do not use yes/no questions unless you can accept a "no" answer ("It is time for your medication now; do you want it with milk or juice?" versus "Do you want your medication now?").
U. Involve parents in child's care.

V. Keep routines as much like home as possible (on admission, ask parents about routines such as toileting, eating, sleeping, and names for bowel movements and urination).
W. Allow parents time and opportunities to ask questions and express themselves.
X. If parents cannot stay with child, encourage them to bring in a favorite toy, pictures of family members, or to make a tape to be played for the child.

Play

A. Play is a way to solve problems, become enculturated, express creativity, decrease stress in the environment, prepare for different situations, sublimate sensations, enhance fine and gross motor development as well as social development.
B. Make play appropriate for mental age and physical/disease state (e.g., appropriate for oxygen tents, isolation, hearing or vision defects).
C. Use multisensory stimulation.
D. Provide toys safe for mental age (no points, sharp edges, small parts, loud noises, propelled objects).
E. Offer play specific to age group.
  1. Toddler: enjoys repetition; solitary play, parallel play.
  2. Preschooler: likes to role play and make believe; associative play.
  3. School-age: likes group, organized activities (to enhance sharing); cooperative play, group goals with interaction.

Preparation for Procedures

A. Allow child to play with equipment to be used.
B. Demonstrate procedure first on a doll.
C. Teach child skills that will be needed after the procedure and provide time to practice (crutches, blow bottles).
D. Show the child pictures of staff garb, special treatment room, special machines to be used, etc., before the procedure.
E. Describe sensations the child may experience during or after the procedure and what child will have to do.
F. Listen carefully to child to detect misconceptions or fantasies.
G. With younger children, the preparatory information should be simple and as close to the time of the procedure as possible.
H. Parents can often be helpful in preparing child for procedures, but need to be prepared as well.
  1. May need different explanation, away from child.
  2. Should have opportunity to ask questions about what will happen to child.
I. School-age children and adolescents may not wish parents to be present during procedure.
  1. Child's desires should be confirmed.
  2. Parents need to be assured that this is not rejection by child.
J. Inadequate preparation leads to heightened anxiety that may result in regressive behavior, uncooperativeness, or acting out.

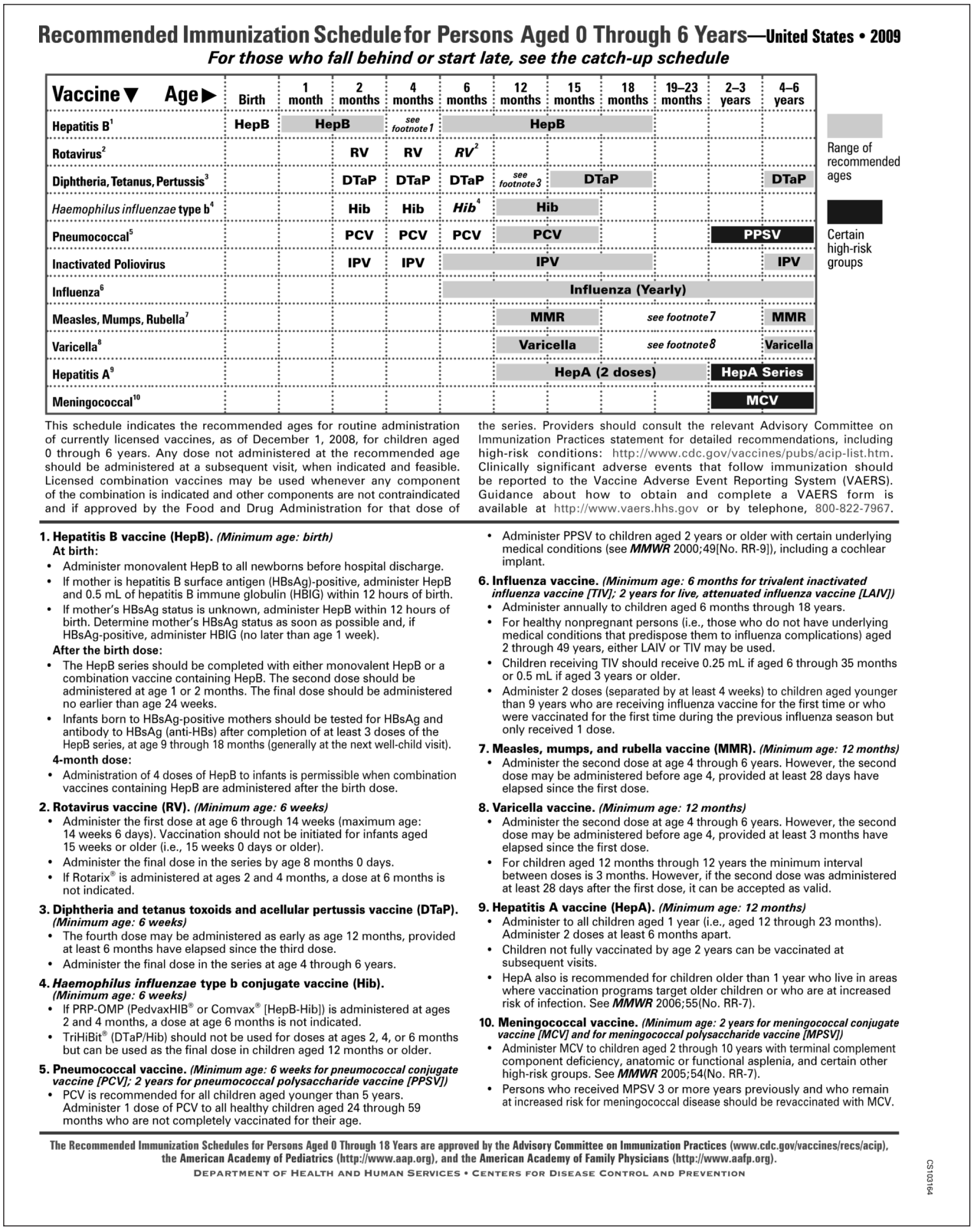
EVALUATION

A. Child maintains normal developmental level during hospitalization.
B. Parents participate in care of child during hospitalization.

GROWTH AND DEVELOPMENT ISSUES

Health Promotion

A. Immunization schedule (see Figure 5-1)
B. Types of immunity
C. Considerations concerning immunization schedule:
  1. If the immunization schedule is interrupted it is not necessary to reinstitute the entire series. Immunization should occur on the next visit as if the usual interval has elapsed.
  2. If immunization status is unknown, children should be considered susceptible and appropriate immunizations administered
  3. For children not immunized during the first year of life and who are less than 7 years old the same immunizations are given but following different time schedule.
  4. For children 7 years old and older who are not immunized, Td rather than DTaP is administered.
  5. Preterm infants are immunized according to chronological, not corrected age.
  6. Minor illnesses are not contraindications to immunization.
D. Contraindications for immunization
  1. Severe allergic reaction to a vaccine contraindicates further doses of that vaccine.
  2. Anaphylactic reaction to a vaccine additive contraindicates the use of vaccines containing that substance (e.g., eggs, neomycin, streptomycin).
  3. Immunocompromised persons should not receive live vaccines.
  4. Immunizations should be delayed after recent transfusion with passive immunity agents (e.g., gamma globulin).
E. Tuberculin testing
  1. The tuberculin skin test is the only practical tool for diagnosing tuberculosis infection.
  2. Tuberculin testing may be done at the same visit at which an immunization is being given.
  3. Routine testing is no longer recommended. Testing is always indicated for individuals with known contact with a person with tuberculosis disease.



Recommended Immunization Schedule for Persons Aged 0 Through 6 Years—United States • 2009

For those who fall behind or start late, see the catch-up schedule

Vaccine ▼ Age ▶	Birth	1 month	2 months	4 months	6 months	12 months	15 months	18 months	19–23 months	2–3 years	4–6 years
Hepatitis B[1]	HepB	HepB		see footnote 1	HepB						
Rotavirus[2]			RV	RV	RV[2]						
Diphtheria, Tetanus, Pertussis[3]			DTaP	DTaP	DTaP	see footnote 3	DTaP				DTaP
Haemophilus influenzae type b[4]			Hib	Hib	Hib[4]	Hib					
Pneumococcal[5]			PCV	PCV	PCV	PCV				PPSV	
Inactivated Poliovirus			IPV	IPV	IPV						IPV
Influenza[6]					Influenza (Yearly)						
Measles, Mumps, Rubella[7]						MMR		see footnote 7			MMR
Varicella[8]						Varicella		see footnote 8			Varicella
Hepatitis A[9]						HepA (2 doses)				HepA Series	
Meningococcal[10]										MCV	

Range of recommended ages

Certain high-risk groups

This schedule indicates the recommended ages for routine administration of currently licensed vaccines, as of December 1, 2008, for children aged 0 through 6 years. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. Licensed combination vaccines may be used whenever any component of the combination is indicated and other components are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. Providers should consult the relevant Advisory Committee on Immunization Practices statement for detailed recommendations, including high-risk conditions: http://www.cdc.gov/vaccines/pubs/acip-list.htm. Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete a VAERS form is available at http://www.vaers.hhs.gov or by telephone, 800-822-7967.

1. Hepatitis B vaccine (HepB). ***(Minimum age: birth)***

At birth:

- Administer monovalent HepB to all newborns before hospital discharge.
- If mother is hepatitis B surface antigen (HBsAg)-positive, administer HepB and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth.
- If mother's HBsAg status is unknown, administer HepB within 12 hours of birth. Determine mother's HBsAg status as soon as possible and, if HBsAg-positive, administer HBIG (no later than age 1 week).

After the birth dose:

- The HepB series should be completed with either monovalent HepB or a combination vaccine containing HepB. The second dose should be administered at age 1 or 2 months. The final dose should be administered no earlier than age 24 weeks.
- Infants born to HBsAg-positive mothers should be tested for HBsAg and antibody to HBsAg (anti-HBs) after completion of at least 3 doses of the HepB series, at age 9 through 18 months (generally at the next well-child visit).

4-month dose:

- Administration of 4 doses of HepB to infants is permissible when combination vaccines containing HepB are administered after the birth dose.

2. Rotavirus vaccine (RV). ***(Minimum age: 6 weeks)***

- Administer the first dose at age 6 through 14 weeks (maximum age: 14 weeks 6 days). Vaccination should not be initiated for infants aged 15 weeks or older (i.e., 15 weeks 0 days or older).
- Administer the final dose in the series by age 8 months 0 days.
- If Rotarix® is administered at ages 2 and 4 months, a dose at 6 months is not indicated.

3. Diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP). ***(Minimum age: 6 weeks)***

- The fourth dose may be administered as early as age 12 months, provided at least 6 months have elapsed since the third dose.
- Administer the final dose in the series at age 4 through 6 years.

4. *Haemophilus influenzae* type b conjugate vaccine (Hib). ***(Minimum age: 6 weeks)***

- If PRP-OMP (PedvaxHIB® or Comvax® [HepB-Hib]) is administered at ages 2 and 4 months, a dose at age 6 months is not indicated.
- TriHiBit® (DTaP/Hib) should not be used for doses at ages 2, 4, or 6 months but can be used as the final dose in children aged 12 months or older.

5. Pneumococcal vaccine. ***(Minimum age: 6 weeks for pneumococcal conjugate vaccine [PCV]; 2 years for pneumococcal polysaccharide vaccine [PPSV])***

- PCV is recommended for all children aged younger than 5 years. Administer 1 dose of PCV to all healthy children aged 24 through 59 months who are not completely vaccinated for their age.
- Administer PPSV to children aged 2 years or older with certain underlying medical conditions (see ***MMWR*** 2000;49[No. RR-9]), including a cochlear implant.

6. Influenza vaccine. ***(Minimum age: 6 months for trivalent inactivated influenza vaccine [TIV]; 2 years for live, attenuated influenza vaccine [LAIV])***

- Administer annually to children aged 6 months through 18 years.
- For healthy nonpregnant persons (i.e., those who do not have underlying medical conditions that predispose them to influenza complications) aged 2 through 49 years, either LAIV or TIV may be used.
- Children receiving TIV should receive 0.25 mL if aged 6 through 35 months or 0.5 mL if aged 3 years or older.
- Administer 2 doses (separated by at least 4 weeks) to children aged younger than 9 years who are receiving influenza vaccine for the first time or who were vaccinated for the first time during the previous influenza season but only received 1 dose.

7. Measles, mumps, and rubella vaccine (MMR). ***(Minimum age: 12 months)***

- Administer the second dose at age 4 through 6 years. However, the second dose may be administered before age 4, provided at least 28 days have elapsed since the first dose.

8. Varicella vaccine. ***(Minimum age: 12 months)***

- Administer the second dose at age 4 through 6 years. However, the second dose may be administered before age 4, provided at least 3 months have elapsed since the first dose.
- For children aged 12 months through 12 years the minimum interval between doses is 3 months. However, if the second dose was administered at least 28 days after the first dose, it can be accepted as valid.

9. Hepatitis A vaccine (HepA). ***(Minimum age: 12 months)***

- Administer to all children aged 1 year (i.e., aged 12 through 23 months). Administer 2 doses at least 6 months apart.
- Children not fully vaccinated by age 2 years can be vaccinated at subsequent visits.
- HepA also is recommended for children older than 1 year who live in areas where vaccination programs target older children or who are at increased risk of infection. See ***MMWR*** 2006;55(No. RR-7).

10. Meningococcal vaccine. ***(Minimum age: 2 years for meningococcal conjugate vaccine [MCV] and for meningococcal polysaccharide vaccine [MPSV])***

- Administer MCV to children aged 2 through 10 years with terminal complement component deficiency, anatomic or functional asplenia, and certain other high-risk groups. See ***MMWR*** 2005;54(No. RR-7).
- Persons who received MPSV 3 or more years previously and who remain at increased risk for meningococcal disease should be revaccinated with MCV.

The Recommended Immunization Schedules for Persons Aged 0 Through 18 Years are approved by the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/recs/acip), the American Academy of Pediatrics (http://www.aap.org), and the American Academy of Family Physicians (http://www.aafp.org).

DEPARTMENT OF HEALTH AND HUMAN SERVICES • CENTERS FOR DISEASE CONTROL AND PREVENTION

CS103164

Figure 5-1 Recommended childhood immunization schedule, 2009 (Courtesy of U.S. Centers for Disease Control and Prevention. Retrieved February 24, 2009 from cdc.gov)

4. Positive reaction signifies infection with *Mycobacterium tuberculosis.*
5. Positive reaction indicates need for further evaluation.
6. Children from other countries who have received BCG vaccine against tuberculosis may show positive skin test.

F. Common childhood communicable diseases (see Table 5-5).

Challenges of Parenting

A. Failure to thrive (FTT)
1. General information
   a. A condition in which a child fails to gain weight and is persistently less than the 5th percentile on growth charts.
   b. When related to nonorganic cause, it is usually due to a disrupted maternal-child relationship.
   c. Other pathology (especially absorption problems and hormonal dysfunction) must be ruled out before a disorder can be diagnosed as FTT.
   d. Growth and developmental delay usually improve with appropriate stimulation.
2. Assessment findings
   a. Sleep disturbances; rumination (voluntary regurgitation and reswallowing)
   b. History of parental isolation and social crisis with inadequate support systems
   c. Physical exam reveals delayed growth and development (decreased vocalization, low interest in environment) and characteristic postures (child is stiff or floppy, resists cuddling)
   d. Disturbed maternal-infant interaction may be demonstrated in feeding techniques, amount of stimulation provided by mother, ability of mother to respond to infant's cues
3. Nursing interventions
   a. Provide consistent care.
   b. Teach parents positive feeding techniques.
      1) Provide quiet environment.
      2) Follow child's rhythm of feeding.
      3) Maintain face-to-face posture with child.
      4) Talk to child encouragingly during feeding.
   c. Involve parents in care.
      1) Provide supportive environment.
      2) Give positive feedback.
      3) Demonstrate and reinforce responding to child's cues.
   d. Refer to appropriate community agencies.

B. Child abuse
1. General information
   a. Physical, emotional, or sexual abuse of children: may result from intentional and nonaccidental actions; or may be from intentional and nonaccidental acts of omission (neglect).
   b. In sexual abuse, 80% of children know their abuser.
   c. Problem usually related to parents' limited capacity to cope with, provide for, or relate to a child and/or to each other.
   d. Adults who abuse were often themselves victims of child abuse; although abuser may care about child, pattern of response to frustration and discipline is to be abusive.
   e. Occurs in all socioeconomic groups.
   f. Only 10% of abusers have serious psychologic disturbances, but most have low self-esteem, little confidence, low tolerance for frustration.
   g. Abuse is most common among toddlers as they exercise autonomy and parents may sense loss of power.
2. Assessment findings
   a. History may be indicative of child abuse.
      1) History inconsistent with injury
      2) Delay in seeking medical attention
      3) History changes with repetition
      4) No explanation for injury
   b. Skin injuries (bruises, lacerations, burns) are most common; may show outline of instrument used and may be in varying stages of healing.
   c. Musculoskeletal injuries, fractures (especially chip or spiral fractures), sprains, dislocations are also common; X-rays may show multiple old fractures.
   d. Signs of central nervous system (CNS) injuries include subdural hematoma, retinal hemorrhage (shaken baby syndrome).
   e. Abdominal injuries may include lacerated liver, ruptured spleen.
   f. Observation of parents and child may reveal interactional problems.
      1) Does parent respond to child's cues?
      2) Does parent comfort child?
      3) Does child respond to parent with fear?
3. Nursing interventions
   a. In emergency room: tend to physical needs of child first; determination of existence of abuse must wait until child's condition is stable.
   b. Report suspected child abuse to appropriate agency.
   c. Provide a role model for parents in terms of communication, stimulation, feeding, and daily care of child.
   d. Encourage parents to be involved in child's care.
   e. Encourage parents to express feelings concerning abuse, hospitalization, and home situation.
      1) Feelings of fear and guilt should be acknowledged.
      2) Provide reassurance.

Table 5-5 Communicable Childhood Diseases

Disease	Characteristics	Immunization
Diphtheria	A respiratory disease caused by bacteria. Bacteria forms a pseudomembrane across the trachea causing respiratory distress; also produces an exotoxin that causes myocarditis and neurologic problems.	Included in DTaP up to 6 years, then in Td, repeated every 10 years throughout life.
Pertussis (whooping cough)	Respiratory disease caused by bacteria; life threatening in young children. Severe paroxysmal cough results in severe respiratory distress; complications include seizures, pneumonia, encephalopathy, and death.	Included in DTaP; not given after 6 years because of risk from associated side effects. Do not give pertussis vaccine if child has active neurologic disorder.
Tetanus (lockjaw)	Neurologic disorder caused by bacterial exotoxin affects motor neurons, causing rigidity and spastic muscles; first symptom is stiffness of the jaw (trismus). No immunity is conferred after having the disease; associated mortality 25–50%.	Included in DTaP up to 6 years; included in Td every 10 years throughout life. May be given with a puncture wound if the wound is dirty and no immunization has been given in 5 years, or if wound is clean but more than 10 years have elapsed since previous immunization.
Measles (rubeola)	Viral infection producing harsh cough, maculopapular rash, photophobia, and Koplik spots; complications may include pneumonia, bacterial superinfections, and encephalitis. Incubation period is 8 to 12 days. Care includes keeping room darkened and providing antipruritic measures.	Maternal antibodies last for at least a year, then included in MMR given at 12 to 15 months. Do not give to pregnant women or immunocompromised persons.
German measles (rubella)	Viral infection causing lymphadenopathy and pink maculopapular rash; very mild disease, no specific care needed; complications may include arthralgia or arthritis, especially if occurring in young adults. Greatest danger is if pregnant woman contracts the disease; causes serious congenital anomalies.	Included in MMR
Mumps (parotitis)	Viral infection causing swelling of the salivary glands with painful swallowing. Ice collar may help relieve discomfort. Complications include orchitis (usually unilateral) if disease occurs after puberty, aseptic meningitis, encephalitis.	Included in MMR
Poliomyelitis (polio)	Viral infection, 95% of infected clients have no symptoms. Virus multiplies in the GI tract and enters the bloodstream to affect the CNS, resulting in paralysis in less than 2% of infected.	IPV
Chickenpox (varicella)	Most common communicable childhood disease, caused by the varicella zoster virus. Causes rash that starts on the trunk and spreads. Rash starts as vesicles, which then erupt and crust over. Highly contagious from 2 days prior to rash to 6 days after rash erupts; incubation period 21 days. Once lesions have crusted or scabbed over they are no longer contagious. Care is directed at comfort measures.	Short-term protection from maternal antibodies. Varicella vaccine.

f. Provide family education concerning child care, especially safety and nutrition needs, discipline, and age-appropriate stimulation.
g. Initiate referrals for long-term follow-up (community agencies, pediatric and mental health clinics, self-help groups).

C. Learning disabilities
1. General information
a. A heterogeneous group of disorders manifested by significant difficulties in acquisition and use of listening, speaking, writing, reasoning, or math skills
b. Presumed to be due to CNS dysfunction
c. Children of average or above-average IQ
d. Affects all aspects of learning, not just academics
e. Boys affected 6 times more often than girls
f. Categories include:
1) Receptive/sensory: perceptual problem (dyslexia, visual misperception)
2) Integrative: difficulty processing information (analysis, organization, sequencing, abstract thought)
3) Expressive: motor dysfunction (aphasia, writing or drawing difficulties, difficulty in sports or games)
4) Diffuse: combination of above
2. Assessment findings
a. Poor attention span
b. Poor grades, normal IQ
c. Low general information scores on standardized IQ tests
d. Decreased participation in extracurricular activities or hobbies
e. Low self-esteem due to multiple failures
f. Diagnostic tests: specific testing to confirm diagnosis and determine type of defect
3. Medical management: psychostimulants may be prescribed to reduce hyperactivity and frustration and to increase attention span and self-control; side effects include anorexia.
4. Nursing interventions
a. Environmental manipulation for behavior management
1) Limit external stimuli.
2) Maintain predictable routines.
3) Enforce limits on behavior.
b. Teaching strategies tailored for child's specific defects
1) Repeat directions often.
2) Elicit feedback from child.
3) Give time to ask questions.
4) Keep teaching sessions short.
5) Do not give nonessential information.

D. Sudden infant death syndrome (SIDS)
1. General information
a. Sudden death of any young child that is unexpected by history and in which thorough postmortem examination fails to demonstrate adequate cause of death
b. Cannot be predicted; cannot be prevented (unexpected and unexplained)
c. Peak age: 3 months; 95% by 6 months
d. Usually occurs during sleep; there is no struggle and death is silent
e. Diagnosis made at autopsy
f. Although cause of death is not known, suffocation and DTaP reactions are *not* causes of SIDS
2. Assessment findings
a. Factors associated with increased SIDS risk: prematurity, low birth weight, multiple births, siblings of SIDS victims, maternal substance abuse
b. Infants with neurologic problems and abnormal respiratory function at higher risk
c. Co-sleeping with parents, prone sleep position, soft bedding associated with higher risk
3. Nursing interventions
a. Nursing care is directed at supporting parents/family; parents usually arrive at emergency department.
b. Provide a room for the family to be alone if possible, stay with them; prepare them for how infant will look and feel (baby will be bruised and blanched due to pooling of blood until death was discovered; also will be cold).
c. Let parents say good-bye to baby (hold, rock).
d. Reinforce that death was not their fault.
e. Provide appropriate support referrals: clergy, notification of significant others, local SIDS program, visiting nurse.
f. Explain how parents can receive autopsy results.
g. Notify family physician or pediatrician.

DEATH AND DYING

Overview

Parental Response to Death

A. Major life stress event
B. Initially parents experience grief in response to potential loss of child
1. Acknowledgment of terminal disease is a struggle between hope and despair with resultant awareness of inevitable death.
2. Parents will be at different stages of grief at different times and constantly changing.
C. Parental response is related to age of child, cause of death, available social support, and degree of uncertainty; response might include denial, shock, disbelief, guilt.
D. Parents often confronted with major decisions such as home care versus hospital care, use of investigational drugs, and continuation of life supports.

E. May have long-term disruptive effects on family system
  1. Stress may result in divorce.
  2. May contribute to behavioral problems or psychosomatic symptoms in siblings.

F. Bereaved parents experience intense grief of long duration.

Child's Response to Death

A. Child's concept of death depends on mental age.
  1. Infants and toddlers
    a. Live only in present.
    b. Are concerned only with separation from mother and being alone and abandoned.
    c. Can sense sadness in others and may feel guilty (due to magical thinking).
    d. Do not understand life without themselves.
    e. Can sense they are getting weaker.
    f. Healthy toddlers may insist on seeing a significant other long after that person's death.
  2. Preschoolers
    a. See death as temporary; a type of sleep or separation.
    b. See life as concrete; they know the word "dead" but do not understand the finality.
    c. Fear separation from parents; want to know who will take care of them when they are dead.
    d. Dying children may regress in their behavior.
  3. School-age
    a. Have a concept of time, causality, and irreversibility (but still question it).
    b. Fear pain, mutilation, and abandonment.
    c. Will ask directly if they are dying.
    d. See death as a period of immobility.
    e. Interested in the death ceremony; may make requests for own ceremony.
    f. Feel death is punishment.
    g. May personify death (bogey man, angel of death).
    h. May know they are going to die but feel comforted by having parents and loved ones with them.
  4. Adolescents
    a. Are thinking about the future and knowing they will not participate.
    b. May express anger at impending death.
    c. May find it difficult to talk about death.
    d. Have an accurate understanding of death.
    e. May wish to write something for friends and family, make things to leave, or make a tape.
    f. May wish to plan own funeral.

Nursing Implications

Communicating with Dying Child

A. Use the child's own language.
B. Do not use euphemisms.
C. Do not expect an immediate response.
D. Never give up hope.

Care Guidelines at Impending Death

A. Do not leave child alone.
B. Do not whisper in the room (increases fears).
C. Know that touching child is important.
D. Let the child and family talk and cry.
E. Continue to read favorite stories to child or play favorite music.
F. Let parents participate in care as far as they are emotionally capable.
G. Be aware of the needs of siblings who are in the room with the family.

Sample Questions

1. The nurse has assessed four children of varying ages; which one requires further evaluation?
  1. A 7-month-old who is afraid of strangers.
  2. A 4-year-old who talks to an imaginary playmate.
  3. A 9-year-old with enuresis.
  4. A 16-year-old male who had nocturnal emissions.

2. The nurse is caring for a 5-year-old child who has leukemia and is now out of remission and not expected to survive. The child says to his mother, "Will you take care of me when I am dead the way you do now?" The child's mother asks the nurse how to answer her child. The nurse's response should be based on which of the following understandings of the child's behavior?
  1. The child is denying that he has a terminal illness.
  2. The child may be hallucinating.
  3. Children of this age do not understand the finality of death.
  4. Most 5-year-old children have a great fear of mutilation.

3. The nurse is talking with the mother of a 1-year-old child in well-baby clinic. Which statement the mother makes indicates a need for more instruction in keeping the child safe?
  1. "I have some syrup of ipecac at home in case my child ever needs it."
  2. "I put all the medicines on the highest shelf in the kitchen."
  3. "We have moved all the valuable vases and figurines out of the family room."
  4. "My husband put the gates up at the top and bottom of the stairs."

4. A baby was born 6 weeks prematurely and is now 2 months old, and her mother brings her to the clinic for her checkup. What will determine if the baby can receive the DTaP?

1. The presence of sufficient muscle mass.
2. Whether the vaccines are live or inactive.
3. The Denver Developmental Screening results.
4. Calculating her age by subtracting 6 weeks from the due date.

5. A 12-month-old is brought in for her well-child checkup. All of the immunizations are up to date. The child's mother asks the nurse what immunizations her child will receive today. What will be the nurse's best response?

1. First dose of MMR.
2. Second dose of Hib.
3. Third dose of DtaP.
4. Final dose of IPV.

6. The presence of what condition would necessitate a change in the standard immunization schedule for a child?

1. Allergy to eggs.
2. Immunosuppression.
3. Congenital defects.
4. Mental retardation.

7. A 2-year-old is brought to the pediatric clinic with an upper respiratory infection. After assessing the child, the nurse suspects this child may be a victim of child abuse. What physical signs usually indicate child abuse?

1. Diaper rash.
2. Bruises on the lower legs.
3. Scraped and scabbed knees.
4. Welts or bruises in various stages of healing.

8. Which action by a parent-child interaction does NOT warrant further assessment when child abuse is suspected?

1. Appears tired and disheveled.
2. Is hypercritical of the child.
3. Pushes the frightened child away.
4. Expresses far more concern than the situation warrants.

9. When child abuse is suspected, what recognizable factor will be present?

1. Have a number of scars.
2. Have identifiable shapes.
3. Display an erratic pattern.
4. Be on one side of the body.

10. The nurse is testing reflexes in a 4-month-old infant as part of the neurologic assessment. Which of the following findings would indicate an abnormal reflex pattern and an area of concern in a 4-month-old infant?

1. Closes hand tightly when palm is touched.
2. Begins strong sucking movements when mouth area is stimulated.
3. Hyperextends toes in response to stroking sole of foot upward.
4. Does not extend and abduct extremities in response to loud noise.

11. The mother of a 4-month-old infant asks the nurse when she can start feeding her baby solid food. Which of the following should the nurse include in teaching this mother about the nutritional needs of infants?

1. Infant cereal can be introduced by spoon when the extrusion reflex fades.
2. Solid foods should be given as soon as the infant's first tooth erupts.
3. Pureed food can be offered when the infant has tripled his birth weight.
4. Infant formula or breast milk provides adequate nutrients for the first year.

12. The nurse is assessing a 6-month-old infant during a well-child visit. The nurse makes all of the following observations. Which of the following assessments made by the nurse is an area of concern indicating a need for further evaluation?

1. Absence of Moro reflex.
2. Closed posterior fontanel.
3. Three-pound weight gain in 2 months.
4. Moderate head lag when pulled to sitting position.

13. The nurse is giving anticipatory guidance regarding safety and injury prevention to the parents of an 18-month-old toddler. Which of the following actions by the parents indicates understanding of the safety needs of a toddler?

1. Supervise the child in outdoor, fenced play areas.
2. Teach the child swimming and water safety.
3. Use automobile booster seat with lap belt.
4. Allow child to cross the street with 4-year-old sibling.

14. The community health nurse is making a newborn follow-up home visit. During the visit the 2-year-old sibling has a temper tantrum. The parent asks the nurse for guidance in dealing

with the toddler's temper tantrums. Which of the following is the most appropriate nursing action?

1. Help the child understand the rules.
2. Leave the child alone in his bedroom.
3. Suggest that the parent ignore the child's behavior.
4. Explain that the toddler is zealous of the new baby.

15. The parent of a 3-year-old child brings the child to the clinic for a well-child checkup. The history and assessment reveals the following findings. Which of these assessment findings made by the nurse is an area of concern and requires further investigation?

1. Unable to ride a tricycle.
2. Has ability to hop on one foot.
3. Uses gestures to indicate wants.
4. Weight gain of 4 pounds in last year.

16. The parents of a 4-year-old child tell the nurse that the child has an invisible friend named "Felix." The child blames "Felix" for any misbehavior and is often heard scolding "Felix," calling him a "bad boy." The nurse understands that the best interpretation of this behavior is which of the following?

1. A delay in moral development.
2. Impaired parent-child relationship.
3. A way for the child to assume control.
4. Inconsistent parental discipline strategies.

17. The nurse is caring for a 5-year-old child who is in the terminal stages of acute leukemia. The child refuses to go to sleep and is afraid that his parents will leave. The nurse recognizes that the child suspects he is dying and is afraid. Which of the following questions about death is most likely to be made by a 5-year-old child?

1. "What does it feel like when you die?"
2. "Who will take care of me when I die?"
3. "What will my friends do when I die?"
4. "Why do children die if they're not old?"

18. The parents of an 8-year-old child bring the child into the clinic for a school physical. The nurse makes all of the following assessments. Which assessment finding is an area of concern and needs further investigation?

1. Complains of a stomach ache on test days at school.
2. Has many evening rituals and resists going to bed at night.
3. Refers to self as being too dumb and too small during the exam.
4. Has lost three deciduous teeth and has the central and lateral incisors.

19. The nurse is performing a neurologic assessment on an 8-year-old child. As part of this neurologic assessment the nurse is assessing how the child thinks. Which of the following abilities best illustrates that the child is developing concrete operational thought?

1. Able to make change from a dollar bill.
2. Describes a ball as both red and round.
3. Tells time in terms of after breakfast and before lunch.
4. Able to substitute letters for numbers in simple problems.

20. The nurse is caring for a 10-year-old child during the acute phase of rheumatic fever. Bed rest is part of the child's plan of care. Which of the following diversional activities is developmentally appropriate and meets the health needs of this child in the acute phase of rheumatic fever?

1. Using handheld computer video games.
2. Sorting and organizing baseball cards in a notebook.
3. Playing basketball with a hoop suspended from the bed.
4. Using art supplies to make drawings about the hospital experience.

21. The nurse is caring for a 13-year-old who has been casted following spinal instrumentation surgery to correct idiopathic scoliosis. The nurse is helping the teen and family plan diversional activities while the teen is in the cast. Which of the following activities would be most appropriate to support adolescent development while the teen is casted?

1. Take the teen shopping at the mall in a wheelchair.
2. Plan family evenings playing a variety of board games.
3. Have teen regularly attend special school activities for own class.
4. Encourage siblings to spend time with teen watching television and movies.

22. A 2-month-old infant is in the clinic for a well-baby visit. Which of the following immunizations can the nurse expect to administer?

1. TD, Varicella, IPV.

2. DTaP, Varicella.
3. DTaP, MMR, Menomune.
4. DTaP, Hib, IPV, HBV.

23. An 18-month-old child with a history of falling out of his crib has been brought to the emergency room by the parents. Examination of the child reveals a skull fracture and multiple bruises on the child's body. Which of the following findings obtained by the nurse is most suggestive of child abuse?
1. Poor personal hygiene of the child.
2. Parents want to comfort child.
3. Conflicting explanations about the accident from the parents.
4. Cuts and bruises on the child's lower legs in various stages of healing.

24. The nurse is discussing the risk of sudden infant death syndrome (SIDS) in infants with the parents whose first baby died of SIDS 6 months ago. The parents express fear that other children will die from SIDS since they have already had one baby die. Which of the following statements made by the parents indicate their understanding of the relationship of future children and the risk of SIDS?
1. "Any new baby will be on home monitoring for one year to prevent SIDS."
2. "There is a 99% chance that we will not have another baby die of SIDS."
3. "Genetic testing is available to determine the likelihood of another baby dying from SIDS."
4. "There is medicine that can be used to stimulate the heart rate while the baby is sleeping."

Answers and Rationales

1. **3.** A 9-year-old should not be wetting the bed. This child may have physiologic or psychologic problems.

2. **3.** Preschool children do not understand the finality of death. They often view it as a long sleep. It is common for preschoolers to ask who will take care of them when they die. Preschool children may know the word "dead" but do not really comprehend what it means.

3. **2.** At 1 year of age babies are, or soon will be, climbing on everything. Putting medicines on the highest shelf is not sufficient. All medicines should be put in a locked cabinet.

4. **1.** DtaP is given intramuscularly; therefore, administration is dependent on the presence of sufficient muscle mass, which may not be present in the infant who was born prematurely.

5. **1.** Current recommendations call for measles, mumps, and rubella combined vaccine (MMR) to be given at 12-15 months.

6. **2.** Immunosuppressed clients may need alteration in immunization protection as live virus vaccines may overwhelm them.

7. **4.** Injuries at various stages of healing are symptomatic of child abuse.

8. **1.** Being tired and disheveled gives no information about the quality of the parent-child interaction. It may be a normal state for a busy parent.

9. **2.** Burns typical of child abuse have symmetrical shapes and resemble the shape of the item used to burn the child.

10. **1.** The palmar grasp is present at birth. The palmar grasp lessens by age 3 months and is no longer reflexive. The infant is able to close hand voluntarily.

11. **1.** Infant cereal is generally introduced first because of its high iron content. The infant is able to accept spoon feeding at around 4 to 5 months when the tongue thrust or extrusion reflex fades.

12. **4.** By 4 to 6 months, head control is well established. There should be no head lag when infant is pulled to a sitting position by the age of 6 months.

13. **1.** The child has great curiosity and has the mobility to explore. Toddlers need to be supervised in play areas. Play areas with soft ground cover and safe equipment need to be selected.

14. **3.** The best approach toward extinguishing attention-seeking behavior is to ignore it as long as the behavior is not inflicting injury.

15. **3.** This behavior indicates a delay in language and speech development. The child may not be able to hear. The child should have a vocabulary of about 900 words and use complete sentences of three to four words.

16. **3.** Imaginary friends are a normal part of development for many preschool children. These imaginary friends often have many faults. The child plays the role of the parent with the imaginary friend. This becomes a way of assuming control and authority in a safe situation.

17. **2.** The greatest fear of preschool children is being left alone and abandoned. Preschool children still think as though they are alive and need to be taken care of.

18. **3.** The school-age years are very important in the development of a healthy self-esteem. These statements by the 8-year-old child indicate a risk for development of a sense of inferiority and need further assessment.

19. **1.** This ability illustrates the concept of conservation, which is one of the major cognitive tasks of school-age children.

20. **2.** The middle childhood years are times for collections. The collections of middle to late school-age children become orderly, selective, and neatly organized in scrapbooks. This quiet activity supports the development of industry and concrete operational thought as well as the physical restrictions related to the rheumatic fever.

21. **3.** Early adolescents have a strong need to fit in and be accepted by their peers. Attending school activities helps the teen continue peer relationships and develop a sense of belonging.

22. **4.** Healthy infants at 2 months of age receive diphtheria, tetanus, and pertussis (DTaP); hemophilus influenza (Hib); polio vaccine (IPV); and hepatitis B virus (HBV).

23. **3.** Incompatibility between the history and the injury is probably the most important criterion on which to base the decision to report suspected abuse.

24. **2.** Whether subsequent siblings of the SIDS infant are at risk is unclear. Even if the increased risk is correct, families have a 99% chance that their subsequent child will not die of SIDS.

Multisystem Stressors

GENETIC DISORDERS

A. Genes are functional units of heredity, capable of replication, mutation, and expression.

B. Teratology is the branch of embryology that deals with the study of abnormal development and congenital malformations.
   1. *Congenital disorders:* present at birth, although may not be noticeable until later; may be caused by genetic factors, nongenetic factors, or a combination.
   2. *Genetic disorders:* caused by a single aberrant gene or a deviation in chromosome structure or number.

C. In humans there are normally 46 chromosomes (23 pairs) that contain the genes.
   1. *Genotype:* the gene constitution of an individual
   2. *Phenotype:* the outward visible physical appearance/expression of a person's genes (color, size, allergies)
   3. *Karyotype:* the number and pattern of chromosomes in a cell
   4. *Allele:* one or two or more forms of a gene that controls expression of specific characteristic (e.g., genes for eye color)
      a. *Mendel's law:* for each hereditary property we receive 2 genes, 1 from each parent; 1 is dominant and expressed; 1 is recessive and not expressed.
      b. *Homozygous:* alleles for characteristic are identical; both dominant (DD) or both recessive (dd).
      c. *Heterozygous:* alleles are different (Dd).

D. Normal cell division
   1. *Meiosis:* cell division that produces gametes, each with a haploid set of chromosomes (one-half the number of the parent cell); this is reductional division, occurs in the ova and sperm.
   2. *Mitosis:* cell division that produces two cells (daughter cells), each with a full complement of chromosomes, identical to the composition of the parent cell.

Principles of Inheritance

Traits that are controlled by genes located on autosomes are inherited according to dominant or recessive patterns. Most cases of autosomal inheritance in humans involve traits controlled by one gene.

Autosomal Dominant

A. General information
  1. Allele responsible for the trait (or disease) is dominant.
  2. Only one parent needs to pass on the gene (child may be heterozygous for trait).
  3. Examples of inherited diseases; Huntington's chorea, myotonic muscular dystrophy, night blindness, osteogenesis imperfecta, neurofibromatosis.

B. Genetic counseling: advise parents that if one of them has a disease inherited through autosomal dominant pattern, there is a 50% chance with each pregnancy that the child will have the disease/disorder.

Autosomal Recessive

A. General information
  1. Allele responsible for trait (or disease) will not result in expression if the other allele in the pair is dominant.
  2. Both parents must pass on the gene(s) (child is homozygous for trait).
  3. Examples of inherited diseases: cystic fibrosis, PKU, sickle cell anemia, albinism, Tay-Sachs.

B. Genetic counseling: advise parents that if both are heterozygous for the trait then:
  1. There is a 25% chance with each pregnancy of having a child with the disease/disorder.
  2. There is a 50% chance with each pregnancy of having a child who is a carrier of the disease but who will not have the symptoms.
  3. There is a 25% chance with each pregnancy of having a child who will neither have the disease nor be a carrier.

Sex-Linked (X-Linked) Inheritance

A. General information
  1. Inheritance of characteristics located on X and Y chromosomes
  2. Only known genetic locus on the Y chromosome is associated with determination of male sex.
  3. X chromosome carries other traits in addition to determination of female sex.
  4. Sex-linked inheritance in males: even a recessive defective gene on X chromosome can manifest itself in males because there is no opposing normal gene on Y chromosome.
  5. Sex-linked inheritance in females: recessive defective gene can be masked by a normal dominant gene.
  6. Examples of sex-linked inherited disorders: color blindness, baldness, hemophilia A and B, Duchenne's muscular dystrophy.

B. Genetic counseling
  1. If a woman is a carrier for a sex-linked disorder and her partner does not have the disorder:
    a. There is a 50% chance with each pregnancy that her son will have the disorder.
    b. There is a 50% chance her daughter will become a carrier.
  2. If a man has a sex-linked disorder, all his daughters will be carriers but none will manifest the disease.
  3. For sex-linked disorders, there are no carrier states in males.

Chromosome Alterations

A. General information: deviations from normal chromosome complement may be numeric or structural.
  1. *Mutation:* spontaneous alteration in genetic material not present in previous generation
  2. *Nondisjunction:* failure of a pair of chromosomes to separate during meiosis; results in numeric change called trisomy (47 chromosomes); can be passed on by either parent (one parent would pass 24 chromosomes)
  3. *Translocation:* the transfer of all or part of a chromosome to another location on the same chromosome or to a different chromosome after chromosome breakage
  4. *Mosaicism:* the presence in the same individual of two or more genotypically different cell lines

B. Genetic counseling: varies depending on the origin of the alteration
  1. Random risk: chromosome alterations caused by environmental agents are not likely to occur in subsequent pregnancies. Therefore, the risk of the same defect recurring is no more than for any person in the general population.
  2. High risk: at least one parent carries a chromosomal aberration or mutant gene and passes it on to the offspring (e.g., if a parent is a balanced translocation carrier, the risk of a child being affected is 1 in 4)
  3. Moderate risk: largest group; includes multifactorial disorders. Risk recurrence in these disorders is empiric, based not on genetic theory but on prior experience and observation.

Assessment

History

A. Careful, detailed history is the basis of genetic counseling; can help confirm diagnosis and establish recurrence risk in multifactorial disorders.

B. Family history (pattern of affected family members) is recorded in form of pedigree chart or family tree.

1. Information about affected child and immediate family: history of this pregnancy and all previous pregnancies, including stillbirths and abortions; information about siblings
2. Information about maternal relatives
   a. Mother's siblings
   b. Outcome of maternal grandmother's pregnancies
   c. Health status of maternal relatives
3. Information about paternal relatives: same as maternal

Laboratory/Diagnostic Tests

A. Amniocentesis
   1. Examination of amniotic fluid to screen for:
      a. Some inborn errors of metabolism
      b. Chromosomal abnormalities
      c. Some CNS disorders (spina bifida)
      d. Sex of infant in sex-related disorders
   2. Indications
      a. One parent is chromosome mosaic or has balanced translocation.
      b. Mother is age 35 or older.
      c. Both parents are heterozygous for an autosomal recessive disorder.
      d. Mother is carrier of an X-linked disorder.
      e. Couple already has an affected child.
B. Karyotyping (chromosomal analysis)
   1. Confirms or refutes probable diagnosis of chromosomal abnormality.
   2. Identifies whether individual is a carrier of chromosomal abnormality.
   3. Determines infant's sex if necessary.
C. Determination of fetal status

Analysis

Nursing diagnoses for the family/individual with a genetic disorder may include:
A. Disturbed thought processes
B. Deficient knowledge (specify)
C. Risk for altered parenting
D. Grief (anticipatory)

Planning and Implementation

Goals

A. Child will achieve maximum potential for cognitive and motor development.
B. Family will develop effective coping strategies.

