LEARNING OBJECTIVES

On completion of this chapter, you should be able to:

1. Discuss ways the infant and child's respiratory system differs from the adult's system.
2. Name the most common complication of acute nasopharyngitis.
3. Discuss nursing care of the child with allergic rhinitis.
4. Discuss nursing care of the child with tonsillitis and adenoiditis.
5. Explain the most common complication of a tonsillectomy and list the signs requiring observation.
6. Compare the croup syndrome disorders including: (a) spasmodic laryngitis, (b) acute laryngotracheobronchitis, and (c) epiglottitis.
7. Discuss the symptoms, diagnosis, and treatment of acute bronchiolitis/respiratory syncytial virus (RSV) infection.
8. Describe asthma including (a) factors that can trigger an asthma attack, (b) the physiologic response that occurs in the respiratory tract during an asthma attack, (c) treatment, and (d) nursing care.
9. Explain the diagnosis of pneumonia including the treatment and nursing care.
10. Identify the basic defect and organs affected by cystic fibrosis, along with diagnostic procedures.
11. Name the most common type of complication in cystic fibrosis and describe the dietary and pulmonary treatments of the disorder.
12. Discuss how tuberculosis is detected and treated.

KEY TERMS
achylia
adenoids
circumoral
coryza
croup
dysphagia
dystic
hypochylia
metered-dose inhaler
nebulizer
stridor
teratogenicity
tonsils
wheezing

RESPIRATORY disorders in infants and children are common. They range from mild to serious, even life threatening. They can be acute or chronic in nature. Sometimes these problems require hospitalization, which interrupts development of the child–family relationship and the child's patterns of sleeping, eating, and stimulation. Although the illness might be acute, if recovery is rapid and the hospitalization brief, the child probably will experience few, if any, long-term effects. However, if the condition is chronic or so serious that it requires long-term care, both child and family may suffer serious consequences.

GROWTH AND DEVELOPMENT OF THE RESPIRATORY SYSTEM

The respiratory system is made up of the nose, pharynx, larynx, trachea, epiglottis, bronchi, bronchioles, and the lungs. These structures are involved in the exchange of oxygen and carbon dioxide and the distribution of the oxygen to the body cells. Tiny, thin-walled sacs called alveoli are responsible for distributing air into the bloodstream. It is also through the alveoli that carbon dioxide is removed from the bloodstream and exhaled through the respiratory system. The structures and organs found in the respiratory system cleanse, warm, and humidify the air that enters the body.

This is critical to remember.
The diameter of the infant and child's trachea is about the size of the child's little finger. This small diameter makes it extremely important to be aware that something can easily lodge in this small passageway and obstruct the child's airway.
Respiratory problems occur more often and with greater severity in infants and children than in adults because of their immature body defenses and small, undeveloped anatomical structures. The respiratory tract grows and changes until the child is about 12 years of age. During the first 5 years, the child’s airway increases in length but not in diameter.

Infants and young children have larger tongues in proportion to their mouths, shorter necks, narrower airways, and the structures are closer together. This leads to the possibility of respiratory obstruction, especially if there is edema, swelling, or increased mucus in the airways. The ability to breathe through the mouth when the nose is blocked is not automatic but develops as the child’s neurologic development increases.

The tonsillar tissue is enlarged in the early school-age child, but the pharynx, which contains the tonsils, is still small, so the possibility of obstruction of the upper airway is more likely. In children older than 2 years of age, the right bronchus is shorter, wider, and more vertical than the left.

Infants use the diaphragm and abdominal muscles to breathe. Beginning at about age 2 to 3 years, the child starts using the thoracic muscles to breathe. The change from using abdominal to using thoracic muscles for respiration is completed by the age of 7 years. Because accessory muscles are used for breathing, weakness of these muscles can cause respiratory failure (Fig. 36-1).

**ACUTE NASOPHARYNGITIS (COMMON COLD)**

The common cold is one of the most common infectious conditions of childhood. The young infant is as susceptible as the older child but generally is not exposed as frequently.

