Chapter 25

The Child with a Respiratory Disorder

Objectives

- Distinguish the differences between the respiratory tract of the infant and that of the adult.
- Review the signs and symptoms of respiratory distress in infants and children.
- Discuss the nursing care of a child with croup, pneumonia, and respiratory syncytial virus (RSV).
- Recognize the precautions involved in the care of a child diagnosed with epiglottitis.

Objectives *(cont.)*

- Compare bedrest for a toddler with bedrest for an adult.
- Describe smoke inhalation injury as it relates to delivery of nursing care.
- Discuss the postoperative care of a 5-year-old who has had a tonsillectomy.
- Recall the characteristic manifestations of allergic rhinitis.

Objectives *(cont.)*

- Discuss how sinusitis in children is different from that in adults.
- Assess the control of environmental exposure to allergens in the home of a child with asthma.
- Express five goals of asthma therapy.
- Interpret the role of sports and physical exercise for the asthmatic child.

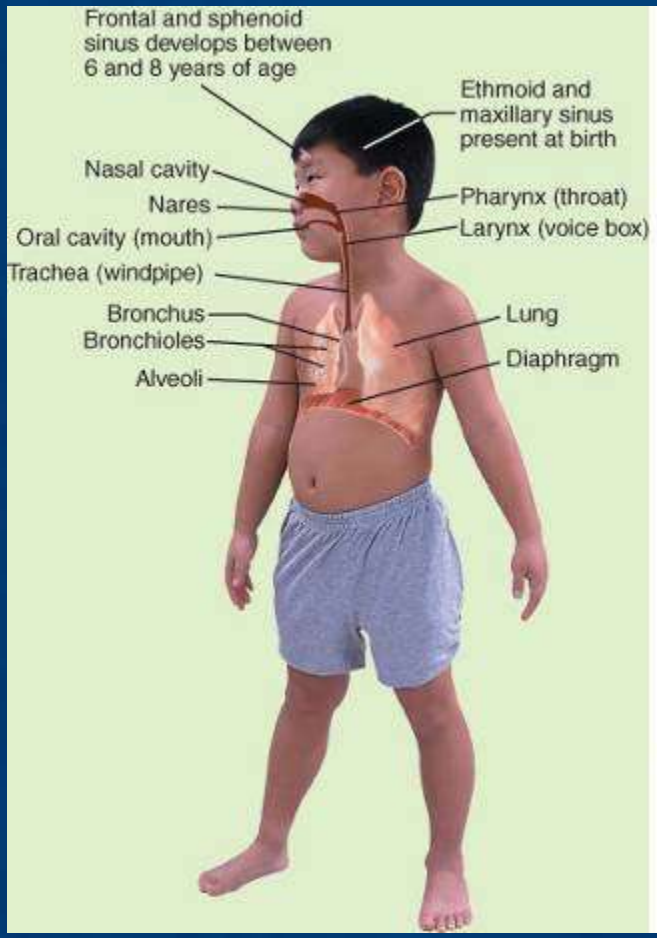
Objectives *(cont.)*

- Recall four nursing goals in the care of a child with cystic fibrosis.
- Devise a nursing care plan for the child with cystic fibrosis, including family interventions.
- Review the prevention of bronchopulmonary dysplasia.
- Examine the prevention of sudden infant death syndrome.

Respiratory System

- Development of the respiratory tract
  - Pulmonary structures differentiate in an orderly fashion during fetal life
    - At 24 weeks gestation, alveolar cells begin to produce surfactant, which prevents the alveoli from collapsing during respirations after birth
      - Spontaneous respiratory movements do occur in the fetus, but gas exchange occurs via placental circulation
    - By 35 weeks gestation, the analysis of amniotic fluid will show the LS ratio; helps determine fetal maturity and the ability of the fetus to survive outside the uterus

Summary of the Respiratory System in Children



RESPIRATORY SYSTEM

- Respiratory rates are higher in children. Diaphragmatic abdominal breathing is common in infants.
- Oxygen consumption is high in children in proportion to body size; metabolic rate is higher than in adults.
- Airway diameter is smaller in children, which increases the potential for obstruction.
- Mucous membranes of airways are highly vascular and are susceptible to trauma, edema, and spasm.
- Surfactant is lacking in preterm infants, which contributes to respiratory distress syndrome.
- Accessory muscles of respiration are not as strong in children, particularly in infants.
- Chest wall retractions are common in infants with respiratory problems because the chest wall is supple.