Interventions

A. Provide community health agency referral.
B. Support family in identification of appropriate stimulation programs for child.
C. Communicate with and provide support for parents.
D. Offer genetic counseling (see Principles of Inheritance).

Evaluation

A. Optimum level of motor and cognitive development is attained.
B. Self-care is performed at satisfactory level.
C. Family is able to function appropriately.
D. Parents demonstrate ability to meet child's physical and developmental needs.
E. Parents derive comfort/satisfaction from parenting affected child.

Chromosome Disorder

Down Syndrome

A. General information
   1. One of the most common causes of mental retardation; incidence: about 1 in 600 live births
   2. Caused by an extra chromosome 21 (total 47)
      a. Most cases associated with nondisjunction; incidence increased with maternal, and to some degree paternal, age; incidence in women over age 35 markedly increased
      b. Also associated with translocation; hereditary type, incidence not increased with parental age
B. Assessment findings
   1. Head and face
      a. Small head, flat facial profile, broad flat nose
      b. Small mouth, normal-size protruding tongue
      c. Upward slanting palpebral fissure
      d. Low-set ears
   2. Extremities
      a. Short, thick fingers and hands
      b. Simian creases (single crease across palms)
      c. Muscle weakness, lax joints
   3. Associated anomalies and disorders
      a. Congenital heart defects (40% incidence)
      b. GI structural defects
      c. Increased incidence of leukemia
      d. Increased incidence of respiratory infection
      e. Visual defects: strabismus, myopia, nystagmus, cataracts
      f. Obesity in older children
   4. Retardation usually moderate, IQ 50–70
C. Nursing interventions: see also Mental Retardation.
   1. Provide parent education concerning
      a. Increased susceptibility to respiratory infection
      b. Nutritional needs, feeding techniques
      c. Medication administration if necessary
      d. Protection from injury due to hypotonia, atlanto-axial instability (weak neck)
      e. Needs of siblings
   2. Promote developmental progress
   3. Provide genetic counseling.

FLUID AND ELECTROLYTE, ACID-BASE BALANCES

General Principles and Variations from Adult

A. Percent body water compared to total body weight
  1. Premature infant: 90% water
  2. Infant: 75–80% water
  3. Child: 64% water
B. Infant also has a higher percentage of water in extracellular fluid compared to adults (therefore, infant has less fluid reserve).
C. Renal function
  1. Concentrating ability of kidney does not reach adult levels until approximately age 2; specific gravity of infant's urine is 1.003.
  2. Glomerular filtration rate does not reach adult levels until approximately age 2.
  3. Average urine output
    a. Infant: 5–10 mL/hour
    b. 1–10 years: 10–25 mL/hour
    c. 35 mL/hour thereafter
D. Metabolic rate in children is 2–3 times that of adults; children therefore have an increased need for nutrients and fluids, and an increased amount of waste to excrete.
E. Fluid is not conserved; there is less reserve, and children more prone to fluid volume deficit than adults; ½ of infant's extracellular fluid is exchanged each day compared with only ⅛ of adult's.
F. Children have faster respiratory rate than adults, causing more water loss through breathing.
G. Infants have a greater body surface area per kg body weight than adults, therefore fluid loss through skin (evaporation) is greater in children.

Assessment

Health History

A. Ascertain age, recent weight, usual feeding habits/patterns, amount and type of daily intake.
B. Determine usual voiding/stooling habits and volume of urine/stool output.
C. Identify any recent illnesses or medications taken.
D. Ascertain usual activity level.

Physical Examination

A. Measure present weight and vital signs.
B. Observe general appearance.
  1. Muscle tone
  2. Reflex responses
  3. Activity level
C. Inspect skin and mucous membranes for turgor, color, temperature.
D. Head and face
  1. Inspect fontanels, eye orbits.
  2. Ascertain presence of tears, saliva.
E. Abdomen/genitalia
  1. Auscultate for bowel sounds, peristaltic waves.
  2. Inspect for diaper rash, urine stream.

Laboratory/Diagnostic Tests

A. Blood studies
  1. Hbg and HCT
  2. Sodium, potassium, chloride, calcium, magnesium
  3. pCO_2 and CO_2
  4. pH
B. Urine studies: specific gravity, glucose, ketones, osmolarity, pH
C. Stool studies: culture, reducing substances, blood, sodium, potassium, pH

Analysis

Nursing diagnoses for children with fluid/electrolyte and acid-base imbalances may include:
A. Diarrhea
B. Pain
C. Deficient fluid volume
D. Imbalanced nutrition
E. Impaired oral mucous membrane
F. Impaired skin integrity
G. Ineffective tissue perfusion
H. Impaired urinary elimination

Planning and Implementation

Goals

A. Child will have normal hydration status.
B. Parents will demonstrate knowledge of child's disorder, prescribed treatment, and prevention of complications.

Interventions

A. Maintain strict I&O.
  1. Weigh diapers.
  2. Monitor urine specific gravity.
  3. Hematest stools.
B. Take daily weights.
C. Keep NPO for bowel rest.
D. Administer IV fluids.
  1. Maintenance plus replacement
  2. Generally use hypotonic solutions (0.25 NSS, 0.33 NSS, or 0.45 NSS)
E. Provide pacifier for infant.
F. Reintroduce oral fluids slowly.
  1. In children under 2 years use Pedialyte, a balanced electrolyte solution.
  2. In children over 2 use weak tea, flat soda.

3. Do not use
   a. Broth (high sodium)
   b. Milk/formula (high solute)
   c. Water, glucose water, Jell-O (no electrolytes)

Evaluation

A. Child has adequate hydration status.
   1. Adequate I&O
   2. Normal stooling pattern
   3. Good skin turgor
   4. Normal vital signs
   5. Normal serum laboratory values
B. Parents participate in care, demonstrate understanding of signs and symptoms of disorder and treatment.

Disorders

Dehydration

A. The most common fluid and electrolyte disturbance in infants and children
B. Osmotic factors, particularly sodium, control the movement of fluid between extracellular and intracellular compartments and influence the types of dehydration
   1. Isotonic dehydration: most common
      a. Plasma sodium level is normal (130–150 mEq/liter).
      b. Water and electrolyte lost in proportionate amounts; net loss is isotonic.
      c. Major loss is from extracellular fluid; loss of circulating blood volume.
      d. Shock may develop if losses are severe.
   2. Hypotonic dehydration
      a. Plasma sodium level is less than 130 mEq/liter.
      b. Electrolyte deficit exceeds water deficit.
      c. May occur when fluid and electrolyte losses are replaced with plain or glucose water.
      d. Fluid lost from extracellular compartment; also moves from extracellular to intracellular compartment.
      e. Signs of decreased fluid appear sooner with smaller fluid losses than in isotonic dehydration.
      f. Shock is a frequent finding.
   3. Hypertonic dehydration
      a. Plasma sodium exceeds 150 mEq/liter.
      b. Water loss exceeds electrolyte loss; may occur when fluid and electrolyte losses are replaced with large amount of solute (hypertonic formula).
      c. Fluid shifts from the intracellular to the extracellular compartments.
      d. Physical signs of dehydration may be less apparent.
      e. Neurologic symptoms (e.g., seizures) may occur.
C. Nursing interventions
   1. Teach caregivers to watch for signs/symptoms of dehydration:
      a. A decrease in wet diapers
      b. Mouth dry inside
      c. No tears present with crying if older than 2–4 months
      d. Irritable or lethargic
      e. Sunken fontanel
      f. Pale, gray, mottled skin color
   2. Correct dehydration with oral solutions that should contain glucose, sodium, potassium, and bicarbonate (Pedialyte, Lytren, Infalyte).
   3. Administer IV fluid therapy as ordered.
   4. Assess daily weight, vital signs, I&O.
   5. Educate family on signs of dehydration and to monitor child's urine output.

Diarrhea

A. General information
   1. A change in consistency and frequency of stool
   2. Very common in young children
   3. Caused by bacteria and viruses, parasites, poisons, inflammation, malabsorption, allergies, abnormal bowel motility, and anatomic alterations
   4. Infants can easily lose 5% of their body weight in 1 day
   5. Intestinal fluids are alkaline; large loss causes metabolic acidosis
   6. Also causes bicarbonate and potassium loss
   7. Body may use its own fat for energy, leading to ketosis
B. Assessment findings
   1. History of frequent stools; child may complain of or indicate abdominal cramping by guarding, weight loss; child may be lethargic and irritable
   2. Decreased urine output, decreased tears and saliva, dry mucous membranes, dry skin with poor tissue turgor
   3. In children less than 18 months, may find depressed anterior fontanel
   4. Soft eyeballs with sunken appearance
   5. Ashen skin color; cold extremities
   6. High-pitched cry
   7. Increased pulse rate and decreased blood pressure
   8. Diagnostic tests
      a. HCT elevated if dehydrated
      b. Serum sodium and potassium decreased
      c. BUN elevated if renal circulation is decreased
      d. CBC will show increased bands if caused by bacterial infection
      e. Low pH and positive sugar with disaccharide intolerance

f. Stool culture will identify specific microorganism
g. Leukocytes in stool if caused by enteroinvasive organisms

C. Nursing interventions
1. Keep NPO to rest bowel, if ordered.
2. Administer IV fluid therapy as ordered.
3. Resume oral feedings slowly; regular diet is recommended.
4. Provide skin care to prevent/treat excoriation of diaper area.
5. Test all stool and chart results.
6. Isolation may be ordered with infectious cause.

Vomiting

A. General information
1. Common symptom during childhood; usually not a cause for concern
2. Differs from spitting up (dribbling of undigested formula, often with burping)
3. If prolonged may result in metabolic alkalosis or aspiration

B. Assessment findings: in addition to vomiting, child may have fever, abdominal pain, and distension.

C. Nursing interventions
1. Assist with identification and treatment of underlying cause.
a. Assess for accompanying diarrhea that may indicate gastroenteritis.
b. Determine whether others in family/school/etc., are also sick; may indicate food poisoning.
c. Assess for history of anxiety-producing life events.
d. Assess amount and force of vomitus; forceful, projectile vomiting may indicate pyloric stenosis
e. Determine frequency and character of vomitus (color, whether formula or food, presence of bile or blood), relationship to feeding (new foods, overeating).
2. Prevent complications: monitor fluid/electrolyte and acid-base status
3. Administer antiemetics if ordered; trimethobenzamide HCl (Tigan) and promethazine HCl (Phenergan) recommended for children.

ACCIDENTS, POISONINGS, AND INGESTION

A. Accidents are the main cause of death in children over the age of 1 year.

B. 90% of accidents are preventable.

C. Interaction among host (the child), agent (the principal cause), and environment (⅔ of accidents occur in the home); safeguard the host while the agent and environment are made safer.

D. Methods of prevention
1. Childproofing the environment
2. Educating parents and child
3. Legislation (e.g., seat belts, safe toys)
4. Anticipatory guidance
5. Understanding and applying growth and development principles
a. Infant: totally dependent on adults for maintenance of safe environment
b. Toddler: more mobile, impatient; urge to investigate and imitate; climbing, running, jumping
c. Preschooler: very curious, exploring neighborhood, running, climbing, riding bikes; can accept and respond to teaching but still needs protection
d. School-age and adolescent: taking dares, sports injuries, peer pressure, learning to drive

E. Precipitating factors
1. Arguments or tension in the home
2. Change in routines
3. Tired child/tired parents
4. Inadequate babysitting
5. Hungry child
6. Illness in immediate family member

F. Potential outcomes include temporary incapacitation, permanent disfigurement, and death

Specific Disorders

Pediatric Poisonings

A. General information
1. Toddlers and suicidal adolescents most often involved
2. Deaths have declined due to continued efforts in prevention and the establishment of Poison Control Centers
3. Modes of exposure: ocular, skin, ingestion (vast majority)
4. Types of substances ingested: drugs, household products (cleaning agents), garden supplies, plants and berries
5. Most ingestions are acute in nature and accompanied by a history of invasion of the medicine chest or cabinet where household cleaners are kept
6. Chronic ingestions result in accumulation of toxic substance, such as lead

B. General assessment findings
1. Signs vary depending on substance ingested
2. May evidence bradycardia; tachycardia; tachypnea; slow depressed respiration; hypotension or hypertension; hypothermia or hyperpyrexia
3. Confusion, disorientation, coma, ataxia, seizures
4. Miosis, mydriasis, nystagmus
5. Jaundice, cyanosis

6. Child may have a distinctive odor: hydrocarbons, alcohol, garlic, sweat

C. General interventions
1. Resuscitate child and stabilize condition: establish patent airway and provide measures to restore circulation as indicated.
2. Prevent absorption.
   a. Determine what, when, and how much was ingested; will frequently not be able to identify substance.
   b. Gastric lavage; may be used to prevent absorption
      1) Use largest nasogastric (NG) or orogastric tube possible.
      2) Recommended within 1 to 2 hours after ingestion.
      3) Indicated when ingested substance is highly toxic or not absorbed by activated charcoal (i.e., lithium, iron, lead).
      4) Contraindicated in ingestion of corrosives.
      5) Complications include aspiration and perforation of esophagus.
   c. Activated charcoal: minimizes amount of toxic agent for absorption.
      1) May be given alone or following gastric lavage.
      2) Used if ingestion has occurred within 2 hours prior to treatment
      3) If liquid form, shake bottle, administer, then rinse bottle with small amount of water, shake again and administer to obtain full dose.
      4) Complications include aspiration and pneumothorax.
   d. Cathartic: may be used after emesis or lavage to speed elimination of ingested substance; recommended agents are sodium or magnesium sulfate.
3. Provide treatment and prevention information to parents.
   a. Parents should always be instructed to save container, vomitus, spills on clothing for analysis.
   b. Teach parents about safety practices that will decrease chances of accidental poisonings; educate as to use of drugs, labeling, storage, and handling of household products, importance of child-resistant safety packaging.
   c. Advise parents to keep Poison Control Center phone number readily available (1-800-222-1222).
   d. Incorporate anticipatory guidance related to developmental stage of child.
   e. Discuss general first aid measures with parents.
   f. Syrup of ipecac is no longer recommended or sold OTC and only used by healthcare personnel.

Salicylate Poisoning

A. General information
1. Toxicity begins at doses of 150–200 mg/kg.
2. Products include not only aspirin but oil of wintergreen and analgesic cold medicines.
3. Peak effect of aspirin is 2–4 hours and effects may last 8 hours.
4. Ingestion may be accidental or due to therapeutic overdosing.
5. Salicylate ingestion causes
   a. Acid-base alterations
   b. Respiratory alkalosis
   c. Metabolic acidosis
   d. Impaired glucose metabolism
   e. An inhibition of prothrombin formation

B. Assessment findings
1. Hyperventilation, confusion, loss of consciousness
2. Hyperpnea, hyperpyrexia, dehydration
3. CNS depression, vomiting, lethargy
4. Coma, respiratory failure, circulatory collapse

C. Nursing interventions
1. Assist with emergency management
2. Administer fluid therapy
3. Monitor vital signs, BP, urine specific gravity, I&O
4. Monitor temperature, provide tepid sponging or cooling mattress
5. Provide emotional support to child and family
6. Administer vitamin K

Acetaminophen Ingestion

A. General information
1. Has become a commonly used analgesic-antipyretic
2. Little associated morbidity or mortality in accidental ingestion
3. Major risk is severe hepatic damage

B. Assessment findings
1. Vague and nonspecific initially; nausea, vomiting, anorexia, sweating
2. Jaundice, liver tenderness, increase in liver enzymes, abdominal pain
3. Progression to hepatic failure

C. Nursing interventions
1. Emesis or lavage; do *not* use activated charcoal (will bind antidote).
2. Administer antidote (acetylcysteine [Mucomyst]): lessens hepatic damage if given within 16 hours of ingestion.

Lead Poisoning

A. General information
1. Increased blood lead levels resulting from ingestion and absorption of lead-containing substances
2. Most common source: candy and spices from other countries not approved by the FDA;

found in lead-based paint (used in houses prior to 1950); toys made in China recalled in 2007 due to lead paint used
3. Toddlers and preschoolers most often affected; many have pica (tendency to eat nonfood substances)
4. Lead value of more than 10 µg/dL is considered a health hazard
5. Acute symptoms usually appear once level is 70 µg/dL
6. Lead is absorbed through the GI tract and pulmonary system; it is then deposited in bone, soft tissue, and blood; excretion occurs via urine, feces, and sweat; toxic effects are due to enzyme inhibition.
7. Low dietary iron and calcium may enhance toxic effects.
8. Widespread screening programs have diminished severe effects.

B. Assessment findings
1. Abdominal complaints including colicky pain, constipation, anorexia, vomiting, weight loss
2. Pallor, listlessness, fatigue
3. Clumsiness, irritability, loss of coordination, ataxia, seizures
4. Encephalopathy
5. Identification of lead in the blood
6. Erythrocyte protoporphyrin (EP) levels increased

C. Nursing interventions
1. Prevention
   a. Nutrition: adequate iron and calcium in diet
   b. Environment: damp mop and damp wipe floors, windowsills, cover over flaking paint, handwashing before meals, baths
2. Chelating agents
   a. Succimer (chemet)-oral
   b. Dimercaprol (BAL)-IM
   c. Disodium calcium edetate (calcium EDTA)-IV or IM
   d. IM agents-multiple injections-pain
      1) Rotate sites
      2) Warm soaks
      3) Topical analgesia (EMLA cream)
   e. All chelating agents
      1) Maintain hydration (chelation is toxic to kidneys).
      2) Measure I&O.
      3) Monitor lead levels.
3. Provide nutritional counseling.
4. Aid in eliminating environmental conditions that led to lead ingestion.

Lyme Disease

A. General information
1. Caused by the spirochete *Borrelia burgdorferi*
2. Transmitted by a deer tick, requires 24-hour tick attachment
3. Most prevalent during summer and early fall
4. Symptoms usually involve the skin, nervous system, and joints
5. Incubation period is 3 to 32 days

B. Medical management
1. Blood tests available, but lack sensitivity and specificity, therefore diagnosis is often based on clinical and epidemiologic data.
2. Antibiotic treatment: if early infection, given for 10–21 days. If neurologic or arthritic symptoms occur, combined treatment for longer duration may be necessary.

C. Assessment findings
1. Divided into stages on the basis of chronologic relationship to the tick bite
   a. Stage I: Skin rash (erythema migrans) starting 3–32 days past tick bite and lasting about 3 weeks. Most common on thighs, buttock, axilla. Systemic symptoms of malaise, fatigue, headache, stiff neck, fever, arthralgia.
   b. Stage II: Symptoms of late disease may occur months to years after the initial disease. Includes neurologic symptoms such as facial palsies, sensory losses, focal weaknesses, cardiac rhythm abnormalities, and increased arthritis complaints involving multiple joints.

D. Nursing interventions
1. Medication administration
2. Prevention
   a. Avoid high-risk areas such as woody, grassy areas
   b. If walking in such areas, wear long pants, long-sleeved shirt, high socks, and sneakers
   c. Use insect repellents for skin and clothing
   d. After every potential exposure, check carefully for ticks
   e. Remove tick by pulling straight out with tweezers

Sample Questions

25. A mother of an 8-year-old child shows the physician a "funny red circle" on the child's leg and states the child went camping last weekend. The physician draws blood to rule out Lyme disease and prescribes doxycycline for the child. The child's mother asks why an antibiotic is prescribed for a tick bite. The nurse's response is based on which of the following understandings?

1. Lyme disease weakens the person so they are susceptible to infections.
2. Lyme disease is caused by a spirochete that is sensitive to doxycycline.
3. Doxycycline will kill the tick, which may still be in the child.
4. Antibiotics are given to cure the infection at the site of the tick bite.

26. The mother of a 3-year-old child calls her nurse neighbor in a panic state, saying that the child swallowed most of a bottle of aspirin. The nurse determines that the child is still alert. What instruction should the nurse give to the mother?

1. Induce vomiting in the child.
2. Observe the child carefully until the ambulance arrives.
3. Call the Poison Control Center
4. Give the child lots of milk to drink.

27. An 8-month-old infant was admitted to the hospital with severe diarrhea and dehydration. Fluid replacement therapy was initiated. Which observation the nurse makes indicates an improvement in the infant's status?

1. Fontanels are depressed.
2. Infant has gained 3 oz since yesterday.
3. Skin remains pulled together after being gently pinched and released.
4. The infant's hematocrit is greater today than yesterday.

28. A 17-year-old has Down syndrome. He is 57 inches tall and weighs 155 pounds. In planning his care, what is the most important fact for the nurse to consider?

1. His mental age.
2. His chronologic age.
3. His bone age.
4. Growth chart percentiles.

29. What is the cause of Down syndrome?

1. An autosomal recessive defect.
2. An extra chromosome.
3. A sex-linked defect.
4. A dominant gene.

30. A 10-day-old baby is admitted with 5% dehydration. The nurse is most likely to note which of the following signs?

1. Tachycardia.
2. Bradycardia.
3. Hypothermia.
4. Hyperthermia.

31. The nurse is asked why infants are more prone to fluid imbalances than adults. What would be the nurse's best response?

1. Adults have a greater body surface area.
2. Adults have a greater metabolic rate.
3. Infants have functionally immature kidneys.
4. Infants ingest a lesser amount of fluid per kilogram.

32. A 10-month-old weighs 10 kg and has voided 100 mL in the past 4 hours. The nurse is aware that _____ is normal urine output.

1. 1–2 mL/kg/hour.
2. 3–5 mL/kg/hour.
3. 7–9 mL/kg/hour.
4. 10 mL/kg/hour.

33. A 3-month-old is NPO for surgery. What would be an appropriate method for the nurse to comfort him?

1. Administering acetaminophen.
2. Encouraging parents to leave so the child can rest.
3. Offering pacifier.
4. Giving 10 cc Pedialyte.

34. An 11-year-old is admitted for treatment of lead poisoning. The nurse includes which of the following in the plan of care?

1. Oxygen.
2. Strict I&O.
3. Heme-occult stool testing.
4. Calorie counts.

35. A 2-month-old is admitted with diarrhea. What is the best room assignment for the nurse to make?

1. Semi-private room with no roommate.
2. Private room with no bathroom.
3. Semi-private room with 10-year-old who has acute lymphocytic leukemia.
4. Open ward.

36. The nurse is discussing safety measures to prevent poisoning with the mother of a 1-year-old. Which statement by the mother demonstrates understanding of safety precautions?

1. "I have child protection locks on my cabinet under the sink."
2. "My child is not potty-trained, so the bathroom is safe."
3. "I keep all poisons and cleaners above the fridge."
4. "I don't think I have any poisons in my house."

37. The home health nurse observes a new mother providing care for her 1 month old infant. What information would the nurse give the mother to help prevent hepatitis A to herself or the infant?

1. Avoid sexual relations for 3 months since birthing occurred.
2. Wear gloves when changing diapers with loose stool.
3. Clean contaminated household surfaces with a solution of ½ alcohol and ½ water.
4. Restrict visitors from holding the infant.

38. A 16-year-old admits to her mother that she tried to commit suicide by swallowing a bottle of Tylenol (acetaminophen) 16 hours ago. Her mother brings the girl to the ER. Which is the treatment of choice for this occurrence?

1. Ipecac syrup.
2. Activated charcoal.
3. Mucomyst.
4. Milk and observation.

39. The nurse would include which of the following nursing diagnoses for a 10-year-old client with stage I Lyme disease?

1. Decreased cardiac output.
2. Impaired mobility.
3. Altered cerebral tissue perfusion.
4. Alteration in skin integrity.

Answers and Rationales

25. 2. Lyme disease is caused by a spirochete that is sensitive to antibiotics.

26. 3. Because the child is still alert, the mother should call the Poison Control Center for guidance. Transport to the hospital will occur, followed by gastric lavage and activated charcoal.

27. 2. A weight gain would suggest greater circulating volume. Blood has weight.

28. 1. Children with Down syndrome have some degree of mental retardation and care must be geared to their mental age.

29. 2. In Down syndrome there is an extra chromosome on the 21st pair, which is why the disease is also called trisomy 21.

30. 1. Tachycardia is associated with dehydration.

31. 3. Infant kidneys are unable to concentrate or dilute urine, to conserve or secrete sodium, or to acidify urine.

32. 1. Normal urine output is 1–2 mL/kg/hour.

33. 3. Non-nutritive sucking will help console and pacify him.

34. 2. CaNaEDTA (treatment for lead poisoning) is nephrotoxic and strict I&O records need to be kept.

35. 2. A bathroom is irrelevant with an infant in diapers. A private room is necessary.

36. 3. All cleaners and poisons should be kept in high locked cabinets.

37. 2. The mode of transmission for hepatitis A is fecal-oral route or poor hygiene. Using gloves will prevent stool on the hands, as the mother also should wash the hands afterwards. Sexual activity is related to hepatitis B, a proper cleaning solution would be with bleach and water and visitors may hold the infant after washing hands to prevent infection to the infant.

38. 3. Mucomyst is the treatment of choice to bind with acetaminophen and help reduce levels.

39. 4. Stage I consists of tick bite followed by small erythematous papules that may be described as burning.

The Neurosensory System

VARIATIONS FROM THE ADULT

Brain and Spinal Cord

Size and Structure

A. Rapid head growth in early childhood: brain is 25% of adult weight at birth, 75% at 2 years, and 90% at 6 years.

B. Head growth results from development of nerve tracts within the brain and an increase in nerve fibers, not an increase in the number of neurons.

C. Infant's skull is not a rigid structure.
   1. Bones of skull are not fused until 18 months.
   2. Head circumference will increase with increase in intracranial volume in infants.
   3. Sutures may separate if there is significant gradual increase in intracranial volume up to age 12.

D. Fontanels ("soft spots"): areas of head not covered by skull
  1. Anterior fontanel
    a. Diamond-shaped opening at junction of parietal and frontal bones
    b. Closes between 9 and 18 months
  2. Posterior fontanel
    a. Triangular-shaped opening at junction of occipital and parietal bones
    b. Closes by 2 months
  3. Should feel flat and firm
  4. May be sunken with severe dehydration
  5. Will bulge with increased intracranial pressure (ICP)

Function

A. Cortical functions (e.g., fine motor coordination) are incompletely developed at birth.
B. The autonomic nervous system (ANS) is intact but immature.
  1. Infant has limited ability to control body temperature
  2. Infant's heart rate very sensitive to parasympathetic stimulation
C. Infant's behavior primarily reflexive
  1. Neurologic exam consists of evaluating reflexes
  2. Babinski's reflex normal in infant; disappears after child begins to walk
D. Peripheral neurons not myelinated at birth
  1. Myelination occurs in later infancy
  2. Motor skill development depends on myelinization
E. Infant usually demonstrates a dominance of flexor muscles; extremities will be flexed even when infant is sleeping
F. Small tremors are normal findings during first few months of life: not considered seizure activity if occurring in response to environmental stimuli, if they are not accompanied by abnormal eye movements, and if movements cease with passive flexion

Eye and Vision

A. Vision changes as the eye and eye muscles undergo physiologic change.
B. Visual function becomes more organized.
  1. Binocular vision developed by 4 months
  2. Maturation of eye muscles by 1 year
    a. Nystagmus common in infant
    b. Strabismus (eyes out of alignment when fixating on an object): due to imbalance in extraocular muscles, common up to 6 months, abnormal after 6 months
  3. Visual acuity changes
    a. 16 weeks: 20/50 to 20/100
    b. 1 year: 20/50+
    c. 2 years: 20/40
    d. 3 years: 20/30
    e. 4 years: nearly 20/20

Ear and Hearing

A. Hearing is fully developed at birth.
B. Abnormal physical structure of ears may indicate genetic problems (low-set ears often associated with renal problems or mental retardation).

ASSESSMENT

History

A. Most important part of neurologic evaluation
B. Family history: seizure disorders, degenerative neurologic diseases, mental retardation, sensory defects
C. History of pregnancy: maternal illness, placental dysfunction, fetal movements, nuchal cord, intrapartal fetal distress, prematurity, meconium staining, Apgar scores
D. Child's health history: delayed motor or speech development, hypotonia, seizures, childhood illnesses
E. Parental concerns: development, vision, hearing

Physical Examination

A. Inspect size and shape of head: note fontanels in infants, chart head circumference on growth chart.
B. Observe posture and activity: note flexed posture versus hypotonia or opisthotonos, symmetry of movement of extremities, excessive tremors or twitching, abnormal eye movements, ineffective suck or swallow, high-pitched cry.
C. Observe respiratory pattern: note apnea, ataxic breathing, asymmetric or paradoxic chest movement.
D. Determine developmental level with Denver II.
E. Vision tests
  1. Binocularity
    a. Corneal light reflex test: performed by shining a light at the bridge of the nose as the child looks straight ahead; light reflex should fall at the same point in both pupils; deviation indicates strabismus
    b. Cover/uncover test: Ask child to fix on an object. Cover one eye, assess uncovered eye movement. Uncover eye, assess that eye for movement. Repeat by covering the other eye. Normal response—no movement of either eye in response to cover/uncover maneuver.
  2. Visual acuity
    a. Snellen E chart or Blackbird cards for preschoolers
    b. Snellen alphabet chart for older children
  3. Peripheral vision
  4. Color vision

F. Auditory tests
  1. Audiometry: perception of sound
  2. Tympanometry: conduction of sound in middle ear
  3. Crib-o-gram: neonatal motor response to sound
  4. Conduction tests
  5. Newborn hearing screening: auditory evoked response

Laboratory/Diagnostic Tests

A. Same neurologic tests that are used in adults are used in children.
B. Child should be carefully prepared and informed of what to expect during the test.
C. Sedation may be necessary for tests requiring child to be immobile for extended period.
D. Positioning and immobilization is crucial to the success of lumbar puncture.

ANALYSIS

Nursing diagnoses for the child with a disorder of the nervous system may include:
A. Impaired physical mobility
B. Disturbed thought process
C. Disturbed sensory perceptions
D. Deficient knowledge
E. Pain
F. Compromised or disabled family coping
G. Risk for injury
H. Impaired verbal communication
I. Risk for impaired skin integrity

PLANNING AND IMPLEMENTATION

Goals

A. Child will be protected from injury.
B. Child will be free from signs and symptoms of increased intracranial pressure.
C. Normal respiratory function will be maintained.
D. Optimum developmental level will be achieved.
E. Family will be able to care for child at home.

Interventions

Care of the Child with Increased Intracranial Pressure

A. General information
  1. Intracranial volume and pressure can increase as a result of:
    a. Increased brain volume (cerebral edema, tumor)
    b. Increased cerebral blood volume (hematoma or hemorrhage)
    c. Increased cerebrospinal fluid (CSF) volume (hydrocephalus)
  2. Herniation of brain tissue: most serious complication of increased ICP; may result in life-threatening deterioration of vital functions
B. Medical management
  1. Directed toward reducing intracranial volume and controlling underlying disorder
  2. Drug therapy
    a. Osmotic diuretics (mannitol, glycerol) to reduce acute brain edema; for short-term use only
    b. Corticosteroids (dexamethasone) to reduce brain swelling
      1) May be used for longer periods than osmotic diuretics
      2) Antacids may be given concomitantly to prevent gastric irritation
  3. Fluid restriction, hyperventilation, temperature regulation may all be used to control increased ICP
  4. Surgery: if increased ICP caused by obstruction to CSF, shunt procedures may be performed
C. Assessment findings
  1. Infants
    a. Lethargy, poor feeding, anorexia, vomiting, or irritability
    b. High-pitched cry
    c. Tense, bulging fontanel; increased head circumference; separation of cranial sutures
  2. Children
    a. Anorexia, nausea, vomiting, irritability, or lethargy
    b. Headache, blurred vision, papilledema
    c. Separation of cranial sutures
  3. Late signs
    a. Altered level of consciousness
    b. Pupil dilation and sluggish response to light
    c. Tachycardia then bradycardia
    d. Altered respiratory rate then apnea
    e. Elevation in BP, increased pulse pressure
    f. Unstable temperature
D. Nursing interventions
  1. Administer medications as ordered.
    a. With osmotic diuretics, monitor fluid and electrolyte balance carefully.
    b. With corticosteroids, monitor for signs of gastric bleeding.
  2. Monitor hydration status carefully.
    a. Administer IV fluids as ordered, assess carefully for fluid overload.
    b. Assess for fluid and electrolyte imbalances.
    c. Monitor for hypovolemic shock if on strict fluid restriction.
  3. Assist with hyperventilation if ordered; monitor arterial blood gases (ABGs)

4. Assist with reduction of body temperature as needed.
   a. Administer antipyretics as ordered.
   b. Use sponge baths, hypothermia pads as necessary.
5. Monitor LOC and behavioral/mental changes carefully.
6. Elevate head of bed 30–45° unless contraindicated (e.g., possible spinal injury); keep neck in neutral alignment and avoid flexion.
7. Arrange nursing care activities to minimize stimulation and keep environment as quiet as possible.
8. Prepare for shunt surgery if needed.

EVALUATION

A. Head growth progresses normally, fontanels are flat, and seizure activity is controlled.
B. Child maintains an appropriate activity level.
C. Child is placed in an appropriate special program or school, if needed.
D. Parents demonstrate ability to perform treatments and administer appropriate medications.

DISORDERS OF THE NERVOUS SYSTEM

Disorders of the Brain and Spinal Cord

Hydrocephalus

A. General information
   1. Increased amount of CSF within the ventricles of the brain
   2. May be caused by obstruction of CSF flow or by overproduction or inadequate reabsorption of CSF
   3. May result from congenital malformation or be secondary to injury, infection, or tumor
   4. Classification
      a. Noncommunicating: flow of CSF from ventricles to subarachnoid space is obstructed.
      b. Communicating: flow is not obstructed, but CSF is inadequately reabsorbed in subarachnoid space, or excess CSF is produced.
B. Assessment findings: depend on age at onset, amount of CSF in brain
   1. Infant to 2 years: enlarging head size; bulging, nonpulsating fontanels; downward rotation of eyes; separation of cranial sutures; poor feeding, vomiting, lethargy, irritability; high-pitched cry and abnormal muscle tone
   2. Older children: changes in head size less common; signs of increased ICP (vomiting, ataxia, headache) common; alteration in consciousness and papilledema late signs
   3. Diagnostic tests
      a. Serial transilluminations detect increases in light areas
      b. CT scan shows dilated ventricles as well as presence of mass; with dye injection shows course of CSF flow
C. Nursing interventions: provide care for the child with increased ICP and for the child undergoing shunt procedures.

Shunts

A. General information (See Figure 5–2)
   1. Insertion of a flexible tube into the lateral ventricle of the brain
   2. Catheter is then threaded under the skin and the distal end positioned in the peritoneum (most common type) or the right atrium; a subcutaneous pump may be attached to ensure patency
   3. Shunt drains excess CSF from the lateral ventricles of the brain in communicating or noncommunicating hydrocephalus; fluid is

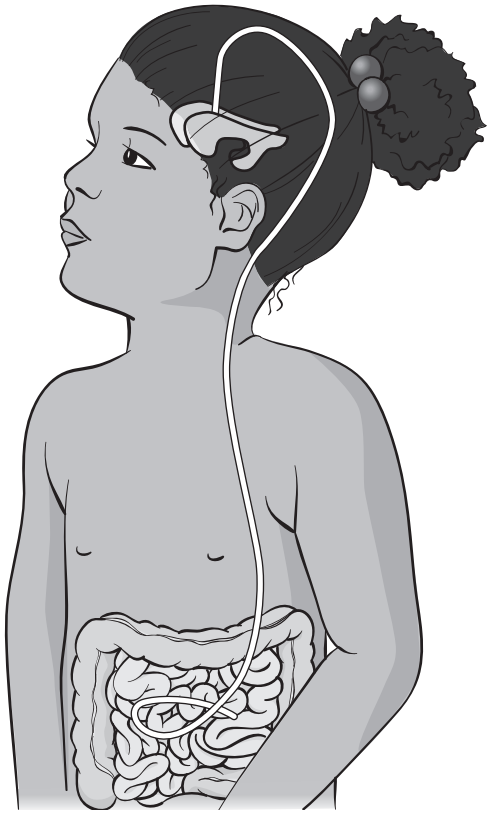


Figure 5–2 Ventriculoperitoneal shunt

then absorbed by the peritoneum or enters the general circulation via the right atrium

B. Nursing interventions
- **1.** Provide routine pre-op care with special attention to monitoring neurologic status.
- **2.** Provide post-op care.
  - **a.** Maintain patency of the shunt.
    - **1)** Position child off the operative site.
    - **2)** Pump the shunt as ordered.
    - **3)** Observe for signs of infection of the incision.
    - **4)** Observe for signs of increased ICP.
    - **5)** Position the child with head slightly elevated or as ordered.
- **3.** Instruct parents regarding:
  - **a.** Wound care, positioning of infant, and how to pump the shunt
  - **b.** Signs of infection
  - **c.** Signs of increased ICP
  - **d.** Need for repeated shunt revisions as child grows or if shunt becomes blocked or infected
  - **e.** Expected level of developmental functioning
  - **f.** Availability of support groups and community agencies

Spina Bifida (Myelodysplasia)

A. General information
- **1.** Failure of posterior vertebral arches to fuse during embryologic development
- **2.** Incidence: 2 in 1,000 infants in the United States
- **3.** Although actual cause is unknown, frequency of the defect is increased if a sibling has had a neural tube defect; radiation, viral, and environmental factors; and maternal folic acid deficiency have been suggested as causative.
- **4.** Site of the defect varies
  - **a.** Approximately 85% of the defects in the spine involve the lower thoracic lumbar or sacral area.
  - **b.** Defects in the upper thoracic and cervical regions make up the remaining 15%.
- **5.** Folic acid supplementation can decrease risk.

B. Types
- **1.** Spina bifida occulta
  - **a.** Spinal cord and meninges remain in the normal anatomic position.
  - **b.** Defect may not be visible, or may be identified by a dimple or a tuft of hair on the spine.
  - **c.** Child is asymptomatic or may have slight neuromuscular deficit.
  - **d.** No treatment needed if asymptomatic; otherwise treatment aimed at specific symptoms.
- **2.** Spina bifida cystica
  - **a.** *Meningocele* (see Figure 5-3)

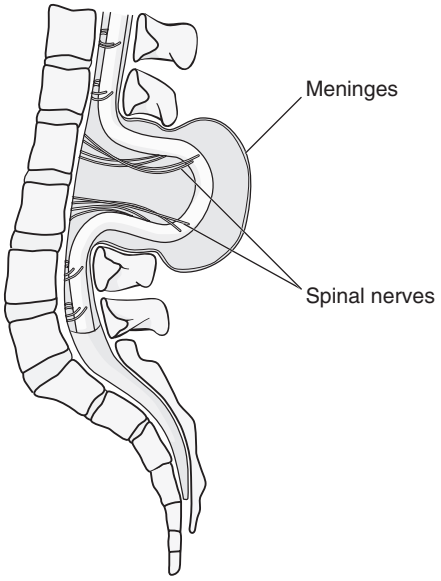


Figure 5-3 Illustration of meningomyelocele

    - **1)** Sac (meninges) filled with spinal fluid protrudes through opening in spinal canal; sac is covered with thin skin
    - **2)** No nerves in sac
    - **3)** No motor or sensory loss
    - **4)** Good prognosis after surgery
  - **b.** Myelomeningocele/meningomyelocele
    - **1)** Same as meningocele except there are spinal nerves in the sac (herniation of dura and meninges).
    - **2)** Child will have sensory/motor deficit below site of the lesion.
    - **3)** 80% of these children have multiple handicaps.

C. Medical management
- **1.** Surgery
  - **a.** Closure of the sac within 48 hours of birth to prevent infection and preserve neural tissue
  - **b.** Shunt procedure if accompanying hydrocephalus
  - **c.** Orthopedic procedures to correct defects of hips, knees, or feet
- **2.** Drug therapy
  - **a.** Antibiotics for prevention of infections.
  - **b.** Anticholinergic drugs to increase bladder capacity and lower intravesicular pressure.
- **3.** Immobilization (casts, braces, traction) for defects of the hips, knees, or feet.

D. Assessment findings
- **1.** Examine the defect for size, level, tissue covering, and CSF leakage.
- **2.** Motor/sensory involvement may include:
  - **a.** Voluntary movement of lower extremities
  - **b.** Withdrawal of lower extremities or crying after pinprick

c. Paralysis of lower extremities
d. Joint deformities
e. Hydrocephalus
f. Evaluate bowel and bladder function. Neurogenic bowel and bladder occur in up to 90% of the children.

3. Diagnostic tests
a. Prenatal
1) Ultrasound image of the pregnant uterus shows fetal spinal defect and sac
2) Amniocentesis: increased alphafetoprotein (AFP) level prior to 18th week of gestation
b. Postbirth
1) X-ray of spine shows vertebral defect; CT scan of skull may show hydrocephalus
2) Myelogram shows extent of neural defect
3) Encephalogram may show hydrocephalus
4) Urinalysis, culture and sensitivity (C&S) may identify organism and indicate appropriate antibacterial therapy
5) BUN may be increased
6) Creatinine clearance rate may be decreased

E. Nursing interventions
1. Prevent trauma to the sac.
a. Cover with sterile dressing soaked with normal saline.
b. Position infant prone or side-lying.
c. Keep the area free from contamination by urine or feces. A protective barrier drape may be necessary.
d. Inspect the sac for intactness or signs of infection.
e. Administer antibiotics as ordered.

2. Prevent complications.
a. Observe for signs of hydrocephalus, meningitis, joint deformities.
b. Clean intermittent urinary catheterization to manage neurogenic bladder.
c. Administer medications to prevent urinary complications as ordered.
d. Perform passive ROM exercises to lower extremities.

3. Provide adequate nutrition: adapt diet and feeding techniques according to the child's position.
4. Provide sensory stimulation.
a. Adjust objects for visual stimulation according to child's position.
b. Provide stimulation for other senses.

5. Provide emotional support to parents/family.
6. Provide client teaching and discharge planning to parents concerning
a. Wound care
b. Physical therapy, range of motion exercises
c. Signs of complications
d. Medication regimen: schedule, dosage, effects, and side effects
e. Feeding, diapering, positioning
f. Availability of appropriate support groups/community agencies/genetic counseling

Meningitis

See Unit 4.

Encephalitis

See Unit 4.

Reye's Syndrome

A. General information
1. An acute encephalopathy with fatty degeneration of the liver
2. Reye's syndrome is a true pediatric emergency: cerebral complication may reach an irreversible state
3. Increased ICP secondary to cerebral edema is major factor contributing to morbidity and mortality
4. Early recognition and prompt management reducing mortality
5. Etiology unknown; links with aspirin have been suspected but not proven

B. Medical management
1. Proper initial staging essential.
2. Treatment is supportive, based on stage of coma and level of blood ammonia.
3. Treatment should take place in a pediatric intensive care unit.

C. Assessment findings
1. Child appears to be recovering from a viral illness, such as influenza or chickenpox, during which salicylates have been administered; symptoms then appear that follow a definite pattern, which has led to clinical staging.
a. Stage I: sudden onset of persistent vomiting, fatigue, listlessness
b. Stage II: personality and behavior changes, disorientation, confusion, hyperreflexia
c. Stage III: coma, decorticate posturing
d. Stage IV: deeper coma, decerebrate rigidity
e. Stage V: seizures, absent deep tendon reflexes, respiratory reflexes, flaccid paralysis

2. Pathophysiologic changes include
a. Increased free fatty acid level
b. Hyperammonemia due to reduction of enzyme that converts ammonia to urea
c. Impaired liver function
d. Structural changes of mitochondria in muscle and brain tissue
e. Significant swelling of the brain

D. Nursing interventions (depend on stage)
- **1.** Stage I: assess hydration status: monitor skin turgor, mucous membranes, I&O, urine specific gravity; maintain IV therapy.
- **2.** Stages I-V: assess neurologic status: monitor LOC, pupils, motor coordination, extremity movement, orientation, posturing, seizure activity.
- **3.** Stages II-V
  - **a.** Assess respiratory status: note changing rate and pattern, presence of circumoral cyanosis, restlessness, agitation.
  - **b.** Assess circulatory status: frequent vital signs, note neck vein distension, skin color and temperature, abnormal heart sounds.
  - **c.** Support child/family.
    - **1)** Explain all treatments and procedures.
    - **2)** Incorporate family members in treatment as applicable.
    - **3)** Organize regular family and client-care conferences.
    - **4)** Use support services as needed.
    - **5)** Educate family on over-the-counter medications containing aspirin (i.e., Alka-Seltzer, Bufferin, Pepto-Bismol).
  - **d.** Provide additional parental and community education to ensure early recognition and treatment.