The illness is of viral origin such as rhinoviruses, Coxsackie virus, respiratory syncytial virus (RSV), influenza virus, parainfluenza virus, or adenovirus. Bacterial invasion of the tissues might cause complications such as ear, mastoid, and lung infections. The child appears to be more susceptible to complications than is an adult. The infant should be protected from people who have colds because complications in the infant can be serious.

**Clinical Manifestations**

The child older than age 3 months usually develops fever early in the course of the infection, often as high as 102°F to 104°F (38.9°C–40°C). Younger infants usually are afebrile. The child sneezes and becomes irritable and restless. The congested nasal passages can interfere with nursing, increasing the infant’s irritability. Because the older child can mouth breathe, nasal congestion is not as great a concern as in the infant. The child might have vomiting or diarrhea, which might be caused by mucous drainage into the digestive system.

**Diagnosis**

This nasopharyngeal condition might appear as the first symptom of many childhood contagious diseases, such as measles, and must be observed carefully. The common cold also needs to be differentiated from allergic rhinitis.

**Treatment and Nursing Care**

The child with an uncomplicated cold may not need any treatment in addition to rest, increased fluids and adequate nutrition, normal saline nose drops, suction with a
bulb syringe, and a humidified environment. In the older child, acetaminophen or children’s ibuprofen can be administered as an analgesic and antipyretic. It is best if aspirin is avoided. If the nares or upper lip become irritated, cold cream or petrolatum (Vaseline) can be used. The child needs to be comforted by holding, rocking, and soothing. If the symptoms persist for several days, the child must be seen by a physician to rule out complications, such as otitis media.

ALLERGIC RHINITIS (HAY FEVER)
Allergic rhinitis in children is most often caused by sensitization to animal dander, house dust, pollens, and molds. Pollen allergy seldom appears before 4 or 5 years of age.

Clinical Manifestations
A watery nasal discharge, postnasal drip, sneezing, and allergic conjunctivitis are the usual symptoms of allergic rhinitis. Continued sniffing, itching of the nose and palate, and the “allergic salute,” in which the child pushes his or her nose upward and backward to relieve itching and open the air passages in the nose, are common complaints. Because of congestion in the nose, there is backpressure to the blood circulation around the eyes, and dark circles are visible under the eyes (Fig. 36-2). Headaches are common in older children.

Treatment and Nursing Care
When possible, offending allergens are avoided or removed from the environment. Antihistamine–decongestant preparations, such as Dimetapp and Actifed, can be helpful for some patients. Hyposensitization can be implemented, particularly if antihistamines are not helpful or are needed chronically. Be sure to teach parents the importance of avoiding allergens and administering antihistamines to decrease symptoms.

TONSILLITIS AND ADENOIDITIS
Tonsillitis is a common illness in childhood resulting from pharyngitis. A brief description of the location and functions of the tonsils and adenoids serves as an introduction to the discussion of their infection and medical and surgical treatments.

A ring of lymphoid tissue encircles the pharynx, forming a protective barrier against upper respiratory infection. This ring consists of groups of lymphoid tonsils, including the faucial, the commonly known tonsils; pharyngeal, known as the adenoids; and lingual tonsils. Lymphoid tissue normally enlarges progressively in childhood between the ages of 2 and 10 years and shrinks during preadolescence. If the tissue itself becomes a site of acute or chronic infection, it may become hypertrophied and can interfere with breathing, cause partial deafness, or become a source of infection in itself.

Clinical Manifestations and Diagnosis
The child with tonsillitis may have a fever of 101°F (38.4°C) or more; a sore throat, often with dysphagia (difficulty swallowing); hypertrophied tonsils; and erythema of the soft palate. Exudate may be visible on the tonsils. The symptoms vary somewhat with the causative organism. Throat cultures are performed to diagnose tonsillitis and the causative organism. Frequently the cause of tonsillitis is viral, although beta-hemolytic streptococcal infection also may be the cause.

Treatment and Nursing Care
Medical treatment of tonsillitis consists of analgesics for pain, antipyretics for fever, and an antibiotic in the case of streptococcal infection. Teach parents that a soft or liquid diet is easier for the child to swallow, and to encourage the child to maintain good fluid intake. A cool-mist vaporizer may be used to ease respirations.