Ventilation

- The process of breathing air into and out of the lungs, affected by
  - Intercostal muscles, diaphragm, ribs
  - Brain
  - Chemoreceptors

Ventilation and Chronic Lung Disease

- High CO_2 level in blood and low O_2 saturation stimulate the brain to increase respiratory rate
- In chronic lung disease, receptors become tolerant to high CO_2 and low O_2 concentrations
- Administration of supplemental oxygen increases the O_2 saturation level
  - May result in decreased respiratory effort (carbon dioxide narcosis), leading to respiratory failure

Procedures that Can Be Done

- Throat and nasopharyngeal cultures
- Bronchoscopy
- Lung biopsy
- Arterial blood gas
- pH analysis
- Pulse oximetry
- Pulmonary function tests
- Chest X-ray
- CT scan
- Radioisotope scan
- Bronchogram
- Angiography

Nasopharyngitis

- Upper respiratory tract infection
  - A cold, also known as coryza, most common infection of the respiratory tract
  - Nasal discharge, irritability, sore throat, cough, and general discomfort
  - Complications include bronchitis, pneumonitis, and ear infections
- Allergic rhinitis
  - Is not the same as a cold
  - Child will not have a fever, purulent nasal discharge, or reddened mucous membranes
  - Will have sneezing and itchy, watery eyes

Nasopharyngitis *(cont.)*

- Treatment and Care
  - Rest
  - Clear airways
    - Moist air soothes the inflamed nose and throat
    - Avoid nosedrops with an oily base
  - Adequate fluid intake
  - Prevention of fever
- Skin care

Acute Pharyngitis

- Inflammation of the structures of the throat
- Common in children 5 to 15 years old
- Virus most common cause
- *Haemophilus influenzae* most common in children younger than 3 years
- Symptoms: fever, malaise, dysphagia, and anorexia, conjunctivitis, rhinitis, cough, and hoarseness with gradual onset, lasts no longer than 5 days
- In child older than 2 years, streptococcal pharyngitis may include fever of 104° F
- May require antibiotics if cause is bacterial

Acute Pharyngitis *(cont.)*

- Prompt treatment is necessary in strep throat to avoid serious complications such as
  - Rheumatic fever
  - Glomerulonephritis
  - Peritonsillar abscess
  - Otitis media
  - Mastoiditis
  - Meningitis
  - Osteomyelitis
  - Pneumonia

Sinusitis in Children

- Frontal sinuses are present around 8 years of age but are not fully mature until around age 18 years
  - Proximity of the sinus to the tooth roots often results in tooth pain when a sinus infection occurs
  - Maxillary and ethmoid sinuses most often involved in childhood sinusitis
- Suspect sinus infection when a URI lasts longer than 10 days
- Requires antimicrobial therapy

Croup Syndromes

- Also referred to as subglottic croup because edema occurs below the vocal cords
- Can lead to airway obstruction, acute respiratory failure, and hypoxia
- Six types of syndromes
- “Barking” cough
- Inspiratory stridor
  - Acute spasmodic laryngitis is milder form
  - Acute laryngotracheobronchitis most common

Croup Syndromes *(cont.)*

- Congenital laryngeal stridor (laryngomalacia)
  - Weakness in airway walls, floppy epiglottis that causes stridor on inspiration
  - Symptoms lessen when infant is placed prone or propped in side-lying position
  - Usually clears spontaneously as child grows and muscles strengthen

Croup Syndromes *(cont.)*

- Spasmodic laryngitis (spasmodic croup)
  - Occurs in children 1 to 3 years of age
- Causes: viral, allergic, psychological
  - Trigger can be gastroesophageal reflux
- Sudden onset, usually at night
- Characterized by barking, brassy cough and respiratory distress; lasts a few hours
- Treatment: increasing humidity and providing fluids

Croup Syndromes *(cont.)*

- Laryngotracheobronchitis
  - Viral condition manifested by edema, destruction of respiratory cilia, and exudate, resulting in respiratory obstruction
  - Mild URI followed by barking cough, then stridor develops and leads to respiratory distress; crying and agitation worsen symptoms
- Child prefers to be in upright position (orthopnea)

Croup Syndromes *(cont.)*

- Treatment
  - Cold water humidifier
  - Helps relieve respiratory distress and laryngeal spasm
  - If hospitalized, may be placed in a mist tent or croupette
  - Cool air saturated in microdroplets enter small airway of child, cooling and vasoconstriction occurs, relieving the respiratory obstruction and distress
  - Opiates are contraindicated, as are sedatives