Seizure Disorders

A. General information
- **1.** Seizures: recurrent sudden changes in consciousness, behavior, sensations, and/or muscular activities beyond voluntary control that are produced by excess neuronal discharge
- **2.** Epilepsy: chronic recurrent seizures
- **3.** Incidence higher in those with family history of idiopathic seizures
- **4.** Cause unknown in 75% of epilepsy cases
- **5.** Seizures may be symptomatic or acquired, caused by:
  - **a.** Structural or space-occupying lesion (tumors, subdural hematomas)
  - **b.** Metabolic abnormalities (hypoglycemia, hypocalcemia, hyponatremia)
  - **c.** Infection (meningitis, encephalitis)
  - **d.** Encephalopathy (lead poisoning, pertussis, Reye's syndrome)
  - **e.** Degenerative diseases (Tay-Sachs)
  - **f.** Congenital CNS defects (hydrocephalus)
  - **g.** Vascular problems (intracranial hemorrhage)
- **6.** Pathophysiology
  - **a.** Normally neurons send out messages in electrical impulses periodically, and the firing of individual neurons is regulated by an inhibitory feedback loop mechanism
  - **b.** With seizures, many more neurons than normal fire in a synchronous fashion in a particular area of the brain; the energy generated overcomes the inhibitory feedback mechanism
- **7.** Classification (Table 5-6)
  - **a.** Generalized: initial onset in both hemispheres, usually involves loss of consciousness and bilateral motor activity
  - **b.** Partial: begins in focal area of brain and symptoms are related to a dysfunction of that area; may progress into a generalized seizure, further subdivided into simple partial or complex partial

B. Medical management
- **1.** Drug therapy (refer to Anticonvulsants)
  - **a.** Phenytoin (Dilantin)
    - **1)** Often used with phenobarbital for its potentiating effect
    - **2)** Inhibits spread of electrical discharge
    - **3)** Side effects include gum hyperplasia, hirsutism, ataxia, gastric distress, nystagmus, anemia, sedation
  - **b.** Phenobarbital: elevates the seizure threshold and inhibits the spread of electrical discharge
- **2.** Surgery: to remove the tumor, hematoma, or epileptic focus

C. Assessment findings
- **1.** Clinical picture varies with type of seizure (see Table 5-6)
- **2.** Diagnostic tests
  - **a.** Blood studies to rule out lead poisoning, hypoglycemia, infection, or electrolyte imbalances
  - **b.** Lumbar puncture to rule out infection or trauma
  - **c.** Skull X-rays, CT scan, or ultrasound of the head, brain scan, arteriogram, or pneumoencephalogram to detect any pathologic defects
  - **d.** EEG may detect abnormal wave patterns characteristic of different types of seizures
    - **1)** Child may be awake or asleep; sedation is ordered and child may be sleep deprived the night before the test
    - **2)** Evocative stimulation: flashing strobe light, clicking sounds, hyperventilation

D. Nursing interventions
- **1.** During seizure activity
  - **a.** Protect from injury.
    - **1)** Prevent falling, gently support head.
    - **2)** Decrease external stimuli; do not restrain.
    - **3)** Do not use tongue blades (they add additional stimuli).
    - **4)** Loosen tight clothing.
  - **b.** Keep airway open.
    - **1)** Place in side-lying position.
    - **2)** Suction excess mucus.

Table 5–6 Types of Seizures

Type of Seizure	Clinical Findings
Generalized seizures	
Major motor seizure (grand mal)	May be preceded by aura; tonic and clonic phases. *Tonic phase:* limbs contract or stiffen; pupils dilate and eyes roll up and to one side; glottis closes, causing noise on exhalation; may be incontinent; occurs at same time as loss of consciousness; lasts 20–40 seconds. *Clonic phase:* repetitive movements, increased mucus production; slowly tapers. Seizure ends with postictal period of confusion, drowsiness.
Absence seizure (petit mal)	Usually nonorganic brain damage (petit mal) present; must be differentiated from daydreaming. Sudden onset, with twitching or rolling of eyes; lasts a few seconds.
Myoclonic seizure	Associated with brain damage, may be precipitated by tactile or visual sensations. May be generalized or local. Brief flexor muscle spasm; may have arm extension, trunk flexion. Single group of muscles affected; involuntary muscle contractions; myoclonic jerks.
Akinetic seizure (tonic)	Related to organic brain damage. Sudden brief loss of postural tone, and temporary loss of consciousness.
Febrile seizure	Common in 5% of population under 5, familial, nonprogressive; does not generally result in brain damage. Seizure occurs only when fever is rising. EEG is normal 2 weeks after seizure.
Partial seizure	
Psychomotor seizure	May follow trauma, hypoxia, drug use. Purposeful but inappropriate, repetitive motor acts. Aura present; dreamlike state.
Simple partial seizure	Seizure confined to one hemisphere of brain. No loss of consciousness. May be motor, sensory, or autonomic symptoms.
Complex partial seizure	Begins in focal area but spreads to both hemispheres. Impairs consciousness. May be preceded by an aura.
Status epilepticus	Usually refers to generalized grand mal seizures. Seizure is prolonged (or there are repeated seizures without regaining consciousness) and unresponsive to treatment. Can result in decreased oxygen supply and possible cardiac arrest.

c. Observe and record seizure.
  1) Note any preictal aura.
    a) Affective signs: fear, anxiety
    b) Psychosensory signs: hallucinations
    c) Cognitive signs: "déjà-vu" symptoms
  2) Note nature of the ictal phase.
    a) Symmetry of movement
    b) Response to stimuli; LOC
    c) Respiratory pattern
  3) Note postictal response: amount of time it takes child to orient to time and place; sleepiness.

2. Provide client teaching and discharge planning concerning:
  a. Care during a seizure
  b. Need to continue drug therapy
  c. Safety precautions/activity limitations
  d. Need to wear Medic-Alert identification bracelet or carry identification card
  e. Potential behavioral changes and school problems
  f. Availability of support groups/community agencies
  g. How to assist the child in explaining disorder to peers
  h. Inform parents that Ketogenic diet has had success (diet limits intake of proteins and carbohydrates)

Cerebral Palsy (CP)

A. General information
  1. Neuromuscular disorder resulting from damage to or altered structure of the part of the brain responsible for controlling motor function
  2. Incidence: 1.5–5 in 1,000 live births
  3. May be caused by a variety of factors resulting in damage to the CNS; possible causes include:
    a. Prenatally: genetic, altered neurologic development, or infection, trauma, or anoxia to mother (toxemia, rubella, accidents, chorioamnionitis)

b. Perinatally: during the birth process (drugs at delivery, precipitate delivery, fetal distress, breech deliveries with delay)
c. Postnatally: kernicterus or head trauma (child falls out of crib or is hit by a car)

B. Medical management
1. Drug therapy
   a. Antianxiety agents
   b. Skeletal muscle relaxants
   c. Local nerve blocks
2. Physical/occupational therapy
3. Speech/audiology therapy
4. Surgery: muscle- and tendon-releasing procedures

C. Assessment findings: disease itself does not progress once established; progressive complications, however, cause changes in signs and symptoms
1. Spasticity: exaggerated hyperactive reflexes (increased muscle tone, increase in stretch reflex, scissoring of legs, poorly coordinated body movements for voluntary activities)
   a. Occurs with pyramidal tract lesion
   b. Found in 40% of all CP
   c. Results in contractures
   d. Also affects ability to speak: altered quality and articulation
   e. Loud noise or sudden movement causes reaction with increased spasm
   f. No parachute reflex to protect self when falling
2. Athetosis: constant involuntary, purposeless, slow, writhing motions
   a. Occurs with extrapyramidal tract (basal ganglia) lesion
   b. Found in 40% of all CP
   c. Athetosis disappears during sleep; therefore, contractures do not develop
   d. Movements increase with increase in physical or emotional stress
   e. Also affects facial muscles
3. Ataxia: disturbance in equilibrium; diminished righting reflex (lack of balance, poor coordination, dizziness, hypotonia)
   a. Occurs with extrapyramidal tract (cerebellar) lesion
   b. Found in 10% of all CP
   c. Muscles and reflexes are normal
4. Tremor: repetitive rhythmic involuntary contractions of flexor and extensor muscles
   a. Occurs with extrapyramidal tract (basal ganglia) lesion
   b. Found in 5% of all CP
   c. Interferes with performance of precise movements
   d. Often a mild disability
5. Rigidity: resistance to flexion and extension resulting from simultaneous contraction of both agonist and antagonist muscle groups
   a. Occurs with extrapyramidal tract (basal ganglia) lesion
   b. Found in 5% of all CP
   c. Diminished or absent reflexes
   d. Potential for severe contractures
6. Associated problems
   a. Mental retardation: the majority of CP clients are of normal or higher than average intelligence, but are unable to demonstrate it on standardized tests; 18–50% have some form of mental retardation
   b. Hearing loss in 13% of CP clients
   c. Defective speech in 75% of CP clients
   d. Dental anomalies (from muscle contractures)
   e. Orthopedic problems from contractures or inability to mobilize
   f. Visual disabilities in 28% due to poor muscle control
   g. Seizures
   h. Disturbances of body image, touch, perception
   i. Feelings of worthlessness

D. Nursing interventions
1. Obtain a careful pregnancy, birth, and childhood history.
2. Observe the child's behavior in various situations.
3. Assist with activities of daily living (ADL), help child to learn as many self-care activities as possible; CP clients cannot do any task unless they are consciously aware of each step in the task; careful teaching and demonstration is essential.
4. Provide a safe environment (safety helmet, padded crib).
5. Provide physical therapy to prevent contractures and assist in mobility (braces if necessary).
6. Provide client teaching and discharge planning concerning:
   a. Nature of disease: CP is a nonfatal, noncurable disorder
   b. Need for continued physical, occupational, and speech therapy
   c. Care of orthopedic devices
   d. Provision for child's enrollment or return to school
   e. Availability of support groups/community agencies

Tay-Sachs Disease

A. General information
1. Degenerative brain disease, caused by absence of hexosaminidase A from all body tissues
2. Autosomal recessive inheritance
3. Occurs predominantly in children of Eastern European Jewish ancestry
4. A fatal disease; death usually occurs before age 4

B. Assessment findings
  1. Progressive lethargy in a previously healthy 2- to 6-month-old infant
  2. Loss of developmental accomplishments
  3. Loss of visual acuity
  4. Hyperreflexia, decerebrate posturing, dysphagia, malnutrition, seizures
  5. Diagnosis confirmed by classic cherry-red spot on the macula and by enzyme measurements in serum, amniotic fluid, or white cells

C. Nursing interventions
  1. Support parents at time of diagnosis; help them cope with feelings of anger and guilt.
  2. Assist parents in planning long-term care for the child.
  3. Provide genetic counseling and psychologic follow-up as needed.

Disorders of the Eye

Blindness

A. Causes
  1. Genetic disorders: Tay-Sach's disease, inborn errors of metabolism
  2. Maternal infections during pregnancy: TORCH syndrome
  3. Perinatal: prematurity, retrolental fibroplasia
  4. Postnatal: trauma, childhood infections

B. Medical management: treatment of causative disorders

C. Assessment findings
  1. Vacant stare; obvious failure to look at objects
  2. Rubbing eyes, tilting head, examining objects very close to the eyes
  3. Does not reach for objects (over 4 months)
  4. Does not smile when mother smiles (over 3 months) but does smile in response to mother's voice
  5. Crawls or walks into furniture (over 12 months)
  6. Does not respond to the motions of others
  7. No concept of the look of an object, no concept of color or reflection of self
  8. Other senses become more keenly developed to compensate
  9. Unable to copy the actions of others; delayed motor milestones in accomplishing tasks but are not mentally handicapped
  10. Various degrees (20/200 O.U. and worse)

D. Nursing interventions
  1. For hospitalized child, find out parents' usual method of care.
  2. Encourage infant to be active; use multisensory stimulation (rocking, water play, musical toys, touch).
  3. From ages 2–5 arrange environment for maximum autonomy and safety (e.g., avoid foods with seeds and bones).
  4. Speak before you touch the child, announce what you plan to do.
  5. Do not rearrange furniture without first telling child.
  6. For a partially sighted child
    a. Encourage child to sit in front of classroom.
    b. Speak directly to child's face; do not look down or turn back.
    c. Use large print and provide adequate nonglare lighting.
    d. Use contrasting colors to help locate areas.
  7. Provide client teaching and discharge planning concerning:
    a. General child care, with adaptations for safety and developmental/functional level
    b. Availability of support groups/community agencies
    c. Special education programs
    d. Interaction with peers: assist child as necessary

Conjunctivitis

A. General information: infection of membrane covering anterior surface of eye globe and inner surface of eyelid due to multiple causes (bacterial, viral, allergic)

B. Medical management: ophthalmic antibiotics, steroids, anesthetics

C. Assessment findings: weeping eye, reddened conjunctiva, sensitivity to light, eyelid stuck shut with exudate

D. Nursing interventions
  1. Administer medications as ordered: apply ophthalmic antibiotic ointments from inner to outer canthus (do not let container touch eye).
  2. Provide client teaching and discharge planning concerning measures to prevent spread of infection
    a. Very contagious if bacterial or viral; no school until antibiotics have been taken for 24–48 hours
    b. Should not share pillows, tissues, toys
    c. Good hand-washing technique
    d. Medication regimen: schedule, dosage, desired and side effects

Disorders of the Ear

Deafness

A. Causes
  1. Conductive: interference in transmission from outer to middle ear from chronic otitis media, foreign bodies
  2. Sensorineural: dysfunction of the inner ear; damage to cranial nerve VIII (from rubella, meningitis, drugs)

B. Medical management
  1. Treatment of causative disorders
  2. Speech/auditory therapy

3. Hearing aids
4. Surgery, depending on the cause
   a. Cochlear implant for neural deafness

C. Assessment findings
1. Infant
   a. Fails to react to loud noises (does have a Moro reflex, but not to noise)
   b. Makes no attempt to locate sound
   c. Remains in babbling stage or ceases to babble
   d. Fails to develop speech
   e. Startled by sudden appearances
2. All children
   a. Respond only when speaker's lips are visible
   b. Cannot concentrate for long on visual images; constantly scan the surroundings for change
   c. May have slow motor development
   d. Appear puzzled or withdrawn, or strain to hear
   e. Use high volume on TV/radio
3. Audiologic testing
   a. Slight hearing deficit: difficulty hearing faint sounds, very little interference in school, no speech defect, benefits from favorable seating
   b. Mild hearing deficit: can understand conversational speech at 3–5 feet when facing the other person, decreased vocabulary, may miss half of class discussions
   c. Marked hearing deficit: misses most of conversation, hears loud noises, needs special education for language skills

D. Nursing interventions
1. Speak slowly, not more loudly.
2. Face child.
3. Get child's attention before talking; let child see you before performing any care.
4. Get feedback from child to make sure child has understood.
5. Decrease outside noises that could interfere with child's ability to discern what you are saying.
6. Be careful not to cover your mouth with hands.
7. Teach language through visual cues, touch, and kinesthetics.
8. Use body demonstrations or use doll play.
9. Provide appropriate stimulation (puppets and musical toys are inappropriate).
10. Provide client teaching and discharge planning concerning:
    a. General child care, with adaptation for safety and developmental/functional levels
    b. Availability of support groups/community agencies
    c. Special education programs
    d. Care and use of hearing aids, cochlear implant equipment
    e. Interaction with peers: assist child as needed

Otitis Media

A. General information
1. Bacterial or viral infection of the middle ear
2. More common in infants and preschoolers as the ear canal is shorter and more horizontal than in older children; also found in children with cleft lip/palate
3. Blockage of eustachian tube causes lymphedema and accumulation of fluid in the middle ear

B. Medical management
1. Drug therapy
   a. Systemic and otic antibiotics
   b. Analgesics/antipyretics
2. Surgery: myringotomy, with or without insertion of tubes (incision into the tympanic membrane to relieve the pressure and drain the fluid)

C. Assessment findings
1. Dysfunction of eustachian tube
2. Ear infection usually related to respiratory infection
3. Increased middle ear pressure; bulging tympanic membrane
4. Pain; infant pulls or touches ear frequently
5. Irritability; cough; nasal congestion
6. Diagnostic tests: C&S of fluid reveals causative organism

D. Nursing interventions
1. Administer antibiotics as ordered, for a full 10-day course. When administering ear drops pull earlobe up and back for children older than 3 years and down and back if younger.
2. Administer acetaminophen for fever and discomfort.
3. Administer decongestants to relieve eustachian tube obstruction as ordered.
4. Provide care for child with a myringotomy tube insertion (day surgery)
   a. Child should wear earplugs when swimming, showering, or having hair washed; do not permit diving.
   b. Be aware that tubes may fall out for no reason.
5. Provide client teaching and discharge planning concerning:
   a. Medication administration
   b. Post-op care, depending on the type of surgery

Sample Questions

40. An infant who was born with a myelomeningocele with accompanying hydrocephalus has had a shunt procedure to alleviate the hydrocephalus. The baby should be placed in which of the following positions?

1. Trendelenburg.
2. Supine.
3. Lithotomy.
4. Prone.

41. The nurse is caring for an infant who is born with hydrocephalus and has a shunt inserted. Which of the following signs indicates that the shunt is functioning properly?
1. The sunset sign.
2. A bulging anterior fontanel.
3. Decreasing daily head circumference.
4. Widened suture lines.

42. A 13-year-old has been diagnosed as having epilepsy. What would be a positive sign that the child is taking his Dilantin properly?
1. Hair growth on his upper lip.
2. Absence of seizures.
3. Lowered hemoglobin and hematocrit.
4. Drowsiness.

43. A 3-year-old is admitted with a diagnosis of viral meningitis. During an initial assessment, what would the nurse expect to find?
1. Headache, fever, and petechiae.
2. Seizures, lethargy, and hypothermia.
3. Pallor, anorexia, and bulging fontanels.
4. Fever, irritability, and nuchal rigidity.

44. To meet the sensory need of a child with viral meningitis, what should be included in the nursing strategies?
1. Minimizing bright lights and noise.
2. Promoting active range of motion.
3. Increasing environmental stimuli.
4. Avoiding physical contact with family members.

45. When addressing the emotional needs of the parents of a young child with meningitis, what should be the primary focus?
1. Assuming all responsibility for physical care of the child.
2. Providing reassurance that the symptoms will resolve within the week.
3. Reinforcing information about the child's condition and plan of treatment.
4. Explaining the importance of an optimistic outlook when interacting with their child.

46. A child who had meningitis is being discharged. What should be included in the discharge teaching?
1. Engaging a tutor to assist with learning problems.
2. Administering the prescribed antibiotic.
3. Notifying the physician if the child's fever or headache persists more than a few days after discharge.
4. Encouraging the child to resume normal activities immediately.

47. A 6-year-old is brought to the emergency department unconscious after being hit by a car. What information will be most helpful for the nurse performing the neurological examination of the child?
1. Normal growth and development.
2. The child's usual behavior and status.
3. The child's past medical history.
4. The child's growth and developmental progress during infancy.

48. The nurse is assessing a child who has a head injury for the occulocephalic reflex (doll's eyes). What will the nurse observe about the child's eyes if this condition is present?
1. Move in the same direction in which his head is turned.
2. Move in the direction opposite to which his head is turned.
3. Remain midline when his head is turned.
4. Move to the medial aspect of the orbit when his head is turned.

49. The pupils of a child with a head injury are dilated and react sluggishly. What occurrence is this indicative of?
1. Barbiturate overdosage.
2. Damage to the diencephalon.
3. Damage to the sympathetic system.
4. Damage to the parasympathetic system.

50. A 4-year-old female is admitted to the pediatric intensive care unit (PICU) after suffering a severe closed head injury following a car accident. An intracranial pressure (ICP) monitor is in place and reveals an ICP of 40 mm Hg. In an effort to lower the ICP, what position will the nurse know is the *best* position for the client?
1. Supine with the head turned to the right.
2. Supine with the head turned to the left.
3. Supine with the head midline.
4. Side-lying on the right with the head turned to the left.

51. A 5-year-old female is admitted to the PICU after being hit by a car while riding her bike. She

sustained a severe closed head injury and has an ICP monitor in place. Her ICP is 40 mm Hg and mannitol is ordered. What is the rationale for administering mannitol for a child with an increased ICP?

1. It will produce a rise in the intravascular osmolality, resulting in a shift of free water from the interstitial and cellular spaces to the intravascular space, thus decreasing the ICP.
2. It will produce a decrease in the intravascular osmolality, resulting in a shift of free water from the interstitial and cellular spaces to the intravascular space, thus decreasing the ICP.
3. It will produce a rise in the intravascular osmolality, resulting in a shift of free water from the intravascular space to the cellular space, thus decreasing the ICP.
4. It will produce a decrease in the intravascular osmolality, resulting in a shift of free water from the interstitial space to the cellular space, thus decreasing the ICP.

52. An infant who has a ventriculoperitoneal (VP) shunt in place for treatment of hydrocephalus is hospitalized for potential shunt malfunction. When developing the plan of care, which of the following assessment findings would the nurse list as a *positive* sign of shunt malfunction?

1. Overriding sutures.
2. Bulging, tense anterior fontanel.
3. Flat, soft anterior fontanel.
4. Consistent head circumference.

53. A male newborn was just admitted to the pediatric floor with a myelomeningocele. When developing the preoperative plan of care, the nurse lists "high risk for infection of and trauma to the nonepithelialized lesion" as the diagnosis of most concern. What would be the *most effective* strategy to prevent infection and trauma to the lesion?

1. Leave the lesion uncovered and open to the air and place the baby supine.
2. Cover the lesion with sterile, saline-soaked gauze and place the baby prone.
3. Apply lotion to the lesion and place the baby on his side.
4. Cover the lesion with dry sterile gauze and place the baby supine.

54. The nurse has been giving instructions to parents on measures to prevent Reye's syndrome. When questioning the parents on a safe medication to provide to their child during a viral illness, which choice indicates that they understand steps toward Reye's syndrome prevention?

1. Pepto-Bismol.
2. Acetaminophen (Tylenol).
3. Children's aspirin.
4. Ritalin.

55. The nurse is caring for a 5-year-old boy with a known seizure disorder. On entering his room, the nurse sees that he is experiencing a generalized, tonic-clonic seizure. What would be the nurse's first response?

1. Immediately leave the room to retrieve intravenous (IV) phenobarbital.
2. Place a metal spoon between his teeth to prevent him from biting his tongue.
3. Position him on his side to maintain a patent airway.
4. Try to hold the client down.

56. When assessing a client who is taking hydantoin (Dilantin), the nurse would recognize which of the following findings as side effects?

1. Drowsiness and irritability.
2. Slurred speech and increased salivation.
3. Hair loss and tremor.
4. Gum hyperplasia and nystagmus.

57. A 12-year-old girl with cerebral palsy has severe language deficits and poor muscle coordination. However, she can voluntarily turn her head from side to side and her mother reports that she has normal intelligence. The nurse is concerned with the child's ability to call when help is needed. Considering the child's abilities, which of the following would be the *best* way for her to call the nurse?

1. Kick the side rails of the bed.
2. Scream loudly.
3. Press the call bell with her fingers.
4. Press a large, padded call bell with her cheek.

58. The nurse is teaching a child how to prevent the spread of conjunctivitis. Which statement by the child would indicate further instruction is necessary?

1. "It is important that I wash my hands regularly."
2. "I can use a tissue to clean my eyes, but must throw it away immediately."
3. "I need to use my own washcloth and towel, not my sister's."
4. "My Dad said he would carry a handkerchief with him so I could wipe my eyes with it during the day."

59. A woman brings her daughter to the pediatric clinic because she is concerned that the child has otitis media. On examination, the nurse would recognize which of the following findings as the *most common* positive sign of otitis media?

1. Temperature of 39°C (102.2°F) and loss of appetite.
2. Pearly gray tympanic membrane and rhinorrhea.
3. Pain on pressure on the tragus and edema within the canal.
4. Feeling of "fullness" in the ear and a popping sensation during swallowing.

Answers and Rationales

40. 4. Pressure must be kept off the spinal sac.

41. 3. With improved draining of the CSF, the head circumference should become smaller.

42. 2. Phenytoin (Dilantin) is an antiepileptic drug that controls seizures. Absence of seizures indicates the client is taking the medication properly.

43. 4. The clinical symptoms of viral (aseptic) meningitis include fever, irritability, and stiffness of the neck (nucchal rigidity). Other symptoms include drowsiness, photophobia, weakness, painful extremities, and sometimes seizures. Aseptic meningitis usually resolves within 2 weeks.

44. 1. Photophobia and hypersensitivity to environmental stimuli are common clinical manifestations of meningeal irritation and infection. Comfort measures include providing an environment that is quiet and has minimal stressful stimuli.

45. 3. Successful coping in times of anxiety and stress requires that the nurse be available to provide information that validates parental right to know and participation in their child's care.

46. 3. Parents should be instructed to contact the physician if the child's symptoms worsen or persist. The child recovering from viral meningitis should show signs of feeling better a week after discharge.

47. 2. The child's usual behavior and level of development is what provides critical baseline information about his pretrauma neurological condition.

48. 2. The occulocephalic reflex occurs if, when the head of an unconscious child is turned rapidly in one direction, the eyes move in the opposite direction.

49. 4. When dilated pupils react sluggishly to light or are nonreactive, it is an indication that there has been damage to the parasympathetic nervous system, which controls the pupillary constriction response.

50. 3. The client's head must be kept in midline to facilitate venous return. Clients with a severe closed head injury have low intracranial compliance and turning of the head may result in an increase of ICP of 10–15 mm Hg. The head of bed (i.e., 30°) should be determined individually for each client based on the ICP and cerebral perfusion pressure (CPP) as well as the clinical appearance.

51. 1. A shift in fluid from the interstitial and cellular space to the intravascular space will occur with a rise in intravascular osmolality, the fluid will then be diuresed resulting in a decreased ICP.

52. 2. This is a common sign of shunt malfunction. The best way to assess an infant's fontanel is when the infant is upright and calm. In this position, a fontanel that is bulging and firm to light palpation is considered abnormal.

53. 2. The lesion must be kept moist with sterile, saline-soaked gauze. The prone position should be maintained preoperatively to prevent tension on the lesion and minimize trauma.

54. 2. Acetaminophen does not contain salicylates, which have been suspected as an ingredient that can lead to Reye's syndrome.

55. 3. The first priority is to maintain a patent airway. The best position for the client during a seizure is on his side.

56. 4. Hydantoin (Dilantin) may cause gum hyperplasia and nystagmus. Other side effects include hirsutism, ataxia, diplopia, anorexia, nausea, nervousness, and folate deficiency.

57. 4. She is able to control her head movements voluntarily. A large padded call bell could easily be pressed when she turns her head to the side.

58. 4. The eye should be wiped with disposable tissues after a single use and no other

individual should be exposed to items that come in contact with the infected eye.

59. 1. Common signs of otitis media include fever (as high as 40°C [104°F]), postauricular and cervical lymph gland enlargement, rhinorrhea, vomiting, diarrhea, loss of appetite, and red tympanic membrane. Infants become irritable, hold their ears, and roll their head from side to side. Young children verbally complain of pain. A concurrent respiratory or pharyngeal infection may also be present.

The Cardiovascular System

VARIATIONS FROM THE ADULT

Fetal Circulation

A. Fetal circulation differs from adult circulation in several ways and is designed to ensure a high-oxygen blood supply to the brain and myocardium.

B. Characteristics
- **1.** Placenta is the source of oxygen for the fetus.
- **2.** Fetal lungs receive less than 10% of the blood volume; lungs do not exchange gas.
- **3.** Right atrium of fetal heart is the chamber with the highest oxygen concentration.

C. Pattern of altered blood flow and facilitating structures
- **1.** Blood is carried from the placenta through the umbilical vein and enters the inferior vena cava through the ductus venosus.
- **2.** This permits most of the highly oxygenated blood to go directly to the right atrium, bypassing the liver.
- **3.** This right atrial blood flows directly into the left atrium through the foramen ovale, an opening between the right and left atria.
- **4.** From the left atrium, blood flows into the left ventricle and aorta, through the subclavian arteries, to the cerebral and coronary arteries, resulting in the brain and heart receiving the most highly oxygenated blood.
- **5.** Deoxygenated blood returns from the head and arms through the superior vena cava, enters the right atrium, and passes into the right ventricle.
- **6.** Blood from the right ventricle flows into the pulmonary artery, but because fetal lungs are collapsed, the pressure in the pulmonary artery is very high.
- **7.** Because pulmonary resistance is high, most of the blood passes into the distal aorta through the ductus arteriosus, which connects the pulmonary artery and the aorta distal to the origin of the subclavian arteries.
- **8.** From the aorta, blood flows to the rest of the body.

Normal Circulatory Changes at Birth

A. When the umbilical cord is clamped or severed, the blood supply from the placenta is cut off, and oxygenation must then take place in the newborn's lungs.

B. As the lungs expand with air, the pulmonary artery pressure decreases and circulation to lungs increases.

C. Structural changes
- **1.** Ductus venosus: after the umbilical cord is severed, flow through the ductus venosus decreases and eventually ceases; it constricts within 3–7 days after birth and eventually becomes ligamentum venosum.
- **2.** Foramen ovale
  - **a.** Functional closure of this valvelike opening occurs when pressure in the left atrium exceeds pressure in the right.
  - **b.** Expansion of the pulmonary artery causes a drop in pulmonary artery pressure and in right atrial and ventricular pressure.
  - **c.** At the same time there is increased pulmonary blood flow to the left atrium and increased aortic pressure (from clamping of the umbilical cord), which in turn raises left ventricular and left atrial pressure.
  - **d.** Anatomic closure of the foramen ovale occurs within the first weeks after birth with the deposit of fibrin.
- **3.** Ductus arteriosus
  - **a.** Increase in aortic blood flow increases aortic pressure and decreases right-to-left shunt through the ductus arteriosus; shunt becomes bidirectional.
  - **b.** Increased pulmonary blood flow increases arterial oxygen, causing vasoconstriction of ductus arteriosus within hours of birth.
  - **c.** Functional closure occurs when this constriction causes cessation of blood flow, usually 24 hours after birth.
  - **d.** Anatomic closure occurs when there is growth of fibrous tissue in the lumen of the ductus arteriosus, by 1–3 weeks.

Abnormal Circulatory Patterns after Birth

A. Normal blood flow in the child may be disrupted as a result of abnormal openings between the pulmonary and systemic circulations.
B. Any time there is a defect connecting systemic and pulmonary circulation, blood will go from high to low pressure (the path of least resistance).
  1. Normally pressure is higher in the systemic circulation, so blood will be shunted from systemic to pulmonary (left to right).
  2. An obstruction to pulmonary blood flow, however, may cause increased pressure proximal to the site of the obstruction.
  3. With an obstruction to pulmonary blood flow, as well as an opening between ventricles, the blood flow may be right to left (if right-sided pressure exceeds left-sided pressure).

ASSESSMENT

Overview

A. Approximately 40,000 babies are born with congenital heart disease (CHD) in the United States yearly.
B. One third of these babies will be seriously ill at birth, one third will have problems detected during childhood or later, and one third never have problems.
C. Etiology is multifactional.

History

A. Family history: parental history of CHD, congenital defects in siblings, history of genetic problems in family.
B. History of pregnancy: rubella, viral infections, medications, X-ray exposure, alcohol ingestion, cigarette smoking.
C. Child's health history
  1. Presenting problem: symptoms may include:
    a. Feeding problems: fatigue, irritability, tachypnea, profuse sweating
    b. Failure to thrive
    c. Respiratory difficulties: tachypnea, difficulty breathing, frequent respiratory infections
    d. Color changes: pallor, cyanosis (persistent or intermittent)
    e. Activity intolerance
    f. All presenting symptoms must be explored within a developmental framework
  2. Past medical history: rheumatic fever; associated chromosomal abnormalities (e.g., Down syndrome)

Physical Examination

A. Plot height and weight on growth chart; measure respiratory rate and rhythm; inspect for chest enlargement or asymmetry.
B. Inspect for presence of cyanosis: lips, mucous membranes, extremities.
C. Inspect for clubbing of fingers (thought to be caused by increased capillary formation and soft tissue fibrosis).
D. Observe for distended veins.
E. Palpate/percuss quality and symmetry of pulses, size of liver and spleen, presence of thrill over heart during expiration.
F. Auscultate for heart rate and rhythm.
G. Auscultate for abnormal heart sounds and murmurs; murmurs are caused by abnormal flow of blood between chambers or vessels; classified as:
  1. Innocent: no anatomic or physiologic abnormality
  2. Functional: no anatomic defect, but may be caused by a physiologic abnormality
  3. Organic: caused by a structural abnormality
H. Measure blood pressure in both arm and thigh.
  1. In infants under 1 year, arm and thigh blood pressure should be the same.
  2. In children over 1 year, systolic pressure in leg is usually higher by 10–40 mm Hg.
  3. A wide pulse pressure (greater than 50 mm Hg) or a narrow pulse pressure (less than 10 mm Hg) may be associated with a heart defect.
I. Select proper blood pressure cuff size.
  1. Too small a cuff can give a falsely elevated BP reading
  2. Bladder inside the cuff should be two thirds the length of the upper arm

Laboratory/Diagnostic Tests

A. Chest X-ray
B. Cardiac fluoroscopy
C. Magnetic resonance imaging (MRI)
D. Electrocardiogram
E. Echocardiography
F. Hematologic testing: polycythemia is often associated with cyanotic heart defects
G. Cardiac catheterization
  1. Femoral vein often used for access
  2. Catheter threaded into right side of the heart since septal defects permit entry into the left side
  3. Nursing care: pretest
    a. Child's preparation should be based on developmental level, level of understanding, and past experience.
    b. Use doll play and pictures as appropriate.
    c. Describe sensations child will feel in simple terms.
    d. Administer medications as ordered.
  4. Nursing care: posttest
    a. Check extremity distal to the catheterization site for color, temperature, pulse, capillary refill.
    b. Keep extremity distal to the catheterization site extended for 6 hours.

c. Check pressure dressing over catheterization site for bleeding.
d. Monitor heart rate for signs of bradycardia, tachycardia, and dysrhythmia.
e. Monitor for transient temperature elevation due to physiologic dehydration (NPO, contrast media).
f. Monitor urine output and BP.

ANALYSIS

Nursing diagnoses for the child with a disorder of the cardiovascular system may include:

A. Delayed growth and development
B. Risk for injury: physiologic
C. Imbalanced nutrition: less than body requirements
D. Fear/anxiety
E. Risk for infection
F. Deficient knowledge
G. Decreased cardiac output
H. Excess fluid volume

PLANNING AND IMPLEMENTATION

Goals

A. Tissue will be adequately oxygenated.
B. Child will achieve normal growth and development milestones.
C. Child will be free from symptoms of complications of heart disease.
D. Parents will understand child's condition.
E. Parents will be able to care for child at home.

Interventions

Care of the Child with Heart Failure (HF)

A. General information
  1. Usually due to a surgically correctable structural abnormality of the heart that results in increased blood volume and pressure or increased pulmonary blood flow
  2. A symptom complex reflecting the heart's inability to meet the metabolic demands of the body
B. Medical management
  1. Directed toward improvement of cardiac function and energy conservation
  2. Drug therapy
    a. Digitalis to improve myocardial contractility and slow the heart rate
    b. ACE inhibitors to decrease cardiac afterload
    c. Diuretics to decrease total body water and to increase urine output
    d. Potassium supplement if diuretic is potassium depleting
  3. High-caloric formula or nasogastric feedings may be required to meet nutritional needs
C. Assessment findings
  1. Tachycardia, gallop rhythm, cardiomegaly, decreased peripheral pulses, and mottling of the extremities
  2. Tachypnea, retractions, grunting, nasal flaring, cough, cyanosis, orthopnea
  3. Hepatomegaly, edema, distended neck and peripheral veins, decreased urine output
  4. Failure to thrive, decreased exercise tolerance
D. Nursing interventions
  1. Decrease energy expenditure
    a. Frequent rest periods
    b. Small, frequent feedings
    c. Minimize crying
    d. Prevent cold stress
  2. Provide adequate nutrition
    a. Estimate daily caloric requirement
    b. Use soft nipple
    c. Consider gavage feeding if necessary
  3. Monitor fluid status
    a. I&O, specific gravity
    b. Daily weight
  4. Administer medications as ordered
    a. Digoxin
      1) Check dosage with another RN
      2) Give 1 hour before feeding or 2 hours after feeding
      3) Take apical pulse for 1 minute; if bradycardia is present, hold dose and contact physician
      4) Monitor serum potassium levels; if less than 3.5 mEq/liter, may be contraindicated
      5) Monitor therapeutic effects; therapeutic serum digoxin levels range from 0.8 to 2.0 ng/mL.
      6) Monitor for toxicity: nausea, anorexia, vomiting, lethargy, bradycardia
      7) Parent/child teaching
    b. ACE inhibitors—also monitor BP
    c. Diuretic (see Table 2-17)
      1) I&O
      2) Daily weight
      3) Monitor side effects: dehydration, electrolyte imbalance especially hypokalemia (potentiates digoxin and may lead to toxicity)
      4) Parent/child teaching
  5. Provide adequate rest
  6. Prevent infections
  7. Promote growth and development
  8. Reduce respiratory distress
    a. Position in semi- or high-Fowler's position
    b. Knee-chest position for children with tetralogy of Fallot

EVALUATION

A. Child demonstrates optimal cardiac status.
  1. Normal color
  2. No respiratory distress
  3. Increased exercise tolerance
  4. Satisfactory growth
B. Child has no evidence of complications.
C. Parents demonstrate ability to care for child, perform necessary treatments, and administer prescribed medications.

DISORDERS OF THE CARDIOVASCULAR SYSTEM

Congenital Heart Defects

See Figure 5-4.

Classification

A. Defects associated with increased pulmonary blood flow

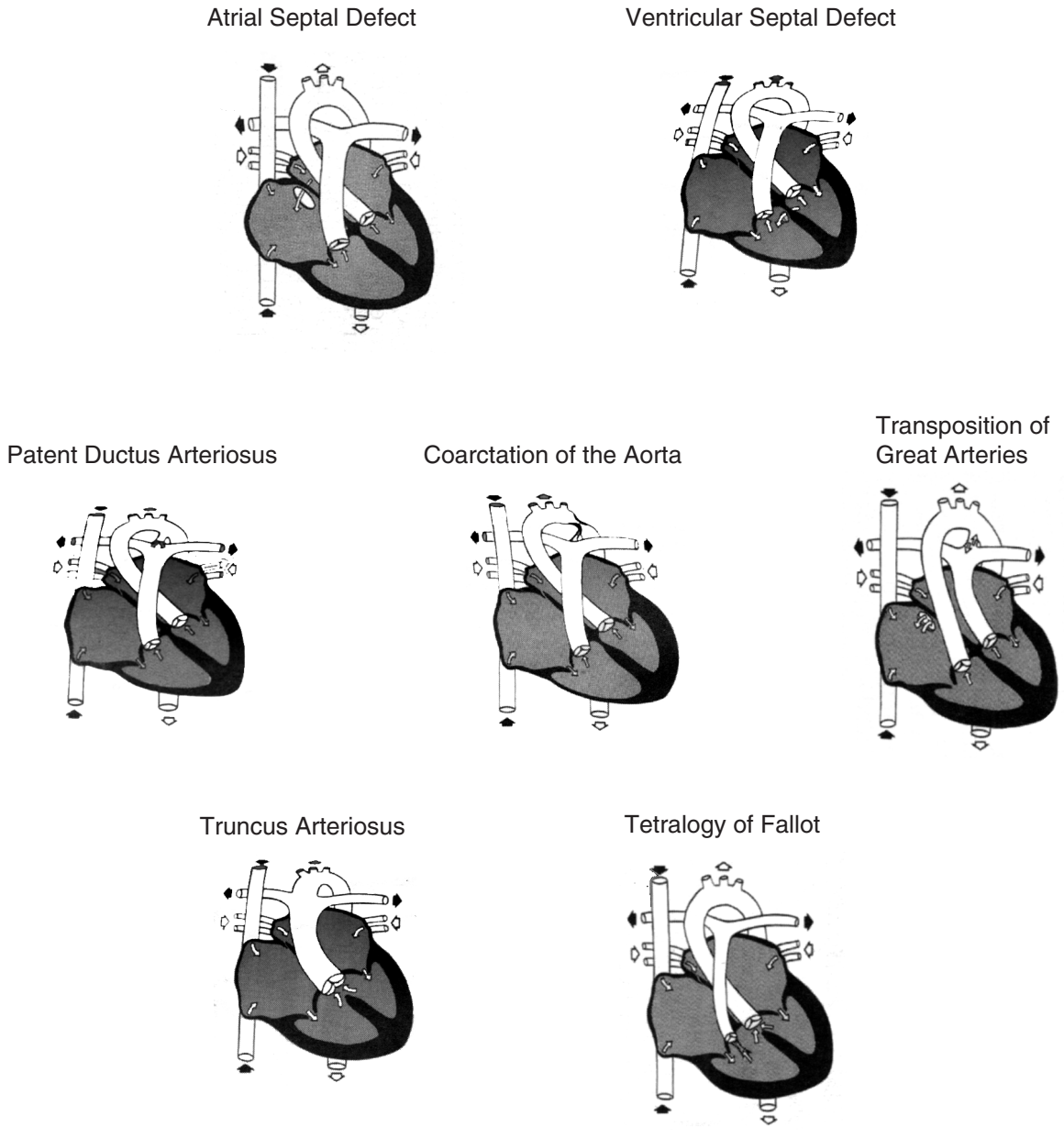


Figure 5-4 Congenital heart abnormalities

1. Left-to-right shunting of blood across a septal defect or blood vessel (higher left side heart pressure)
2. Pulmonary overcirculation and increased work of ventricles, possible right ventricular hypertrophy
3. Risk for heart failure
4. Usually acyanotic
5. Examples: atrial septal defect, ventricular septal defect, patent ductus arteriosus, atrioventricular canal (also called endocardial cushion defect)

B. Defects associated with decreased pulmonary blood flow
1. Right-to-left shunting of blood due to presence of a defect and obstruction of pulmonary blood flow (obstructed pulmonary flow leads to higher right side heart pressure)
2. Some or most blood does not enter the pulmonary circulation and does not pick up oxygen in the lungs; instead, blood is shunted to the left side of the heart
3. Deoxygenated as well as oxygenated blood circulated to the body
4. Cyanosis and hypoxemia present
5. Example: tetralogy of Fallot

C. Defects causing obstruction to cardiac chamber outflow
1. Narrowing of outflow tract from heart to blood vessels
2. Increased work of heart as it strains to push blood out
3. Risk for heart failure and poor cardiac output
4. Examples: coarctation of the aorta, pulmonic stenosis, aortic stenosis

D. Defects associated with mixing of saturated and desaturated blood
1. Oxygenated and deoxygenated blood mixes in heart chambers
2. Increased pulmonary blood flow due to defect
3. Hypoxemia and cyanosis present, often severe
4. Risk for poor cardiac output and risk for heart failure (HF).
5. Examples: transposition of the great vessels (also called transposition of the great arteries), truncus arteriosus, hypoplastic left heart syndrome

Increased Pulmonary Blood Flow

A. General information and medical management
1. Atrial septal defect (ASD): opening between right and left atria with left-to-right shunting of blood
   a. 15% of congenital heart defects
   b. Manifestations dependent on age and size and location of defect.
   c. Small lesions may be asymptomatic until childhood.
   d. Dyspnea, tachycardia, growth failure, HF may be present. Systolic pulmonary ejection murmur present.
   e. Surgical repair includes patching of defect—open heart/cardiopulmonary bypass procedure. Some defects plugged during cardiac catheterization.
2. Ventricular septal defect (VSD): opening in ventricular septum with left-to-right shunting of blood
   a. 25% of congenital heart defects.
   b. Manifestations dependent on age, size of defect, and degree of pulmonary vascular resistance. Usually found in infancy.
   c. Small lesions may be asymptomatic; may close spontaneously.
   d. With large lesions, higher pressure in ventricles results in high degree of shunting.
   e. Risk for right ventricular hypertrophy, HF, bacterial endocarditis, pulmonary problems.
   f. Dyspnea, tachycardia, growth failure, HF, frequent respiratory infections common. Harsh systolic murmur at lower left sternal border present.
   g. Surgical repair includes suturing or patching of defect using open heart/cardiopulmonary bypass procedure, usually done in infancy. Primary (complete) repair is preferred.
   h. Occasionally, surgical palliation with pulmonary artery banding for severely ill infants, with complete repair when infant is more stable. Banding decreases blood flow through pulmonary artery: decreases pressure difference between right and left ventricles to decrease left-to-right shunting of blood across defect.
3. Patent ductus arteriosus (PDA): failure of fetal ductus arteriosus to close after birth
   a. 10% of congenital heart defects in term infants, more common in preterm infants.
   b. Blood vessel connecting pulmonary artery and aorta.
   c. Higher pressure in aorta results in left-to-right shunting of blood from aorta to pulmonary circulation.
   d. Manifestations depend on size of defect. Small lesions may be asymptomatic.
   e. Risk for HF.
   f. May have bounding pulses and visible precordial pulsations (especially preterm infants). Continuous machine-like murmur at upper left sternal border.
   g. Administration of indomethacin may close defect in preterm infants.
   h. If indomethacin fails, or if not a preterm infant, surgical ligation of vessel (closed

heart procedure) or mechanical occlusion of vessel.