Tonsillectomies and adenoidectomies are controversial. One can be performed independent of the other, but they are often done together. No conclusive evidence has been found that a tonsillectomy in itself improves a child’s health by reducing the number of respiratory
infections, increasing the appetite, or improving general well-being. Currently, tonsillectomies generally are not performed unless other measures are ineffective or the tonsils are so hypertrophied that breathing and eating are difficult. Tonsillectomies are not performed while the tonsils are infected. The adenoids are more susceptible to chronic infection. An indication for adenoidectomy is hypertrophy of the tissue to the extent of impairing hearing or interfering with breathing. Performing only an adenoidectomy if the tonsil tissue appears to be healthy is an increasingly common practice. Tonsillectomy is postponed until after the age of 4 or 5 years, except in the rare instance when it appears it is urgently needed. Often when a child has reached the acceptable age, the apparent need for the tonsillectomy has disappeared.

**Nursing Process for the Child Having a Tonsillectomy**

**Assessment**

Much of the preoperative preparation, such as complete blood count, bleeding and clotting time, and urinalysis, is done on a preadmission outpatient basis. In many facilities, the child is admitted on the day of surgery or the procedure is done in a day surgery setting. Psychological preparation is often accomplished through preadmission orientation. Acting out the forthcoming experience, particularly in a group, with the use of puppets, dolls, and play-doctor or play-nurse material helps the child develop security. The amount and the timing of preparation before admission depend on the child’s age. The child may become frightened about losing a body part. Telling the child that the troublesome tonsils are going to be “fixed” is a much better choice than saying that they are going to be “taken out.” Include the child and the caregiver in the admission interview. Ask about any bleeding tendencies because postoperative bleeding is a concern. Carefully explain all procedures to the child and be sensitive to the child’s apprehension. Take and record vital signs to establish a baseline for postoperative monitoring. The temperature is an important part of the data collection to determine that the child has no upper respiratory infection. Observe the child for loose teeth that could cause a problem during administration of anesthesia, document findings.

**Selected Nursing Diagnoses**

- Risk for Aspiration postoperatively related to impaired swallowing and bleeding at the operative site
- Acute Pain related to surgical procedure
- Deficient Fluid Volume related to inadequate oral intake secondary to painful swallowing
- Deficient Knowledge related to caregivers understanding of postdischarge home care and signs and symptoms of complications

**Outcome Identification and Planning**

The major postoperative goals for the child include preventing aspiration; relieving pain, especially while swallowing; and improving fluid intake. The major goal for the family is to increase knowledge and understanding of postdischarge care and possible complications. Design the plan of care with these goals in mind.

**Implementation**

**Preventing Aspiration Postoperatively**

Immediately after a tonsillectomy, place the child in a partially prone position with head turned to one side until the child is completely awake. This position can be accomplished by turning the child partially over and by flexing the knee where the child is not resting to help maintain the position. Keeping the head slightly lower than the chest helps facilitate drainage of secretions. Avoid placing pillows under the chest and abdomen, which may hamper respiration. Encourage the child to expectorate all secretions, and place an ample supply of tissues and a waste container near him or her. Discourage the child from coughing. Check vital signs every 10 to 15 minutes until the child is fully awake and then check every 30 minutes to 1 hour. Note the child’s preoperative baseline vital signs to interpret the vital signs correctly. Hemorrhage is the most common complication of a tonsillectomy. Bleeding is most often a concern within the first 24 hours after surgery and the fifth to seventh postoperative day. During the 24 hours after surgery, observe, document, and report any unusual restlessness or anxiety, frequent swallowing, or rapid pulse that may indicate bleeding. Vomiting dark, old blood may be expected, but bright, red-flecked emesis or oozing indicates fresh bleeding. Observe the pharynx with a flashlight each time vital signs are checked. Bleeding can occur when the clots dissolve between the fifth and seventh postoperative days if new tissue is not yet present. Because the child is cared for at home by this time, give the family caregivers information concerning signs and symptoms for which to watch.