Croup Syndromes *(cont.)*

- Epiglottitis
  - Swelling of the tissues above the vocal cords
    - Narrows airway inlet
  - Caused by H. influenzae type B
  - Most often seen in children 3 to 6 years of age
    - Can occur in any season
  - Course is rapid, progressive, and life-threatening

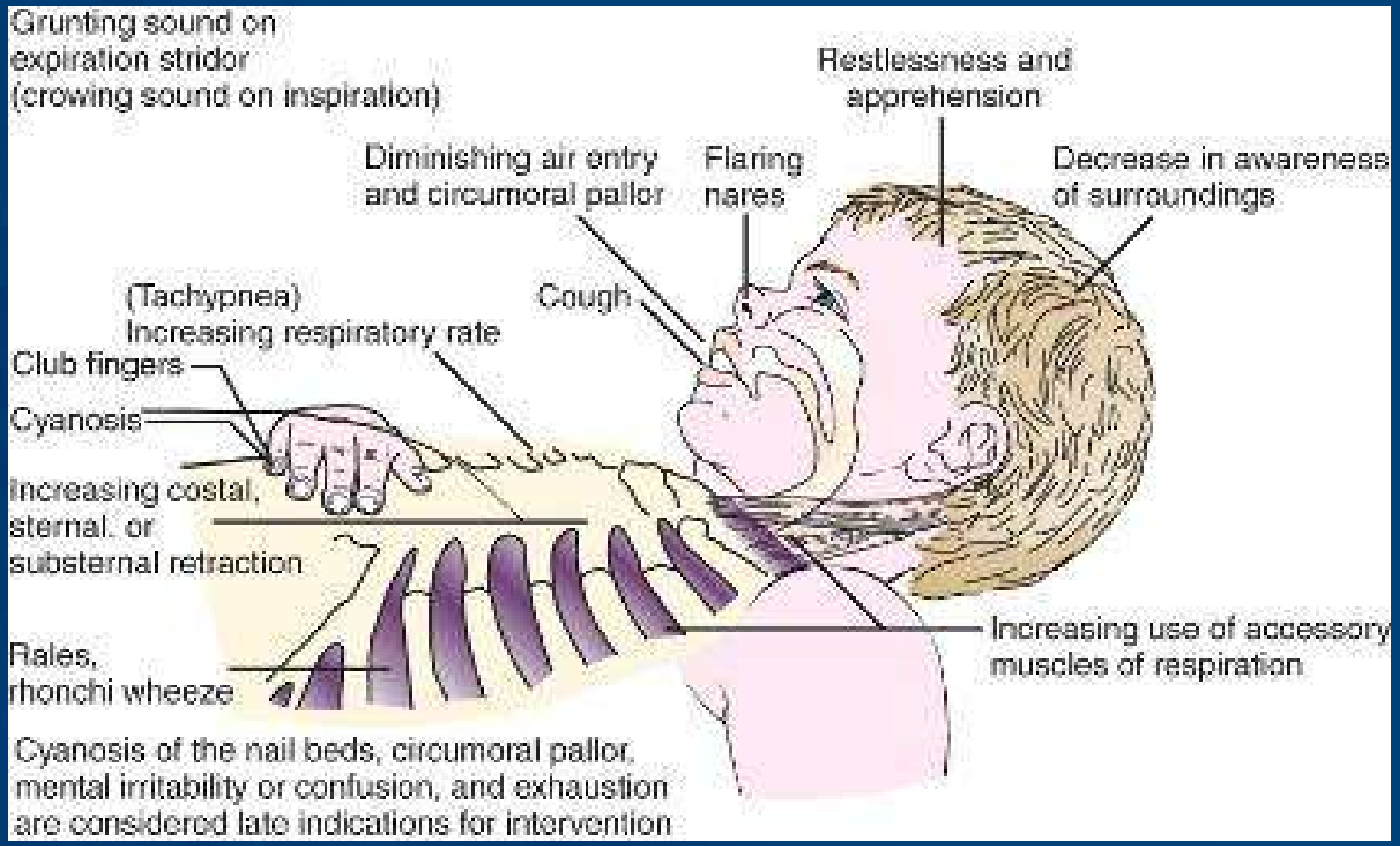
Croup Syndromes *(cont.)*

- Onset of epiglottitis is abrupt
- Child insists on sitting up, leaning forward with mouth open, drools saliva because of difficulty in swallowing
- Cough is absent
- Examining the throat with a tongue blade could trigger laryngospasms; therefore, a tracheotomy set should be at the bedside before examination of the throat takes place