4. Atrioventricular canal (AV canal): combination septal defect resulting in large opening between right and left atria and ventricles and defects of valves.
   a. Most common cardiac defect in children with Down syndrome.
   b. High degree of left-to-right shunting of blood.
   c. HF commonly develops. Pulmonary flow murmurs and valvular murmurs present.
   d. Open heart/cardiopulmonary bypass surgical repair.

B. Assessment findings in conditions with increased pulmonary blood flow
1. Poor feeding, anorexia
2. Growth failure, poor weight gain
3. Respiratory difficulties: tachypnea, dyspnea, orthopnea, coughing, wheezing, hoarseness, grunting, nasal flaring, retractions, frequent respiratory infections
4. Exercise intolerance, fatigue, lethargy, excessive sweating with feeding or activity
5. Signs/symptoms of heart failure
6. Cardiac murmur

C. Nursing interventions
1. Prepare child/family for diagnostic studies, surgery.
2. Administer medications as ordered. See HF.
3. Ensure adequate nutrition.
   a. Anticipate infant hunger to prevent crying and increased oxygen demands.
   b. Small, frequent feedings/small frequent, nutritious meals if child.
   c. Feed infants in semi-upright position.
   d. Soft nipple to decrease fatigue during infant feedings. Gavage feedings may be necessary.
   e. Burp frequently during bottle and breast feedings.
   f. Observe for tolerance of feedings if high-calorie formula or breast milk fortifier used: vomiting, diarrhea.
   g. Assist breastfeeding mothers.
   h. Monitor growth.
4. Monitor vital signs.
5. Provide rest.
   a. Quiet age-appropriate play if HF present.
   b. Cluster care to provide periods of undisturbed rest.
   c. Anticipate needs; prevent crying.
6. Position semi-upright if HF or respiratory difficulty present.
7. Prevent infections.
8. Meet age-appropriate developmental needs.
9. Bacterial endocarditis antibiotic prophylaxis for unrepaired ASD, VSD, PDA, and all other congenital heart defect before or after repair. Give prescribed antibiotic 1 hour before dental, genitourinary tract, and surgical procedures. Will be required throughout life.
10. Teach care to family.

Decreased Pulmonary Blood Flow

A. General information and medical management
1. Tetralogy of Fallot (TOF)
   a. Most common congenital heart defect causing cyanosis and hypoxemia; 10% of all congenital heart defect.
   b. Four associated defects: pulmonary stenosis, VSD, overriding aorta (also called dextropositioned aorta), right ventricular hypertrophy.
   c. Pulmonary stenosis creates obstruction to outflow of blood from right ventricle to pulmonary artery, causing decreased pulmonary blood flow. Increased right ventricle pressure creates right-to-left shunt. Right-shifted aorta sits over VSD so blood from both right and left ventricles flows into aorta.
   d. Aorta carries mixed oxygenated and deoxygenated blood to body.
   e. Manifestations include low oxygen saturation, cyanosis, polycythemia, activity intolerance, fatigue, poor feeding, poor growth, harsh systolic murmur along left sternal border, hypercyanotic spells (also called TET spells), also signs of chronic hypoxia.
   f. Hypercyanotic spells: occur when oxygen demand exceeds supply.
      1) Transient obstruction of pulmonary blood flow.
      2) Increasing cyanosis, tachypnea, poor muscle tone, loss of consciousness. May progress to seizures, CVA, death.
      3) Often precipitated by crying, feeding, defecation.
      4) Treat by placing in knee-chest position, give oxygen, morphine, occasionally propranolol.
   g. Surgical repair includes open heart/cardiopulmonary bypass procedure to patch VSD and relieve stenosis. Palliative surgery to increase pulmonary blood flow includes anastomosis of right or left subclavian artery to pulmonary artery (Blalock-Taussig shunt).

B. Assessment findings in conditions with decreased pulmonary blood flow
1. Low oxygen saturation
2. Cyanosis
3. Polycythemia (chronic hypoxemia results in increased production of RBCs)
4. Clubbing of digits (chronic hypoxia)
5. Poor feeding, anorexia, fatigue, activity intolerance, growth failure, weak cry

6. Squatting: increases systemic vascular resistance and improves pulmonary blood flow (not seen frequently due to early repair of cardiac defects)
7. Hypercyanotic (TET) spells
8. Tachycardia, tachypnea, dyspnea
9. Cardiac murmur
10. Risk for emboli, bacterial endocarditis

C. Nursing interventions
1. Squatting: observe only. No other intervention needed unless distress develops.
2. Cluster care. Provide age-appropriate quiet activities. Promote uninterrupted rest.
3. Provide oxygen as needed.
4. Prevent crying; anticipate needs.
5. Monitor vital signs.
6. Support nutrition (see interventions for increased pulmonary blood flow).
7. Prepare child/family for diagnostic tests and surgery.
8. Administer medications as ordered.
9. Bacterial endocarditis prophylaxis as noted earlier.
10. For hypercyanotic spells, place in knee-chest position, administer oxygen, prepare to administer morphine.
11. Meet age-appropriate developmental needs.
12. Teach care to parents.

Obstruction to Outflow

A. General information and medical management
1. Coarctation of the aorta: narrowing of a portion of aorta, usually near aortic arch beyond left subclavian artery
   a. Decreased blood flow to lower part of body, more blood shunted to arms and head.
   b. Manifestations dependent on degree of narrowing, include arm blood and pulse pressures greater than in legs, strong brachial and diminished femoral pulses, lower body cooler than upper. In older children, dizziness, headaches, fainting, epistaxis occur.
   c. Risk for heart failure, hypertension, rupture of aorta, CVA.
   d. Vascular surgery to remove narrowed portion or repair with graft.
2. Pulmonic stenosis: narrowed pulmonic valve opening
   a. Minor to moderate narrowing may be asymptomatic.
   b. Severe narrowing causes increased work of right ventricle and ventricular hypertrophy.
   c. Manifestations: cyanosis, systolic thrill, systolic ejection murmur at upper left sternal border.
   d. Repair includes balloon angioplasty to dilate stenosed area or surgical valvotomy.
3. Aortic stenosis: narrowed aortic valve
   a. Increased resistance to left ventricular blood outflow into aorta.
   b. Leads to left ventricular hypertrophy, left-sided heart failure.
   c. Manifestations include faint pulses, tachycardia, hypotension, poor feeding, exercise intolerance, aortic murmur.
   d. Repair: balloon angioplasty or valvotomy.

B. Assessment findings: HF, cardiac murmur; also see individual defects

C. Nursing interventions
1. Monitor for hypotension.
2. Monitor for HF.
3. Monitor for cyanosis and hypoxemia in children with pulmonic stenosis.
4. Prepare child and family for diagnostic/therapeutic procedures and surgery.
5. Support nutrition as noted earlier.
6. Promote rest as noted earlier.
7. Administer medications as ordered.
8. Bacterial endocarditis prophylaxis as noted earlier.
9. Meet age-appropriate developmental needs.
10. Teach care to parents.

Lesions with Mixing of Saturated and Desaturated Blood

A. General information and medical management
1. Transposition of the great vessels (transposition of the great arteries): aorta emerges from right ventricle and pulmonary artery emerges from left ventricle.
   a. Essentially two independent circulations:
      1) Unoxygenated blood from right ventricle exits to aorta, goes to body and returns to right atrium without flowing to lungs.
      2) Oxygenated blood exits left ventricle to pulmonary arteries, goes to lungs, and returns to left atrium.
   b. Incompatible with life unless there is communication between left and right sides of heart (usually through foramen ovale or PDA).
   c. Manifestations include neonatal cyanosis, hypoxemia, systolic murmur.
   d. Treatment includes administration of Prostaglandin E to maintain patency of ductus arteriosus, balloon atrial septostomy (also called Rashkind procedure) during cardiac catheterization to improve mixing of blood in atria.
   e. Surgical repair: arterial switching procedure in newborn period or installation of atrial baffle to direct venous blood to left ventricle and oxygenated blood to right ventricle (Senning and Mustard procedures) in older children (rarely used).

2. Truncus arteriosus: failure of embryonic blood vessel to divide into aorta and pulmonary artery results in one large vessel positioned over both ventricles.
   a. Has associated large VSD.
   b. Both oxygenated and deoxygenated blood flow to systemic circulation; blood flow and pressure in pulmonary circulation are increased.
   c. Manifestations include cyanosis, growth failure, activity intolerance, HF.
   d. Treatment includes digoxin and diuretics for HF.
   e. Surgical repair includes open heart/cardiopulmonary bypass procedure to close VSD, incorporate trunk into left ventricle, grafting of right and left pulmonary arteries to right ventricle.
3. Hypoplastic left heart syndrome: poorly developed left side of heart, including hypoplastic left ventricle, aortic valve atresia or mitral valve atresia, narrowed ascending aorta and aortic arch.
   a. Some oxygenated blood flows from left atrium across foramen ovale to right atrium, enters pulmonary circulation, and flows across PDA into aorta.
   b. Clinical manifestations include progressive cyanosis, pallor, weak or absent pulses, HF, shock.
   c. Treatment includes administration of Prostaglandin E to maintain PDA, administration of medications to support blood pressure and cardiac function.
   d. Usually fatal without surgery or heart transplantation.
      1) Norwood procedure (palliative): connect pulmonary artery and aorta, create ASD, allows mixed blood to get to tissues.
      2) Repair includes intracardiac redirection of blood flow (Fontan procedure) involving open heart/cardiopulmonary bypass technique.
      3) Heart transplant may be performed.

B. Assessment findings in conditions with mixing of oxygenated and deoxygenated blood
1. Cyanosis and hypoxemia
2. Tachycardia, dyspnea, tachypnea
3. Cardiac murmur
4. Poor feeding, growth failure, activity intolerance, weak cry, lethargy
5. Varying degrees of HF
6. Polycythemia
7. Clubbing of digits
8. Risk for bacterial endocarditis, emboli, stroke

C. Nursing interventions
1. Prepare child/family for diagnostic procedures and surgery.
2. Assess vital signs and assess for poor cardiac output.
3. Monitor infants receiving Prostaglandin E for apnea, hypotension, hypothermia.
4. Cluster care to provide periods of uninterrupted rest.
5. Provide oxygen as ordered.
6. Prevent crying; anticipate needs.
7. Support nutrition (see interventions for increased pulmonary blood flow).
8. Bacterial endocarditis prophylaxis as noted earlier.
9. Meet age-appropriate developmental needs.
10. Teach care to parents.

Cardiac Surgery

A. General information
1. Surgical correction of congenital defects within the heart, or surgery of the great vessels in the immediate area surrounding the heart
2. Open-heart surgery (uses cardiopulmonary bypass): provides a relatively blood-free operative site; heart-lung machine maintains gas exchange during surgery
3. Closed-heart surgery does not use cardiopulmonary bypass machine; indicated for ligation of a patent ductus arteriosus or coarctation of the aorta

B. Nursing interventions: preoperative
1. Determine the child's level of understanding; have child draw a picture, tell you a story, or use doll play.
2. Correct misunderstandings/teach the child about the surgery using diagrams and play therapy; use terms appropriate to developmental level.
3. Accompany the child to the operating and recovery rooms and the intensive care unit, explaining the various equipment; allow child to handle/experience it, if possible, and introduce staff and clients, depending on child's developmental/emotional levels.
4. Have child practice post-op procedures (turning, coughing, deep breathing, etc.).
5. Include parents in teaching sessions, but have separate sessions for the parents only.
6. Establish pre-op baseline data for vital signs, activity/sleep patterns, I&O.

C. Nursing interventions: postoperative
1. Prevent injury/complications.
   a. Monitor vital signs and circulatory pressure readings frequently until stable. Monitor ECG.
   b. Assess neurologic status frequently.
   c. Observe surgical site for intactness/drainage.
2. Promote gas exchange (client may be on mechanical ventilation).
   a. Position as ordered.
   b. Administer oxygen at prescribed rate.
   c. Provide humidification.

d. Suction as necessary.
e. Perform postural drainage and chest percussion as ordered.
f. Turn, cough, and deep breathe hourly.
g. Perform routine care of chest tubes and drainage system, depending on the type of surgery.

3. Monitor I&O.
4. Provide nutrition as ordered.
5. Provide alternative means of communication if mechanical ventilation is used, e.g., picture cards.
6. Provide psychologic support of the child/family.
7. Allow activity as tolerated.
8. Provide client teaching and discharge planning concerning:
a. Need for child/family to express feelings/fears
b. Resumption of ADL
c. Assisting child in dealing with peers/returning to school
d. Referral for parents to support groups/community agencies

Acquired Heart Disease

Rheumatic Fever (RF)

A. General information
1. An inflammatory disorder that may involve the heart, joints, connective tissue, and the CNS
2. Peaks in school-age children; linked to environmental factors and family history of disorder
3. Thought to be an autoimmune disorder
a. Preceded by an infection of group A beta-hemolytic streptococcus (usually a strep throat); the heart itself is not infected, however.
b. Antigenic markers for strep toxin closely resemble markers for heart valves; this resemblance causes antibodies made against the strep to also attack heart valves.

4. Prognosis depends on degree of heart damage
B. Medical management
1. Drug therapy
a. Penicillin
1) Used in the acute phase
2) Used prophylactically for several years after the attack
3) Erythromycin substituted if child is sensitive to penicillin

b. Salicylates: for analgesic, anti-inflammatory, antipyretic effect
c. Steroids: for anti-inflammatory effect

2. Decrease cardiac workload: bed rest until lab studies return to normal
C. Assessment findings
1. Major symptoms (Jones' criteria)
a. Carditis
1) Seen in 50% of clients
2) Aschoff nodules (areas of inflammation and degeneration around heart valves, pericardium, and myocardium)
3) Valvular insufficiency of mitral and aortic valves possible
4) Cardiomegaly
5) Shortness of breath, hepatomegaly, edema

b. Polyarthritis
1) Migratory, therefore no contractures develop
2) Most common in large joints, which become red, swollen, painful
3) Synovial fluid is sterile
4) No arthralgia

c. Chorea (Sydenham's chorea, St. Vitus' dance): CNS disorder characterized by abrupt, purposeless, involuntary muscular movements
1) Gradual, insidious onset: starts with personality change or clumsiness
2) Mostly seen in prepubertal girls
3) May appear months after strep infection
4) Movements increase with excitement
5) Lasts 1–3 months

d. Subcutaneous nodules
1) Usually a sign of severe disease
2) Occur with active carditis
3) Firm, nontender nodes on bony prominences of joints
4) Lasts for weeks

e. Erythema marginatum: transient, nonpruritic rash starting with central red patches that expand; results in series of irregular patches with red, raised margins and pale centers (resemble giraffe spots)

2. Minor symptoms
a. Reliable history of RF, fever
b. Recent history of strep infection
c. Diagnostic tests: erythrocyte sedimentation rate (ESR) and antistreptolysin O (ASO) titer increased; changes on ECG

D. Nursing interventions
1. Carditis
a. Administer penicillin as ordered.
1) Used prophylactically to prevent future attacks of strep and further damage to the heart
2) To be taken until age 20 or for 5 years after attack, whichever is longer

b. Promote bed rest until ESR returns to normal.

2. Arthritis: administer aspirin as ordered, change child's position in bed frequently.

3. Chorea
   a. Decrease stimulation.
   b. Provide a safe environment: no forks with meals, assistance with mobility.
   c. Provide small, frequent meals; increased muscle activity causes increased kcal requirements.
4. Nodules and rash: none.
5. Alleviate child's anxiety about the ability of heart to continue to function.
6. Prevent recurrent infection.
7. Minimize boredom with age-appropriate sedentary play.
8. Provide client teaching and discharge planning concerning:
   a. Adaptation of home environment to promote bed rest (commode, call bell, diversional activities)
   b. Importance of prophylactic medication regimen
   c. Diet modification in relation to decreased activity/cardiac demands
   d. Avoidance of reinfections
   e. Home-bound education
   f. Availability of community agencies

Sample Questions

60. A 4-year-old with tetralogy of Fallot is seen in a squatting position near his bed. What would be the nurse's response?
1. Administer oxygen.
2. Take no action if he looks comfortable but continue to observe him.
3. Pick him up and place him in Trendelenburg's position in bed.
4. Have him stand up and walk around the room.

61. A 2-month-old is suspected of having coarctation of the aorta. What is a cardinal sign of this defect?
1. Clubbing of the digits and circumoral cyanosis.
2. Pedal edema and portal congestion.
3. Systolic ejection murmur.
4. Upper extremity hypertension.

62. When assessing the apical heart rate in infants and toddlers, where is the point of maximal impulse (PMI) located?
1. Between the third and fourth left intercostal space.
2. Between the fourth and fifth left intercostal space.
3. At the fifth intercostal space to the right of the midclavicular line.
4. In the aortic area.

63. A 2-week-old infant has a patent ductus arteriosus. Prior to administering digoxin, which action by the nurse would be correct?
1. Take the apical pulse for 30 seconds and multiply by 2.
2. Give the medication if his pulse is 92, but notify the physician.
3. Take the radial pulse for 1 full minute.
4. Give the medication after finding that the apical pulse is 135 beats/minute.

64. The nurse is planning care for a 2-week-old infant who has a congenital heart defect. Which of the following actions are appropriate? Select all that apply.
_____ Using a soft "preemie" nipple for feedings.
_____ Providing passive stimulation.
_____ Allowing him to cry to promote increased oxygenation.
_____ Placing him in orthopneic position.

65. A 10-year-old has been hospitalized for 2 weeks with rheumatic fever. The child's mother questions whether her other children can catch the rheumatic fever. What is the nurse's best response?
1. "The fact that you brought your child to the hospital early enough will decrease the chance of your other children getting it."
2. "It is caused by an autoimmune reaction and is not contagious."
3. "You appear concerned that your child's disease is contagious."
4. "Your other children should be taking antibiotics to prevent them from catching rheumatic fever."

66. A 10-year-old child is admitted with rheumatic fever. In addition to carditis, for what other problem would the nurse assess?
1. Arthritis.
2. Bronchitis.
3. Malabsorption.
4. Oliguria.

67. An infant's blood pressure is reported to be very high. What is the most appropriate nursing action to take?
1. Take it again in 20 minutes.
2. Call the nursing supervisor.

3. Measure the cuff width to the infant's arm.
4. Prepare to give an antihypertensive.

68. Prior to discharge from the newborn nursery at 48 hours old, the nurse knows that murmurs are frequently assessed and are most often due to which factor?
1. A ventricular septal defect.
2. Heart disease of the newborn period.
3. Transition from fetal to pulmonic circulation.
4. Cyanotic heart disease.

69. A 10-year-old with a ventricular septal defect (VSD) is going to have a cardiac catheterization. Which of the following needs to be a high priority for the nurse to assess?
1. Capillary refill.
2. Breath sounds.
3. Arrhythmias.
4. Pedal pulses.

70. An infant with heart failure (HF) is admitted to the hospital. Which goal has the highest priority when planning nursing care?
1. The infant will maintain an adequate fluid balance.
2. The infant will have digoxin at the bedside.
3. Skin integrity will be addressed.
4. Administer medications on time.

71. An infant on the ward is receiving digoxin and diuretic therapy. The nurse knows that which of the following choices indicates no toxicity?
1. Heart rate less than 100, no dysrhythmias.
2. Heart rate of 80–100.
3. Heart rate greater than 100, no dysrhythmias.
4. Vomiting.

72. An infant with cardiac disease has been admitted to the nursery from the delivery room. Which finding helps the nurse to differentiate between a cyanotic and an acyanotic defect?
1. Infants with cyanotic heart disease feed poorly.
2. The pulse oximeter does not read above 93%.
3. Infants with cyanotic heart disease usually go directly to the operating room.
4. Cyanotic heart disease causes high fevers.

73. A child with tetralogy of Fallot has been admitted. What equipment is most important to have at the bedside?
1. Morphine.
2. A blood pressure cuff.
3. A thermometer.
4. An oxygen setup.

74. A 9-year-old boy has been transferred back to the floor after cardiac surgery. Which of the following does the nurse need to include in the plan of care to evaluate that the fluid needs are being appropriately met?
1. Call if the heart rate falls below 60 per minute.
2. Place a Foley catheter.
3. Prepare to assist with an arterial line to monitor blood pressure.
4. Calculate the daily maintenance fluid requirements and ensure correct delivery.

75. A 9-year-old girl with rheumatic fever is asking to play. Which diversional activity is the nurse likely to offer?
1. Walking to the gift store.
2. Coloring books and crayons.
3. A 300-piece puzzle.
4. A dancing contest.

76. A 10-year-old girl has been diagnosed with rheumatic fever and is now being discharged. What statement made by the parents shows an understanding of long-term care?
1. "She will need penicillin each day."
2. "She will need antibiotic prophylaxis when she has dental work."
3. "We will have yearly checkups."
4. "The murmur will always go away by adolescence."

Answers and Rationales

60. 2. Squatting is a normal response in a child who has tetralogy of Fallot. This position increases pulmonary blood flow because it changes the relationship between systemic and pulmonary vascular resistance.

61. 4. Coarctation of the aorta is characterized by upper extremity hypertension and diminished pulses in the extremities.

62. 1. The heartbeat is most easily counted at the point of maximum impulse. From birth through toddlerhood it is located between the third and fourth left intercostal space.

63. 4. The apical pulse is taken for one full minute and the medication is withheld if the pulse is less than 100 beats/minute.

64. *Using a soft "preemie" nipple for feedings* should be selected. This will help to reduce energy expenditure.
Providing passive stimulation should be selected. This will help to reduce energy expenditure.
Placing the child in orthopneic position should be selected. This will help promote oxygenation.

65. 2. Rheumatic fever is an autoimmune reaction to a streptococcal infection and is limited to the person having the reaction. It is not a contagious disease.

66. 1. A major symptom of rheumatic fever is arthritis.

67. 3. The cuff should be approximately two thirds the length of the humerus.

68. 3. As the transition occurs, the murmurs may become loud, and then resolve.

69. 4. The nurse needs to know the baseline pedal pulses.

70. 1. This is a major priority for HF clients.

71. 3. Infants' heart rates need to be greater than 100, with no rhythm disturbances.

72. 2. Cyanotic heart disease is unlikely to produce a reading above 93%.

73. 4. This is used emergently in a TET spell.

74. 4. It is vital for pediatric nurses to know exactly how much fluid should be delivered each 24 hours to evaluate proper fluid needs.

75. 3. This will be quiet, yet stimulating.

76. 2. This will be necessary for many years.

The Hematologic System

VARIATIONS FROM THE ADULT

A. In the young child all the bone marrow is involved in blood cell formation.
B. By puberty, only the sternum, ribs, pelvis, vertebrae, skull, and proximal epiphyses of femur and humerus are involved.
C. During the first 6 months of life, fetal hemoglobin is gradually replaced by adult hemoglobin, and it is only after this that hemoglobin disorders can be diagnosed.

ASSESSMENT

History

A. Family history: genetic hematologic disorders, anemia, or jaundice
B. History of pregnancy: parents' blood types, anemia, infection or drug ingestion, course of labor and delivery
C. Child's health history
  1. Neonatal course: occurrence, duration, and treatment of jaundice; bleeding episodes; blood transfusions
  2. Accidents, operations, hospitalizations (any blood transfusions or unusual bleeding)
  3. Nutrition: dietary intake of iron and vitamin B_{12}; history of pica
  4. Ingestions: lead-based paint; drugs
  5. Ability to participate in age-appropriate activities

Physical Examination

A. General appearance
  1. Skin: note whether cyanotic, pale, ruddy, jaundiced; note bruises or petechiae, other evidences of hemorrhage; pain, swelling around joints.
  2. Neurologic status: note listlessness or fatigue, irritability, dizziness, or lightheadedness.
B. Measure vital signs; note tachycardia or tachypnea.
C. Plot height and weight on growth chart.
D. Inspect and palpate abdomen; note enlargement of liver and spleen, pain, or tenderness on palpation.

ANALYSIS

Nursing diagnoses for the child with a disorder of the hematologic system may include:
A. Activity intolerance
B. Pain
C. Impaired gas exchange
D. Ineffective tissue perfusion: cardiopulmonary
E. Imbalanced nutrition

PLANNING AND IMPLEMENTATION

Goals

A. Child will have adequate tissue oxygenation.
B. Child will be free from complications associated with hematologic diseases.
C. Child will be free from pain, or have pain controlled.
D. Optimal growth and developmental level will be achieved.
E. Parents will participate in care of child.

Interventions

See Unit 4.

EVALUATION

A. Serum values of hematologic components are normal.
B. Child is free from signs or symptoms of infection.
C. Child has no abnormal bleeding episodes.
D. Normal activity level is maintained without pain or fatigue.
E. Parents are able to describe symptoms of disease and complications.
F. Parents are able to administer medications and participate in child's care.

DISORDERS OF THE HEMATOLOGIC SYSTEM

Anemias

Iron Deficiency Anemia

A. General information: iron deficiency is most common cause of anemia in children; children whose diet consists mainly of cow's milk, which is low in absorbable iron, are especially vulnerable.
B. Assessment findings
  1. Pallor, fatigue, irritability
  2. History of iron-deficient diet
  3. Diagnostic tests
    a. RBC normal or slightly reduced
    b. Hgb below normal range for child
    c. HCT below normal
C. Nursing interventions
  1. Add iron to formula, food, or by vitamins by age 4–6 months.
    a. Oral iron
      1) Give iron with citrus juice and on empty stomach (iron is best absorbed in an acidic environment).

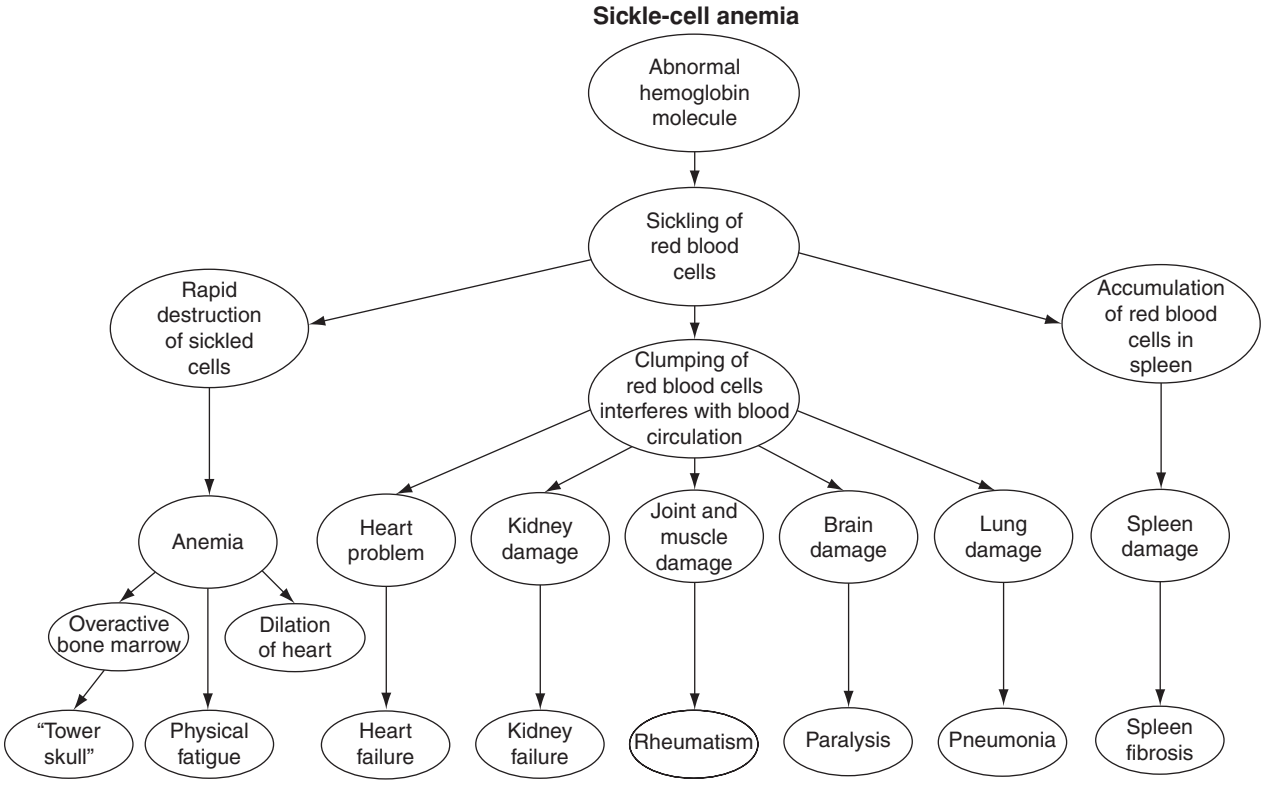


Figure 5-5 A series of damages and effects caused by sickle-cell anemia

2) Have child use straw if possible, because iron stains teeth and skin.

b. Administer IM iron if ordered. Use z-track method.

2. Provide iron-rich foods: meats, nuts, dried beans/legumes, dried fruit, dark-green leafy vegetables, whole grains, egg yolk, potatoes, shellfish.

D. Also see Unit 4.

Sickle-Cell Anemia

A. General information (see Figure 5-5)

1. Most common inherited disorder in U.S. African American population; sickle cell trait found in 10% of African Americans.
2. Autosomal recessive inheritance pattern.
3. Individuals who are homozygous for the sickle cell gene have the disease (more than 80% of their hemoglobin is abnormal [HgbS]).
4. Those who are heterozygous for the gene have sickle cell trait (normal hemoglobin predominates, may have 25–50% HgbS). Although sickle cell trait is not a disease, carriers may exhibit symptoms under periods of severe anoxia or dehydration.
5. In this disease, the structure of hemoglobin is changed; the sixth rung of the beta chain changes glutamine for valine.
6. HgbS (abnormal Hgb), which has reduced oxygen-carrying capacity, replaces all or part of the hemoglobin in the RBCs.
7. When oxygen is released, the shape of the RBCs changes from round and pliable to crescent-shaped, rigid, and inflexible (see Figure 5-6).
8. Local hypoxia and continued sickling lead to plugging of vessels.
9. Sickled RBCs live for 6–20 days instead of 120, causing hemolytic anemia.
10. Usually no symptoms prior to age 6 months; presence of increased level of fetal hemoglobin tends to inhibit sickling.

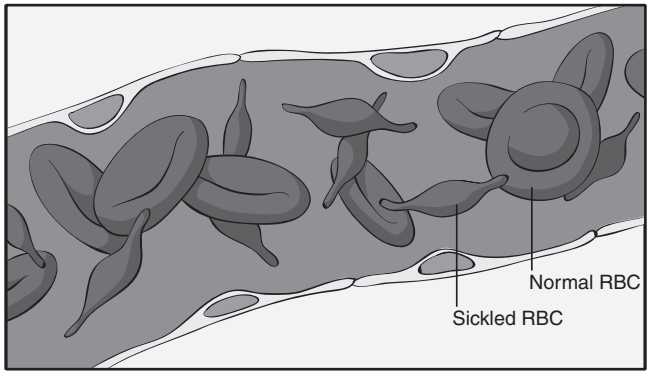


Figure 5-6 Regular and sickled RBCs

11. Death often occurs in early adulthood due to occlusion or infection.
12. Sickle cell crisis
    a. Vaso-occlusive (thrombocytic) crisis: most common type
        1) Crescent-shaped RBCs clump together; agglutination causes blockage of small blood vessels.
        2) Blockage causes the blood viscosity to increase, producing sludging and resulting in further hypoxia and increased sickling.
    b. Splenic sequestration: often seen in toddler/preschooler
        1) Sickled cells block outflow tract resulting in sudden and massive collection of sickled cells in spleen.
        2) Blockage leads to hypovolemia and severe decrease in hemoglobin and blood pressure, leading to shock.

B. Medical management: sickle cell crisis

1. Drug therapy
    a. Urea: interferes with hydrophobic bonds of the HgbS molecules
    b. Analgesics/narcotics to control pain
    c. Antibiotics to control infection
2. Exchange transfusions
3. Hydration: oral and IV
4. Bed rest
5. Surgery: splenectomy

C. Assessment findings

1. First sign in infancy may be "colic" due to abdominal pain (abdominal infarct)
2. Infants may have dactylitis (hand-foot syndrome): symmetrical painful soft tissue swelling of hands and feet in absence of trauma (aseptic, self-limiting)
3. Splenomegaly: initially due to hemolysis and phagocytosis; later due to fibrosis from repeated infarct to spleen
4. Weak bones or spinal defects due to hyperplasia of marrow and osteoporosis
5. Frequent infections, especially with *H. influenzae* and *D. pneumoniae*
6. Leg ulcers, especially in adolescents, due to blockage of blood supply to skin of legs
7. Delayed growth and development, especially delay in sexual development
8. CVA/infarct in the CNS
9. Renal failure: difficulty concentrating urine due to infarcts; enuresis
10. Heart failure due to hemosiderosis
11. Priapism: may result in impotence
12. Pain wherever vaso-occlusive crisis occurs
13. Development of collateral circulation
14. Diagnostic tests
    a. Hgb indicates anemia, usually 6–9 g/dL
    b. Sickling tests
        1) Sickle cell test: deoxygenation of a drop of blood on a slide with

a cover slip; takes several hours for results to be read; false negatives for the trait possible.

2) Sickledex: a drop of blood from a finger stick is mixed with a solution; mixture turns cloudy in presence of HgbS; results available within a few minutes; false negatives in anemia clients or young infants possible.

c. Hgb electrophoresis: diagnostic for the disease and the trait; provides accurate, fast results.

D. Nursing interventions: sickle cell crisis

1. Keep child well hydrated and oxygenated.
2. Avoid tight clothing that could impair circulation.
3. Keep wounds clean and dry.
4. Provide bed rest to decrease energy expenditure and oxygen use.
5. Correct metabolic acidosis.
6. Administer medications as ordered.
   a. Analgesics: acetaminophen, Ketoralac (NSAID), morphine (avoid aspirin as it enhances acidosis, which promotes sickling).
   b. Avoid anticoagulants (sludging is not due to clotting)
   c. Antibiotics
7. Administer blood transfusions as ordered.
8. Keep arms and legs from becoming cold.
9. Decrease emotional stress.
10. Provide good skin care, especially to legs.
11. Test siblings for presence of sickle cell trait/disease.
12. Provide client teaching and discharge planning concerning:
    a. Pre-op teaching for splenectomy if needed
    b. Genetic counseling
    c. Need to avoid activities that interfere with oxygenation, such as mountain climbing, flying in unpressurized planes

Disorders of Platelets or Clotting Mechanism

Immune Thrombocytopenic Purpura (ITP)

A. General information

1. Formerly known as idiopathic thrombocytopenic purpura
2. Increased destruction of platelets with resultant platelet count of less than 100,000/mm^3 characterized by petechiae and ecchymoses of the skin
3. Autoimmune disorder; onset sudden, often preceded by a viral illness
4. The spleen is the site for destruction of platelets; spleen is not enlarged

B. Medical management

1. Drug therapy: steroids, immunosuppressive agents, anti-D antibody
2. Platelet transfusion
3. Surgery: splenectomy

C. Assessment findings

1. Petechiae: spider-web appearance of bleeding under skin due to small size of platelets
2. Ecchymosis
3. Blood in any body secretions, bleeding from mucous membranes, nosebleeds
4. Diagnostic tests: platelet count decreases, anemia

D. Nursing interventions

1. Control bleeding
   a. Administer platelet transfusions as ordered.
   b. Apply pressure to bleeding sites as needed.
   c. Position bleeding part above heart level if possible.
2. Prevent bruising.
3. Provide support to client and be sensitive to change in body image.
4. Protect from infection.
5. Measure normal circumference of extremities for baseline.
6. Administer medications orally, rectally, or IV, rather than IM; if administering immunizations, give subcutaneously (SC) and hold pressure on site for 5 minutes.
7. Administer analgesics (acetaminophen) as ordered; avoid aspirin.
8. Provide care for the client with a splenectomy.
9. Provide client teaching and discharge planning concerning:
   a. Pad crib and playpen, use rugs wherever possible.
   b. Provide soft toys.
   c. Sew pads in knees and elbows of clothing.
   d. Provide protective headgear during toddlerhood.
   e. Use soft Toothettes instead of bristle toothbrushes.
   f. Keep weight to low normal to decrease extra stress on joints.
   g. Use stool softeners to prevent straining.
   h. Avoid contact sports; suggest swimming, biking, golf, billiards.

Hemophilia

A. General information

1. A group of bleeding disorders in which there is a deficit of one of several factors in clotting mechanism
2. Sex-linked, inherited disorder; classic form affects males only

3. Types
   a. Hemophilia A: factor VIII deficiency (75% of all hemophilia)
   b. Hemophilia B (Christmas disease): factor IX deficiency (10–12% of all hemophilia)
   c. Hemophilia C: factor XI deficiency (autosomal recessive, affects both sexes)
4. Only the intrinsic system is involved; platelets are not affected, but fibrin clot does not always form; bleeding from minor cuts may be stopped by platelets.
5. If individual has less than 20–30% of factor VIII or IX, there is an impairment of clotting and clot is jelly-like.
6. Bleeding in neck, mouth, and thorax requires immediate professional care.

B. Assessment findings
1. Prolonged bleeding after minor injury
   a. At birth after cutting of cord
   b. Following circumcision
   c. Following IM immunizations
   d. Following loss of baby teeth
   e. Increased bruising as child learns to crawl and walk
2. Bruising and hematomas but no petechiae
3. Peripheral neuropathies (due to bleeding near peripheral nerves): pain, paresthesias, muscle atrophy
4. Hemarthrosis
   a. Repeated bleeding into a joint results in a swollen and painful joint with limited mobility
   b. May result in contractures and possible degeneration of joint
   c. Knees, ankles, elbows, wrists most often affected
5. Diagnostic tests
   a. Platelet count normal
   b. Prolonged coagulation time: PTT increased
   c. Anemia

C. Nursing interventions
1. Control acute bleeding episode.
   a. Apply ice compress for vasoconstriction.
   b. Immobilize area to prevent clots from being dislodged.
   c. Elevate affected extremity above heart level.
   d. Provide manual pressure or pressure dressing for 15 minutes; do not keep lifting dressing to check for bleeding status.
   e. Maintain calm environment to decrease pulse.
   f. Avoid sutures, cauterization, aspirin: all exacerbate bleeding.
   g. Administer hemostatic agents as ordered.
      1) Fibrin foam
      2) Topical application of adrenalin/epinephrine to promote vasoconstriction
2. Provide care for hemarthrosis.
   a. Immobilize joint and control acute bleeding.
   b. Elevate joint in a slightly flexed position.
   c. Avoid excessive handling of joint.
   d. Administer analgesics as ordered; pain relief will minimize increases in pulse rate and blood loss.
   e. Aspirin should not be given because it inhibits platelet function.
   f. Instruct to avoid weight bearing for 48 hours after bleeding episode if bleeding is in lower extremities.
   g. Provide active or passive ROM exercises after bleeding has been controlled (48 hours), as long as exercises do not cause pain or irritate trauma site.
3. Administer factor VIII concentrate, or DDAVP as ordered
4. Provide client teaching and discharge planning concerning
   a. Prevention of trauma (see Immune Thrombocytopenic Purpura)
   b. Genetic counseling
      1) When mother is carrier: 50% chance with each pregnancy for sons to have hemophilia, 50% chance with each pregnancy for daughters to be carriers
      2) When father has hemophilia, mother is normal: no chance for children to have disease, but all daughters will be carriers
   c. Availability of support/counseling agencies

Disorder of White Blood Cells

Infectious Mononucleosis

A. General information
1. Viral infection that causes hyperplasia of lymphoid tissue and a characteristic change in mononuclear cells of the blood
2. Affects adolescents and young adults most commonly
3. Caused by the Epstein-Barr virus, which is not highly contagious but is transmitted by saliva (the "kissing disease")
4. Incubation period 2–6 weeks
5. Pathophysiology: mononuclear infiltration of lymph nodes and other body tissue

B. Assessment findings
1. Lethargy
2. Sore throat/tonsilitis
3. Lymphadenopathy; enlarged spleen, liver involvement
4. Diagnostic tests
   a. Atypical WBCs increased
   b. Heterophil antibody and Monospot tests positive

Sample Questions

77. The mother of a child with classic hemophilia asks the nurse what her chances are of having another child with hemophilia. What is the nurse's best response?
1. "All of your daughters will be carriers of the disease."
2. "If you have another son, there is almost a 100% chance he will have hemophilia."
3. "If you have a son, there is a 50% chance he will have hemophilia but none of your daughters are likely to have it."
4. "There is a 25% chance of having another child with hemophilia."

78. A 4-year-old male has been diagnosed as having iron deficiency anemia. A liquid iron preparation has been prescribed. What intervention will the nurse include in the medication administration?
1. Ask the child if he wants to take his medicine.
2. Mix the medication in his milk bottle and give it to him at nap time.
3. Allow him to sip the medication through a straw.
4. Give the medication after lunch with a sweet dessert to disguise the taste.

79. A 10-year-old has hemophilia A and is admitted to the hospital for hemarthrosis of the right knee. He is in a great deal of pain. Which of the following interventions would aggravate his condition?
1. Applying an ice bag to the affected knee.
2. Administering children's aspirin for pain relief.
3. Elevating the right leg above the level of his heart.
4. Keeping the right leg immobilized.

80. Which is a correct statement regarding a client with the sickle cell trait?
1. The client has a chronic form of sickle cell anemia.
2. The client has the most lethal form of the disease.
3. The client will transmit the disease to all children.
4. The client has some normal and some abnormal hemoglobin cells.

81. The mother of a child with sickle cell anemia tells the nurse that she learned that sickled blood cells do not have as long a life expectancy as normal red cells. Which answer would be correct for the nurse to tell the mother regarding how long a sickled blood cell survives?
1. 5 days.
2. 15 days.
3. 30 days.
4. 60 days.

82. What symptom would the child with sickle cell exhibit?
1. Vitiligo.
2. Hyperactivity.
3. Mild mental retardation.
4. Delayed physical development.

83. A child who has sickle cell anemia has developed stasis ulcers on her lower extremities. What is the cause of the ulcers?
1. Poor range of motion.
2. Ruptured blood vessels.
3. Impaired venous circulation.
4. Hypertrophy of muscular tissue.

84. Which complication is associated with sickle cell anemia?
1. Constipation.
2. Hypothyroidism.
3. Addison's disease.
4. Cerebrovascular accidents.

85. Both parents carry the sickle cell anemia trait. Their 8-month-old child contracted chickenpox from his brother and now is very weak, febrile, and anorexic, and cries with pain when his wrists and elbows are moved. He is admitted to the hospital with a diagnosis of sickle cell crisis. The child's mother asks the nurse why he has not been symptomatic before now. What would be the nurse's best response?
1. High fetal hemoglobin protected him against sickling.
2. His red blood cell levels remained normal.
3. Maternal antibodies protected him against sickling.
4. Sickle cell hemoglobin was not present until about 1 year of life.

86. In planning care for a child with newly diagnosed sickle cell anemia, what should his mother be taught to prevent vaso-occlusive crises?
1. Prophylactic administration of acetaminophen.
2. Eating food with a high iron content.

3. Exercising regularly.
4. Promoting hydration.

87. How could the nurse best evaluate whether parents are giving their child with iron deficiency anemia iron as prescribed?
1. Parents state they offer orange juice when they give the medication.
2. Parents state the child has greenish black stools.
3. Parents state the child experiences nausea with the iron preparation.
4. Parents state they are giving the iron as prescribed.