**Providing Comfort and Relieving Pain**

Apply an ice collar postoperatively; however, remove the collar if the child is uncomfortable with it. Administer pain medication as ordered. Liquid acetaminophen with codeine is often prescribed. Rectal or intravenous analgesics may be used. Encourage the caregiver to remain at the bedside to provide soothing reassurance. Crying irritates the raw throat and increases the child’s discomfort; thus, it should be avoided if possible. Teach the caregiver what may be expected in drainage and signs that should be reported immediately to the nursing staff.

**Encouraging Fluid Intake**

When the child is fully awake from surgery, give small amounts of clear fluids or ice chips. Synthetic juices,
carbonated beverages that are “flat,” and frozen juice popsicles are good choices. Avoid irritating liquids, such as orange juice and lemonade. Milk and ice cream products tend to cling to the surgical site and make swallowing more difficult; thus, they are poor choices, despite the old tradition of offering ice cream after a tonsillectomy. Continue administration of intravenous fluid and record intake and output until adequate oral intake is established.

**Providing Family Teaching**

The child typically is discharged on the day of or the day after surgery if no complications are present. Instruct the caregiver to keep the child relatively quiet for a few days after discharge. Recommend giving soft foods and non-irritating liquids for the first few days. Teach family members that if at any time after the surgery they note any signs of hemorrhage (bright red bleeding, frequent swelling, restlessness), they should notify the care provider. Provide written instructions and telephone numbers before discharge. Advise the caregivers that a mild earache may be expected on the third day.

**Evaluation: Goals and Expected Outcomes**

**Goal:** The child’s airway will remain patent after surgery.

**Expected Outcomes:** The child
- shows signs of an open and clear airway.
- expectorates saliva and drainage with no aspiration.

**Goal:** The child will show signs of being comfortable.

**Expected Outcomes:** The child
- rests quietly and does not cry.
- exhibits pulse rate that is regular and normal for their age.
- states that pain is lessened.

**Goal:** The child’s fluid intake will be adequate for their age.

**Expected Outcomes:** The child’s
- skin turgor is good.
- mucous membranes are moist.
- hourly urinary output is at least 20 to 30 mL.
- parenteral fluids are maintained until oral fluid intake is adequate.

**Goal:** Family caregivers will verbalize an understanding of postdischarge care.

**Expected Outcomes:** Family caregivers
- give appropriate responses when questioned about care at home.
- verbalize signs and symptoms of complications and ask appropriate questions for clarification.

**CROUP SYNDROMES**

*Croup* is not a disease, but a group of disorders typically involving a barking cough, hoarseness, and inspiratory *stridor* (shrill, harsh respiratory sound). The disorders are named for the respiratory structures involved. Acute laryngotracheobronchitis, for instance, affects the larynx, trachea, and major bronchi.

**SPASMOMATIC LARYNGITIS**

Spasmodic laryngitis occurs in children between ages 1 and 3 years. The cause is undetermined; it may be of infectious or allergic origin, but certain children seem to develop severe laryngospasm with little, if any, apparent cause.

**Clinical Manifestations and Diagnosis**

The attack may be preceded by coryza (runny nose) and hoarseness or by no apparent signs of respiratory irregularity during the evening. The child awakens after a few hours of sleep with a bark-like cough, increasing respiratory difficulty, and stridor. The child becomes anxious, restless, and markedly hoarse. A low-grade fever and mild upper respiratory infection may be present.

This condition is not serious but is frightening both to the child and to the family. The episode subsides after a few hours; little evidence remains the next day when an anxious caregiver takes the child to the physician. Attacks frequently occur 2 or 3 nights in succession.

**Treatment and Nursing Care**

Humidified air is helpful in reducing laryngospasm. Humidifiers may be used in the child’s bedroom to provide high humidity. Cool humidifiers are recommended, but vaporizers also may be used. If a vaporizer is used, caution must be taken to place it out of the child’s reach to protect the child from being burned. Cool-mist humidifiers provide safe humidity. Humidifiers and vaporizers must be cleaned regularly to prevent the growth of undesirable organisms. Sometimes the spasm is relieved by exposure to cold air—when, for instance, the child is taken out into the night to go to the emergency department or to see the care provider. The physician may prescribe an *emetic* (an agent that causes vomiting) in a dosage less than that needed to produce vomiting; this usually gives relief by helping to reduce spasms of the larynx.