Croup Syndromes *(cont.)*

- Treatment of choice is immediate tracheotomy or endotracheal intubation and oxygen
  - Prevents hypoxia, brain damage, and sudden death
- Parenteral antibiotics show dramatic improvements within a few days
- Prevention: HIB vaccine beginning at 2 months of age

Croup Syndromes *(cont.)*



Bronchitis

- Infection of bronchi
  - Seldom primary infection
  - Caused by variety of microorganisms
- Unproductive “hacking” cough
  - Cough suppressants prior to bedtime so child can sleep
- OTC agents such as antihistamines, cough expectorants, and antimicrobial agents are normally not helpful

Bronchiolitis

- Viral infection of small airways
- Infants and children (6 months to 2 years)
  - Obstruction of airway leads to atelectasis
  - Increased respiratory rate
    - Can lead to irritability and dehydration
- RSV primary cause in 50% of cases
- Treat symptoms and place in semi-Fowler's position

Respiratory Syncytial Virus (RSV)

- Responsible for 50% of cases of bronchiolitis in infants and young children
- Spread by direct contact with respiratory secretions
- Survives more than 6 hours on countertops, tissues, and bars of soap
- Incubation approximately 4 days
- If hospitalized, place in contact isolation precautions

Respiratory Syncytial Virus (RSV) *(cont.)*

- Infant should be assigned to personnel who are not caring for patients at high risk for adverse response to RSV
- Adults who have RSV can shed the virus for up to 1 week after the infection; therefore, precautions should be taken if that adult is caring for infants
- Strict adherence to isolation precautions and hand hygiene are essential
- Symptomatic care is provided and can include
  - Supplemental oxygen
  - Intravenous hydration
  - Antiviral medication, such as ribavirin
  - IV immune globulin (RespiGam)

Safety Alert

- Caregivers who are pregnant or wear contact lenses should not give direct care to infants who are receiving ribavirin aerosol therapy
- *Routine immunizations may have to be postponed for 9 months after RespiGam has been given*

Pneumonia

- Inflammation of lungs in which the alveoli become filled with exudate and surfactant may be reduced
- Breathing shallow, resulting in decreased oxygenated blood
- Many types, classified according to causative organism (i.e., bacterial, viral)
- Group B streptococci most common cause in newborns
- Chlamydia most common cause in infants 3 weeks to 3 months of age

Pneumonia *(cont.)*

- Toddlers can aspirate small objects that can result in pneumonia
- *Lipoid pneumonia* occurs when infants inhale an oil-based substance
- *Hypostatic pneumonia* occurs if patients who have poor circulation in their lungs remain in one position for too long

Pneumonia *(cont.)*

- Symptoms vary with age and causative organism/agent
  - Dry cough, fever, increased respiratory rate
  - Respirations shallow to reduce chest pain typically caused by coughing or from pleural irritation
  - Child is listless, poor appetite, tends to lie on affected side
- Chest X-ray confirms diagnosis
- Elevated WBC
- Cultures may be obtained from nose, throat, or sputum

Smoke Inhalation Injury

- May cause carbon monoxide poisoning
  - Prevents oxygen from combining with Hgb so carboxyhemoglobin cannot be formed
- Has three stages
  - Pulmonary insufficiency in first 6 hours
  - Pulmonary edema from 6 to 72 hours
  - Bronchopneumonia after 72 hours
    - Can lead to atelectasis

Tonsillitis and Adenoiditis

- Tonsils and adenoids are made of lymph tissue and are part of body's defense against infection
- Tonsillitis and adenoiditis
  - Difficulty swallowing and breathing
  - Provide cool mist vaporizer, salt-water gargles, throat lozenges (if age-appropriate), cool liquid diet, acetaminophen
  - Removal of tonsils and adenoids not recommended if under 3 years of age
  - Tonsillectomy done only if persistent airway obstruction or difficulty breathing occurs

Safety Alert

- Frequent swallowing while the child is sleeping is an early sign of bleeding after a tonsillectomy
- Milk and milk products may coat the throat and cause the child to “clear” the throat, further irritating the operative site

Allergic Rhinitis

- Inflammation of nasal mucosa caused by an allergic response
- Often occurs during specific seasons
- Not a life-threatening condition
- Accounts for many lost school days

Allergic Rhinitis *(cont.)*

- History shows seasonal occurrence and absence of fever or purulent drainage
- Mast cells respond to antigen by releasing mediators, such as histamine, which cause edema and increased mucus secretion
- Characteristic signs
  - Nasal congestion
  - Clear, watery nasal discharge
  - Sneezing
  - Itching of the eyes