88. Parents of a child who has sickle-cell anemia want to know why their child did not have the first episode until he was approximately a year old. What would be the best reply from the nurse?
1. "Are you sure your child has sickle-cell anemia and not sickle-cell trait?"
2. "Affected children can be asymptomatic in infancy because of high levels of fetal hemoglobin that inhibit sickling."
3. "Have you asked your doctor about this?"
4. "Your child probably had a crisis and you did not realize it."

89. A 5-year-old is admitted to the nursing care unit in vaso-occlusive crisis from sickle cell anemia. What is the priority nursing intervention?
1. Teaching the family about sickle cell anemia and home care needs.
2. Managing the child's pain.
3. Encouraging a high-protein, high-calorie diet.
4. Administering oxygen via nasal cannula.

90. A 3-year-old with a recent history of chickenpox is admitted to the unit with immune thrombocytopenic purpura. His platelet count is 15,000 mm^3/dL. His lesions are enlarging. Which of the following nursing actions best provides for the child's safety?
1. Supervised outdoor play.
2. Set times of rest periods.
3. Only allowing him to have soft stuffed toys to play with.
4. Keeping him on complete bed rest.

91. A child is admitted to the pediatric unit with hemarthrosis secondary to hemophilia. What would be the most appropriate nursing intervention?
1. Daily bleeding times.
2. Prophylactic antibiotic therapy.
3. Elevating and immobilizing the affected joint.
4. Encouraging active range of motion of affected joint.

Answers and Rationales

77. 3. Classic hemophilia is inherited as an X-linked recessive trait. If this family has another son, there is a 50% chance that he will have the disease. If they have a daughter she is very unlikely to have the disease but there is a 50% chance she will be a carrier.

78. 3. Iron is given with a straw to prevent staining the teeth.

79. 2. Aspirin is an anticoagulant. The child has a clotting disorder and has been bleeding into his knee joint. He should not receive an anticoagulant.

80. 4. Clients with sickle cell trait inherit only one defective gene. They can synthesize both normal and abnormal hemoglobin chains.

81. 2. The life span of a sickled cell is 6 to 20 days as opposed to 120 days for a normal red blood cell.

82. 4. Children with sickle cell disease usually manifest growth impairment.

83. 3. The tissues of a client with sickle cell disease are constantly vulnerable to microcirculatory interruptions.

84. 4. The sudden appearance of a stroke in sickle cell anemia is related to the microcirculatory interruptions that are caused by the sickled cell.

85. 1. High levels of fetal hemoglobin inhibit sickling of red cells prior to the age of 6 months.

86. 4. Promoting good hydration is a major factor in maintaining the blood viscosity needed to maximize the circulation of red blood cells. Dehydration causes sickling of red blood cells.

87. 2. When an adequate dosage of iron is reached, the stools usually turn a greenish black. Absence of this color stool usually gives a clue to poor compliance.

88. 2. Children with sickle-cell anemia are often asymptomatic until at least 4 to 6 months of age.

A crisis is usually precipitated by an acute upper respiratory or gastrointestinal infection.

89. 4. During a vaso-occlusive crisis, tissue hypoxia and ischemia cause pain. By delivering oxygen at the prescribed rate, further tissue hypoxia can be avoided.

90. 4. Initially when his platelets are below 20,000 mm^3/dL and he is experiencing active bleeding or progression of lesions, activity is restricted.

91. 3. During bleeding episodes, hemarthrosis is managed by elevating and immobilizing the joint and applying ice packs.

The Respiratory System

VARIATIONS FROM THE ADULT

A. Infants are obligatory nose breathers and diaphragmatic breathers.
B. Number and size of alveoli continue to increase until age 8 years.
C. Until age 5, structures of the respiratory tract have a narrower lumen and children are more susceptible to obstruction/distress from inflammation.
D. Normal respiratory rate in children is faster than in adults.
  1. Infants: 40–60/minute
  2. 1 year: 20–40/minute
  3. 2–4 years: 20–30/minute
  4. 5–10 years: 20–25/minute
  5. 10–15 years: 17–22/minute
  6. 15 and older: 15–20/minute
E. Most episodes of acute illness in young children involve the respiratory system due to frequent exposure to infection and a general lack of immunity.

ASSESSMENT

History

A. Presenting problem: symptoms may include cough, wheezing, dyspnea
B. Medical history: incidence of infections, respiratory allergies or asthma, prescribed and OTC medications, recent immunizations
C. Exposure to other children with respiratory infections or other communicable diseases

Physical Examination

A. Inspect shape of chest; note:
  1. Barrel chest: occurs with chronic respiratory disease.
  2. Pectus carinatum (pigeon breast): sternum protrudes outward, producing increased A–P diameter; usually not significant.
  3. Pectus excavatum (funnel chest): lower part of sternum is depressed; usually does not produce symptoms; may impair cardiac function.
B. Note pattern of respirations.
  1. Rate
  2. Regularity
    a. Periodic respirations (periods of rapid respirations, separated by periods of slow breathing or short periods of no respirations) normal in young infants
    b. Apnea episodes (cessation of breathing for 20 seconds or more accompanied by color change or bradycardia) an abnormal finding
  3. Respiratory effort
    a. Nasal flaring: attempt to widen airway and decrease resistance
    b. Open-mouth breathing: chin drops with each inhalation
    c. Retractions: from use of accessory muscles
C. Observe skin color and temperature, particularly mucous membranes and peripheral extremities.
D. Note behavior: position of comfort, signs of irritability or lethargy, facial expression (anxiety).
E. Note speech abnormalities: hoarseness or muffled speech.
F. Observe presence and quality of cough: productive; paroxysmal, with inspiratory "whoop" characteristic of pertussis.
G. Auscultate for abnormal breath sounds (auscultation may be more difficult in infants and young children because of shallowness of respirations).
  1. Grunting on expiration
  2. Stridor: harsh inspiratory sound associated with obstruction or edema
  3. Wheezing: whistling noise during inspiration or expiration due to narrowed airways, common in asthma
  4. "Snoring": noisy breathing associated with nasal obstruction

Laboratory/Diagnostic Tests

A. Pulmonary function testing is usually not done under age 6 years because children have difficulty following directions.
B. Chest X-rays: avoid unnecessary exposure; protect gonads and thyroid.

ANALYSIS

Nursing diagnoses for the child with a disorder of the respiratory system may include:
A. Activity intolerance
B. Altered respiratory functions: ineffective airway clearance, ineffective breathing pattern, impaired gas exchange
C. Anxiety
D. Fatigue
E. Impaired oral mucous membrane
F. Altered nutrition
G. Disturbed sleep pattern
H. Acute pain
I. Deficient knowledge (caregiver) (specify)

PLANNING AND IMPLEMENTATION

Goals

A. Child will have patent airway and satisfactory oxygenation.
B. Child will be free from symptoms of respiratory distress.
C. Child will have improved ability to tolerate exercise, conserve energy.
D. Parents will participate in caring for child.

Interventions

Oxygen Tent (Croup Tent, Mist Tent, Oxygen Canopy)

A. General information
  1. Used when desired oxygen concentration is 40% or less as oxygen concentration can be difficult to control
  2. Primarily used for croup, when mist is to be delivered
B. Nursing care
  1. Keep sides of plastic down and tucked in.
  2. If tent has been opened for awhile, increase oxygen flow to raise concentration quickly.
  3. If child has been out of the tent, return oxygen concentration to ordered percent before returning child to tent.
  4. If tent enclosure gets too warm, add ice to cooling chamber as needed.
  5. Mist is usually prescribed in addition to oxygen
    a. Keep reservoir for humidification filled.
    b. Do not allow condensation on tent walls to obstruct view of child.
    c. Keep clothes and bedding dry to avoid chilling.
  6. Provide safety measures.
    a. Keep plastic away from child's face.
    b. Avoid toys that produce spark or friction, such as mechanical toys.
    c. Avoid stuffed toys because of tendency to absorb moisture.
    d. Encourage use of one or two favorite toys or transitional object in tent; other toys may be kept outside of tent in child's view.

Vaporizers

A. General information
  1. Same principle as oxygen tent
  2. Used at home; placed at bedside; mist directed into room around child
  3. Usually cool mist
B. Nursing responsibilities: teach parents to clean frequently because bacteria that grow in vaporizer can be dispersed into air.

Chest Physical Therapy

A. Postural drainage: infants and young children do not have enough rib cage for a lower front position
  1. Combine side and lower front positions
  2. Five positions: upper front, upper back, lower back, right side and front, and left side and front
  3. 2–5 minutes per position
B. Percussion
  1. Do not use with clients with an acute attack of asthma or croup (dislodged mucus may cause plugging because of bronchial edema).
  2. Use percussion 30 minutes before meals to clear mucus before eating, thus enhancing intake.
  3. If aerosol medications are being used, administer immediately before percussion.
  4. Percussion is done with cupped hand, never on bare skin, over the rib cage only
    a. Use an undershirt, gown, or diaper over skin.
    b. If infant's chest is too small for nurse's hand, a small face mask can be substituted.
    c. Be careful to avoid spine and neck during percussion.
    d. Infants can be percussed while being held on nurse's lap.
    e. If child is unable to cough during and after percussion, suction as needed.
C. Vibration: performed on expiration.

Suctioning

A. Bulb syringes can be used to clear nasal stuffiness.
B. For nasotracheal and nasopharyngeal suction, use low pressure.
C. Assess response, and for improved respiratory status.

Deep Breathing Exercises

A. Encourage deep breathing by making exercises into games (e.g., touch toes, sit-ups, jumping jacks, blowing out "flashlight," ping-pong ball games using blowing).
B. Encourage use of toys that require blowing (harmonica, bubbles).
C. Laughing and crying also stimulate coughing and deep breathing.

Apnea Monitor

A. General information: monitors often use same three chest leads for simultaneous cardiac and respiratory rate monitoring
  1. Lead placement will differ from that usually prescribed for cardiac monitoring if apnea monitoring is also required.
  2. To monitor respiratory rate, chest leads will need to be where chest moves during inspiration.
  3. As chest wall movement rather than air entry is monitored, obstruction and dyspnea may not be recognized early.
  4. Most useful for early recognition of cessation of breathing.
B. Nursing care: when alarm sounds
  1. Note whether cardiac or respiratory rate has triggered alarm.
  2. Assess child's color, activity, and presence of respiratory effort.
  3. Auscultate cardiac and respiratory sounds.
  4. If no physical distress, check lead placement.
  5. If apneic, gently stimulate lower extremities. May need oxygen.
  6. If no improvement with stimulation and oxygen, assess need for cardiopulmonary resuscitation (CPR).

EVALUATION

A. Child is satisfactorily oxygenated.
  1. Absence of respiratory distress
  2. Normal color and activity
  3. Decreased need for supplementary oxygen therapy
B. Parents are able to care for child at home.
  1. Identify symptoms of increased oxygen need
  2. Perform prescribed treatments
  3. Have obtained and demonstrated use of necessary equipment

DISORDERS OF THE RESPIRATORY SYSTEM

Tonsillitis

A. General information
  1. Inflammation of tonsils often as a result of a viral or bacterial pharyngitis
  2. 10–15% caused by group A beta-hemolytic streptococci
B. Medical management
  1. Comfort measures and symptomatic relief
  2. Antibiotics for bacterial infection, usually penicillin or erythromycin
  3. Surgery: removal of tonsils/adenoids if necessary
C. Assessment findings
  1. Enlarged, red tonsils; fever
  2. Sore throat, difficulty swallowing, mouth breathing, snoring
  3. White patches of exudate on tonsillar pillars, enlarged cervical lymph nodes
D. Nursing interventions
  1. Provide soft or liquid diet.
  2. Use cool-mist vaporizer.
  3. Administer salt water gargles, throat lozenges.
  4. Administer analgesics (acetaminophen) as ordered.
  5. Administer antibiotics as ordered; stress to parents importance of completing entire course of medication.

Tonsillectomy

A. General information
  1. One of the most common operations performed on children
  2. Indications for tonsillectomy include recurrent tonsillitis, peritonsillar abscess, airway or esophageal obstruction
  3. Indications for adenoidectomy include nasal obstruction due to hypertrophy
B. Nursing interventions: preoperative
  1. Make pre-op preparation age-appropriate; child enters the hospital feeling well and will leave with a very sore throat.
  2. Obtain baseline bleeding and clotting times.
  3. Check for any loose teeth.
C. Nursing interventions: postoperative
  1. Position on side or abdomen to facilitate drainage of secretions.
  2. Avoid suctioning if possible; if not, be especially careful to avoid trauma to surgical site.
  3. Provide ice collar/analgesia for pain.
  4. Observe for hemorrhage; signs may include frequent swallowing, increased pulse, vomiting bright red blood (vomiting old dried blood or pink-tinged emesis is normal).

5. Offer clear, cool, noncitrus, nonred fluids when awake and alert.
6. Provide client teaching and discharge planning concerning:
   a. Need to maintain adequate fluid and food intake and to avoid spicy and irritating foods
   b. Quiet activity for a few days
   c. Need to avoid coughing, mouth gargles
   d. Chewing gum (but not Aspergum): can help relieve pain and difficulty swallowing and aids in diminishing bad breath
   e. Mild analgesics for pain
   f. Signs and symptoms of bleeding and need to report to physician

Acute Spasmodic Laryngitis (Croup)

A. General information
   1. Respiratory distress characterized by paroxysmal attacks of laryngeal obstruction
   2. Etiology unclear but familial predisposition, allergy, viruses, psychologic factors, and anxious temperament have been implicated
   3. Common in children ages 1–3 years
   4. Attacks occur mostly at night; onset sudden and usually preceded by a mild upper respiratory infection
   5. Respiratory symptoms last several hours; may occur in a milder form on a few subsequent nights
B. Assessment findings
   1. Inspiratory stridor, hoarseness, barking cough, anxiety, retractions
   2. Afebrile, skin cool
C. Nursing interventions
   1. Instruct parents to take the child into the bathroom, close the door, turn on the hot water, and sit on floor of the steamy bathroom with child.
   2. If the laryngeal spasm does not subside the child should be taken to the emergency department.
   3. After the spasm subsides, provide cool mist with a vaporizer.
   4. Provide clear fluids.
   5. Try to keep child calm and quiet.
   6. Assure parents this is self-limiting.

Laryngotracheobronchitis

A. General information
   1. Viral infection of the larynx that may extend into trachea and bronchi
   2. Most common cause for stridor in febrile child
   3. Parainfluenza viruses most common cause
   4. Infection causes endothelial insult, increased mucus production, edema, low-grade fever
   5. Affects children less than 5 years of age
   6. Onset more gradual than with croup, takes longer to resolve; usually develops over several days with upper respiratory infection
   7. Usually treated on outpatient basis; indications for admission include dehydration and respiratory compromise
B. Medical management
   1. Drug therapy
      a. Aerosolized racemic epinephrine
      b. Antibiotics only if secondary bacterial infection present
      c. Steroids
   2. Oxygen therapy: low concentrations to relieve mild hypoxia
   3. Oral or nasotracheal intubation for moderate hypoxia
   4. IV fluids to maintain hydration
C. Assessment findings
   1. Fever, coryza, inspiratory stridor, barking cough, tachycardia, tachypnea, retractions
   2. May have difficulty taking fluids
   3. WBC normal
D. Nursing interventions
   1. Instruct parents to take child into steamy bathroom for acute distress.
   2. Keep child calm.
   3. After distress subsides, use cool mist vaporizer in bedroom.
   4. Child may vomit large amounts of mucus after the episode; reassure parents that this is normal.
   5. For hospitalized child
      a. Monitor vital signs, I&O, skin color, and respiratory effort.
      b. Maintain hydration.
      c. Provide care for the intubated child.
      d. Plan care to disturb the child as little as possible.

Epiglottitis

A. General information
   1. Life-threatening bacterial infection of epiglottis and surrounding structures
   2. Primary organism: *H. influenzae,* type B
   3. Often preceded by upper respiratory infection
   4. Rapid progression of swelling causes reduction in airway diameter; may lead to sudden respiratory arrest
   5. Affects children ages 3–7 years
B. Assessment findings
   1. Fever, tachycardia, inspiratory stridor (possibly), labored respirations with retractions, sore throat, dysphagia, drooling, muffled voice
   2. Irritability, restlessness, anxious-looking, quiet
   3. Position: sitting upright, head forward and jaw thrust out
   4. Diagnostic tests
      a. WBC increased
      b. Lateral neck X-ray reveals characteristic findings

C. Nursing interventions
1. Provide mist tent with oxygen.
2. Administer IV antibiotics as ordered.
3. Provide tracheostomy or endotracheal tube care; note the following:
   a. Restlessness, fatigue, dyspnea, cyanosis, pallor, tachycardia, tachypnea, diminished breath sounds, adventitious lung sounds.
   b. Need for suctioning to remove secretions; note amount, color, consistency.
4. Reassure child through touch, sound, and physically being present.
5. Involve parents in all aspects of care.
6. Avoid direct examination of the epiglottis as it may precipitate spasm and obstruction.
7. Remember this is extremely frightening experience for child and parents; explain procedures and findings; reinforce explanations of physician.

Bronchiolitis

A. General information
1. Pulmonary viral infection characterized by wheezing
2. Usually caused by respiratory syncytial virus
3. Virus invades epithelial cells of nasopharynx and spreads to lower respiratory tract, causing increased mucus production, decreased diameter of bronchi, hyperinflation, and possible atelectasis
4. Affects infants ages 2–8 months
5. Increased incidence of asthma as child grows older

B. Medical management
1. Nebulized bronchodilators (e.g., Albuterol)
2. Steroids
3. Ribavirin—antiviral, given by aerosol (SPAG) through hood, tent, mask, or ventilator—for severe symptoms
4. Humidity, oxygen, fluids
5. Prevention: RSV antibodies
   a. RSV-IG (immune globulin)-given IV monthly
   b. Palivizumab (Synagis)-given IM monthly

C. Assessment findings
1. Difficulty feeding, fever
2. Cough, coryza
3. Wheezing, prolonged expiratory phase, tachypnea, nasal flaring, retractions (intercostal more pronounced than supraclavicular retractions)
4. Diagnostic tests
   a. WBC normal
   b. X-ray reveals hyperaeration

D. Nursing interventions
1. Provide high-humidity environment, with oxygen in some cases (instruct parents to take child into steamy bathroom if at home).
2. Offer small, frequent feedings; clear fluids if trouble with secretions.
3. Provide adequate rest.
4. Administer antipyretics as ordered to control fever.

Asthma

A. General information (See Figure 5-7.)
1. Obstructive disease of the lower respiratory tract
2. Most common chronic respiratory disease in children, in younger children affects twice as many boys as girls; incidence equal by adolescence
3. Often caused by an allergic reaction to an environmental allergen, may be seasonal or year-round
4. Immunologic/allergic reaction results in histamine release, which produces three main airway responses
   a. Edema of mucous membranes
   b. Spasm of the smooth muscle of bronchi and bronchioles
   c. Accumulation of tenacious secretions
5. Status asthmaticus occurs when there is little response to treatment and symptoms persist

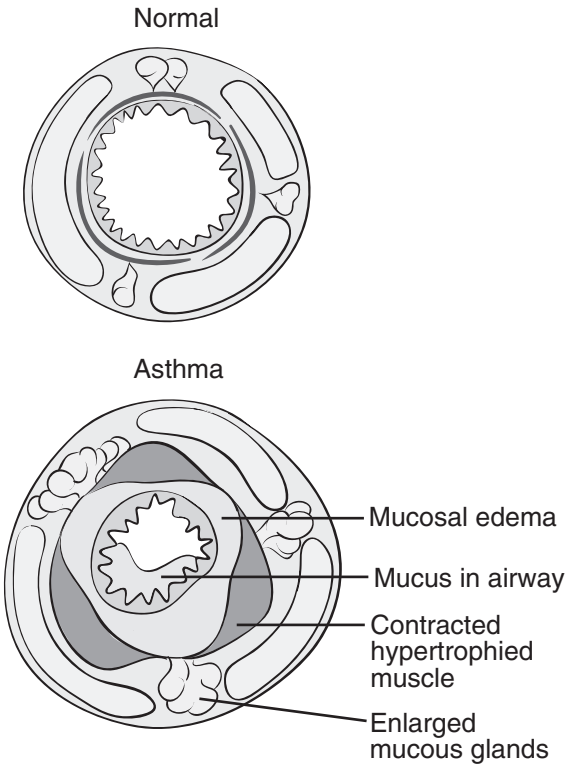
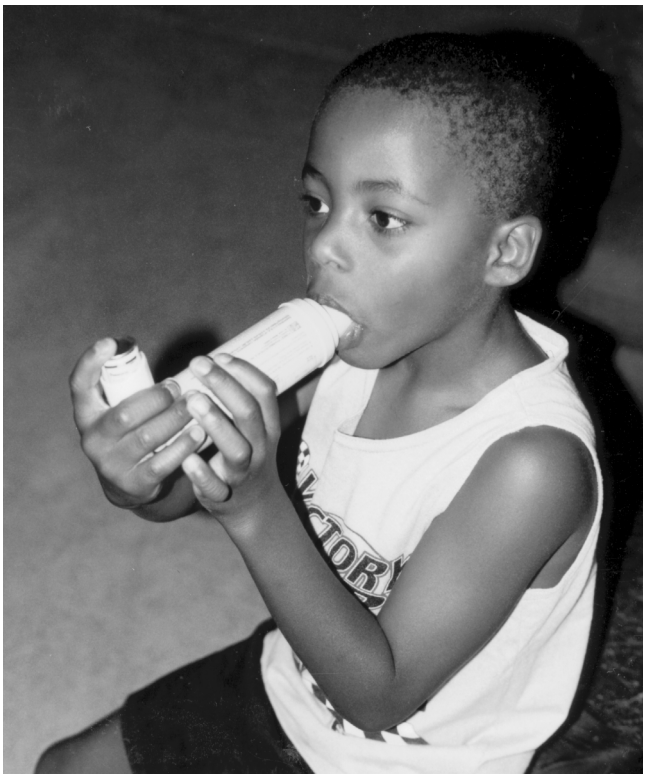


Figure 5-7 Pathophysiology of asthma

B. Medical management
- **1.** Drug therapy: Bronchodilators
  - **a.** Beta-adrenergic agonists
    - **1)** Metered dose inhaler (MDI)—most children will need spacers
    - **2)** Nebulizer—infants and toddlers
    - **3)** Rescue drugs for acute attacks
  - **b.** Corticosteroids
    - **1)** Inhaled by MDI or nebulizer
    - **2)** Oral for persistent wheezing
    - **3)** IV in hospital
  - **c.** Nonsteroid anti-inflammatory agents
    - **1)** Cromolyn sodium
    - **2)** Nedocromil
    - **3)** Leukotriene inhibitors and receptor-antagonists
    - **4)** Used for maintenance, not rescue
  - **d.** Xanthine-derivatives
    - **1)** Theophylline (oral)
    - **2)** Aminophylline (IV)
    - **3)** Used for status asthmaticus
  - **e.** Procedure for use of oral inhaler. See Figure 5-8.
- **2.** Physical therapy
- **3.** Hyposensitization
- **4.** Exercise

C. Assessment findings
- **1.** Family history of allergies
- **2.** Client history of eczema
- **3.** Respiratory distress: shortness of breath, expiratory wheeze, prolonged expiratory phase, air trapping (barrel chest if chronic), use of accessory muscles, irritability (from hypoxia), diaphoresis, change in sensorium if severe attack
- **4.** Diagnostic tests: ABGs indicate respiratory acidosis

D. Nursing interventions
- **1.** Place client in high-Fowler's position.
- **2.** Administer oxygen as ordered.
- **3.** Administer medications as ordered.
- **4.** Provide humidification/hydration to loosen secretions.
- **5.** Provide chest percussion and postural drainage when bronchodilation improves.
- **6.** Monitor for respiratory distress.
- **7.** Provide client teaching and discharge planning concerning:
  - **a.** Modification of environment
    - **1)** Ensure room is well ventilated.
    - **2)** Stay indoors during grass cutting or when pollen count is high.
    - **3)** Use damp dusting.
    - **4)** Avoid rugs, draperies or curtains, stuffed animals.
    - **5)** Avoid natural fibers (wool and feathers).
  - **b.** Importance of moderate exercise (swimming is excellent)
  - **c.** Purpose of breathing exercises (to increase the end expiratory pressure of each respiration)



1. Attach metered dose inhaler canister to mouthpiece to spacer.
2. Shake to increase pressure in canister.
3. Blow out air.
4. Place mouthpiece in mouth and make a seal with lips.
5. Activate the canister.
6. Breathe in slowly to total lung capacity.
7. Hold breath for 5–10 seconds, then breathe normally. (For infants and small children, a mask should be used and remain in place until they have taken 5–6 breaths.)
8. Wait 60 seconds.
9. Repeat steps 2–7.
10. Rinse mouth and equipment following use to prevent fungal infections.

Figure 5-8 Instructions for use of an oral inhaler with spacer

Aspiration of a Foreign Object

A. General information
- **1.** Relatively common airway problem.
- **2.** Severity depends on object (e.g., pins, coins, nuts, buttons, parts of toys) aspirated and the degree of obstruction.
- **3.** Depending on object aspirated, symptoms will increase over hours or weeks.
- **4.** The curious toddler is most frequently affected.

5. If object does not pass trachea immediately, respiratory distress will be evident.
6. If object moves beyond tracheal region, it will pass into one of the main stem bronchi; symptoms will be vague, insidious.
7. Causes 400 deaths per year in children under age 4.

B. Medical management
1. Objects in upper airway require immediate removal.
2. Lower airway obstruction is less urgent (bronchoscopy or laryngoscopy).

C. Assessment findings
1. Sudden onset of coughing, dyspnea, wheezing, stridor, apnea (upper airway)
2. Persistent or recurrent pneumonia, persistent croupy cough or wheeze
3. Object not always visible on X-ray
4. Secondary infection

D. Nursing interventions
1. Perform Heimlich maneuver if indicated.
2. Reassure the scared toddler.
3. After removal, place child in high-humidity environment and treat secondary infection if applicable.
4. Counsel parents regarding age-appropriate behavior and safety precautions.

Cystic Fibrosis (CF)

A. General information
1. Disorder characterized by dysfunction of the exocrine glands (mucus-producing glands of the respiratory tract, GI tract, pancreas, sweat glands, salivary glands)
2. Transmitted as an autosomal recessive trait
3. Incidence: According to Cystic Fibrosis Foundation: 30,000 Americans, 3000 Canadians, and 20,000 Europeans.
4. Most common lethal genetic disease among Caucasians in United States and Europe
5. Prenatal diagnosis of CF is not reliable
6. Secretions from mucous glands are thick, causing obstruction and fibrosis of tissue
7. Sweat and saliva have characteristic high levels of sodium chloride
8. Affected organs
   a. Pancreas: 85% of CF clients have pancreatic involvement
      1) Obstruction of pancreatic ducts and eventual fibrosis and atrophy of the pancreas leads to little or no release of enzymes (lipase [fats], amylase [starch], and trypsin [protein])
      2) Absence of enzymes causes malabsorption of fats and proteins
      3) Unabsorbed food fractions excreted in the stool produce steatorrhea
      4) Loss of nutrients and inability to absorb fat-soluble vitamins causes failure to thrive
   b. Respiratory tract: 99.9% of CF clients have respiratory involvement
      1) Increased production of secretions causes increased obstruction of airway, air trapping, and atelectasis
      2) Pulmonary congestion leads to cor pulmonale
      3) Eventually death occurs by drowning in own secretions
   c. Reproductive system
      1) Males are sterile
      2) Females can conceive, but increased mucus in vaginal tract makes conception more difficult
      3) Pregnancy causes increased stress on respiratory system of mother
   d. Liver: one third of clients have cirrhosis/portal hypertension
9. 95% of deaths are from abnormal mucus secretion and fibrosis in the lungs; shortened life span

B. Medical management
1. Pancreatic involvement: aimed at promoting absorption of nutrients
   a. Diet modification
      1) Infant: predigested formula
      2) Older children: may require high-calorie, high-protein, or low/limited-fat diet, but many CF clients tolerate normal diet
   b. Pancreatic enzyme supplementation: enzyme capsules, tablets, or powders (Pancrease, Cotazym, Viokase) given with meals and snacks
2. Respiratory involvement: goals are to maintain airway patency and to prevent lung infection
   a. Chest physiotherapy
   b. Antibiotics for infection

C. Assessment findings: symptoms vary greatly in severity and extent
1. Pancreatic involvement
   a. Growth failure; failure to thrive
   b. Stools are foul smelling, large, frequent, foamy, fatty (steatorrhea), contain undigested food
   c. Meconium ileus (meconium gets stuck in bowel due to lack of enzymes) in newborns
   d. Rectal prolapse is possible
   e. Voracious appetite
   f. Characteristic protruding abdomen with atrophy of extremities and buttocks
   g. Symptoms associated with deficiencies in the fat-soluble vitamins
   h. Anemia
   i. Diagnostic tests
      1) Trypsin decreased or absent in aspiration of duodenal contents
      2) Fecal fat in stool specimen increased
2. Respiratory involvement
   a. Signs of respiratory distress
   b. Barrel chest due to air trapping

c. Clubbing of digits
d. Decreased exercise tolerance due to distress
e. Frequent productive cough
f. Frequent pseudomonas infections
g. Diagnostic tests
1) Chest X-ray reveals atelectasis, infiltrations, emphysemic changes
2) Pulmonary function studies abnormal
3) ABGs show respiratory acidosis

3. Electrolyte involvement
a. Hyponatremia/heat exhaustion in hot weather
b. Salty taste to sweat
c. Diagnostic tests
1) Pilocarpine iontophoresis sweat test: indicates 2–5 times normal amount of sodium and chloride in the sweat
2) Fecal fat elevated
3) Fecal trypsin absent or decreased

D. Nursing interventions
1. Pancreatic involvement
a. Administer pancreatic enzymes with meals as ordered: do not mix enzymes until ready to use them; best to mix in applesauce.
b. Provide a high-calorie, high-carbohydrate (no empty-calorie foods), high-protein, normal-fat diet.
c. Provide a double dose of multivitamins per day, especially fat-soluble vitamins (A, D, E, K), in water-soluble form.
d. If low-fat diet required, MCT (medium-chain triglycerides) oil may be used.

2. Respiratory involvement
a. Administer antibiotics as ordered (all antibiotics for pseudomonas are given IV; doses may be above recommended levels (for virulent organisms).
b. Administer expectorants, mucolytics (rarely used) as ordered.
c. Avoid cough suppressants and antihistamines.
d. Encourage breathing exercises.
e. Provide percussion and postural drainage 4 times a day.
f. Provide aerosol treatments as needed; handheld nebulizers, mask, intermittent positive pressure breathing (IPPB), mist tent.

3. Electrolyte involvement
a. Add salt to all meals, especially in summer.
b. Give salty snacks (pretzels).

4. Provide appropriate long-term support to child and family.

5. Provide client teaching and discharge planning concerning:
a. Genetic counseling
b. Promotion of child's independence
c. Avoidance of cigarette smoking in the house
d. Availability of support groups/community agencies
e. Alternative school education during extended hospitalization/home recovery

Sample Questions

92. The nurse is caring for a child who had a tonsillectomy performed 4 hours ago. Which of the following is an abnormal finding and a cause for concern?
1. An emesis of dried blood.
2. Increased swallowing.
3. Pink-tinged mucus.
4. The child complains of a very sore throat.

93. A 7-year-old has been diagnosed as having cystic fibrosis. Chest physiotherapy has been ordered. When should chest percussion be performed?
1. Before postural drainage.
2. ½ hour before meals.
3. Before an aerosol treatment.
4. After suctioning.

94. The nurse is performing chest physiotherapy on a 6-year-old child who has congestion in his left lower lobe. In which position should the nurse place the child?
1. Left side in semi-Fowler's position.
2. Right side in semi-Fowler's position.
3. Left side in Trendelenburg position.
4. Right side in Trendelenburg position.

95. An infant is being evaluated for possible cystic fibrosis. The sweat test will show an elevation of which electrolyte?
1. Chloride.
2. Fluoride.
3. Potassium.
4. Calcium.

96. A 2-year-old is admitted to the hospital with cystic fibrosis. He is small for his age. What dietary suggestions can the nurse recommend to the child's mother to enhance his growth?
1. Low-fat, low-residue, and high-potassium diet.
2. Low-carbohydrate, soft diet with no sugar products.

3. High-carbohydrate, high-fat diet with extra water between meals.
4. High-protein, high-calorie meals with skim-milk milkshakes between meals.

97. The nurse is caring for a 2-year-old who has cystic fibrosis. His mother asks why the child developed cystic fibrosis. What explanation will the nurse provide?
1. It develops due to meconium ileus at birth.
2. It is an autosomal recessive genetic defect.
3. It occurs during embryologic development.
4. It results from chromosomal nondysjunction that occurred at conception.

98. A 2-year-old is admitted to the hospital and will need to stay for several days. The child's mother is unable to stay overnight because there is no one to care for her other children. What should the nurse recommend the mother do?
1. Leave something of hers with the child and tell him she'll be back in the morning.
2. Leave while he is in the playroom.
3. Leave after he has fallen asleep.
4. Tell him she'll be back in a few minutes after she has dinner.

99. The mother of a 2-year-old who has cystic fibrosis tells the nurse that the family is planning their first summer vacation. She wants to know if there are any special precautions needed because he has cystic fibrosis. What condition will the nurse state that children with cystic fibrosis are particularly susceptible?
1. Severe sunburn.
2. Infectious diarrhea.
3. Heat exhaystion.
4. Respiratory allergies.

100. A 4-year-old is admitted to the hospital for the treatment of an acute asthma attack. She received nebulized albuterol (Proventil) in the emergency department and was transferred to the pediatric unit with an aminophylline infusion. What significant finding will inform the nurse that the treatment is effective?
1. A decrease in mucus production.
2. A decrease in wheezing.
3. An increase in blood pressure.
4. A sleeping child.

101. A 12-month-old is hospitalized for a severe case of croup and has been placed in an oxygen tent. Today the oxygen order has been reduced from 35% to 25%. His blood gases are normal. The child refuses to stay in the oxygen tent. Attempts to placate him only cause him to become more upset. What would be an appropriate action for the nurse to perform?
1. Restrain him in the tent and notify the physician.
2. Take him out of the tent and notify the physician.
3. Take him out of the tent and let him sit in the playroom.
4. Tell him it will please his mother if he stays in the tent.

102. The nurse should recognize which of the following respiratory findings as normal in a 10-month-old infant?
1. Respiratory rate of 60 at rest.
2. Use of accessory muscles to assist in respiratory effort.
3. Respiratory rate of 32 at rest.
4. Diaphoresis with shallow respirations.

103. An 18-month-old presents with nasal flaring, intercostal and substernal retractions, and a respiratory rate of 50. What is the most appropriate nursing diagnosis?
1. Knowledge deficit.
2. Ineffective breathing pattern.
3. Ineffective individual coping.
4. High risk for altered body temperature: hyperthermia.

104. An 11-month-old is admitted to the hospital with bronchiolitis. He is currently in a croup tent with supplemental oxygen. Which toy is most appropriate for the nurse to recommend to the child's parents?
1. A stuffed animal made from a washable fabric.
2. A soft plastic stacking toy with multicolored rings.
3. A set of wooden blocks.
4. A pull toy.

105. Which of the following statements best assures the nurse that the parents understand the safety concerns related to use of a vaporizer at home?
1. "I have a high dresser in the bedroom on which to place the vaporizer. The cord will be concealed behind the dresser."

2. "I plan to put the vaporizer on a stool next to the bed so that my child will get the most benefit from the cool mist."
3. "I purchased a warm mist vaporizer because I don't want my child to get chilled from the mist in her face."
4. "I thought I could just set the vaporizer on the floor next to the bed."

106. A 4-year-old is experiencing an acute asthma attack. Why should the nurse avoid chest percussion with this child?

1. Chest percussion may lead to increased bronchospasm and more respiratory distress.
2. Chest percussion may cause mucous plugging of the alveoli.
3. Chest percussion is useful in removing airway secretions and should be used.
4. Chest percussion will produce increased coughing and thereby enhance respiratory distress.

107. A 5-month-old has severe nasal congestion. What is the best way for the nurse to clear his nasal passages?

1. Administer saline nose drops and use a bulb syringe to clear passages.
2. Ask him to blow his nose and keep tissues handy.
3. Place him in a mist tent with 40% oxygen.
4. Administer vasoconstrictive nose drops before meals and at bedtime.

108. A 30-week gestation infant who had apnea of prematurity is ready for discharge and will be going home on apnea monitoring. What should the nurse teach the parents for proper use of the monitor?

1. The monitor is only used when the child is awake. It is not indicated at night or during naps.
2. The alarms on the monitor should be turned off when an attendant is with the infant.
3. The monitor should be kept on at all times except when the infant is being bathed. Careful attention to skin integrity and hygiene is important.
4. It is best for the parents to have 24-hour home health supervision to watch the infant while monitoring is required.

109. A 3-year-old underwent a tonsillectomy this morning. As the nurse giving discharge instructions, which comment by the child's mother suggests that she understands the care requirements?

1. "I plan to take her back to her play group tomorrow. I know she won't want to stay home."
2. "I have bought popsicles to give her later today."
3. "I will give her aspirin if she gets irritable."
4. "She is just waiting for the ice cream we promised her before she came to the hospital."

110. A 3-year-old boy presents in the ER with dysphagia, drooling, and respiratory difficulty that has increased significantly over the past 6 hours. The nurse should know that these findings are suggestive of which of the following conditions?

1. Croup.
2. Pneumonia.
3. Bronchopulmonary dysplasia.
4. Epiglottitis.

111. A 2-year-old presents to an urgent care center with respiratory distress and cyanosis. Parents report an initial episode of choking. What is the best initial action for the nurse to take?

1. Call 911 and have parents wait for an ambulance to transport the child to a pediatric hospital.
2. Administer oxygen by face mask and call the child's pediatrician.
3. Perform abdominal thrusts as described in the Heimlich maneuver.
4. Start CPR after the child loses consciousness.

Answers and Rationales

92. 2. Increased swallowing could be a sign of hemorrhage from the surgical site.

93. 2. Chest percussion is done between meals to prevent vomiting, which might occur if done following meals.

94. 4. The affected lobe must be uppermost to be drained by gravity.

95. 1. There is increased excretion of chloride in the sweat of children with cystic fibrosis. A chloride level of over 60 mEq/liter is diagnostic for the disease.

96. 4. A person with cystic fibrosis lacks pancreatic enzymes necessary for fat absorption. A diet high in protein and calories is necessary to meet the child's growth needs. Between-meal snacks, milkshakes made with skim milk may be given to provide additional protein, vitamins, and calories.

97. 2. Cystic fibrosis is an autosomal recessive genetic disease. If both parents have the cystic fibrosis trait, each child has a 25% chance of developing the disease, a 50% chance of being a carrier, and a 25% chance of not having the disease.

98. 1. Leaving something of his mother's with the child and telling him that she will be back in the morning is the best approach in developing trust between the mother and her child.

99. 3. Persons with cystic fibrosis are prone to electrolyte imbalances due to increased loss of sodium and potassium in their sweat. The mother should avoid having her child become overheated and should frequently replenish body fluids with water or fruit juices.

100. 2. Aminophylline is a bronchodilator. As it exerts its effects, wheezing will decrease.

101. 2. The energy expended by the child in resisting the oxygen tent is causing increased respiratory effort. The child should be removed from the tent and closely monitored to be sure that he handles being in room air. The physician should be notified because the oxygen content of room air is only 20%, which is less than that ordered.

102. 3. Rates of 20–40 breaths per minute are normal at this age.

103. 2. The findings on assessment suggest respiratory distress. Ineffective breathing pattern is an appropriate diagnosis with the information now available.

104. 2. Stacking toys with bright, large, colored plastic rings provide age-appropriate activity that is safe within the croup tent environment. The large rings can be held or stacked. They can be wiped down if damp. The size of the objects prevent them from creating any environmental hazards if the child is not continuously supervised.

105. 1. It is best to keep the vaporizer out of the child's way. Concealing the cord and placing the appliance on a high surface is preferable.

106. 1. During the course of an acute asthma attack, bronchospasm is a significant problem. Chest percussion can enhance the bronchospasm, leading to more pronounced respiratory distress.

107. 1. Saline nose drops will help loosen secretions. The bulb syringe is necessary because the child is not old enough to effectively blow his nose.

108. 3. Although apneic episodes are most common during sleep, they can occur at other times. Initially, it is particularly advisable to use the monitor continually except when bathing the infant.

109. 2. Clear liquids are a good choice during the first 24 hours after surgery. Popsicles are appealing to children while providing fluids. They are less likely to irritate the surgical site than juices.

110. 4. Epiglottitis is a medical emergency. The drooling and dysphagia are most often diagnostic of this condition.

111. 3. The reported episode of choking and the child's condition suggest foreign body aspiration. The Heimlich maneuver should be attempted as an initial action to remove the object.

The Gastrointestinal System

VARIATIONS FROM THE ADULT

A. Mechanical functions of digestion are immature at birth.
  1. No voluntary control over swallowing until 6 weeks
  2. Stomach capacity decreased
  3. Peristalsis increased, faster emptying time, more prone to diarrhea
  4. Relaxed cardiac sphincter contributes to tendency to regurgitate food

B. Liver functions (glyconeogenesis and storage of vitamins) are immature throughout infancy.

C. Production of mucosal-lining antibodies is decreased.

D. Gastric acidity is low in infants, slowly rises until age 10, and then increases again during adolescence to reach adult levels.
E. Secretory cells are functional at birth, but efficiency of enzymes impaired by lower gastric pH.
F. Infant has decreased saliva, which causes decreased ability to digest starches.
G. Digestive processes are mature by toddlerhood.
H. Completion of myelinization of spinal cord allows voluntary control of elimination.

ASSESSMENT

History

A. Presenting problem: symptoms may include:
  1. Vomiting: type, color, amount, relationship to eating or other events
  2. Abnormal bowel habits: diarrhea, constipation, bleeding
  3. Weight loss or growth failure
  4. Pain: location; relationship to meals or other events; effect on sleep, play, appetite
  5. Any other parental concerns
B. Diet/nutrition history: appetite, daily caloric intake, food intolerances, feeding schedule, nutritional deficits

Physical Examination

A. General appearance
  1. Plot height and weight on growth chart.
  2. Measure midarm circumference and tricep skinfold thickness.
  3. Observe color: jaundiced or pale.
B. Mouth
  1. Note level of dentition, presence of dental caries.
  2. Observe mucosal integrity.
C. Abdomen
  1. Observe skin integrity.
  2. Note abdominal distension or visible peristaltic waves (seen in pyloric stenosis).
  3. Inspect for hernias (umbilical, inguinal).
  4. Auscultate for bowel sounds (a sound every 10–30 seconds is normal).
  5. Palpate for tenderness.
  6. Palpate for liver (inferior edge normally palpated 1–2 cm below right costal margin).
  7. Palpate for spleen (may be felt on inspiration 1–2 cm below left costal margin).
D. Vital signs: note presence of fever.

ANALYSIS

Nursing diagnoses for the child with a disorder of the gastrointestinal system may include:
A. Constipation or diarrhea
B. Pain
C. Risk for deficient fluid volume
D. Imbalanced nutrition: less than body requirements
E. Impaired oral mucous membrane
F. Risk for impaired skin integrity
G. Ineffective tissue perfusion
H. Interrupted family processes

PLANNING AND IMPLEMENTATION

Goals

A. Child will maintain adequate nutritional intake.
B. Child will be free from complications of inadequate nutritional intake.
C. Pain will be relieved/controlled.
D. Child will reach optimal developmental level.
E. Parents will be able to care for child at home.

Interventions

Nasogastric Tube Feeding

A. Provide continuous NG tube feedings when child needs high-calorie intake.
B. Use infusion pump to ensure sustained intake.
C. Check tube placement every 4 hours.
D. Check residuals and refeed every 4 hours.

Gastrostomy

A. Used for clients at high risk for aspiration.
B. Regulate height of tube so feeding flows in over 20–30 minutes.

Parenteral Nutrition

A. Use central venous line for high dextrose solutions (greater than 10%).
B. Check infusion rate and amount every 30 minutes.
C. Monitor urine sugar and acetone every 4 hours for 24 hours after a solution change, then every 8 hours.
D. Monitor for signs of hyperglycemia (nausea, vomiting, dehydration).
E. Provide sterile care for insertion site.
  1. Change solution and tubing every 24 hours.
  2. Change dressing every 1–3 days.
  3. Apply restraints (if needed) to prevent dislodgment of central line.
F. Provide infants who are not receiving oral feedings with a pacifier to satisfy sucking needs.