It is important to explain which symptoms can be treated at home (hoarseness, croupy cough, and inspiratory stridor).
stridor) and which symptoms might indicate a more serious condition in which the child needs to be seen by the care provider (continuous stridor, use of accessory muscles, labored breathing, lower-rib retractions, restlessness, pallor, and rapid respirations). The family must be aware that recurrence of these conditions may occur.

**ACUTE LARYNGOTRACHEOBRONCHITIS**

Laryngeal infections are common in small children, and they often involve tracheobronchial areas as well. Acute laryngotracheobronchitis (bacterial tracheitis or laryngotracheobronchitis) may progress rapidly and become a serious problem within a matter of hours. The toddler is the most frequently affected age group. This condition is usually of viral origin, but bacterial invasion, usually staphylococcal, follows the original infection. It generally occurs after an upper respiratory infection with fairly mild rhinitis and pharyngitis.

**Clinical Manifestations and Diagnosis**

The child develops hoarseness and a barking cough with a fever that may reach 104°F to 105°F (40°C–40.6°C). As the disease progresses, marked laryngeal edema occurs, and the child’s breathing becomes difficult, the pulse is rapid, and cyanosis may appear. Heart failure and acute respiratory embarrassment can result.

**Treatment and Nursing Care**

The major goal of treatment for acute laryngotracheobronchitis is to maintain an airway and adequate air exchange. Antimicrobial therapy is ordered. The child is placed in a supersaturated atmosphere, such as a croupette or some other kind of mist tent, that also can include the administration of oxygen. To achieve bronchodilation, racemic or nebulized epinephrine may be administered, usually by a respiratory therapist. Nebulization is usually administered every 3 or 4 hours. Nebulization often produces rapid relief because it causes vasoconstriction. However, the child requires careful observation for the reappearance of symptoms.

If necessary, intubation with a nasotracheal tube may be performed for a child with severe distress unrelieved by other measures. Tracheostomies, once performed frequently, are rarely performed today; intubation is preferred. Antibiotics are administered parenterally initially and continued after the temperature has normalized.

Close and careful observation of the child is important. Observation includes checking the pulse, respirations, and color; listening for hoarseness and stridor; and noting any restlessness that may indicate an impending respiratory crisis. Pulse oximetry is used to determine the degree of hypoxia.

**EPIGLOTTITIS**

Epiglottitis is acute inflammation of the epiglottis (the cartilaginous flap that protects the opening of the larynx). Commonly caused by Haemophilus influenzae type B, epiglottitis most often affects children ages 2 to 7 years. The epiglottis becomes inflamed and swollen with edema. The edema decreases the ability of the epiglottis to move freely, which results in blockage of the airway and creates an emergency.

**Clinical Manifestations and Diagnosis**

The child may have been well or may have had a mild upper respiratory infection before the development of a sore throat, dysphagia (difficulty swallowing), and a high fever of 102.2°F to 104°F (39°C–40°C). The dysphagia may cause drooling. A tongue blade should never be used to initiate a gag reflex because complete obstruction may occur. The child is very anxious and prefers to breathe by sitting up and leaning forward with the mouth open and the tongue out. This is called the “tripod” position (Fig. 36-3). Immediate emergency attention is necessary.

**Treatment and Nursing Care**

The child may need endotracheal intubation or a tracheostomy if the epiglottis is so swollen that intubation cannot be performed. Moist air is necessary to help reduce the inflammation of the epiglottis. Pulse oximetry is required to monitor oxygen requirements. Antibiotics are administered intravenously. After 24 to 48 hours of antibiotic therapy, the child may be extubated. Antibiotic therapy usually is continued for 10 days. This condition is not common, and it is extremely frightening for the child and the family.
ACUTE BRONCHIOLITIS/RESPIRATORY SYNCYTIAL VIRUS INFECTION

Acute bronchiolitis (acute interstitial pneumonia) is most common during the first 6 months of life and is rarely seen after the age of 2 years. Most cases occur in infants who have been in contact with older children or adults with upper respiratory viral infections. It usually occurs in the winter and early spring.

Acute bronchiolitis is caused by a viral infection. The causative agent in more than 50% of cases has been shown to be RSV. Other viruses associated with the disease are parainfluenza virus, adenoviruses, and other viruses not always identified.