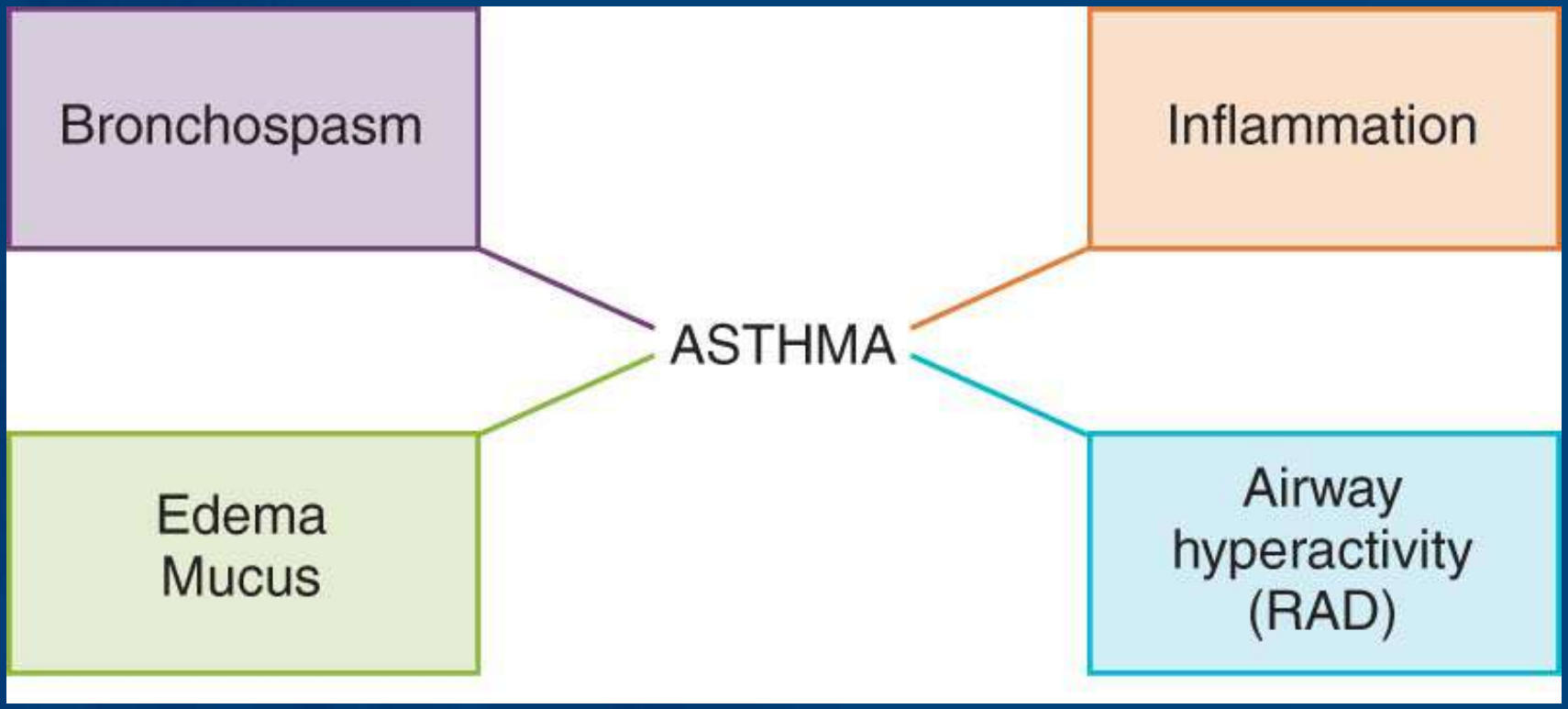
Allergic Rhinitis *(cont.)*

- Symptomatic treatment
  - Antihistamines and decongestants to reduce edema
- Nursing goals
  - Help parent identify the difference between allergy and a cold
  - Provide referral for medical care and support
  - Dust control, prevention of contact with animal dander, use of HEPA filters, and planning of vacation locales are examples of parent teaching the nurse can provide

Asthma

- Syndrome caused by increased responsiveness of the tracheobronchial tree to various stimuli
- Leading cause of school absenteeism, emergency department visits, and hospitalization
- Recurrent and reversible obstruction of airways in which bronchospasms, mucosal edema, secretions, and plugging by mucus contribute to significant narrowing of airways and subsequent impaired gas exchange

Four Main Components of Asthma



Asthma Triggers

- House dust
- Animal dander
- Wool
- Feathers
- Pollen
- Mold
- Passive smoking
- Strong odors
- Certain food
- Vigorous physical activity (especially in cold weather)
- Rapid changes in temperature
- Emotional upset