EVALUATION

A. Child is receiving adequate nourishment as evidenced by normal growth and development.
B. Skin is intact, free from signs of redness or inflammation.

C. Child is free from infection, diarrhea, or vomiting.
D. Child is free from pain.
  1. Relaxed facial expression
  2. Level of activity
  3. No guarding of abdomen
E. Parents participate in care of child.
F. Child participates in normal daily activities with family and peers.

DISORDERS OF THE GASTROINTESTINAL SYSTEM

Congenital Disorders

Cleft Lip and Palate

A. General information
  1. Nonunion of the tissue and bone of the upper lip and hard/soft palate during embryologic development
  2. Familial disorder, often associated with other congenital abnormalities; incidence higher in Caucasians
    a. Cleft lip or palate: 1.5 in 1000 births
    b. Cleft lip with or without cleft palate affects more boys; cleft palate affects more girls
  3. With cleft palate, the failure of the bone and tissues to fuse results in a communication between the mouth and nose
B. Medical management: team approach for therapy
  1. Speech therapist
  2. Dentist and orthodontist
  3. Audiologist, otolaryngologist, pediatrician (these children are prone to otitis media and possible hearing loss)
  4. Surgical correction
    a. Timing varies with severity of defect; early correction helps to avoid speech defects.
    b. Cheiloplasty: correction of cleft lip
      1) Goal is to unite edges to allow lips to be both functional and cosmetically attractive.
      2) Usually performed approximately age 2 months (to prepare gums for eruption of teeth) when child is free from respiratory infection.
      3) Steri-Strips or Logan bow usually used to take tension off suture line.
    c. Cleft palate repair is usually not done until age 18 months in anticipation of speech development.
      1) Between lip and palate repair child is maintained on normal nutritional and respiratory status; also maintains normal immunization schedule.
      2) Child should be weaned and able to take liquids from a cup before palate repair.
C. Assessment findings
  1. Facial abnormality visible at birth: cleft lip or palate or both, unilateral or bilateral, partial or complete
  2. Difficulty sucking, inability to form airtight seal around nipple (size of defect may preclude breastfeeding)
  3. Formula/milk escapes through nose in infants with cleft palate
  4. Predisposition to infection because of free communication between mouth and nose
  5. Possible difficulty swallowing
  6. Abdominal distension due to swallowed air
D. Nursing interventions: preoperative cleft lip repair
  1. Feed in upright position to decrease chance of aspiration and decrease amount of air swallowed.
  2. Burp frequently; increased swallowed air causes abdominal distension and discomfort.
  3. Use a large-holed nipple; press cleft lip together with fingers to encourage sucking and to strengthen muscles needed later for speech.
  4. If infant unable to suck, use a rubber-tipped syringe and drip formula into side of mouth.
  5. Administer gavage feeding as ordered if necessary.
  6. Finish feeding with water to wash away formula in palate area.
  7. Provide small, frequent feedings.
  8. Provide emotional support for parents/family.
    a. Demonstrate benefits of surgery by showing before and after pictures.
    b. Reinforce that disorder is not their fault and that it will not affect child's life span or mental ability.
E. Nursing care: postoperative cleft lip repair
  1. Maintain patent airway (child may appear to have respiratory distress because of closure of previously open space; adaptation occurs quickly).
  2. Assess color; monitor amount of swallowing to detect hemorrhage.
  3. Do not place in prone position or with pressure on cheeks; avoid any pressure or tension on suture line.
  4. Avoid straining on suture line by anticipating child's needs.
    a. Prevent crying.
    b. Keep child comfortable and content.
  5. Use elbow restraints or pin sleeves of shirt to diaper to keep child's hands away from suture line.
  6. Resume feedings as ordered.
  7. Keep suture line clean; clean after each feeding with saline, peroxide, or water to remove crusts and prevent scarring.
  8. Provide pain control/relief.
F. Nursing interventions: preoperative cleft palate repair
  1. Prepare parents to care for child after surgery.

2. Instruct concerning feeding methods and positioning.

G. Nursing interventions: postoperative cleft palate repair
   1. Position on side for drainage of blood/mucus.
   2. Have suction available but use only in emergency.
   3. Prevent injury or trauma to suture line.
      a. Use cups only for liquids; no bottles.
      b. Avoid straws, utensils, Popsicle sticks, chewing gum.
      c. Provide soft toys.
      d. Use elbow restraints.
      e. Provide liquid diet initially, then progress to soft before returning to normal.
      f. Give water after each feeding to clean suture line.
      g. Hold and cuddle these babies to help distract them.

Altered Connections between Trachea, Esophagus, and Stomach

A. General information
   1. Types (Figure 5-9)
      a. Esophageal atresia: esophagus ends in a blind pouch; no entry route to stomach
      b. Tracheoesophageal fistula (TEF): open connection between trachea and esophagus
      c. Esophageal atresia with TEF: esophagus ends in a blind pouch; stomach end of esophagus connects with trachea
   2. These deformities are found more often in low-birth-weight or premature infants, and are associated with polyhydramnios in the mother and multiple congenital anomalies.

B. Medical management
   1. Drug therapy: antibiotics for respiratory infections
   2. Surgery
      a. Palliative
         1) Gastrostomy for placement of a feeding tube
         2) Esophagostomy to drain secretions
      b. Corrective
         1) End-to-end anastomosis to correct the defect and restore normal anatomy
         2) Colon transplant for defects where there is insufficient tissue for an end-to-end anastomosis

C. Assessment findings
   1. Esophageal atresia
      a. History of polyhydramnios in mother (from infant's inability to swallow and excrete amniotic fluid)
      b. Inability to pass an NG tube
      c. Increased drooling and salivation
      d. Immediate regurgitation of undigested formula/milk when fed
      e. Intermittent cyanosis from choking on aspirated secretions
   2. TEF
      a. Normal swallowing but some food/mucus crosses fistula, causing choking and intermittent cyanosis
      b. Distended abdomen from inhaled air crossing fistula into stomach
      c. Aspiration pneumonia from reflux of gastric secretions into the trachea

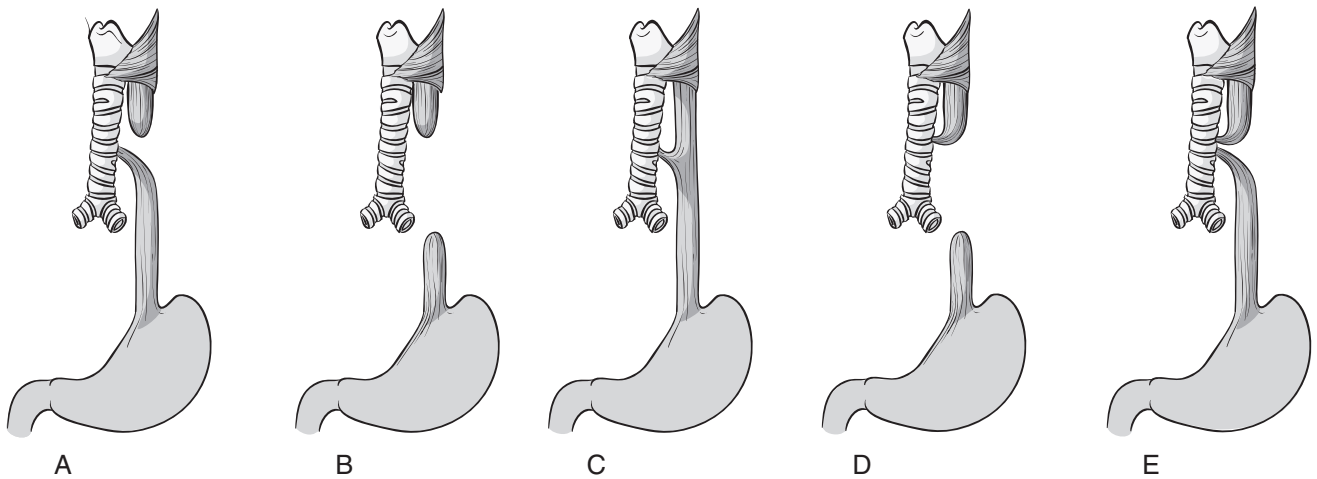


Figure 5-9 Types of esophageal atresia and tracheoesophageal fistula. (A) Esophageal atresia with distal tracheoesophageal fistula; (B) isolated or pure esophageal atresia; (C) tracheoesophageal fistula without esophageal atresia; (D) esophageal atresia with proximal tracheoesophageal fistula; and (E) esophageal atresia with proximal and distal tracheoesophageal fistula.

3. Esophageal atresia with TEF
   a. All findings for esophageal atresia
   b. Abdominal distension and aspiration pneumonia from gas and reflux of gastric acids into trachea
4. Diagnostic tests: fluoroscopy with contrast material reveals type of defect

D. Nursing interventions: preoperative
1. Maintain patent airway.
   a. Position according to type of defect (usually 30° head elevation).
   b. Provide continuous or prn nasal suctioning.
2. Keep NPO.
3. Administer IV fluids as ordered.

E. Nursing interventions: postoperative
1. Provide nutrition.
   a. Provide gastrostomy tube feedings until the anastomosis site has healed.
   b. Start oral feedings when infant can swallow well.
   c. Progress from glucose water to small, frequent formula feedings.
2. Promote respiratory function.
   a. Position properly.
   b. Suction as needed.
   c. Provide chest tube care.
3. Provide client teaching and discharge planning concerning:
   a. Alternative feeding methods
   b. Signs of respiratory distress and suctioning technique

Gastroesophageal Reflux (Chalasia)

A. General information
1. Reversal of flow of stomach contents into lower portion of esophagus
2. More common in premature infants due to hypotonia
3. Caused by relaxed cardiac sphincter or overdistension of stomach by gas or overfeeding
4. Results in local irritation of the lining of the esophagus from backflow of acidic gastric contents; sometimes causes aspiration pneumonia

B. Assessment findings
1. Irritability
2. "Spitting up" (versus vomiting or projectile vomiting); note relationship to feedings
3. Diagnostic tests
   a. Muscle tone of cardiac sphincter reduced
   b. Esophageal pH: contents acidic
   c. Fluoroscopy: presence of refluxed contrast material not quickly cleared or repeated reflux

C. Nursing interventions
1. Position with head elevated 30–45°.
2. Give small, frequent feedings with adequate burping.
3. Provide client teaching and discharge planning: teach parents how to position and feed infant.

Pyloric Stenosis

A. General information
1. Hypertrophy (thickening) of the pyloric sphincter causing stenosis and obstruction
2. Incidence: 5 in 1000 births; more common in Caucasian, firstborn, full-term boys
3. Cause unknown; possibly familial

B. Medical management
1. Correction of fluid electrolyte abnormalities
2. Surgery: pyloromyotomy (Fredet-Ramstedt procedure)

C. Assessment findings
1. Olive-size bulge under right rib cage
2. Vomiting
   a. As obstruction increases, vomiting becomes more forceful and projectile.
   b. Vomitus does not contain bile (bile duct is distal to the pylorus).
3. Peristaltic waves during and after feeding (look like rolling balls under abdominal wall)
4. Failure to thrive, even though infant appears hungry after vomiting
5. Dehydration: sunken fontanels, poor skin turgor, decreased urinary output
6. Diagnostic tests
   a. Upper GI series reveals narrowing of the diameter of the pylorus
   b. Sodium, potassium, chloride decreased
   c. HCT increased
   d. Metabolic alkalosis

D. Nursing interventions: preoperative
1. Administer replacement fluids and electrolytes as ordered.
2. Prevent vomiting.
   a. May be NPO with NG tube to suction.
   b. Keep in high-Fowler's position.
   c. Place on right side after feedings.
   d. Minimize handling.
   e. Record strict I&O, daily weights, and urine specific gravity.
3. Observe for symptoms of aspiration of vomitus.

E. Nursing interventions: postoperative
1. Advance diet as tolerated.
2. Place on right side after feeding. Elevate head.
3. Monitor strict I&O, daily weights.
4. Observe incision for signs of infection.
5. Provide client teaching and discharge planning concerning feeding and positioning of infant.

Intussusception

A. General information
1. Telescoping of bowel into itself (usually at the ileocecal valve) causing edema, obstruction, and possible necrosis of the bowel

2. Most common at about age 6 months; occurs more often in boys than in girls; associated with cystic fibrosis and celiac disease
3. Cause unknown

B. Medical management
1. Barium or contrast medium enema to reduce telescoping by hydrostatic pressure
2. Surgery if barium enema unsuccessful or if signs of peritonitis

C. Assessment findings
1. Piercing cry
2. Severe abdominal pain (pulls legs up)
3. Vomiting of bile-stained fluid
4. Bloody mucus in stool
5. "Currant-jelly" stool

D. Nursing interventions
1. Provide routine pre- and post-op care for abdominal surgery.
2. Monitor for fluid and electrolyte imbalance and intervene as needed.
3. Monitor for peritonitis and intervene as needed.
4. Monitor stools. Report changes.

Hirschsprung's Disease (Aganglionic Megacolon)

A. General information
1. Absence of autonomic parasympathetic ganglion cells in a portion of the large colon (usually occurs 4–25 cm proximally from anus), resulting in decreased motility in that portion of the colon and signs of functional obstruction
2. Usually diagnosed in infancy
3. Familial disease; more common in boys than girls; associated with Down syndrome
4. When stool enters the affected part of the colon, lack of peristalsis causes it to remain there until additional stool pushes it through; colon dilates as stool is impacted.

B. Medical management
1. Drug therapy: stool softeners
2. Isotonic enemas
3. Diet therapy: low residue
4. Surgery
   a. Palliative: loop or double-barrel colostomy
   b. Corrective: abdominal-perineal pull through; bowel containing ganglia is pulled down and anastomosed to the rectum.

C. Assessment findings
1. Failure or delay in passing meconium
2. Abdominal distension; failure to pass stool
3. Temporary relief following digital rectal exam
4. Loose stools; only liquid can get around impaction (may also be a ribbonlike stool)
5. Nausea, anorexia, lethargy
6. Possibly bile-stained or fecal vomiting
7. Loss of weight, failure to grow
8. Volvulus (bowel twists upon itself, causing obstruction and necrosis) and enterocolitis due to fecal stagnation
9. Diagnostic tests: rectal biopsy confirms presence of aganglionic cells

D. Nursing interventions
1. Administer enemas as ordered.
   a. Use mineral oil or isotonic saline.
   b. Do not use tap water or soap suds enemas in infants because of danger of water intoxication.
   c. Use volume appropriate to weight of child.
      1) Infants: 150–200 mL
      2) Children: 250–500 mL
2. Do not treat the loose stools; the child actually is constipated.
3. Administer TPN as ordered.
4. Provide a low-residue diet.
5. Provide client teaching and discharge planning concerning colostomy care and low-residue diet.

Imperforate Anus

A. General information
1. Congenital malformation caused by abnormal fetal development
2. Many variations; anal agenesis most frequent
3. Often associated with fistula formation to rectum or vagina and other congenital anomalies
4. Surgical correction performed in stages with completion at about age 1 year
5. May need temporary colostomy

B. Medical management
1. Manual dilatation
2. Surgery: anoplasty (reconstruction of anus)
3. Prophylactic antibiotics

C. Assessment findings
1. No stool passage within 24 hours of birth
2. Meconium stool from inappropriate orifice
3. Inability to insert thermometer

D. Nursing interventions
1. If suspected, do not take rectal temperature because of risk of perforating wall and causing peritonitis.
2. Perform manual dilatation as ordered; instruct parents in proper technique.
3. After surgery prevent infection; keep anal incisional area as clean as possible.
4. After surgery use side-lying position, or have child lie prone with hips elevated.

Acquired Gastrointestinal Disorders

Celiac Disease

A. General information
1. Malabsorption syndrome characterized by intolerance of gluten, found in rye, oats, wheat, and barley
2. Familial disease, found more commonly in Caucasians

3. Cause unknown; thought to be an inborn error of metabolism or an immunologic disorder
4. Characterized by flat mucosal surface and atrophy of villi of the intestine; reduced absorptive surface causes marked malabsorption of fats

B. Medical management: diet therapy main intervention; gluten-free diet, TPN in children who are severely malnourished

C. Assessment findings
1. Steatorrhea: frothy, pale, bulky, foul-smelling, greasy stools
2. Chronic diarrhea during late infancy and throughout toddlerhood
3. Failure to thrive
4. Grossly distended abdomen; muscle wasting of limbs and buttocks
5. Abdominal pain, irritability, listlessness, vomiting
6. Symptoms of vitamin A, D, E, and K deficiency
7. Diagnostic tests
   a. Pancreatic enzymes and sweat chloride test normal (performed to rule out the possibility of cystic fibrosis)
   b. Jejunal and duodenal biopsies show characteristic atrophy of the mucosa

D. Nursing interventions
1. Monitor gluten-free diet (no wheat, barley, oats, and rye products)
2. Provide supplemental fat-soluble vitamins in water-soluble form
3. Provide client teaching and discharge planning concerning:
   a. Gluten-free diet; stress allowed foods and importance of reading labels carefully
   b. Avoidance of infection
   c. Assisting child to feel like a "normal" peer
   d. Importance of adhering to diet even though symptoms are controlled
   e. Importance of long-term follow-up management

Appendicitis

A. General information
1. Inflammation of the appendix that prevents mucus from passing into the cecum; if untreated, ischemia, gangrene, rupture, and peritonitis occur
2. Most common in school-age children
3. May be caused by mechanical obstruction (fecaliths, intestinal parasites) or anatomic defect; may be related to decreased fiber in the diet

B. Assessment findings
1. Diffuse pain, localizes in lower right quadrant
2. Nausea/vomiting
3. Guarding of abdomen, rebound tenderness, walks stooped over
4. Decreased bowel sounds
5. Fever
6. Diagnostic tests
   a. WBC increased
   b. Elevated acetone in urine

C. Nursing interventions
1. Administer antibiotics/antipyretics as ordered
2. Prevent perforation of the appendix; do not give enemas or cathartics or use heating pad
3. In addition to routine pre-op care for appendectomy:
   a. Give support to parents if seeking treatment was delayed.
   b. Explain necessity of obtaining lab work prior to surgery.
4. In addition to routine post-op care:
   a. Monitor NG tube (usually with low suction).
   b. Monitor Penrose drains.
   c. Position in semi-Fowler's or lying on right side to facilitate drainage.
   d. Administer antibiotics as ordered.

Parasitic Worms

A. General information
1. A parasite is an organism that lives in, on, or at the expense of the host.
2. Common human GI parasites are pinworms and roundworms.
3. Medication varies depending on type of parasite.

B. Assessment findings
1. Pinworms: anal irritation, itching, disturbed sleep
2. Roundworm: colic, abdominal pain, lack of appetite, weight loss

C. Nursing interventions
1. Obtain stool culture.
2. Observe for worms in all excreta (Scotch tape test for stool).
3. Instruct parents to change clothing, bed linens, towels and launder in hot water.
4. Clean toilets with disinfectant.
5. Instruct all family members to scrub hands and fingernails prior to eating and after using toilet.
6. Follow specific medication and hygiene orders given by physician.

Giardiasis

A. General information
1. Common cause of diarrhea
2. Protozoan *Giardia lamblia*
3. Common in daycare centers
4. Cysts ingested, mature in GI tract, cysts excreted in stools, and complete maturation
5. Multiple stool cultures required as all stools don't contain cysts

6. Usually fecal-oral transmission, also contaminated water and animals

B. Assessment findings
1. Diarrhea
2. Vomiting, anorexia
3. Failure to thrive
4. Abdominal cramps

C. Medical management
1. Metronidazole (Flagyl)
2. Furazolidone (Furoxone)

D. Nursing interventions
1. Hygiene, especially with diaper changes
2. Handwashing
3. Instructions about drug therapy

Constipation

A. General information
1. Decrease in number of bowel movements with large, hard stools
2. May be caused by high fat and protein and low fluid in diet
3. May cause bowel obstruction if severe

B. Medical management
1. Drug therapy: stool softeners, suppositories, enemas
2. Diet therapy: increased fluids and fiber

C. Assessment findings
1. Less frequent stools, difficulty eliminating stool, hard consistency compared to normal pattern (children do not have to stool every day)
2. Bleeding with stooling
3. Abdominal pain

D. Nursing interventions
1. Assess for other pathologic causes of constipation.
2. Dietary modification, increase fiber and fluids.
3. Apply lubricant around anus.
4. Remove stool digitally if possible.
5. Provide prune juice (1 oz); add fruits to diet.
6. Add small amount of Karo syrup to formula.
7. Teach parents methods to prevent further episodes.

Sample Questions

112. A 9-year-old has celiac disease, which has been in good control since it was diagnosed 6 years ago. She has now been admitted to the hospital for an emergency appendectomy. Which preoperative procedure should the nurse withhold?
1. A cleansing enema.
2. Starting an IV.
3. Keeping her NPO.
4. Obtaining a blood sample for a CBC.

113. An 8-year-old has celiac disease. She had an emergency appendectomy. She is progressing well and is having her first real meal. Which food should the nurse remove from her tray?
1. Chicken rice soup.
2. Crackers.
3. Hamburger patty.
4. Fresh fruit cup.

114. A 10-month-old is brought to the clinic for a checkup and his MMR immunization. While talking to the nurse, the mother reports that her teenage babysitter has just come down with rubeola. What is the most appropriate plan of treatment for the child?
1. Administer immune serum globulin.
2. Administer prophylactic penicillin.
3. Vaccinate him now with MMR.
4. Allow him to catch measles from the babysitter in order to develop active immunity.

115. The nurse is caring for a 12-month-old child who has a cleft palate. A cleft lip was repaired when he was 2 months old. His mother asks the nurse when he will be ready for a cleft palate repair. What response would best inform the parent when the cleft palate repair can be performed?
1. Prior to development of speech.
2. When the child is toilet trained.
3. When the child is completely weaned from the bottle and pacifier.
4. When a large-holed nipple is ineffective for his feedings.

116. A 2-year-old has had a cleft palate repair. Which priority teaching fact will be included when educating the mother about the post-op period?
1. Resume toilet training after he is up and around.
2. Use a cup or wide bowl spoon for feeding.
3. He will be more prone to respiratory infections now that his airway is smaller.
4. No further treatment will be needed until his adult teeth come in at age 6.

117. What is the appropriate feeding technique for the nurse to use with an infant who has a cleft palate?
1. Suction client prior to feeding.
2. Feed in sitting position.
3. Have the nurse feed the client during hospitalization.
4. Burp client after feeding to reduce risk of aspiration.

118. How would you evaluate that the new nurse is using appropriate technique to feed a 3-day-old with a cleft lip?

1. NG tube is patent.
2. Infant is seated in upright position.
3. The nurse uses a Nuk nipple.
4. The nurse adds rice to formula.

119. A baby girl is born prematurely to a mother with polyhydramnios. The baby is diagnosed with esophageal atresia with tracheoesophageal fistula. What assessment finding would the nurse be likely to note?

1. Jaundice, high bilirubin.
2. Seedy yellow stools.
3. Projectile emesis.
4. Frothy saliva, drooling.

120. A 5-month-old girl is admitted with gastroesophageal reflux. Her signs and symptoms include emesis, poor weight gain, hemepositive stools, irritability, and gagging with feeds. The nurse would include which intervention?

1. Urine dipstick each void.
2. Appropriate feeding positioning.
3. Biweekly weights.
4. Monitor WBC as indicator for infection.

121. A 4-week-old is admitted for observation. Her assessment reveals projectile vomiting, visible gastric peristalsis, and an olive-shaped mass in the epigastrium. Which nursing diagnosis is of highest best priority?

1. Altered nutrition.
2. Self-care deficit.
3. Impaired gas exchange.
4. Fluid volume deficit.

122. The nurse would find which stool characteristic consistent with a diagnosis of intussusception?

1. Yellow seedy stools.
2. Currant jelly-like stools.
3. Mucus-like stools.
4. Hard black stools.

123. A 6-month-old boy is treated at home with saline enemas due to his Hirschsprung's disease. His mother asks if she can use tap water to reduce costs. Which is the best response by the nurse?

1. "Yes, tap water is as effective as saline, just be sure to boil it first."
2. "No, saline enemas must be used to maintain his electrolyte balance."
3. "Yes; you can use tap water after letting it run for one minute to clear any lead from the pipes."
4. "No; tap water enemas are not allowed, but soap suds enemas are just as effective."

124. A 5-year-old boy has celiac disease. Which statement by the child informs the nurse that he is following his diet?

1. "I had hot dogs and french fries for lunch."
2. "I ate chicken and vegetables for dinner."
3. "I had macaroni and cheese for lunch."
4. "I ate soup and crackers for dinner."

125. A 14-year-old is admitted to your unit following an emergency appendectomy. What is the nurse's goal for this client?

1. Pain related to inflamed appendix.
2. Patient will experience minimized risk of spread of infection.
3. Maintain NG tube decompression until bowel motility returns.
4. Child demonstrates resolution of peritonitis.

126. A 9-year-old girl comes into the clinic with a diagnosis of pinworms. What is it essential for the nurse to teach?

1. Check for pinworms every morning for a week with a Scotch tape test.
2. Save the girl's next bowel movement to check for pinworms.
3. Follow-up with local doctor in 6 months to check for recurrence.
4. Scrub hands and fingernails thoroughly before each meal and after each use of the toilet.

Answers and Rationales

112. **1.** Enemas, cathartics, and heat to the abdomen should all be avoided in appendicitis because they may cause perforation of the appendix.

113. **2.** The prescribed diet for children with celiac disease is gluten free. Crackers contain gluten.

114. **1.** Administration of immune serum globulin will provide the child with passive immunity to prevent a full-blown case of measles or reduce the severity of symptoms.

115. **1.** Cleft palate repair should be done before speech is well developed. This allows for the formation of a more normal speech pattern.

116. 2. Care must be taken not to put anything in the mouth that could damage the suture line.

117. 2. This position reduces the risk of aspiration.

118. 2. This position reduces the risk of aspiration.

119. 4. Infants with esophageal atresia (EA) with tracheoesophageal fistula (TEF) have difficulty handling their secretions.

120. 2. It may be a challenge to find the optimum position. Best positions include upright prone and 30° head of bed elevation.

121. 4. Infants with pyloric stenosis are at high risk for electrolyte imbalance and these need to be corrected prior to a pyloromyotomy.

122. 2. The obstruction causes bloody mucus known as currant jelly stools.

123. 2. Repeated water enemas cause electrolyte dilution.

124. 2. Chicken and vegetables do not contain gluten. Gluten is in barley, rye, oats, and wheat.

125. 2. This is an appropriate goal.

126. 4. Handwashing prevents reinfection and/or new infections in other people.

The Genitourinary System

VARIATIONS FROM THE ADULT

A. Nephrons continue to develop after birth.
B. Glomerular filtration rate is 30% below adult levels at birth; reaches normal level by age 2 years.
C. Tubular functions immature at birth; tubular absorption and secretion reach adult levels by age 2 years.
D. Urethra is shorter in children and more prone to ascending infection (particularly true in girls); the urethra is also closer to anus as source of contamination.
E. Many GU conditions in children become chronic.

ASSESSMENT

History

A. Presenting problem: symptoms may include:
  1. Change in appearance, color, or smell of urine
  2. Change in amount, frequency, or pattern of urination
  3. Abdominal or back pain
  4. Anorexia, nausea, vomiting, weight loss
  5. Headaches, seizures
  6. Fatigue, lethargy
  7. Excessive thirst
  8. Drug use or accidental ingestions
B. Family history: kidney disease, hypertension

Physical Examination

A. General appearance: note presence of edema.
B. Abdomen and genitalia: note abdominal distension, presence of undescended testicle, tenderness to palpation, placement of urinary meatus, urinary stream during voiding
C. Vital signs: note presence of fever; increased blood pressure (common in renal disease)

ANALYSIS

Nursing diagnoses for the child with a disorder of the genitourinary tract may include:
A. Excess fluid volume
B. Impaired urinary elimination
C. Pain
D. Activity intolerance
E. Interrupted family process

PLANNING AND IMPLEMENTATION

Goals

A. Child will have normal urinary function.
B. Child's fluid and electrolyte and acid-base balances will be normal.
C. Child will be free from signs of infection.
D. Child's blood pressure will be within normal limits.
E. Parents will be able to care for child at home.

Intervention

Pediatric Urine Collector (PUC)

A. Used when child is not toilet trained
B. Nursing care
  1. Wash genitalia as for clean catch specimens.
  2. Apply bag directly to dry skin; do not use powder or creams.
  3. If child has not voided within 45 minutes, remove bag and repeat process.

EVALUATION

A. Child is adequately hydrated as evidenced by normal serum electrolyte levels and normal urine output.
B. Child is free from complications such as infection, skin breakdown, or hypertension.
C. Parents demonstrate ability to administer appropriate medications and treatments.

DISORDERS OF THE GENITOURINARY SYSTEM

Urinary Tract Infection (UTI)

A. General information
  1. Bacterial invasion of the kidneys or bladder
  2. More common in girls, preschool, and school-age children
  3. Usually caused by *E. coli;* predisposing factors include poor hygiene, irritation from bubble baths, urinary reflux
  4. The invading organism ascends the urinary tract, irritating the mucosa and causing characteristic symptoms.
B. Assessment findings
  1. Low-grade fever
  2. Abdominal pain
  3. Enuresis, pain/burning on urination, frequency, hematuria
C. Nursing interventions
  1. Administer antibiotics as ordered; prevention of kidney infection/glomerulonephritis important. (*Note:* obtain cultures before starting antibiotics.)
  2. Provide warm baths and allow child to void in water to alleviate painful voiding.
  3. Force fluids.
  4. Encourage measures to acidify urine (cranberry juice, acid-ash diet).
  5. Provide client teaching and discharge planning concerning:
    a. Avoidance of tub baths (contamination from dirty water may allow microorganisms to travel up urethra)
    b. Avoidance of bubble baths that might irritate urethra
    c. Importance for girls to wipe perineum from front to back
    d. Increase in foods/fluids that acidify urine

Vesicoureteral Reflux

A. General information
  1. Regurgitation of urine from the bladder via the ureters to the kidneys due to faulty valve mechanism at the vesicoureteral junction
  2. Predisposes child to:
    a. UTIs from urine stasis
    b. Pyelonephritis from chronic UTIs
    c. Hydronephrosis from increased pressure on renal pelvis
B. Assessment findings: same as for urinary tract infections
C. Nursing interventions for surgical reimplantation of ureters
  1. Assist with preoperative studies as needed (IVP, voiding cystourethrogram, cystoscopy).
  2. Provide postoperative care.
    a. Monitor drains; may have one from bladder and one from each ureter (ureteral stents).
    b. Check output from all drains (expect bloody drainage initially) and record carefully.
    c. Observe drainage from abdominal dressing; note color, amount, frequency.
    d. Administer medication for bladder spasms as ordered.

Exstrophy of the Bladder

A. General information
  1. Congenital malformation in which nonfusion of abdominal and anterior walls of the bladder during embryologic development causes anterior surface of bladder to lie open on abdominal wall
  2. Varying degrees of defect
B. Assessment findings
  1. Associated structural changes
    a. Prolapsed rectum
    b. Inguinal hernia
    c. Widely split symphysis
    d. Rotated hips
  2. Associated anomalies
    a. Epispadias
    b. Cleft scrotum or clitoris
    c. Undescended testicles
    d. Chordee (downward deflection of the penis)
C. Medical management: two-stage reconstructive surgery, possibly with urinary diversion; usually delayed until age 3–6 months
D. Nursing interventions: preoperative
  1. Provide bladder care; prevent infection.
    a. Keep area as clean as possible; urine on skin will cause irritation and ulceration.

b. Change diaper frequently; keep diaper loose fitting.
c. Wash with mild soap and water.
d. Cover exposed bladder with Vaseline gauze.

E. Nursing interventions: postoperative
1. Design play activities to foster toddler's need for autonomy (e.g., Play-Doh, talking toys, books); child will be immobilized for extended period of time.
2. Prevent trauma; as child gets older and more mobile, trauma more likely; teach parents to avoid areas such as sandboxes.

Undescended Testicles (Cryptorchidism)

A. General information
1. Unilateral or bilateral absence of testes in scrotal sac
2. Testes normally descend at 8 months of gestation, will therefore be absent in premature infants
3. Incidence increased in children having genetically transmitted diseases
4. Unilateral cryptorchidism most common
5. 75% will descend spontaneously by age 1 year

B. Medical management
1. Whether or not to treat is still controversial; if testes remain in abdomen, damage to the testes (sterility) is possible because of increased body temperature.
2. If not descended by age 8 or 9, chorionic gonadotropin can be given.
3. Orchipexy: surgical procedure to retrieve and secure testes placement; performed between ages 1–3 years.

C. Assessment findings: unable to palpate testes in scrotal sac (when palpating testes be careful not to elicit cremasteric reflex, which pulls testes higher in pelvic cavity)

D. Nursing interventions
1. Advise parents of absence of testes and provide information about treatment options.
2. Support parents if surgery is to be performed.
3. Post-op, avoid disturbing the tension mechanism (will be in place for about 1 week).
4. Avoid contamination of incision.

Hypospadias

A. General information
1. Urethral opening located anywhere along the ventral surface of penis
2. Chordee (ventral curvature of the penis) often associated, causing constriction
3. In extreme cases, child's sex may be uncertain

B. Medical management
1. Minimal defects need no intervention
2. Neonatal circumcision delayed, tissue may be needed for corrective repair
3. Surgery performed at age 3–9 months; 2 years of age for complex repairs

C. Assessment findings
1. Urinary meatus misplaced
2. Inability to make straight stream of urine

D. Nursing interventions
1. Diaper normally.
2. Provide support for parents.
3. Provide support for child at time of surgery.
4. Postoperatively check pressure dressing, monitor catheter drainage, assess pain.

Enuresis

A. General information
1. Involuntary passage of urine after the age of control is expected (about 4 years)
2. Types
a. Primary: in children who have never achieved control
b. Secondary: in children who have developed complete control and lose it
3. May occur at any time of day but is most frequent at night
4. More common in boys
5. No organic cause can be identified; familial tendency
6. Etiologic possibilities
a. Sleep disturbances
b. Delayed neurologic development
c. Immature development of bladder leading to decreased capacity
d. Psychologic problems

B. Medical management
1. Bladder retention exercises
2. Behavior modification, e.g., bed alarm devices
3. Drug therapy: results are temporary; side effects may be unpleasant or even dangerous
a. Tricyclic antidepressants: imipramine HCI (Tofranil)
b. Anticholinergics
c. DDAVP

C. Assessment findings
1. Physical exam normal
2. History of repeated involuntary urination

D. Nursing interventions
1. Provide information/counseling to family as needed.
a. Confirm that this is not conscious behavior and that child is not purposely misbehaving.
b. Assure parents that they are not responsible and that this is a relatively common problem.
2. Involve child in care; give praise and support with small accomplishments.
a. Age 5–6 years: can strip bed of wet sheets.
b. Age 10–12 years: can do laundry and change bed.
3. Avoid scolding and belittling child.

Nephrosis (Nephrotic Syndrome)

A. General information
  1. Autoimmune process leading to structural alteration of glomerular membrane that results in increased permeability to plasma proteins, particularly albumin
  2. Course of the disease consists of exacerbations and remissions over a period of months to years
  3. Commonly affects preschoolers, boys more often than girls
  4. Pathophysiology
    a. Plasma proteins enter the renal tubule and are excreted in the urine, causing proteinuria.
    b. Protein shift causes altered oncotic pressure and lowered plasma volume.
    c. Hypovolemia triggers release of renin and angiotensin, which stimulates increased secretion of aldosterone; aldosterone increases reabsorption of water and sodium in distal tubule.
    d. Lowered blood pressure also stimulates release of ADH, further increasing reabsorption of water; together with a general shift of plasma into interstitial spaces, results in edema.
  5. Prognosis is good unless edema does not respond to steroids.

B. Medical management
  1. Drug therapy
    a. Corticosteroids to resolve edema
    b. Antibiotics for bacterial infections
    c. Thiazide diuretics in edematous stage
  2. Bed rest
  3. Diet modification: high protein, low sodium

C. Assessment findings
  1. Proteinuria, hypoproteinemia, hyperlipidemia
  2. Dependent body edema
    a. Puffiness around eyes in morning
    b. Ascites
    c. Scrotal edema
    d. Ankle edema
  3. Anorexia, vomiting and diarrhea, malnutrition
  4. Pallor, lethargy
  5. Hepatomegaly

D. Nursing interventions
  1. Provide bed rest.
    a. Conserve energy.
    b. Find activities for quiet play.
  2. Provide high-protein, low-sodium diet during edema phase only.
  3. Maintain skin integrity.
    a. Do not use Band-Aids.
    b. Avoid IM injections (medication is not absorbed into edematous tissue).
    c. Turn frequently.
  4. Obtain morning urine for protein studies.
  5. Provide scrotal support.
  6. Monitor I&O and vital signs and weigh daily.
  7. Administer steroids to suppress autoimmune response as ordered.
  8. Protect from known sources of infection.

Acute Glomerulonephritis

A. General information
  1. Immune complex disease resulting from an antigen-antibody reaction
  2. Secondary to a beta-hemolytic streptococcal infection occurring elsewhere in the body
  3. Occurs more frequently in boys, usually between ages 6–7 years
  4. Usually resolves in about 14 days, self-limiting

B. Medical management
  1. Antibiotics for streptococcal infection
  2. Antihypertensives if blood pressure severely elevated
  3. Digitalis if circulatory overload
  4. Fluid restriction if renal insufficiency
  5. Peritoneal dialysis if severe renal or cardiopulmonary problems develop

C. Assessment findings
  1. History of a precipitating streptococcal infection, usually upper respiratory infection or impetigo
  2. Edema, anorexia, lethargy
  3. Hematuria or dark-colored urine, fever
  4. Hypertension
  5. Diagnostic tests
    a. Urinalysis reveals RBCs, WBCs, protein, cellular casts
    b. Urine specific gravity increased
    c. BUN and serum creatinine increased
    d. ESR elevated
    e. Hgb and HCT decreased

D. Nursing interventions
  1. Monitor I&O, blood pressure, urine; weigh daily.
  2. Provide diversional therapy.
  3. Provide client teaching and discharge planning concerning:
    a. Medication administration
    b. Prevention of infection
    c. Signs of renal complications
    d. Importance of long-term follow-up

Hydronephrosis

A. General information
  1. Collection of urine in the renal pelvis due to obstruction to outflow
  2. Obstruction most common at ureteral-pelvic junction (see Vesicoureteral Reflux) but may also be caused by adhesions, ureterocele, calculi, or congenital malformation
  3. Obstruction causes increased intrarenal pressure, decreased circulation, and atrophy of the kidney, leading to renal insufficiency

4. May be unilateral or bilateral; occurs more often in left kidney
5. Prognosis good when treated early

B. Medical management: surgery to correct or remove obstruction

C. Assessment findings
1. Repeated UTIs
2. Failure to thrive
3. Abdominal pain, fever
4. Fluctuating mass in region of kidney

D. Nursing interventions: prepare child for multiple urologic studies (see also Vesicoureteral Reflux).

Sample Questions

127. A 4-year-old has just been diagnosed as having nephrotic syndrome. What is related to his potential for impairment of skin integrity?
1. Joint inflammation.
2. Drug therapy.
3. Edema.
4. Generalized body rash.

128. A 20-month-old is admitted to the hospital with a diagnosis of cryptorchidism. What will surgical correction help to prevent?
1. Difficulty in urinating.
2. Sterility.
3. Herniation.
4. Peritonitis.

129. A 3-day-old is diagnosed with hypospadias. His parents are very upset and have been willing listeners as the nurse has explained this problem to them. In hypospadias, what primary problem will the nurse discuss with the parents?
1. Ambiguous genitalia.
2. Urinary incontinence.
3. Ventral curvature of the penis.
4. Altered location of the urethral meatus.

130. The parents of a newborn who has hypospadias ask about surgical repair. What age is the preferred time to schedule surgical repair of hypospadias?
1. 9 months old.
2. 5 years old.
3. 12 years old.
4. 17 years old.

131. The parents of a baby boy who was born with hypospadias want to know about the surgical repair. The success of hypospadias surgery will be evaluated by what occurrence?
1. The cosmetic appearance of the penis.
2. Maintaining stable blood pressure in the child.
3. Observing a straight stream when he voids.
4. His ability to void without discomfort.

132. The nurse is teaching parents about post-op care of their child who has had an orchiopexy. What instructions will the nurse give the parents?
1. "You must tighten the rubber band around the scrotum every 4 hours to maintain the testicle."
2. "You must increase tension on the rubber band every 4 hours."
3. "You must check the rubber band every 4 hours to check for disconnection."
4. "Cut the rubber band after 24 hours."

133. A baby boy is born with a hypospadias. The parents decide to wait until the child is 6 months old for the repair. The father asks the nurse why the doctor said not to have the baby circumcised. What is the nurse's best response?
1. "It is best to wait until the baby is older and understands the surgery."
2. "Circumcision carries a high infection rate and that may delay his hypospadias repair."
3. "The foreskin may be used during the hypospadias repair."
4. "He will need the foreskin to help anchor the Foley catheter after the repair."

134. The nurse is planning care for a 2-year-old who has nephrotic syndrome and is in remission. What type of diet would the nurse plan to feed this child?
1. High protein, low calorie.
2. High calorie, low protein.
3. Low sodium, low fat.
4. Regular diet, no added salt.

135. A 5-year-old girl recovered from a strep infection 2 weeks ago. She now presents with loss of appetite, dark colored urine, and orbital edema. What is the nurse's assessment?
1. Nephrotic syndrome.
2. Glomerulonephritis.
3. Renal tubular acidosis.
4. Hemolytic uremic syndrome.

136. A 4-year-old boy is admitted with glomerulonephritis. His mother asks why his eyes are so puffy. What is the nurse's best response?
1. "This is a common finding due to circulatory congestion in the kidneys."

2. "Children cry a lot with glomerulonephritis and the puffiness should subside when he feels better."
3. "Has he been rubbing his eyes excessively?"
4. "Periorbital edema is associated with hypertension."

Answers and Rationales

127. 3. A child with nephritic syndrome will have massive edema. A child with edema is prone to skin breakdown.

128. 2. If the testes remain in the abdomen beyond the age of 5, damage resulting from exposure to internal body temperature can cause sterility.

129. 4. In hypospadias, the urethral opening may be anywhere along the underside of the penis.

130. 1. Most surgical repairs are scheduled for the child between 6 and 18 months of age.

131. 3. Observing the child void in a straight stream while standing is the expected successful outcome of hypospadias repair.

132. 3. The Torek procedure attaches a rubber band from the testicle to the scrotal sac to the thigh to maintain the testicle in the pouch. The family must check the rubber band every 4 hours and call the doctor if the rubber band breaks or becomes disconnected.

133. 3. The foreskin is frequently used as a flap during the repair.

134. 4. The child who is in remission is allowed a regular diet; salt is restricted in the form of no added salt at the table and excluding foods with very high salt content.

135. 2. Acute poststreptococcal glomerulonephritis is the most common of the noninfectious renal diseases in children.

136. 1. Periorbital edema is often associated with circulatory congestion in the kidneys.

The Musculoskeletal System

VARIATIONS FROM THE ADULT

Bones

A. Linear growth results from skeletal development
  1. Centers of ossification
    a. Primary centers in diaphyses
    b. Secondary centers in epiphyses
    c. Used in assessment of bone age; number of ossification centers in wrist equals age in years plus 1
    d. Centers appear earlier in girls than in boys
  2. Metaphysis
    a. Cartilaginous plate between diaphysis and epiphysis
    b. The site of active growth in long bones
    c. Disappears over time with bony fusion of diaphysis and epiphysis
    d. Linear growth ends with epiphyseal fusion
    e. Assessment of bone age includes the advancing bone edges

B. Bone circumference growth occurs as new bone tissue is formed beneath the periosteum.

C. Skeletal maturity is reached by age 17 in boys and 2 years after menarche in girls.

D. Certain characteristics of bone in children affect injury and healing, bones are more prone to injury, and injury results from relatively minor accidents.
  1. Metaphysis
    a. Absorbs shock, protects joints from injury.
    b. Traumatic injury or infection to this growth plate can cause deformity.
    c. If not injured, this growth plate participates in healing and straightening of limbs by process of remodeling.
  2. Porous bone
    a. Increases flexibility; absorbs force on impact.
    b. Allows bones to bend, buckle, and break in "greenstick" or incomplete fracture.
  3. Thicker periosteum
    a. More active osteogenic potential
    b. Healing more rapid
      1) Neonatal period: may take 2–3 weeks
      2) Early childhood: may take 4 weeks
      3) Later childhood: may take 6 weeks
      4) Adolescence: 8–10 weeks

c. Stiffness after immobilization is rare unless joint has been injured.