The bronchi and bronchioles become plugged with thick, viscid mucus, causing air to be trapped in the lungs. The child can breathe air in but has difficulty expelling it. This hinders the exchange of gases and cyanosis appears.

Clinical Manifestations

The onset of dyspnea is abrupt, sometimes preceded by a cough or nasal discharge. Manifestations include a dry and persistent cough, extremely shallow respirations, air hunger, and often marked cyanosis. Suprasternal and subcostal retractions are present. The chest becomes barrel-shaped from the trapped air. Respirations are 60 to 80 breaths per minute.

Fever is not extreme, seldom higher than 101°F to 102°F (38.3°C–38.9°C). Dehydration may become a serious factor if competent care is not given. The infant appears apprehensive, irritable, and restless.

Diagnosis

Diagnosis is made from clinical findings and can be confirmed by laboratory testing (enzyme-linked immunosorbent assay [ELISA]) of the mucus obtained by direct nasal aspiration or nasopharyngeal washing.

Treatment and Nursing Care

The child is usually hospitalized and treated with high humidity by mist tent (see Chapter 30, Fig. 30-6), rest, and increased fluids. Oxygen may be administered in addition to the mist tent. Monitoring of oxygenation may be done by means of capillary blood gases or pulse oximetry. Antibiotics are not prescribed because the causative organism is a virus. Intravenous fluids often are administered to ensure an adequate intake and to permit the infant to rest. The hospitalized child is placed on contact transmission precautions to prevent the spread of infection.

Ribavirin (Virazole) is an antiviral drug that may be used to treat certain children with RSV. It is administered as an inhalant by hood, mask, or tent. The American Academy of Pediatrics states that the use of ribavirin must be limited to children at high risk for severe or complicated RSV such as children with chronic lung disease, premature infants, transplant recipients, and children receiving chemotherapy. Ribavirin is classified as a category X drug, signifying a high risk for teratogenicity (causing damage to a fetus). Health care personnel and others may inhale the mist that escapes into the room, so care must be taken when the drug is administered.

For children who are at high risk for getting RSV and having serious complications, there are some new drugs available that may be given to prevent RSV. These drugs are administered only in specific cases and are given intravenously or intramuscularly.

Test Yourself

✔ What is the most common complication after a tonsillectomy? What two time periods is bleeding a concern after a tonsillectomy? Explain the reasons these time periods are a concern for bleeding.
✔ What is a fast and effective way to reduce laryngospasm for the child with croup?
✔ What is a complication often seen in the infant with a respiratory infection?
✔ What is the causative agent in many cases of bronchiolitis?

ASTHMA

Asthma is a spasm of the bronchial tubes caused by hypersensitivity of the airways in the bronchial system and inflammation that leads to mucosal edema and mucous hypersecretion. Asthma is also sometimes referred to as reactive airway disease. This reversible obstructive airway disease affects millions of people in the United States, including 5% to 10% of all children in the United States.

Asthma attacks are often triggered by a hypersensitive response to allergens. In young children, asthma may be a response to certain foods. Asthma is often triggered by exercise, exposure to cold weather, irritants such as wood-burning stoves, cigarette smoke, dust, and pet dander and foods such as chocolate, milk, eggs, nuts, and grains. Infections, such as bronchitis and upper respiratory infection, can provoke asthma attacks. In children with asthmatic tendencies, emotional stress or anxiety can trigger an attack. Some children with asthma may have no evidence of an immunologic cause for the symptoms.

Asthma can be either intermittent, with extended periods when the child has no symptoms and does not need
medication, or chronic, with the need for frequent or continuous therapy. Chronic asthma affects the child’s school performance and general activities and may contribute to poor self-confidence and dependency. Asthma accounts for one third of the missed school days in the United States (Eggleston, 2006).

Spasms of the smooth muscles cause the lumina of the bronchi and bronchioles to narrow. Edema of the mucous membranes lining these bronchial branches and increased production of thick mucus within them combine with the spasm to cause respiratory obstruction (Fig. 36-4).