Asthma *(cont.)*

- Rarely diagnosed in infancy
- Increased susceptibility of infants to respiratory obstruction and dyspnea may result from
  - Decreased smooth muscle of an infant's airway
  - Presence of increased mucus glands in the bronchi
  - Normally narrow lumen of the normal airway
  - Lack of muscle elasticity in the airway
  - Fatigue-prone and overworked diaphragmatic muscle on which infant respirations depend

Asthma *(cont.)*

- Manifestations
  - Obstruction most severe during expiration
  - During acute episodes, patient coughs, wheezes, and has difficulty breathing, particularly during expiration
  - Signs of air hunger, such as flaring of the nostrils, and use of accessory muscles may be evident; orthopnea appears
- Chronic asthma is manifested by discoloration beneath the eyes (allergic shiners), slight eyelid eczema, and mouth breathing

Asthma *(cont.)*

- Treatment and long-term management
  - Maintain near-normal pulmonary function and activity level
  - Prevent chronic signs and symptoms as well as exacerbations that require hospital treatment
  - Prevent adverse responses to medications
  - Promote self-care and monitoring consistent with developmental level

Asthma *(cont.)*

- Medication treatment
  - Bronchodilators
  - Antiinflammatory drugs
  - Leukotriene modifiers
  - Metered-dose inhalers

Status Asthmaticus

- Continued severe respiratory distress that is not responsive to drugs, including epinephrine and aminophylline
- **This is a medical emergency**
- ICU admission, supplemental oxygen, IV medications, and frequent vital signs (including pulse oximetry readings) are essential

Safety Alert

- Oxygen is a drug, and administration should be correlated with monitoring of oxygen saturation levels
  - Too little oxygen can result in hypoxia
  - Too much oxygen can result in lung damage

Cystic Fibrosis

- Major cause of serious chronic lung disease
- Occurs 1 in 3000 live births of Caucasian infants
- Occurs 1 in 17,000 live births of African Americans
- Inherited recessive trait, with both parents carrying a gene for the disease