E. Bone growth is affected by Wolff's law: bone will grow in the direction in which stress is placed on it.

Muscles

A. Muscle growth is responsible for a large part of increase in body weight.
B. The number of muscle fibers is constant throughout life; growth results from an increase in the size of the muscle fibers and by an increased number of nuclei per fiber.
C. Muscle growth most apparent in adolescence, influenced by growth hormone, adrenal androgens, and, in boys, by testosterone.

ASSESSMENT

History

A. Presenting problem: symptoms may include:
1. Delayed motor development
2. Injury
3. Pain, loss of sensation, tingling
4. Muscle weakness, loss of function of an extremity
5. Interference with normal activity or play
6. Other parental concerns

B. Family history: genetic disorders, skeletal deformities
C. Inadequate nutrition (e.g., vitamin D deficiency causes rickets)

Physical Examination

A. General appearance: note any asymmetry, visible deformities, swelling (of joints or over bones), quality of movement (ROM, gait, guarding).
B. Measure muscle strength.
C. Identify warmth or tenderness over bones and joints.
D. Assess pain: note type, location, onset, relationship to activity.
E. Perform examination in standing, lying, and sitting positions.

ANALYSIS

Nursing diagnoses for the child with a disorder of the musculoskeletal system may include:

A. Risk for activity intolerance
B. Pain
C. Deficient diversional activity
D. Risk for injury
E. Impaired physical mobility
F. Self-care deficit
G. Disturbed body image
H. Risk for impaired skin integrity
I. Ineffective tissue perfusion

PLANNING AND IMPLEMENTATION

Goals

A. Injury or deformity will be identified and treated early.
B. Child will achieve maximum level of mobility.
C. Pain will be relieved/controlled.
D. Child will be free from injury.
E. Parents will be able to care for child at home.

Interventions

Care of the Child with a Cast

Also see Unit 4.

A. General information
1. Initial chemical hardening reaction may cause a change in an infant's body temperature; monitor and intervene as needed.
2. Choose toys too big to fit down cast.
3. Do not use baby powder near cast because it clumps and provides a medium for bacterial growth.
4. Prepare for anticipated casting by having child help apply a cast to a doll the day before.
5. Demonstrate the use of a cast cutter on a doll before using on child to show it does not cut skin.

B. Care of child in hip spica cast (cast encases child from nipples to knees; legs are abducted with a bar between the thighs)
1. Use firm mattress to allow for increased weight of plaster cast.
2. Do not lift cast by crossbar.
3. Protect cast from water and urine.
   a. Put waterproof material over petaling (Chux®, plastic diapers).
   b. Elevate head of bed slightly to prevent urine and stool from seeping under cast; confirm that entire body is on a slant, not just the head.
   c. Use Bradford frame (canvas board with opening near genitalia) and place a bedpan under opening.
4. Use pillows to support all parts of the cast.
5. Drape towel across top of chest part of cast during feedings to prevent crumbs from entering cast.
6. Monitor for pain/pressure points due to growth if cast is on for a long time.

Care of the Child in Traction

A. General information
1. Infants and young toddlers do not have enough body weight to use traditional tractions effectively.
2. Children do not understand the necessity of maintaining proper body alignment and will need frequent repositioning.

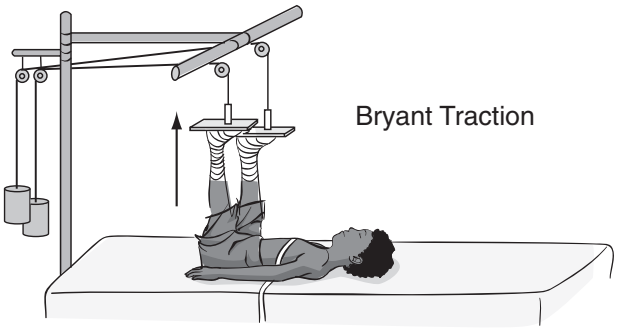


Figure 5–10 Bryant traction

B. Bryant's traction: used primarily in children (See Figure 5-10.)
  1. Child is own counterweight.
  2. Both legs are at 90° angle to bed.
  3. Buttocks must be slightly off mattress in order to ensure sufficient traction on legs.
  4. Used with children under age 2 years whose weight is too low (under 30 lb [14 kg]) to counterbalance without additional gravitational force.
  5. Used for fractured femur and dislocated hip.
  6. Monitor for vascular injury to feet with frequent neurovascular checks.

Care of the Child with a Brace

A. General information
  1. Orthopedic device made of metal or leather applied to the body, particularly the trunk and lower extremities, to support the weight of the body, to correct or prevent deformities, and to prevent involuntary movements in spastic conditions
  2. Types
    a. Milwaukee brace
      1) Steel and leather brace fitted and adapted to child individually
      2) Extends from chin cup and neck pad to pelvis
      3) Used in scoliosis to correct curvature
      4) Worn 23 hours/day, removed once daily for bathing
      5) Causes little interference with activity
    b. Rotowalker
      1) Used to provide upright mobility in children with lower limb paralysis
      2) Child shifts weight to achieve mobility
    c. Leg brace
      1) Designed to stabilize extremity and offer support during ambulation
      2) Special hinges permit hip, knee, and ankle to flex during sitting

B. Nursing care: provide client teaching and discharge planning concerning:
  1. Importance of meticulous skin care
  2. Need to wear protective clothing under brace
  3. Potential problems of ill-fitting braces
    a. Difficulty in balancing
    b. Muscle stress and skin breakdown
  4. Need for frequent checking and adjustment of braces with growth

EVALUATION

A. Child's musculoskeletal development is normal as evidenced by normal growth and activity.
B. Child experiences minimal discomfort.
C. Injuries are prevented.
D. Parents demonstrate ability to identify complications and administer treatments correctly.

DISORDERS OF THE MUSCULOSKELETAL SYSTEM

Congenital Dislocation of the Hip (Developmental Dysplasia of the Hip)

A. General information
  1. Displacement of the head of the femur from the acetabulum; present at birth, although not always diagnosed immediately
  2. One of the most common congenital malformations; incidence is 2 in 1000 live births
  3. Familial disorder, more common in girls; may be associated with spina bifida
  4. Cause unknown; may be fetal position in utero (breech delivery), genetic predisposition, or laxity of ligaments
  5. The acetabulum is shallow and the head of the femur cartilaginous at birth, contributing to the dislodgment.
B. Medical management
  1. Goal is to enlarge and deepen socket by pressure.
  2. The earlier treatment is initiated, the shorter and less traumatic it will be.
  3. Early treatment consists of positioning the hip in abduction with the head of the femur in the acetabulum and maintaining it in position for several months.
  4. If these measures are unsuccessful, traction and casting (hip spica) or surgery may be successful.
C. Assessment findings
  1. May be unilateral or bilateral, partial or complete
  2. Limitation of abduction (cannot spread legs to change diaper)

3. Ortolani's click (should only be performed by an experienced practitioner)
   a. With infant in supine position (on the back), bend knees and place thumbs on bent knees, fingers at hip joint.
   b. Bring femurs 90° to hip, then abduct.
   c. With dislocation there is a palpable click where the head of the femur snaps over edge of acetabulum.
4. Barlow's test
   a. With infant on back, bend knees.
   b. Affected knee will be lower because the head of the femur dislocates toward bed by gravity (referred to as telescoping of limb).
5. Additional skin folds with knees bent, from telescoping
6. When lying on abdomen, buttocks of affected side will be flatter because head of femur falls toward bed from gravity
7. Trendelenburg test (used if child is old enough to walk)
   a. Have child stand on affected leg only.
   b. Pelvis will dip on normal side as child attempts to stay erect.

D. Nursing interventions
1. Maintain proper positioning: keep legs abducted.
   a. Pavlik harness (place undershirt under harness and socks on legs)
   b. Frejka pillow splint (jumperlike suit to keep legs abducted)
   c. Place infant on abdomen with legs in "frog" position
   d. Other immobilization devices (splints, casts, braces)
2. Provide adequate nutrition; adapt feeding position as needed for immobilization device.
3. Provide sensory stimulation; adapt to immobilization device and positioning.
4. Provide client teaching and discharge planning concerning:
   a. Application and care of immobilization devices
   b. Modification of child care using immobilization devices

Clubfoot (Talipes)

A. General information
1. Abnormal rotation of foot at ankle
   a. Varus (inward rotation): would walk on ankles, bottoms of feet face each other
   b. Valgus (outward rotation): would walk on inner ankles
   c. Calcaneous (upward rotation): would walk on heels
   d. Equinas (downward rotation): would walk on toes
2. Most common deformity (95%) is talipes equinovarus.
3. Deformity almost always congenital; usually unilateral
4. Occurs more frequently in boys than in girls; may be associated with other congenital disorders but cause unknown
5. General incidence: 1 in 700–1000

B. Medical management
1. Exercises
2. Casting (cast is changed periodically to change angle of foot)
3. Denis Browne splint (bar shoe): metal bar with shoes attached to the bar at specific angle
4. Surgery and casting for several months

C. Assessment findings: foot cannot be manipulated by passive exercises into correct position (differentiate from normal clubbing of newborn's feet)

D. Nursing interventions
1. Perform exercises as ordered.
2. Provide cast care or care for child in a brace.
3. Child who is learning to walk must be prevented from trying to stand; apply restraints if necessary.
4. Provide diversional activities.
5. Adapt care routines as needed for cast or brace.
6. Assess toes to be sure cast it not too tight.
7. Provide skin care.
8. Provide client teaching and discharge planning concerning:
   a. Application/care of immobilization device
   b. Preparation for surgery if indicated
   c. Need to monitor special shoes for continued fit throughout treatment.

Tibial Torsion

A. General information
1. Rotational deformity of tibia (greater than that normally found in newborn)
2. Types
   a. Internal: knee forward and foot inward
   b. External: knee forward and foot outward (rare, associated with muscle paralysis)
3. Majority of cases resolve without treatment

B. Medical management
1. Splinting: use of Denis Browne splint at night
2. Surgical correction if still evident by age 3 years

C. Assessment findings: with child lying supine, assess for straight line between tibial tuberosity and 2nd toe; in tibial torsion, the line intersects the 4th or 5th toe.

D. Nursing interventions
1. If no treatment needed, encourage parents to be patient and emphasize that condition usually resolves by itself
2. If stretching exercises are recommended, teach parents normal ROM exercises and how to carry them out.
3. Instruct parents on use of Denis Browne splint if needed.

Legg-Calvè-Perthes Disease

- **A.** General information
  - **1.** Aseptic necrosis of femoral head due to disturbance of circulation to the area
  - **2.** Primarily affects boys ages 4–10 years
  - **3.** Stages: lasting from 18 months to a few years
    - **a.** Initial stage: may not be distinguishable from transient synovitis
    - **b.** Avascular stage: often the first stage noticed
    - **c.** Revascularization stage: regeneration of vascular and connective tissue
    - **d.** Regeneration stage: formation of new bone
- **B.** Medical management: goal is to minimize deformity until healing process is completed
  - **1.** Initial bed rest with traction and then an abduction brace
  - **2.** Possible surgery
- **C.** Assessment findings
  - **1.** Limp, limitation of movement
  - **2.** Pain in groin, hip, and referred to knee; often difficult for child to localize pain
  - **3.** Diagnostic test: X-ray reveals opaque ossification center of head of the femur (softened in avascular stage)
- **D.** Nursing interventions
  - **1.** Provide care for a child with a cast or brace.
  - **2.** Provide diversional activities.

Slipped Femoral Capital Epiphysis

- **A.** General information
  - **1.** Spontaneous displacement of proximal femoral epiphysis in a posterior and inferior direction
  - **2.** Onset insidious; usually occurs during fast growth period of adolescence (growth hormones weaken epiphyseal plate)
  - **3.** Occurs most often in very tall and very obese adolescents; boys affected more frequently
- **B.** Medical management
  - **1.** Skeletal traction
  - **2.** Surgical stabilization with pinning
- **C.** Assessment findings
  - **1.** Limp and referred pain to groin, hip, or knee
  - **2.** Limited internal rotation and abduction of hip
- **D.** Nursing interventions
  - **1.** Suggest weight reduction program for obese children to decrease stress on bones.
  - **2.** Provide care for the child with a cast or traction.

Osteogenesis Imperfecta

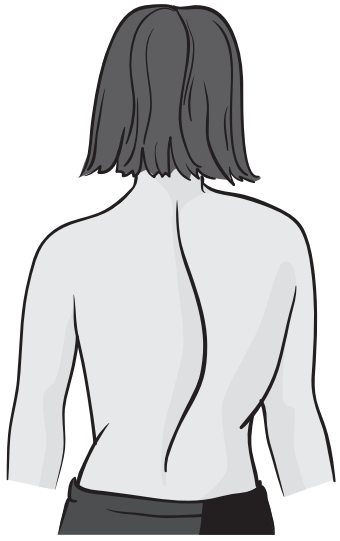
- **A.** General information
  - **1.** An inherited disorder affecting collagen formation and resulting in pathologic fractures
  - **2.** Types
    - **a.** Osteogenesis imperfecta congenita: autosomal recessive, prognosis poor
    - **b.** Osteogenesis imperfecta tarda: autosomal dominant, less severe form, involvement of varying degrees
  - **3.** Classic picture includes soft, fragile bones; blue sclera; otosclerosis
  - **4.** Severity of symptoms decreases at puberty due to hormone production and child's ability to prevent injury
- **B.** Medical management
  - **1.** Magnesium oxide supplements
  - **2.** Reduction and immobilization of fractures
- **C.** Assessment findings
  - **1.** Osteogenesis imperfecta congenita
    - **a.** Multiple fractures at birth
    - **b.** Possible skeletal deformity due to intrauterine fracture
    - **c.** Bones of skull are soft
    - **d.** Occasional intracranial hemorrhage
  - **2.** Osteogenesis imperfecta tarda
    - **a.** Delayed walking, fractures, structural scoliosis as child grows
    - **b.** Lower limbs more frequently affected
    - **c.** Hypermobility of joints
    - **d.** Prone to dental caries
- **D.** Nursing interventions
  - **1.** Support limbs, do not stretch.
  - **2.** Position with care; use blankets to aid in mobility and provide support.
  - **3.** Instruct parents in bathing, dressing, diapering.
  - **4.** Support parents; encourage expression of feelings of anger or guilt (parents may have been unjustly suspected of child abuse).

Scoliosis

- **A.** General information
  - **1.** Lateral curvature of the spine
  - **2.** Most commonly occurs in adolescent girls
  - **3.** Disorder has a familial pattern; associated with other neuromuscular disorders
  - **4.** Majority of the time (75% of cases) disorder is idiopathic; others causes include congenital abnormality of vertebrae, neuromuscular disorders, and trauma
  - **5.** May be functional or structural
    - **a.** Nonstructural/functional: "C" curve of spine
      - **1)** Due to posture, can be corrected voluntarily and disappears when child lies down
      - **2)** Not progressive
      - **3)** Treated with posture exercises
    - **b.** Structural/progressive: "S" curve of spine
      - **1)** Usually idiopathic
      - **2)** Structural change in spine, does not disappear with position changes
      - **3)** More aggressive intervention needed

B. Medical management
  1. Stretching exercises of the spine for nonstructural changes
  2. Bracing
    a. Milwaukee brace
    b. TSLO-custom molded plastic orthotic brace
    c. Braces worn 16–23 hours/day; off only for hygiene
  3. Surgical correction
    a. Spinal alignment
    b. Fusion with bone chips
    c. Instrumentation to stabilize position
      1) Harrington rod
      2) Luque instrumentation: wires and hooks

A.



B.

Figure 5-11 Adolescent girl with scoliosis. (A) Frontal view; (B) posterior view

C. Assessment findings (structural scoliosis) (See Figure 5-11.)
  1. Failure of curve to straighten when child bends forward with knees straight and arms hanging down to feet (curve disappears with functional scoliosis)
  2. Uneven bra strap marks
  3. Uneven hips
  4. Uneven shoulders
  5. Asymmetry of rib cage
  6. Diagnostic test: X-ray reveals curvature

D. Nursing interventions
  1. Teach/encourage exercises as ordered.
  2. Provide care for child with Milwaukee brace
    a. Child wears brace 23 hours/day; is removed once a day for bathing.
    b. Monitor pressure points, adjustments may be needed to accommodate increase in height or weight.
    c. Promote positive body image with brace.
  3. Provide cast/traction care.
  4. Assist with modifying clothing for immobilization devices.
  5. Adjust diet for decreased activity.
  6. Provide diversional activities.
  7. Provide care for child with Harrington rod insertion.
  8. Provide client teaching and discharge planning concerning:
    a. Exercises
    b. Brace/traction/cast care
    c. Correct body mechanics
    d. Alternative education for long-term hospitalization/home care
    e. Availability of community agencies

Surgical Correction for Scoliosis

A. General information
  1. Spinal fusion and installation of supports along spine
  2. Used for moderate to severe curvatures
  3. Usually results in increase in height; positive body image changes

B. Nursing interventions (see also Discectomy)
  1. Provide general pre-op teaching and care.
  2. In addition to routine post-op care.
    a. Log roll.
    b. Do not raise head of bed.
    c. Usually out of bed to chair after 48 hours with Luque procedure.
    d. Discuss adapting home environment to allow for privacy yet interaction with family during recovery.
    e. Discuss alternate methods of education during recovery period.

Muscular Dystrophy

A. General information
- **1.** A group of muscular diseases in children characterized by progressive muscle weakness and deformity
- **2.** Genetic in origin; biochemical defect is suspected
- **3.** Types
  - **a.** Pseudohypertrophic (Duchenne type): most frequent type
    - **1)** X-linked recessive
    - **2)** Affects only boys
    - **3)** Usually manifests in first 4 years
  - **b.** Facioscapulohumeral
    - **1)** Autosomal dominant
    - **2)** Mild form, with weakness of facial and shoulder girdle muscles
    - **3)** Onset usually in adolescence
  - **c.** Limb girdle
    - **1)** Autosomal recessive
    - **2)** Affects boys and girls
    - **3)** Onset usually in adolescence
  - **d.** Congenital
    - **1)** Autosomal recessive
    - **2)** Onset in utero
  - **e.** Myotonic
    - **1)** Autosomal dominant
    - **2)** More common in boys
    - **3)** Onset in infancy or childhood, or adult onset
    - **4)** Prognosis in childhood form is guarded
- **4.** Disease causes progressive disability throughout childhood; most children with Duchenne's muscular dystrophy are confined to a wheelchair by age 8–10 years.
- **5.** Death occurs by age 20 in 75% of clients with Duchenne's muscular dystrophy.

B. Assessment findings (Duchenne type)
- **1.** Pelvic girdle weakness is early sign (child waddles and falls)
- **2.** Gower's sign (child uses hands to push up from the floor)
- **3.** Scoliosis (from weakness of shoulder girdle)
- **4.** Contractures and hypertrophy of muscles
- **5.** Diagnostic tests
  - **a.** Muscle biopsy reveals histologic changes: degeneration of muscle fibers and replacement of fibers with fat.
  - **b.** EMG shows decrease in amplitude and duration of potentials.
- **6.** Serum enzymes increased, especially CPK

C. Nursing interventions
- **1.** Prepare child for EMG and muscle biopsy.
- **2.** Maintain function at optimal level; keep child as active and independent as possible.
- **3.** Plan diet to prevent obesity.
- **4.** Continually evaluate capabilities.
- **5.** Support child and parents and provide information about availability of community agencies and support groups.

Juvenile Rheumatoid Arthritis

A. General information
- **1.** Systemic, chronic disorder of connective tissue, resulting from an autoimmune reaction
- **2.** Results in eventual joint destruction
- **3.** Affected by stress, climate, and genetics
- **4.** More common in girls; peak ages 2–5 and 9–12 years
- **5.** Types
  - **a.** Mono/pauciarticular JRA
    - **1)** Fewer than four joints involved (usually in legs)
    - **2)** Asymmetric; rarely systemic
    - **3)** Generally mild signs of arthritis
    - **4)** Symptoms may decrease as child enters adulthood
    - **5)** Prognosis good
  - **b.** Polyarticular JRA
    - **1)** Multiple joints affected
    - **2)** Symmetrical symptoms of arthritis, disability may be mild to severe
    - **3)** Involvement of temporomandibular joint may cause earaches
    - **4)** Characterized by periods of remissions and exacerbations
    - **5)** Prognosis poorer
    - **6)** Treatment symptomatic for arthritis: physical therapy, ROM exercises, aspirin
  - **c.** Systemic disease with polyarthritis (Still's disease)
    - **1)** Explosive course with remissions and exacerbations lasting for months
    - **2)** Begins with fever, rash, lymphadenopathy, anorexia, and weight loss

B. Medical management, assessment findings, and nursing interventions: see Rheumatoid Arthritis

Sample Questions

137. An 18-month-old has a fractured femur and is in Bryant's traction. In evaluating the correct application of the traction, what will the nurse note?

1. The child is being continuously and gradually pulled toward bottom of bed.
2. The child's buttocks are raised slightly.
3. The child's leg is at a 45° angle to the bed.
4. The child can move the unaffected leg freely.

138. A 14-year-old is in a hip spica cast. Which is the correct method to turn the adolescent?

1. Use the cross bar.
2. Turn her upper body first, then turn the lower body.
3. Log-roll her.
4. Tell her to pull on the trapeze and sit up to help in turning.

139. A routine physical examination on a 2-day-old uncovered evidence of congenital dislocation, or dysplasia, of the right hip. When assessing the infant, what would be a sign of one-sided hip displacement?

1. An unusually narrow perineum
2. Pain where her leg is abducted.
3. Symmetrical skin folds near her buttocks and thigh.
4. Asymmetrical skin folds over the buttocks and thigh.

140. An infant is being treated for congenital hip dysplasia with a Pavlik harness. The baby's mother asks if she can remove the harness if it becomes soiled. What would be the nurse's best response?

1. No, the harness may not be removed.
2. No, she will only be wearing it a few days.
3. Yes, just long enough to clean the area.
4. Yes, just overnight while she is sleeping.

141. A 10-year-old takes aspirin QID for Still's disease (juvenile rheumatoid arthritis). What symptoms would her mother observe that would be indicative of aspirin toxicity?

1. Hypothermia.
2. Hypoventilation.
3. Decreased hearing acuity.
4. Increased urinary output.

142. Which of the following would the nurse include in a plan of care for a toddler with a newly applied hip spica cast?

1. Petal the cast around the perineum area with waterproof tape.
2. Teach the parents care of the child just before discharge.
3. Give the child small blocks and beads to promote eye-hand coordination.
4. Check neurovascular status every shift.

143. The mother of a 6-year-old asks why she was told not to use powder under her child's long leg cast. Which of the following is the most accurate basis for the nurse's response?

1. Promoting adequate circulation is a top priority.
2. Drying the cast is very important.
3. Assessing the smell of a cast is a top priority.
4. Preserving skin integrity is of the utmost importance.

144. In examining a newborn, the nurse notes the following: asymmetric gluteal folds, shortened right leg, and limited abduction of the right thigh. The nurse would correctly interpret these observations as which of the following?

1. Right congenital dislocated hip.
2. Spastic cerebral palsy.
3. Left hip dysplasia.
4. Myelodysplasia.

145. An infant with congenital hip dysplasia is placed in a Pavlik harness. In the nurse's teaching plan for the mother, which of the following would be important to include?

1. Adjustment of daily care routines as the harness is worn 24 hours a day.
2. Clothing should not be worn under the harness.
3. The harness should be removed for bathing and diapering only.
4. The infant should be confined to the crib.

146. In assessing a newborn for talipes equinovarus, the nurse would note which of the following?

1. The feet turn inward when the infant lies still, but they are flexible.
2. The feet are rigid and cannot be manipulated to a neutral position.
3. Uneven knee length occurs when both knees are flexed.
4. Limited abduction is observed when performing the Ortolani maneuver.

147. The nurse would evaluate that the parents correctly understand the care of their infant being treated for talipes equinovarus if the parents said which of the following?

1. "We will unwrap the cast every night and massage his feet with lotion to prevent skin breakdown."
2. "We'll petal the cast around the baby's groin to protect it from urine and bowel movements."
3. "Every day we'll check the baby's toes for movement and color after we squeeze them."
4. "We're so glad that the casts will cure his club feet."

148. Which of the following comments by the school nurse would be most appropriate in screening for scoliosis of a 13-year-old?

1. "You may leave your shirt on, but stand erect and turn to the side."
2. "Do you have any back pain?"
3. "Remove your clothes from the waist up and bend over at your waist."
4. "Have you noticed that your skirts don't hang evenly?"

149. A child is admitted to the hospital for a spinal fusion and Harrington rod insertion. What would be a nursing priority in the first 8 hours postoperatively?
1. Give fluids and fiber to promote bowel elimination.
2. Check neurovascular function in extremities.
3. Log roll every 4 hours.
4. Monitor hourly urine output.

150. The nurse would evaluate that a child understood the effective use of her Milwaukee brace for her scoliosis if she said which of the following?
1. "I'm so glad that I don't have to sleep in this brace."
2. "I've toughened my skin so I can wear the brace right next to my skin."
3. "I can't believe that I'm not allowed to chew gum anymore."
4. "I'm going to look forward to my bath time each day without this brace."

151. A 4-year-old has recently been diagnosed with Duchenne's muscular dystrophy. His parents ask if their 2-year-old daughter will get the disease. The nurse's best response would be which of the following?
1. "Every child you have has a 25% chance of developing the disease and a 50% chance of being a carrier."
2. "Sons are affected 50% of the time, whereas 50% of the time daughters will become carriers who have no symptoms."
3. "Only your sons have a 25% chance of developing the disease."
4. "Every child has a 50% chance of developing the disease."

Answers and Rationales

137. 2. In Bryant's traction both legs are in traction at a 90° angle and the buttocks are raised slightly off the bed.

138. 3. The client in a hip spica cast should be turned as a unit.

139. 4. Displacement of the hip on one side causes asymmetry of skin folds.

140. 1. The harness is not to be removed until the hip is stable with 90° of flexion and X-ray confirmation. This usually occurs after about 3 weeks in a Pavlik harness.

141. 3. Tinnitus or ringing in the ears is a side effect of aspirin therapy. In salicylate poisoning the child will have hypothermia, hyperventilation to compensate for metabolic acidosis, and may develop renal failure.

142. 1. It is important to protect the cast from urine and stool to prevent skin and cast breakdown.

143. 4. Powder may irritate the skin, leading to skin breakdown and infection.

144. 1. These are all signs of right congenital dislocated hip in a newborn.

145. 1. The harness is worn 24 hours a day so that parents must learn how to manage daily care (sponging and dressing the baby) with the harness on.

146. 2. Talipes equinovarus is a rigid deformity with forefoot adduction, inversion of the heel, and plantar flexion of the feet.

147. 3. Parents should be taught to assess neurovascular status of the toes because babies grow quickly and may outgrow the casts.

148. 3. This is part of the screening process for scoliosis. The nurse is checking for rib hump and flank asymmetry. Also included is visual inspection of frontal and dorsal posture, observation for uneven hip and shoulder levels as well as for muscular disproportion.

149. 2. One of the greatest risks of spinal surgery is of paralysis if the spinal cord is injured or compressed by swelling. Monitoring for sensation and movement is the top priority.

150. 4. For best results in correction, the brace should be worn for 20–23 hours a day and only removed for hygiene and skin care.

151. 2. Duchenne's muscular dystrophy is an X-linked recessive disorder. The defective gene is transmitted through carrier females to affected sons 50% of the time depending on which X is transmitted. Daughters have a 50% chance of becoming carriers.

The Endocrine System

VARIATIONS FROM THE ADULT

A. Adenohypophysis (anterior lobe of pituitary gland)
  1. Growth hormone
    a. Does not affect prenatal growth.
    b. Main effect on linear growth is through increase of cells in skeletal bones.
    c. Maintains rate of synthesis of body protein.
  2. Thyroid-stimulating hormone (TSH)
    a. Important for normal development of bones, teeth, and brain.
    b. Secretion decreases throughout childhood, then increases at puberty.
  3. Adrenocorticotropic hormone (ACTH)
    a. Little is produced throughout childhood.
    b. Becomes active in adolescence.
    c. Stimulates adrenals to secrete sex hormones.
    d. Influences production of gonadotropic hormone by hypothalamus.
      1) Gonadotropic hormones activate gonads.
      2) Gonads secrete estrogen or testosterone, which stimulate development of secondary sex characteristics.
  4. Estrogen has an inhibitory effect on epiphyseal growth.

ANALYSIS

Nursing diagnoses for the child with a disorder of the endocrine system may include:
A. Ineffective health maintenance
B. Impaired home maintenance
C. Noncompliance
D. Disturbed body image
E. Low self-esteem

PLANNING AND IMPLEMENTATION

Goals

A. Any endocrine imbalance in childhood will be identified and treated.
B. Child will achieve a normal metabolic state.
C. Child will develop successful coping mechanisms for manifestations of disease.
D. Child will have no signs of complications of the disease.

EVALUATION

A. Child receives appropriate medication, and nutritional requirements are met; symptoms of endocrine disease are controlled.
B. Child is free from complications of disease.
C. Child is achieving growth and developmental tasks on as normal a timetable as possible.
D. Child discusses feelings about body image and uses coping mechanisms that promote a positive self-image.

DISORDERS OF THE ENDOCRINE SYSTEM

Diabetes Mellitus

Also see Unit 4.
A. General information
  1. Most common endocrine disease of children; onset may be at any age
  2. Children typically develop Type 1: insulin-dependent diabetes mellitus
  3. Possible genetic predisposition to disease
  4. Treatments vary based on rapid growth rate in children, increased incidence of infections, and dietary fads of peers; all include insulin administration.
  5. Risk of complications is high; most commonly retinopathy, neuropathy, nephropathy, skin changes, predisposition to infection
  6. Children sometimes have one honeymoon period that occurs shortly after a child is regulated on insulin for the first time
    a. Lasts from 1 month to 1 year.
    b. Represents final effort of pancreas to provide insulin until beta cells are completely destroyed.
    c. Parents may distrust the diagnosis of diabetes and need to be reminded that symptoms will reappear and child will need insulin for life.
B. Medical management
  1. Insulin
  2. Diet therapy
  3. Exercise
  4. Prevention of complications
C. Assessment findings
  1. Rapid onset
  2. Polyuria, polydipsia, polyphagia, fatigue
  3. Weight loss

4. Ketoacidosis
5. Dry, flushed skin with hyperglycemia

D. Nursing interventions
1. Administer insulin (regular and NPH) as ordered.
2. Force fluids without sugar.
3. Monitor blood glucose levels daily.
4. Observe for hypoglycemia (insulin shock): behavior changes, sweating.
5. Provide client teaching and discharge planning concerning:
   a. Daily regimen for home care
   b. Urine and blood glucose monitoring
   c. Nutrition management
   d. Effects of infection and exercise on carbohydrate metabolism
   e. Prevention of acute and chronic complications

Congenital Hypothyroidism (Cretinism)

A. General information
1. Disorder related to absent or nonfunctioning thyroid
2. Newborns are supplied with maternal thyroid hormones that last up to 3 months

B. Medical management
1. Prevention: neonatal screening blood test (mandatory in many states)
2. Drug therapy: thyroid hormone replacement
3. Without treatment mental retardation and developmental delay will occur after age 3 months

C. Assessment findings
1. Altered body proportions; short stature with legs shorter than they should be in proportion to trunk
2. Tongue is enlarged and protrudes from mouth; may result in breathing and feeding difficulties
3. Hypothermia with cool extremities
4. Short, thick neck; delayed dentition
5. Hypotonia
6. Low levels of T_3 and T_4

D. Nursing interventions
1. Administer oral thyroxine and vitamin D as ordered to prevent mental retardation.
2. Provide client teaching and discharge planning concerning:
   a. Medication administration and side effects
   b. Importance of continued therapy

Hypopituitarism (Pituitary Dwarfism)

A. General information
1. Hyposecretion of growth hormone by the anterior lobe of the pituitary gland
2. Cause may be unknown or it may be due to craniopharyngioma

B. Medical management: administration of growth hormone (limited in supply since it is rendered from human cadavers)

C. Assessment findings
1. Newborn is of normal size, but child falls below the third percentile by age 1.
2. Child is well proportioned, but may be overweight for height.
3. Underdeveloped jaw, abnormal position of teeth, high voice, delayed puberty
4. Diagnostic tests
   a. X-rays reveal delayed closing of epiphyseal plates of long bones
   b. Normal IQ

D. Nursing interventions
1. Interact with child according to chronologic age/developmental level, and not according to physical appearance.
2. Administer growth hormone as ordered (because of delay in bone development, these children can still grow even when their peers have stopped).
3. Monitor for signs and symptoms of additional neurologic disorders.
4. Keep careful records of height and weight.
5. Encourage child/parents to express feelings.
6. Assist child in learning to interact normally with peers.

Hyperpituitarism (Gigantism)

A. General information
1. Hypersecretion of growth hormone (usually related to a tumor of the anterior pituitary) resulting in enlargement of bones of head, hands, and feet, and overgrowth of long bones
2. Especially noticeable at puberty

B. Medical management
1. Surgery to remove tumor
2. Radiation therapy if there is no tumor

C. Assessment findings
1. Height beyond maximum upper percentile
2. Proportional weight and muscle growth
3. Coarse facial features
4. Signs of increased ICP if caused by a tumor

D. Nursing interventions
1. Record height and head circumference.
2. Provide nursing care for a client receiving radiation therapy.
3. Provide care for the child with a brain tumor.
4. Assist child in interacting normally with peers.

Sample Questions

152. An 8-year-old is newly diagnosed with diabetes mellitus. Which of the following symptoms is different from what you would expect to find in maturity-onset (Type 2) diabetes?

1. Increased appetite.
2. Increased thirst.
3. Increased urination.
4. Weight loss.

153. A 7-year-old is newly diagnosed with diabetes mellitus. She had an injection of regular and NPH insulin at 0730. At 1510 she complains that she does not feel well. She is pale, perspiring, and trembling. What instructions should the nurse give the child?

1. Tell her to lie down and wait for the dinner trays to arrive.
2. Ask her to give a urine specimen and test it for sugar and acetone.
3. Give her a carbohydrate snack.
4. Administer the afternoon dose of regular insulin.

154. A 10-year-old with diabetes mellitus is learning how to administer her insulin. She asks the nurse why she cannot take pills like her grandmother who also has diabetes. Which would be a correct response from the nurse?

1. How long has your grandmother been taking oral medication?
2. You'll be able to stop taking insulin once you stop growing.
3. You have a different kind of diabetes and you will need to take insulin throughout your life.
4. You'll be able to switch to pills when you reach your grandmother's age.

Answers and Rationales

152. 4. Weight loss is associated with juvenile diabetes, whereas weight gain develops in maturity-onset diabetes.

153. 3. The symptoms suggest she is having a hypoglycemic reaction from the NPH insulin and needs an afternoon snack.

154. 3. Juvenile or Type 1 diabetics need lifetime insulin because they no longer produce their own.

The Integumentary System

VARIATIONS FROM THE ADULT

A. Skin is only 1 mm thick at birth; approximately twice as thick at maturity.
B. Evaporative water loss is greater in infants and small children.
C. Skin is more susceptible to bacterial infection in children.
D. Children are more prone to toxic erythema as a result of drug reactions and skin eruptions.
E. Children's skin is more susceptible to sweat retention and maceration.

ASSESSMENT

History

A. Medical history: previous skin disease, allergic conditions
B. History of present condition: onset, relationship to eating or other activities, medication usage

Physical Examination

A. Lesion type: note petechiae, erythema, ecchymosis; note secondary symptoms from rubbing, scratching, or healing.
B. Observe distribution pattern.
C. Note presence of pain or altered sensation.
D. Check scalp for signs of lice or nits.

ANALYSIS

Nursing diagnoses for the child with a disorder of the integumentary system may include:
A. Pain
B. Disturbed body image
C. Disturbed sensory perception

D. Risk for impaired skin integrity
E. Low self-esteem

PLANNING AND IMPLEMENTATION

Goals

A. Child will be free from discomfort.
B. Skin integrity will be restored.
C. Spread of infection and secondary infection will be prevented.

EVALUATION

A. Child is free from discomfort.
  1. Minimal scratching or rubbing
  2. Relaxed facial expression
  3. Minimal restlessness
B. Child's skin is clean, dry, and free from redness or signs of irritation.
C. Child is free from complications such as spread of infection.
D. Parents demonstrate satisfactory hygiene measures when caring for child with disorder of skin or scalp.

DISORDERS OF THE INTEGUMENTARY SYSTEM

Burns

Also see Unit 4.
A. For children, the rule of nines is modified; the head of a small child is 18–19%, the trunk 32%, each leg 15%, each arm 9½%.
B. Burns in infants and toddlers are frequently due to spills (pulling hot fluids on them or falling into hot baths); for older children, flame burns are more frequent.

Impetigo

A. General information
  1. Superficial bacterial infection of the outer layers of skin (usually staphylococcus or streptococcus)
  2. Common in toddlers and preschoolers
  3. Related to poor sanitation
  4. Very contagious
B. Medical management: topical and systemic antibiotics
C. Assessment findings
  1. Well-demarcated lesions
  2. Macules, papules, vesicles that rupture, causing a superficial moist erosion
  3. Moist area dries, leaving a honey-colored crust
  4. Spreads peripherally
  5. Most commonly found on face, axillae, and extremities
  6. Pruritus
D. Nursing interventions
  1. Implement skin isolation techniques.
  2. Soften the skin and crusts with Burrow's solution compresses.
  3. Remove crusts gently.
  4. Cover draining lesions to prevent spread of infection.
  5. Administer antibiotics as ordered, both orally and as bacteriocidal ointments.
  6. Prevent secondary infection.
  7. Provide client teaching and discharge planning concerning:
    a. Medication administration
    b. Proper hygiene techniques

Ringworm

A. General information
  1. Dermatomycosis due to various species of fungus
  2. Infected sites include:
    a. Scalp (tinea capitis)
    b. Body (tinea corporis)
    c. Feet (tinea pedis or athlete's foot)
  3. May be transmitted from person to person or acquired from animals or soil
B. Assessment findings
  1. Scalp
    a. Scaly circumscribed patches on the scalp
    b. Base of hair shafts are invaded by spores of the fungus; causes hair to break off, resulting in alopecia
    c. Spreads in a circular pattern
    d. Detected by Wood's lamp (fluoresces green at base of the affected hair shafts)
  2. Skin: red-ringed patches of vesicles; pain, scaling, itching
C. Nursing interventions
  1. Prevention: isolate from known infected persons.
  2. Apply antifungal ointment as ordered.
  3. Administer oral griseofulvin as ordered.

Pediculosis (Head Lice)

A. General information
  1. Parasitic infestation
  2. Adult lice are spread by close physical contact (sharing combs, hats, etc.)
  3. Occurs in school-age children, particularly those with long hair
B. Medical management: special shampoos followed by use of fine-tooth comb to remove nits
C. Assessment findings
  1. White eggs (nits) firmly attached to base of hair shafts
  2. Pruritus of scalp

D. Nursing interventions
  1. Institute skin isolation precautions (especially head coverings and gloves to prevent spread to self, other staff, and clients)
  2. Use special shampoo and comb the hair
  3. Provide client teaching and discharge planning concerning:
    a. How to check self and other family members and how to treat them
    b. Washing of clothes, bed linens, etc.; discouraging sharing of brushes, combs, and hats

Allergies

Diaper Rash

A. General information
  1. Contact dermatitis
  2. Plastic/rubber pants and linings of disposable diapers exacerbate the condition by prolonging contact with moist, warm environment; skin is further irritated by acidic urine
  3. May also be caused by sensitivity to laundry soaps used
B. Medical management: exposure of skin to air/heat lamp
C. Assessment findings
  1. Erythema/excoriation in the perineal area
  2. Irritability
D. Nursing interventions
  1. Keep area clean and dry; clean with mild soap and water after each stool and as soon as child urinates.
  2. Take off diaper and expose area to air during the day.
  3. Use heat lamp as ordered.
  4. Provide client teaching and discharge planning concerning:
    a. Proper hygiene/infant care
    b. Diaper laundering methods
    c. Avoiding use of plastic pants or disposable diapers with a plastic lining
    d. Avoiding use of cornstarch (a good medium for bacteria once it becomes wet)
    e. Need to avoid use of commercially prepared diaper wipes because they contain chemicals and alcohol, which may be irritating

Poison Ivy

A. General information
  1. Contact dermatitis; mediated by T-cell response so rash is not seen for 24–48 hours after contact.
  2. Poison ivy is not spread by the fluid in the vesicles; can be spread by clothes and animals that retain the plant resin.
B. Assessment findings: very pruritic impetigo-like lesions
C. Nursing interventions
  1. Administer antihistamines and cortisone as ordered.
  2. Provide client teaching and discharge planning concerning:
    a. Plant identification
    b. Need to wash with soap and water after contact with plant
    c. Importance of washing clothes to get the resin out

Eczema

A. General information
  1. Atopic dermatitis, often the first sign of an allergic predisposition in a child; many later develop respiratory allergies
  2. Usually manifests during infancy
B. Medical management
  1. Drug therapy
    a. Topical steroids
    b. Antihistamines
    c. Emollients
    d. Cautious administration of immunizations
    e. Medicated or colloid baths
  2. Diet therapy: elimination diet to detect offending foods
C. Assessment findings
  1. Erythema, weeping vesicles that rupture and crust over
  2. Usually evident on cheeks, scalp, behind ears, and on flexor surfaces of extremities (rarely on diaper area)
  3. Severe pruritus; scratching causes thickening and darkening of skin
  4. Dry skin, sometimes urticaria
D. Nursing interventions
  1. Avoid heat and prevent sweating; keep skin dry (moisture aggravates condition).
  2. Monitor elimination diet to detect food cause.
    a. Remove all solid foods from diet (formula only).
    b. If symptoms disappear after 3 days, start one new food group every 3 days to see if symptoms reappear.
    c. The food that is suspected of causing the rash is withdrawn again to make sure symptoms go away in 3 days and is then introduced a second time (challenge test).
  3. Check materials in contact with child's skin (sheets, lotions, soaps).
  4. Tepid baths, mild soaps.
    a. Provide lubricant immediately after bath.
    b. Pat dry gently with soft towel (do not rub) and pat in lubricant.
    c. Avoid the use of harsh soaps (dry skin).
  5. Administer topical steroids as ordered (penetrate better if applied within 3 minutes after bath). Thin layer of topical steroid.
  6. Use cotton instead of wool clothing.

7. Keep child's nails short to prevent scratching and secondary infection; use gloves or elbow restraints if needed.
8. Apply wet saline or Burrow's solution compresses.
9. Double-rinse laundry.
10. Assess skin for infection.

Acne

A. General information
1. Skin condition associated with increased production of sebum from sebaceous glands at puberty.
2. Lesions include pustules, papules, and comedones.
3. Majority of adolescents experience some degree of acne, mild to severe.
4. Lesions occur most frequently on face, neck, shoulders, and back.
5. Caused by a variety of interrelated factors including increased activity of sebaceous glands, emotional stress, certain medications, menstrual cycle.
6. Secondary infection can complicate healing of lesions.
7. There is no evidence to support the value of eliminating any foods from the diet; if cause and effect can be established, however, a particular food should be eliminated.

B. Assessment findings
1. Appearance of lesions is variable and fluctuating
2. Systemic symptoms absent
3. Psychologic problems such as social withdrawal, low self-esteem, feelings of being "ugly"

C. Nursing interventions
1. Discuss OTC products and their effects.
2. Instruct child in proper hygiene (handwashing, care of face, not to pick or squeeze any lesions).
3. Demonstrate proper administration of topical ointments and antibiotics if indicated.

Sample Questions

155. A 2-year-old was recently found to have impetigo. What measures should be given the highest priority to prevent its spread while in the hospital?
1. Keeping it covered.
2. Good handwashing.
3. Applying A&D ointment.
4. Placing the child in isolation.