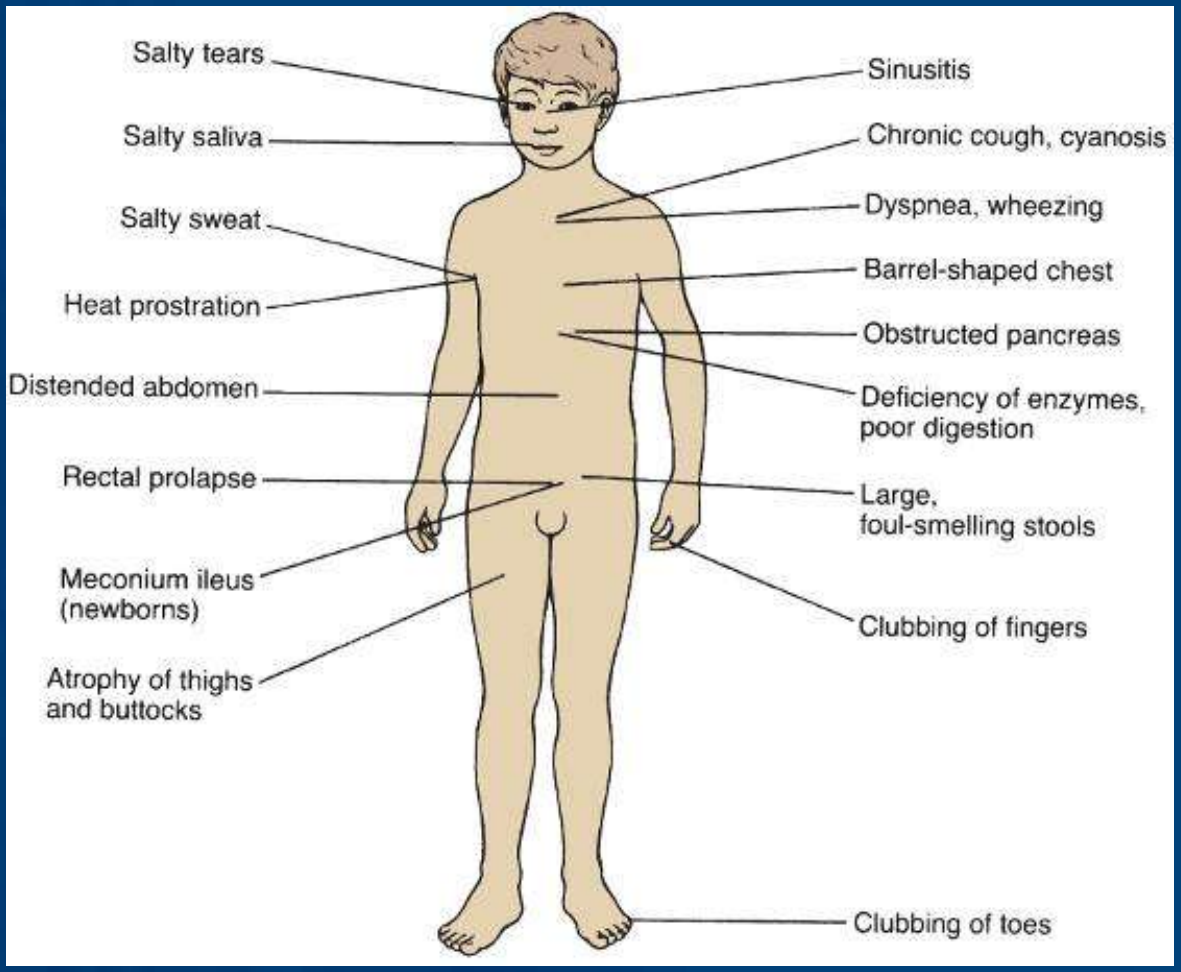
Cystic Fibrosis *(cont.)*

- Basic defect is an exocrine gland dysfunction that includes
  - Increased viscosity (thickness) of mucus gland secretions
  - A loss of electrolytes in sweat because of an abnormal chloride movement

Cystic Fibrosis *(cont.)*

- Multisystem disease in which thick, viscid secretions affect
  - Respiratory system—obstructed by secretions
  - Digestive system—secretions prevent digestive enzymes from flowing to GI tract, results in poor absorption of food
    - Bulky, foul-smelling stools that are frothy because of the undigested fat content
  - Skin—loss of electrolytes in sweat causes “salty” skin surface
  - Reproductive system—secretions decrease sperm motility; thick cervical mucus can inhibit sperm from reaching fallopian tubes

Cystic Fibrosis *(cont.)*

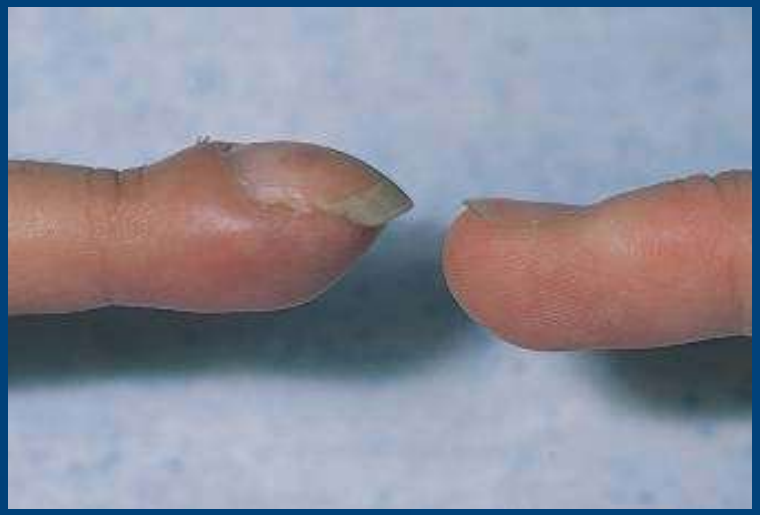


Cystic Fibrosis *(cont.)*

- Lung involvement
- Air passages become clogged with mucus
- Widespread obstruction of bronchioles
- Expiration is difficult, more air becomes trapped, small areas collapse (atelectasis)
- Right ventricle of heart, which supplies the lungs, may become strained and enlarged

Cystic Fibrosis *(cont.)*

- Clubbing of nails—a compensatory response indicating a chronic lack of oxygen—may be present
- Dyspnea, wheezing, and cyanosis may occur
- Prognosis for survival depends on extent of lung damage



Cystic Fibrosis *(cont.)*

- Pancreatic involvement
  - Thickened secretions block flow of pancreatic digestive enzymes
  - Newborn may experience meconium ileus
  - Infant stools may be loose
- Sweat glands
  - Sweat, tears, saliva abnormally salty due to increased chloride levels
  - Analysis of sweat is a major aid in diagnosing the condition

Nursing Care for Cystic Fibrosis

- Oxygen therapy
- Antibiotic therapy
- Aerosol therapy
- Use of inhalers
- Postural drainage
- Breathing exercises
- Prevention of infection is essential
- Oral pancreatic preparations are given to help child to digest and absorb food
- Diet should be high in protein and calories
- Free access to salt