156. A 7-year-old boy has a loss of scalp hair and is diagnosed with ringworm. What question will the nurse most likely ask?
1. Whether the family owns any pets.
2. From what economic background is the family.
3. Whether other children in his classroom have ringworm.
4. Whether the child can read the medicine directions.

157. Three school children have pediculosis capitus. The school nurse has been instructing the parents of all three students on prevention. Which statement made by one mother indicates an understanding of prevention?
1. "I will put all of the stuffed animals in plastic bags for 2 weeks."
2. "Since the sheets are now clean, the kids can share beds, too."
3. "Once I cut her hair, all the nits should be gone."
4. "I will now bathe my child every day to prevent reinfection."

158. Prior to discharge home with their new baby, which of the following will demonstrate to the nurse that the parents understand diaper rash prevention?
1. They articulate that the baby should be checked for wet diapers every half an hour.
2. They are observed wiping with soap and water at diaper changes.
3. The mother discusses needs to use tight rubber pants to keep diapers from leaking.
4. The father wipes carefully and uses a mild ointment to protect the skin.

159. A 3-year-old girl has had eczema since 4 months of age. Which statement made by her father indicates to the nurse that he understands the management of eczema?
1. "Benadryl should be given every night before bedtime."
2. "It's beneficial to keep her in the bubble bath for as long as possible each day."
3. "Typical eruption areas that need to be treated include flexor surfaces of joints."
4. "Hot water is better in which to bathe."

Answers and Rationales

155. 2. Good handwashing is of paramount importance in preventing its spread.

156. 1. Pets are known to be carriers of ringworm.

157. 1. Stuffed animals can harbor eggs and cause reinfection.

158. 4. Careful cleansing on delicate skin and use of ointments helps to preserve the skin's integrity.

159. 3. These are the joint areas typically affected in the childhood years.

Pediatric Oncology

OVERVIEW

A. Cancer is the leading cause of death from disease in children from 1–14 years.
B. Incidence
  1. 6000 children develop cancer per year.
  2. 3000 children die from cancer annually.
  3. Boys are affected more frequently.
C. Leukemia is the most frequent type of childhood cancer, followed by tumors of the CNS.
D. Etiologic factors include environmental agents, viruses, familial/genetic factors, and host factors.

Major Stressful Events

Five events have been identified as major stressors:
A. Diagnosis*:* child is initially hospitalized to determine extent of disease, plan course of treatment, and to educate child and family.
B. Treatment: multimodal
  1. May include surgery, radiation, chemotherapy
  2. Side effects are serious and unpleasant; child/family may complain that the "treatment is worse than the disease."
C. Remission: child is without evidence of disease, treatment continues; goals for this period include:
  1. Maintenance of normal family patterns: discipline and usual household chores
  2. Maintenance of relationships among family and friends
    a. Parents' marriage may be strained
    b. Siblings may feel neglected or jealous
  3. Attendance at school
    a. Child may fear rejection by peers due to change in appearance or not being able to keep up
    b. Teacher may be unsure as to what to say or how to treat the child
    c. Classmates need to be prepared for child's return; may have fears/concerns about whether the disease is catching and whether their friend will die
D. Recurrence
  1. An event of enormous magnitude and a cause of severe disappointment
  2. May occur while still on treatment or after treatment has been completed
E. Death

ASSESSMENT

History

A. Family history: some cancers suggest patterns of inheritance
B. Prenatal exposure
C. Children with chromosomal disorders have a higher-than-average incidence of cancer
D. History may elicit symptoms that have been present for a period of time
E. Presenting problems: symptoms may include:
  1. Fever, pain, bleeding
  2. Abdominal mass
  3. Night sweats, weight loss
  4. Hematuria, hypertension

Physical Examination

A. General appearance
  1. Skin: note color, bruises, or petechiae
  2. Neurologic status: note fatigue, activity level, behavior, headache, dizziness, gait disturbances
  3. Pain: guarding of any body part, changes in range of motion
B. Measure vital signs including BP
C. Plot height and weight on growth chart
D. Inspect and palpate abdomen; note enlargement of liver and spleen
E. Palpate for enlarged lymph nodes
F. Inspect eyes for nystagmus

Laboratory/Diagnostic Test

A. Blood studies, e.g., CBC
B. X-rays, bone scans, CT scans, MRI, ultrasound
C. Lumbar puncture
D. Bone marrow aspiration

ANALYSIS

Nursing diagnoses for the child with cancer may include:
A. Risk for infection
B. Risk for injury
C. Fear/anxiety
D. Disturbed body image
E. Deficient knowledge

PLANNING AND IMPLEMENTATION

Goals

A. Child will be free from infection
B. Child will be free from pain
C. Optimum developmental level will be achieved
D. Family will develop effective coping strategies

Interventions

Surgery

A. May be performed for tumor removal, to obtain a biopsy, to determine extent of disease, or for palliation
B. Often used in conjunction with radiation or chemotherapy

Radiation Therapy

A. Primarily used in children to improve prognosis
B. Goal is to achieve maximum effect on tumor while sparing normal tissue
  1. May be used for palliative relief from pain, disfigurement
  2. May be curative, destroys cancer cells/reduces size of tumor
  3. Frequently used as an adjunct to chemotherapy and surgery
  4. Must weigh gain versus risks of permanent damage to normal tissue
  5. Infants particularly susceptible to developing skeletal deformities in later years as a result of radiation
  6. Complications to growing child include scoliosis, arrested skeletal development, and pulmonary fibrosis (depends on site radiated)
  7. Dosage range varies; may be as low as 1000 rad to relieve bone pain in a specific area, to as high as 7000 rad to achieve a cure in Ewing's sarcoma
  8. Usually performed 5 days a week for 2–6 weeks

Chemotherapy

Almost all pediatric cancer clients receive some form of drug therapy.
A. Childhood cancers are more sensitive and responsive to drugs than are adult cancers.
B. Childhood cancers tend to metastasize early and systemic treatment is needed in addition to localized treatment.

Hematopoietic Stem Cell Transplantation (HSCT) [Previously known as Bone Marrow Transplantation]

A. General information
  1. Treatment alternative for a variety of childhood diseases including:
    a. Definite: acute lymphoblastic leukemia, acute nonlymphocytic leukemia, severe aplastic anemia, immunodeficiencies, and malignant infantile osteopetrosis
    b. Possible: chronic myelogenous leukemia, solid tumors, some hematologic disorders, and some inherited metabolic disorders
  2. Types
    a. Autologous: client transplanted with own harvested marrow
    b. Syngeneic: transplant between identical twins
    c. Allogeneic: transplant from a genetically nonidentical donor
      1) Most common transplant type
      2) Sibling most common donor
  3. Procedure
    a. Donor suitability determined through tissue antigen typing; includes human leukocyte antigen (HLA) and mixed leukocyte culture (MLC) typing.
    b. Donor bone marrow is aspirated from multiple sites along the iliac crests under general anesthesia.
    c. Donor marrow is infused IV into the recipient.
  4. Early evidence of engraftment seen during the second week posttransplant; hematologic reconstitution takes 4–6 weeks; immunologic reconstitution takes months.
  5. Hospitalization of 2 or 3 months required.
  6. Prognosis is highly variable depending on indication for use.
B. Complications
  1. Failure of engraftment
  2. Infection: highest risk in first 3–4 weeks
  3. Pneumonia: nonbacterial or interstitial pneumonias are principal cause of death during first 3 months posttransplant

4. Graft vs host disease (GVHD): principal complication; caused by an immunologic reaction of engrafted lymphoid cells against the tissues of the recipient
   a. Acute GVHD: develops within first 100 days posttransplant and affects skin, gut, liver, marrow, and lymphoid tissue
   b. Chronic GVHD: develops 100–400 days posttransplant; manifested by multiorgan involvement
5. Recurrent malignancy
6. Late complications such as cataracts, endocrine abnormalities

C. Nursing care: pretransplant
1. Extensive time must be spent with child/parents in preparing for this procedure.
2. Recipient immunosuppression attained with total body irradiation (TBI) and chemotherapy to eradicate existing disease and create space in host marrow to allow transplanted cells to grow.
3. Provide protected environment.
   a. Child should be in a laminar air flow room or on strict reverse isolation; surveillance cultures done twice a week.
   b. Encourage use of toys and familiar objects; they must be sterilized before being brought into the room.
   c. Encourage frequent contact with schoolteacher/play therapist.
   d. Introduce new people where they can be seen, but outside child's room so child can see what they look like without isolation garb.
4. Monitor central lines frequently; check patency and observe for signs of infection (fever, redness around site).
5. Provide care for the child receiving chemotherapy and radiation therapy to induce immunosuppression.
   a. Administer chemotherapy as ordered, assist with radiation therapy if required.
   b. Monitor side effects and keep child as comfortable as possible.
   c. Monitor carefully for potential infection.
   d. Child will become very ill; prepare parents.

D. Nursing care: posttransplant
1. Prevent infection.
   a. Maintain protective environment.
   b. Administer antibiotics as ordered.
   c. Assess all mucous membranes, wounds, catheter sites for swelling, redness, tenderness, pain.
   d. Monitor vital signs frequently (every 1–4 hours as needed).
   e. Collect specimens for cultures as needed and twice a week.
   f. Change IV set-ups every 24 hours.
2. Provide mouth care for stomatitis and mucositis (severe mucositis develops about 5 days after irradiation).
   a. Note tissue sloughing, bleeding, changes in color.
   b. Provide mouth rinses, viscous lidocaine, and antibiotic rinses.
   c. Do not use lemon and glycerin swabs.
   d. Administer parenteral narcotics as ordered if necessary to control pain.
   e. Provide care every 2 hours or as needed.
3. Provide skin care: skin breakdown may result from profuse diarrhea from the TBI.
4. Monitor carefully for bleeding.
   a. Check for occult blood in emesis and stools.
   b. Observe for easy bruising, petechiae on skin, mucous membranes.
   c. Monitor changes in vital signs.
   d. Check platelet count daily.
   e. Replace blood products as ordered (all blood products should be irradiated).
5. Maintain fluid and electrolyte balance and promote nutrition.
   a. Measure I&O carefully.
   b. Provide adequate fluid, protein, and caloric intake.
   c. Weigh daily.
   d. Administer fluid replacement as ordered.
   e. Monitor hydration status: check skin turgor, moisture of mucous membranes, urine output.
   f. Check electrolytes daily.
   g. Check urine for glucose, ketones, protein.
   h. Administer antidiarrheal agents as needed.
6. Provide client teaching and discharge planning concerning:
   a. Home environment (e.g., cleaning, pets, visitors)
   b. Diet modifications
   c. Medication regimen: schedule, dosages, effects, and side effects
   d. Communicable diseases and immunizations
   e. Daily hygiene and skin care
   f. Fever
   g. Activity

STAGES OF CANCER TREATMENT

A. Induction
1. Goal: to remove bulk of tumor
2. Methods: surgery, radiation/chemotherapy, bone marrow transplant
3. Effects: often the most intensive phase; side effects of treatment are potentially life threatening

B. Consolidation
1. Goal: to eliminate any remaining malignant cells

2. Methods: often chemotherapy/radiation therapy
3. Effects: side effects will still be evident

C. Maintenance
1. Goal: to keep child disease free
2. Method: chemotherapy (this phase may last for several years)

D. Observation
1. Goal: to monitor the child at intervals for evidence of recurrent disease and complications of treatment
2. Method: treatment is complete; child may continue in this stage indefinitely

E. Late effects of treatment
1. Impaired growth and development, usually related to radiation of growth centers
2. CNS damage resulting in intellectual, psychologic, or neurologic sequelae
3. Impaired pubertal development including hormonal or reproductive problems
4. Development of secondary malignancy
5. Psychologic problems (poor self-esteem, depression, anxiety) related to living with a life-threatening disease and complex treatment regimen

Side Effects

A. From combined effects of treatment: nausea, vomiting, diarrhea, alopecia, anemia (low RBCs), increased susceptibility to infection (low WBCs), bleeding (low platelets), stomatitis, mucositis, pain, learning problems

B. From radiation (findings differ according to site radiated): sleepiness, reddened skin

C. From chemotherapy: drug toxicity specific to agents used; liver and renal toxicity

D. Developmental: behavior problems, avoidance of school and friends, low self-esteem or poor self-image

Nursing Interventions

A. Help child cope with intrusive procedures.
1. Provide information geared to developmental level and emotional readiness.
2. Explain what is going to happen, why it is necessary, and how it will feel.
3. Allow child to handle and manipulate equipment.
4. Use needle play as indicated.
5. Allow child some control in situations (e.g., positioning, selecting injection site).

B. Support child and parents.
1. Maintain frequent clinical conferences to keep all informed.
2. Always tell the truth.
3. Acknowledge feelings and encourage child/family to express them, assure them that feelings are normal.
4. Provide contact with another parent or an organized support group such as Candlelighters.
5. Try to keep daily life as normal as possible.

C. Minimize side effects of treatment.
1. Skin breakdown
a. Keep clean and dry; wash with warm water, no soaps or creams.
b. Do not wash off radiation markings.
c. Avoid exposure to sunlight.
d. Avoid all topical agents with alcohol (perfumes and powders).
e. Do not use electric heating pads or hot water bottles.

2. Bone marrow suppression
a. Decreased RBCs
1) Allow child to determine activities.
2) Provide frequent rest periods.

b. Decreased WBCs
1) Avoid crowds, isolate from children with known communicable disease.
2) Evaluate any potential site of infection.
3) Monitor temperature elevations.

c. Decreased platelets
1) Make environment safe.
2) Select activities that are physically safe.
3) Avoid use of salicylates.

d. Administer transfusions as ordered.
e. Interpret peripheral blood counts to guide specific interventions and precautions.

3. Nausea and vomiting
a. Administer antiemetic at least half an hour before chemotherapy; repeat as necessary.
b. Encourage relaxation techniques.
c. Eat light meal prior to administration of therapy.
d. Ensure adequate oral intake or administer IV fluids as necessary.

4. Alopecia
a. Reduce trauma of hair loss (especially in children over age 5 years).
b. Buy wig before hair falls out.
c. Discuss various head coverings with boys and girls.
d. Avoid exposing head to sunlight.
e. Discuss feelings.

5. Stomatitis, mucositis (see Bone Marrow Transplant).

6. Nutrition deficits
a. Establish baseline prior to start of treatment.
b. Measure height and weight regularly.
c. Provide small, frequent meals.
d. Consult dietitian as needed.
e. Provide high-calorie, high-protein supplements.

7. Developmental delays
a. Discuss limit setting, discipline.
b. Some behavior problems might be side effects of drug therapy.
c. Facilitate return to school as soon as able.
d. Realize changing needs of child.

CANCERS

Leukemia

A. General information
- **1.** Most common form of childhood cancer
- **2.** Peak incidence is between 2 and 3 years of age
- **3.** Proliferation of abnormal white blood cells that do not mature beyond the blast phase
- **4.** In the bone marrow, blast cells crowd out healthy white blood cells, red blood cells, and platelets, leading to bone marrow depression
- **5.** Blast cells also infiltrate other organs, most commonly the liver, spleen, kidneys, and lymph tissue
- **6.** Symptoms reflect bone marrow failure and associated involvement of other organs
- **7.** Types of leukemia, based on course of disease and cell morphology
  - **a.** Acute lymphocytic leukemia (ALL)
    - **1)** 75% of childhood leukemia
    - **2)** Malignant change in the lymphocyte or its precursors
    - **3)** Acute onset
    - **4)** 95% chance of obtaining remission with treatment
    - **5)** 75% chance of surviving 5 years or more
    - **6)** Prognostic indicators include: initial white blood count (less than 10,000/mm^3), child's age (2–9 years), histologic type, sex
  - **b.** Acute nonlymphocytic leukemia (ANLL)
    - **1)** Includes granulocytic and monocytic types
    - **2)** 60–80% will obtain remission with treatment
    - **3)** 30–40% cure rate
    - **4)** Prognostic indicators less clearly defined

B. Medical management
- **1.** Diagnosis: blood studies, bone marrow biopsy
- **2.** Treatment stages
  - **a.** Induction: intense and potentially life threatening
  - **b.** CNS prophylaxis: to prevent central nervous system disease. Combination of radiation and intrathecal chemotherapy.
  - **c.** Maintenance: chemotherapy for 2 to 3 years.

C. Assessment findings
- **1.** Anemia (due to decreased production of RBCs), weakness, pallor, dyspnea
- **2.** Bleeding (due to decreased platelet production), petechiae, spontaneous bleeding, ecchymoses
- **3.** Infection (due to decreased WBC production), fever, malaise
- **4.** Enlarged lymph nodes
- **5.** Enlarged spleen and liver
- **6.** Abdominal pain with weight loss and anorexia
- **7.** Bone pain due to expansion of marrow

D. Nursing interventions
- **1.** Monitor for signs of bleeding, anemia, thrombocytopenia, DIC.
- **2.** Provide care for the child receiving chemotherapy and radiation therapy.
- **3.** Provide support for child/family; needs will change as treatment progresses.
- **4.** Support child during painful procedures (frequent bone marrow aspirations, lumbar punctures, venipunctures needed).
  - **a.** Use distraction, guided imagery.
  - **b.** Allow child to retain as much control as possible.
  - **c.** Administer sedation prior to procedure as ordered.

Brain Tumors

A. General information
- **1.** A space-occupying mass in the brain tissue; may be benign or malignant
- **2.** Males affected more often; peak age 3–7 years
- **3.** Second most prevalent type of cancer in children
- **4.** Cause unknown; genetic and environmental factors may play a role; familial tendency for brain tumors, which are found with preexisting neurocutaneous disorders.
- **5.** Two thirds of all pediatric brain tumors are beneath the tentorium cerebelli (in the posterior fossa), often involving the cerebellum or brain stem.
- **6.** Three fourths of brain tumors in children are gliomas (medulloblastoma and astrocytoma).

B. Types (See Figure 5–12.)
- **1.** Medulloblastoma: highly malignant tumor usually found in cerebellum; runs a rapid course
  - **a.** Findings include increased ICP plus unsteady walk, ataxia, anorexia, early morning vomiting
  - **b.** Treated with radiation because complete removal is impossible
- **2.** Astrocytoma: a benign, cystic, slow-growing tumor usually found in cerebellum
  - **a.** Onset of symptoms is insidious.
  - **b.** Findings include focal disturbances, papilledema, optic nerve atrophy, blindness.
- **3.** Ependymoma: a usually benign tumor that arises in the ventricles of the brain, causing noncommunicating hydrocephalus and damage (by pressure) to other vital tissues of the brain
- **4.** Craniopharyngioma: tumor that arises from remnants of embryonic tissue near the

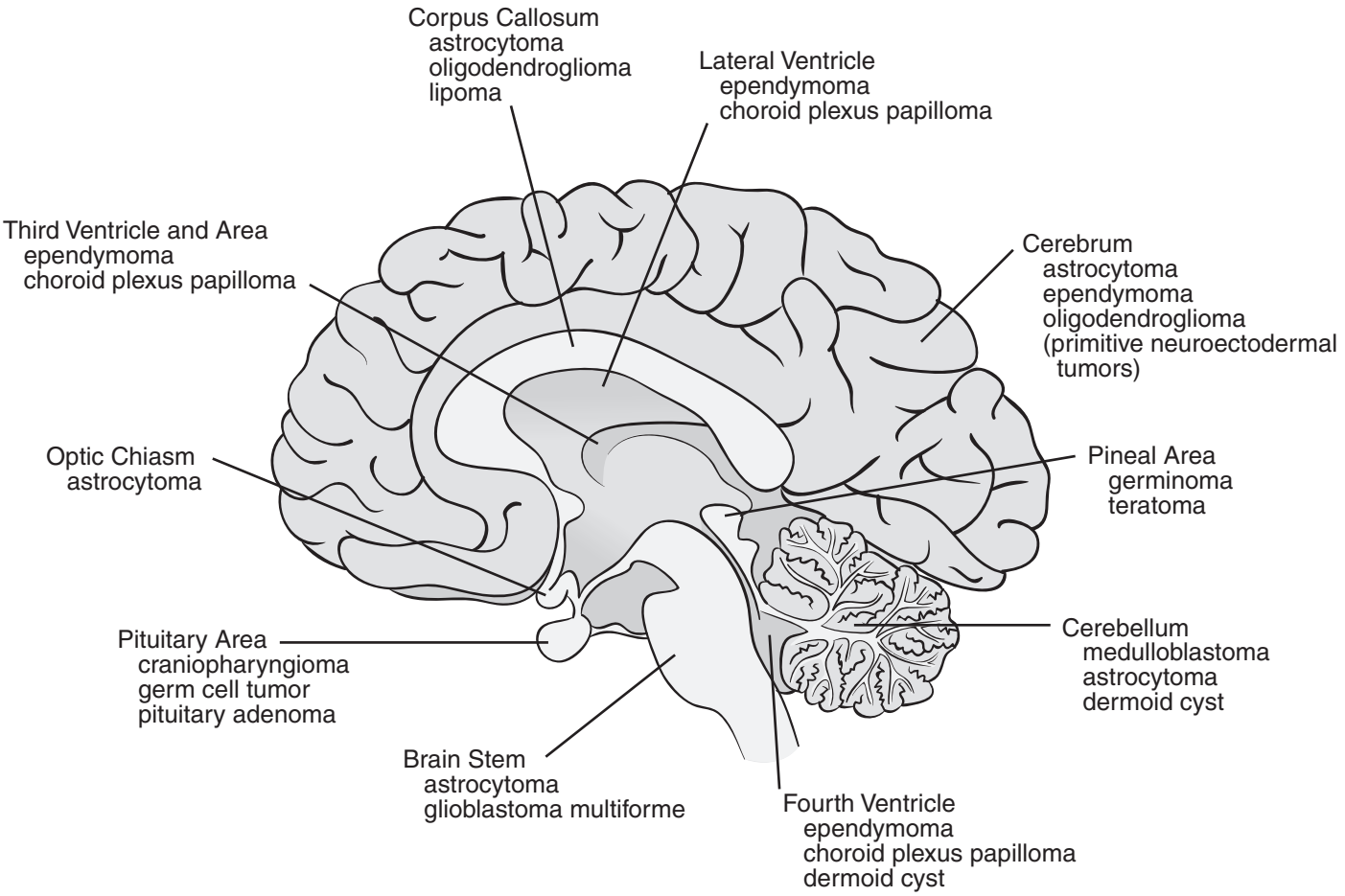


Figure 5-12 Location of common childhood brain tumors. Source: From American Brain Tumor Association. *A primer of brain tumors: A patient's reference manual.* (2004). Des Plaines, IL: American Brain Tumor Association. Used with permission.

pituitary gland in the sella turcica, causes pressure on the third ventricle
   - **a.** Decreased secretion of ADH causes diabetes insipidus (these children may need Pitressin).
   - **b.** Additional symptoms include altered growth pattern, visual difficulties, difficulty regulating body temperature.
5. Brain stem glioma: slow-growing tumor, indicated by cranial nerve palsies, ataxia

C. Medical management
1. Surgery: some tumors entirely or partially resected; others are not amenable to surgery because of proximity to vital brain parts
2. Radiation therapy: often used to shrink tumors
3. Chemotherapy: vincristine, lomustine, procarbazine, intrathecal methotrexate; not as effective with brain tumors as with other childhood cancers

D. Assessment findings
1. Symptoms dependent on location and type of tumor.
2. A definite diagnosis is difficult in children because of the elasticity of child's skull and generally poor coordination of the young child.
3. A decrease in school performance may be the first sign.
4. Increased ICP
   - **a.** Morning headache
   - **b.** Morning vomiting without nausea; vomiting without relation to feeding schedule; projectile vomiting
   - **c.** Personality changes
   - **d.** Diplopia
     - **1)** Difficult to assess in young children
     - **2)** Observe child for tilting of head, closing or covering one eye, rubbing the eyes, or impaired eye-hand coordination
   - **e.** Papilledema: a late sign
   - **f.** Increased blood pressure with decreased pulse: also a late sign

g. Cranial enlargement
1) More readily noticeable prior to 18 months when suture lines are still open
2) Bulging, tense, pulsating fontanels
3) Widened suture lines
4) 90% or more on head circumference chart

5. Focal signs and symptoms
a. Ataxia
1) In cerebellar tumors
2) May not be readily identified because of uncoordinated movements of young children

b. Muscle strength
1) Weakness with cerebellar tumors
2) Weakness, spasticity, and paralysis of lower extremities with cerebral or brain stem tumors
3) Change in handedness, posture, or manual coordination: may be early signs

c. Head tilt
1) In posterior fossa tumors
2) Early sign of visual impairment
3) Associated with nuchal rigidity
4) Due to traction on the dura

d. Ocular signs
1) Nystagmus: corresponds to the same side as the infratentorial lesion
2) Diplopia/strabismus: from palsy of cranial nerve VI with brain stem glioma or increased ICP
3) Visual field deficit (child does not react to activity on periphery of vision): with craniopharyngiomas

e. Seizures: with cerebral tumors

6. Diagnostic tests
a. Skull X-ray reveals presence and location of tumor
b. CT scan (with or without contrast dye) reveals position, consistency, size of tumor, and effect on surrounding tissue
c. EEG may show seizure activity

E. Nursing interventions
1. Obtain baseline vital signs and perform thorough neurologic assessment; monitor vital signs and neurologic status frequently.
2. Prevent injury/complications.
a. Institute seizure precautions.
b. Monitor for fluid and electrolyte imbalance from vomiting.
c. Observe for increased ICP.
d. Provide safety measures (bed rails up).

3. Promote comfort/relief of headache.
a. Decrease environmental stimuli.
b. Administer analgesics as ordered.

4. Prevent constipation (straining increases ICP).
a. Provide appropriate foods and fluids as ordered.
b. Provide stool softeners as ordered.
c. Avoid enemas, which increase ICP.

5. Provide care for the child undergoing brain surgery.
6. Provide care for the child undergoing radiation or chemotherapy.
7. Provide client teaching and discharge planning concerning:
a. Diagnostic tests (instruction needs to be appropriate to the child's developmental level)
1) Machines will make clicking sounds
2) Wires attached to the head for an EEG will not electrocute child
3) Head is immobilized for a CT scan
4) The use of contrast dye and expected sensations if used
5) Need to lie still with the technician out of the room for most tests (younger children will be sedated for fuller cooperation)

b. Importance of family discussion of fears/anxiety about surgery and prognosis
c. Need to assist in implementing child's interaction with peers
d. Available support groups and community agencies

Brain Surgery

A. General information
1. Indications
a. Removal of a tumor
b. Evacuation of a hematoma
c. Removal of a foreign body or skull fragments resulting from trauma
d. Aspiration of an abscess
e. Insertion of a shunt

B. Nursing interventions: preoperative
1. Assess the child's understanding of the procedure; have the child draw a picture, tell a story; observe doll play.
2. Explain the procedure in terms according to the child's developmental level.
3. Allow the child to visit the operating room/intensive care unit, if permitted, depending on the child's emotional and developmental levels.
4. Explain that pre-op symptoms such as headache and ataxia may be temporarily aggravated.
5. Advise child/parents that blindness may result, depending on the location of the tumor.
6. Inform the child/parents that the head will be shaved; long hair may be saved; hats or scarves may be used to cover the head once the dressings are removed.
7. Support the child/family if a tumor cannot be totally removed.

8. Provide instruction about radiation and chemotherapy (may need to be delayed because detail may be overwhelming).
9. Explain to the child/parents about the post-op dressing, monitoring devices, and possibility of facial edema.

C. Nursing interventions: postoperative
1. Prevent injury/complications.
   a. Monitor vital signs and neuro status frequently until stable.
   b. Apply hypothermia blanket as ordered.
   c. Assess respiratory status/signs of infection.
   d. Observe the dressing for discharge/hemorrhage.
   e. Close or cover eyes, apply ice, instill saline drops or artificial tears.
   f. Position as ordered according to the location of the tumor and type of surgery.
   g. Assess for increased ICP.
   h. Institute seizure precautions.
2. Promote comfort.
   a. Decrease environmental stimuli.
   b. Administer analgesics as ordered, first assessing LOC.
3. Promote adequate nutrition.
   a. Administer fluids as ordered.
   b. Monitor I&O.
   c. Provide diet as ordered.
4. Provide emotional support and encourage child/family to discuss prognosis.
5. Provide client teaching and discharge planning concerning:
   a. Wound care
   b. Signs of increased ICP
   c. Activity level
   d. Sensation and time period of hair growth
   e. Peer acceptance
   f. Radiation/chemotherapy, if indicated
   g. Availability of support groups/community agencies

Hodgkin's Lymphoma

A. General information
1. Malignant neoplasm of lymphoid tissue, usually originating in localized group of lymph nodes; a proliferation of lymphocytes
2. Metastasizes first to adjacent lymph nodes
3. Cause unknown
4. Most prevalent in adolescents; accounts for 5% of all malignancies
5. Prognosis now greatly improved for these children; influenced by stage of disease and histologic type
6. Long-term treatment effects include increased incidence of second malignancies, especially leukemia and infertility

B. Medical management
1. Diagnosis: extensive testing to determine stage, which dictates treatment modality
   a. Lymphangiogram determines involvement of all lymph nodes (reliable in 90% of clients); is helpful in determining radiation fields
   b. Staging via laparotomy and biopsy
      1) Stage I: single lymph node involved; usually in neck; 90–98% survival
      2) Stage II: involvement of 2 or more lymph nodes on same side of diaphragm; 70–80% survival
      3) Stage III: involvement of nodes on both sides of diaphragm; 50% survival
      4) Stage IV: metastasis to other organs
   c. Laparotomy and splenectomy
   d. Lymph node biopsy to identify presence of Reed-Sternberg cells and for histologic classification
2. Radiation: used alone for localized disease
3. Chemotherapy: used in conjunction with radiation therapy for advanced disease

C. Assessment findings
1. Major presenting symptom is enlarged nodes in lower cervical region; nodes are nontender, firm, and movable
2. Recurrent, intermittent fever
3. Night sweats
4. Weight loss, malaise, lethargy
5. Pruritus
6. Diagnostic test: presence of Reed-Sternberg cells

D. Nursing interventions
1. Provide care for child receiving radiation therapy.
2. Administer chemotherapy as ordered and monitor/alleviate side effects.
3. Protect client from infection, especially if splenectomy performed.
4. Provide support for child/parents; specific needs of adolescent client must be considered.

Non-Hodgkin's Lymphoma

A. General information
1. Tumor originating in lymphatic tissue
2. Significantly different from Hodgkin's lymphoma
   a. Control of primary tumor is difficult
   b. Disease is diffuse, cell type undifferentiated
   c. Tumor disseminates early
   d. Includes wide range of disease entities: lymphosarcoma, reticulum cell sarcoma, Burkitt's lymphoma
3. Primary sites include GI tract, ovaries, testes, bone, CNS, liver, breast, subcutaneous tissues
4. Affects all age groups.

B. Medical management
1. Chemotherapy: multiagent regimens including cyclophosphamide (Cytoxan), vincristine,

prednisone, procarbazine, doxorubicin, bleomycin
2. Radiation therapy: primary treatment in localized disease
3. Surgery for diagnosis and clinical staging

C. Assessment findings
1. Depend on anatomic site and extent of involvement
2. Rapid onset and progression
3. Many have advanced disease at diagnosis

D. Nursing interventions: provide care for child receiving chemotherapy, radiation therapy, and surgery.

Wilms' Tumor (Nephroblastoma)

A. General information
1. Large, encapsulated tumor that develops in the renal parenchyma, more frequently in left kidney (usually unilateral)
2. Originates during fetal life from undifferentiated embryonic tissues
3. Peak age of occurrence: 1–3 years
4. Prognosis good if there are no metastases.

B. Medical management
1. Nephrectomy, with total removal of tumor
2. Postsurgical radiation in treatment of stages II, III, and IV; stage I disease does not usually require radiation, but it may be used if the tumor histology is unfavorable.
3. Postsurgical chemotherapy: vincristine and daunorubicin, doxorubicin

C. Assessment findings
1. Staging
a. Stage I: limited to kidney
b. Stage II: tumor extends beyond kidney, but is completely encapsulated
c. Stage III: tumor confined to abdomen
d. Stage IV: tumor has metastasized to lung, liver, bone, or brain
e. Stage V: bilateral renal involvement at diagnosis
2. Usually mother notices mass while bathing or dressing child; nontender, usually midline near liver
3. Hypertension and possible hematuria, anemia, and signs of metastasis
4. Diagnostic test: IVP reveals mass

D. Nursing interventions
1. Do not palpate abdomen to avoid possible dissemination of cancer cells.
2. Handle child carefully when bathing and giving care.
3. Provide care for the client with a nephrectomy; usually performed within 24–48 hours of diagnosis.
4. Provide care for the child receiving chemotherapy and radiation therapy.

Neuroblastoma

A. General information
1. A highly malignant tumor that develops from embryonic neural crest tissue; arises anywhere along the craniospinal axis, usually from the adrenal gland
2. Incidence
a. One in 10,000
b. Males slightly more affected
c. From infancy to age 4
3. Staging
a. Stage I: tumor confined to the organ of origin
b. Stage II: tumor extends beyond primary site but not across midline
c. Stage III: tumor extends beyond midline
d. Stage IV: tumor metastasizes to skeleton (bone marrow), soft tissue (liver), and lymph nodes

B. Medical management: depends on the staging of tumor and age of child; includes surgery, radiation therapy, chemotherapy

C. Assessment findings vary, depending on the tumor site and stage
1. If in the abdomen, may initially resemble Wilms' tumor
2. Local signs and symptoms caused by pressure of the tumor on surrounding tissue
3. Metastatic manifestations
a. Ocular: supraorbital ecchymosis, periorbital edema, exophthalmos
b. Cervical or supraclavicular lymphadenopathy
c. Bone pain: may or may not occur with bone metastasis
d. Nonspecific complaints; pallor, anorexia, weight loss, irritability, weakness
4. Diagnosis usually made after metastasis has occurred
5. Diagnostic tests
a. X-rays of the head, chest, or abdomen reveal presence of primary tumor or metastases
b. IVP: if tumor is adrenal, shows a downward displacement of the kidney on the affected side
c. Bone marrow aspiration: to rule out metastasis; neuroblasts have a clumping pattern
d. CBC: RBCs and platelets decreased
e. Coagulation studies: abnormal due to thrombocytopenia
f. Catecholamine excretion: VMA levels in urine increased
1) Child must not ingest vanilla, chocolate, bananas, or nuts for 3 days prior to the test
2) 24-hour urine specimen needed

D. Nursing interventions: same as for leukemia and brain tumors.

Bone Tumors

Osteogenic Sarcoma

A. General information
  1. Primary bone tumor arising from the mesenchymal cells and characterized by formation of osteoid (immature bone)
  2. Invades ends of long bones, most frequently distal end of femur or proximal end of tibia
  3. Occurs more often in boys, usually between ages 10 and 20 years
  4. Lungs most frequent site of metastasis
  5. 5-year survival rate is 10–20%

B. Medical management
  1. Surgery: treatment of choice
    a. Amputation: temporary prosthesis used immediately after surgery; permanent one usually fitted a few weeks later
    b. Limb salvage procedures
    c. Lung surgery if there are metastases
  2. Radiation: only in areas where tumor is not accessible to surgery
  3. Chemotherapy: adjuvant therapy being studied

C. Assessment findings
  1. Insidious pain, increasing with activity, gradually becoming more severe
  2. Tender mass, warm to touch; limitation of movement
  3. Pathologic fractures

D. Nursing interventions
  1. Prepare child for amputation: discuss fears, concerns, and facts of procedure; answer questions regarding prosthetic devices, limited activity
  2. Assure child that phantom limb pain will subside

Ewing's Sarcoma

A. General information
  1. Primary tumor arising from cells in bone marrow
  2. Invades bone longitudinally, destroying bone tissue; no new bone formation
  3. Femur most frequently affected site
  4. More common in males, between ages 5 and 15 years
  5. Lungs most frequent site of metastasis

B. Medical management
  1. High-dose radiation is primary treatment
  2. Chemotherapy
  3. Value of surgery presently being reassessed

C. Assessment findings
  1. Pain and swelling
  2. Palpable mass, may be tender, warm to touch
  3. 10–30% of clients have metastatic disease at time of diagnosis

D. Nursing interventions
  1. Promote exercise of affected limb to maintain function.
  2. Avoid activities that may cause added stress to affected limb.

Sample Questions

160. A 10-year-old is being prepared for a bone marrow transplant. Which statement by the boy will demonstrate to the nurse that he understands this treatment?
1. "I'll be much better after this blood goes to my bones."
2. "I won't feel too good until my body makes healthy cells."
3. "This will help all of the medicine they give me to work better."
4. "You won't have to wear a mask and gown after my transplant."

161. A 4-year-old has leukemia. Her mother understands the white count involvement in this disease but doesn't understand why her child has bruises and anemia. Which statement will be the best explanation for the bruises and anemia?
1. All blood cells are made in the bone marrow and therefore all types will be affected.
2. The anemia is because her child hasn't been eating well; the bruises are from the multiple needle sticks.
3. They are related to inactivity.
4. This is indicative that the end is near.

162. A 14-year-old has had an exacerbation of acute lymphocytic leukemia. What is the primary effect of leukemia on the bone marrow?
1. Crowding out of normal bone marrow cells.
2. Proliferation of cells producing blood components.
3. A selective reduction in the number of neutrophils.
4. Leukopenia, thrombocytopenia, and anemia.

163. A 14-year-old girl has acute lymphocytic leukemia and is admitted. She is terminally ill. What would be an appropriate nursing action?
1. Leave her alone as much as possible and whisper when in her room in order not to disturb her.
2. Assist her in giving away her possessions to friends and family.

3. Encourage her parents to explain to her 5-year-old sister that she will be asleep for a long time.
4. Reduce emotional stress by not having the child's parents/family participate in her care.

164. A 10-year-old is receiving cranial irradiation for a brain tumor. He has developed alopecia. Which of the following is an appropriate nursing intervention?
1. Have the child identify famous movie stars and sports heroes who are bald.
2. Assure the child that his hair will grow in before he leaves the hospital.
3. Wrap a bandage around his head.
4. Help him select a variety of hats.

165. A 6-year-old girl is newly diagnosed with acute lymphoid leukemia (ALL). During your assessment, which of the following signs and symptoms would you expect?
1. Fever, pallor, bone and joint pain.
2. Fever, ruddy complexion, petechiae.
3. Abdominal pain, cystitis, swollen joints.
4. Enlarged lymph nodes, low grade fever, night sweats.

166. A 12-year-old girl with ALL is receiving induction therapy with vincristine, prednisone, and L-asparaginase. She presents with paresthesia, alopecia, and moon face. Which of the following nursing diagnoses would be most appropriate for this child?
1. High risk for injury.
2. Impaired physical mobility.
3. Body image disturbance.
4. Altered nutrition: less than body requirements.

167. You are caring for a 10-year-old with ALL who underwent a bone marrow transplant. To provide a safe, effective care environment, what would be included in a plan of care?
1. Rectal temperature every 4 hours to monitor for infection.
2. Encouraging the child to go to the playroom to limit isolation.
3. Use of a pressure-reducing mattress.
4. Inserting a Foley catheter to monitor output.

168. A 15-year-old girl with ALL has been on maintenance therapy for 6 months. She is receiving chemotherapy of L-asparaginase, methotrexate, and cytarabine. Her absolute neutrophil count is 500/mm^3. In planning for her care, which of the following would be included in a nursing care plan?
1. Good handwashing by visitors and staff.
2. Daily CBCs drawn.
3. Daily physical therapy.
4. Restriction of activity.

169. A 5-year-old boy is newly diagnosed with an astrocytoma brain tumor. His symptoms include headache, nausea, and seizures. Based on this information, which nursing diagnosis would be most appropriate for him?
1. High risk for infection.
2. High risk for injury.
3. Anticipated grief.
4. Impaired physical mobility.

170. Which of the following statements made by parents of an 8-year-old boy who just had surgery for a brain tumor reflect understanding of safety needs?
1. "We will obtain a tutor to teach him at home."
2. "We will not allow him to participate in sports anymore."
3. "We will tell our other children to let him have his way and not upset him."
4. "He will wear a helmet for sports."

171. A 16-year-old boy is admitted with Hodgkin's lymphoma. Which assessment finding would you expect?
1. Small, tender lymph nodes in the groin.
2. Enlarged, firm nontender nodes in the supraclavicular area.
3. Enlarged, tender nodes all over the body.
4. Small, nontender, nonmoveable nodes in the cervical area.

172. A 3-year-old with a Wilms' tumor is returning to the unit after surgery to remove the tumor. Which of the following actions have the highest priority in caring for this child?
1. Maintaining NPO.
2. Frequent blood pressure.
3. Turning every 4 hours.
4. Administering pain medication every 4 hours.

173. A child is to receive radiation therapy following surgery for Wilms' tumor. Which of the following measures would be important to include in the care plan prior to radiation therapy?
1. Give compazine every 6 hours for nausea.
2. Place a sign over the bed that reads "no needle punctures."

3. Practice lying in the required position.
4. Encourage play appropriate to age.

174. A 6-year-old boy with Ewing's sarcoma has just finished his course of chemotherapy. Which of the following statements by his parents indicate they understand the signs of complications from the chemotherapy?

1. "He will be playing football next week."
2. "We will keep him on a liquid diet until he feels better."
3. "We understand he is more susceptible to infections; we will keep him away from any sick family members."
4. "He will wear a baseball hat to bed."

Answers and Rationales

160. 2. The goal of a bone marrow transplant is to have the donor cells produce functioning blood cells for the client.

161. 1. In leukemia, bone marrow is replaced by blast cells, resulting in decreased white cells, red cells, and platelets. The bruises are due to the child's decreased platelet count.

162. 1. Leukemia cells are capable of an increased rate of production and a long cell life, causing crowding out of the normal bone marrow cells. Cells producing normal blood components are then unable to reproduce.

163. 2. Adolescents who know they are dying frequently want to give away their belongings.

164. 4. Selecting hats to cover his head will help the child deal with the change in body image.

165. 1. The signs and symptoms of leukemia are a result of infiltration of the bone marrow. These include fever, pallor, fatigue, anorexia, petechiae, and bone and joint pain.

166. 3. This may be especially true for this child as she is entering adolescence. Her loss of hair and "fat face" will make her different from her friends. Adolescents need to belong and be accepted by a group of peers.

167. 3. Skin breakdown and impaired healing are common with bone marrow transplant. This is a preventive measure for the integrity of the skin.

168. 1. Because of the maintenance therapy and neutrophil count, this client may have bone marrow suppression, which increases her risk for infection. Good handwashing is essential to help prevent infection.

169. 2. Seizure precautions should be instituted to prevent an injury.

170. 4. To protect the skull while it is healing, a child may need to wear a padded helmet for active sports.

171. 2. The most common symptom of Hodgkin's disease is enlarged, firm, nontender moveable nodes in the supraclavicular area.

172. 2. Frequent blood pressure measurements are needed to watch for signs of shock and as an indication of the functioning of the remaining kidney.

173. 3. The child may stay in a fixed position during each therapy session, which may last 10–20 minutes. Having the child practice the required position prior to beginning radiation therapy can be helpful.

174. 3. This client is likely to have bone marrow suppression, which increases his risk for infection and bleeding.

REFERENCES AND SUGGESTED READINGS

American Academy of Pediatrics, Committee on Infectious Diseases. (2003). *The red book: Report of the committee on infectious diseases.* Elk Grove, IL: Author.

Axton, S., & Fugate, T. (2008). *Pediatric nursing care plans for the hospitalized child* (3rd ed.). Upper Saddle River, NJ: Pearson Education.

Ball, J. W., & Bindler, R. C. (2007). *Pediatric nursing: Caring for children* (4th ed.). Upper Saddle River, NJ: Prentice-Hall.

Centers for Disease Control and Prevention. (2004). Most recent childhood immunization schedule can be found at: Retrieved on Sep. 7, 2008, from http://www.cdc.gov/nip/recs/child-schedule.htm

Child passenger safety. Retrieved on Sep. 7, 2008, from www.nhtsa.dot.gov

Hockenberry, M. J., Wilson, D., Wilkenstein, M. L., & Kline, N. E. (2006). *Wong's nursing care of infants and children* (8th ed.). St. Louis, MO: Mosby.

Potts, N. & Mandleco, B. (2007). *Pediatric nursing: Caring for children and their families* (2nd ed.). Clifton Park, NY: Delmar Learning.

Zitelli, B. J., & Davis, H. (2007). *Atlas of pediatric physical diagnosis.* (5th ed.). St. Louis, MO: Mosby.