Nursing Care for Cystic Fibrosis *(cont.)*

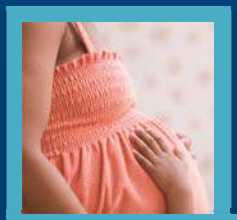
- General hygiene
  - Care should be given to diaper area
  - Frequent changes of position help prevent development of pneumonia
  - Child wears light clothing to prevent overheating
  - Teeth may be in poor condition due to dietary deficiencies
- Long-term care
  - Goals include minimizing pulmonary complications, ensuring adequate nutrition, promoting growth and development, and assisting family to adjust to chronic care required

Nursing Care for Cystic Fibrosis *(cont.)*

- Parents need explicit instructions regarding
  - Diet
  - Medication
  - Postural drainage
  - Prevention of infection
  - Rest
  - Continued medical support
  - Parents and child will also need emotional support

Bronchopulmonary Dysplasia

- A fibrosis, or thickening, of alveolar walls and bronchiolar epithelium caused by oxygen concentration above 40% or by mechanical pressure ventilation given to newborns for prolonged period of time
- Swelling of tissues causes edema, respiratory cilia paralyzed by high oxygen concentration, and loss of ability to clear mucus
- Respiratory obstruction, mucus plugs, and atelectasis follow



Bronchopulmonary Dysplasia *(cont.)*

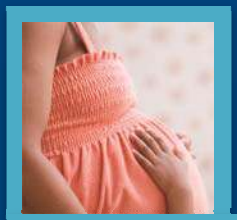
- Respiratory distress syndrome (RDS) in the newborn is major reason why oxygen and ventilators are used
- Main cause of RDS in the newborn is prematurity
- Goal of treatment
  - Administer only the amount of oxygen required to prevent hypoxia at the minimum ventilator pressures needed to prevent tissue trauma
  - Antenatal steroids hasten lung development during preterm labor
  - Administration of surfactant within 15 minutes of delivery may also be helpful

Bronchopulmonary Dysplasia *(cont.)*

- Symptoms include
  - Wheezing
  - Retractions
  - Cyanosis on exertion
  - Use of accessory respiratory muscles
  - Clubbing of the fingers
  - Failure to thrive
  - Irritability caused by hypoxia

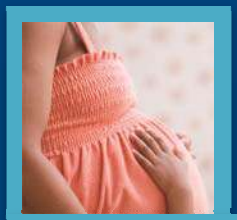
Bronchopulmonary Dysplasia Treatment

- Goal
  - To reduce inflammation of the airway and to wean infant from mechanical ventilator
- Oxygen can be delivered by
  - Synchronous intermittent mandatory ventilation (SIMV) via nasal cannula prongs
  - Continuous positive airway pressure (CPAP)
  - High-flow humidified oxygen
- Right-sided heart failure may develop
- Fluid restriction
- Bronchodilators
- Diuretics
- Nasogastric tube feedings may be required to conserve energy



Sudden Infant Death Syndrome (SIDS)

- Clinically defined as the sudden, unexpected death of an apparently healthy infant between 2 weeks and 1 year of age
- Clinical features of the disease remain constant
  - Death occurs during sleep
  - Infant does not cry or make other sounds of distress



Sudden Infant Death Syndrome (SIDS) *(cont.)*

- Thought to be caused by a brainstem abnormality related to cardiorespiratory control
  - Overheating, irregular respiratory patterns
  - Decreased arousal responses are contributing factors
- Increased risk factors include
  - Maternal smoking or cocaine use that causes hypoxia of the fetus
  - Preterm birth
  - Poor postneonatal care
- A face-down sleeping position may cause infant to rebreathe expired air
- Wrapping the infant who is placed face down may increase risk by preventing infant from lifting and turning the face to the side

Sudden Infant Death Syndrome (SIDS) *(cont.)*

- Prevention
- “Back to sleep”
- For high-risk infants, they may be sent home on an apnea monitor
- Parents must be taught CPR

Nursing Care Related to SIDS

- With grieving parents, the nurse must convey some important facts
  - The infant died of a disease called SIDS; currently the disease cannot be predicted or prevented, and they are not responsible for the child's death
- Parents must be given the opportunity to say goodbye to their child
  - Parents are catapulted into a totally unexpected bereavement that requires numerous explanations to relatives and friends

Question for Review

- Smoke inhalation injury may cause what to occur?

Review

- Objectives
- Key Terms
- Key Points
- Online Resources
- Review Questions