**Clinical Manifestations**

The onset of an attack can be very abrupt or can progress over several days, as evidenced by a dry hacking cough, **wheezing** (the sound of expired air being pushed through obstructed bronchioles), and difficulty breathing. Asthma attacks often occur at night and awaken the child from sleep. The child must sit up and is totally preoccupied with efforts to breathe. Attacks might last for only a short time, or might continue for several days. Thick, tenacious mucus might be coughed up or vomited after a coughing episode. In some asthmatic patients, coughing is the major symptom, and wheezing occurs rarely if at all. Many children no longer have symptoms after puberty, but this is not predictable. Other allergies may develop in adulthood.

**Diagnosis**

The history and physical examination are of primary importance in diagnosing asthma. When observing the child’s breathing, dyspnea and labored breathing may be noted, especially on expiration. When listening to the child’s lung sounds (auscultation), the examiner hears wheezing, which is often generalized over all lung fields. Mucus production may be profuse. Pulmonary function tests are valuable diagnostic tools and indicate the amount of obstruction in the bronchial airways, especially in the smallest airways of the lungs. A definitive diagnosis of asthma is made when the obstruction in the airways is reversed with bronchodilators.

**Treatment**

Children and their families must be taught to recognize the symptoms that lead to an acute attack so they can be treated as early as possible. These symptoms include respiratory retractions and wheezing and an increased amount of coughing at night, in the early morning, or with activity. Use of a peak flow meter is an objective way to measure airway obstruction, and children as young as 4 or 5 years of age can be taught to use one (see Family Teaching Tips: How to Use a Peak Flow Meter and Fig. 36-5). A peak flow diary should be maintained and also can include symptoms, exacerbations, actions taken, and outcomes. Families must make every effort to eliminate any possible allergens from the home.

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**Did you know?**

Prevention is the most important aspect in the treatment of asthma.

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**Figure 36-4** Note airway edema, mucus production, and bronchospasm occurring with asthma.

**Figure 36-5** The child with asthma uses a peak flow meter and keeps track of readings on a daily basis.
HOW TO USE A PEAK FLOW METER

INTRODUCTION
Your child cannot feel early changes in the airway. By the time the child feels tightness in the chest or starts to wheeze, he or she is already far into an asthma episode. The most reliable early sign of an asthma episode is a drop in the child’s peak expiratory flow rate, or the ability to breathe out quickly, which can be measured by a peak flow meter. Almost every asthmatic child over the age of 4 years can and should learn to use a peak flow meter (Figs. A and B.)

STEPS TO ACCURATE MEASUREMENTS
1. Remove gum or food from the mouth.
2. Move the pointer on the meter to zero.
3. Stand up and hold the meter horizontally with fingers away from the vent holes and marker.
4. With mouth wide open, slowly breathe in as much air as possible.
5. Put the mouthpiece on the tongue and place lips around it.
6. Blow out as hard and fast as you can. Give a short, sharp blast, not a slow blow. The meter measures the fastest puff, not the longest.
7. Repeat steps 1–6 three times. Wait at least 10 seconds between puffs. Move the pointer to zero after each puff.
8. Record the best reading.

GUIDELINES FOR TREATMENT
Each child has a unique pattern of asthma episodes. Most episodes begin gradually, and a drop in peak flow can alert you to start medications before the actual symptoms appear. This early treatment can prevent a flare-up from getting out of hand. One way to look at peak flow scores is to match the scores with three colors:

<table>
<thead>
<tr>
<th>Green</th>
<th>Yellow</th>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>80%–100% personal best</td>
<td>50%–80% personal best</td>
<td>Below 50% personal best</td>
</tr>
<tr>
<td>No symptoms</td>
<td>Mild to moderate symptoms</td>
<td>Serious distress</td>
</tr>
<tr>
<td>Full breathing reserve</td>
<td>Diminished reserve</td>
<td>Pulmonary function is significantly impaired</td>
</tr>
<tr>
<td>Mild trigger may not cause symptoms</td>
<td>A minor trigger produces noticeable symptoms</td>
<td>Any trigger may lead to severe distress</td>
</tr>
<tr>
<td>Continue current management</td>
<td>Augment present treatment regimen</td>
<td>Contact care provider</td>
</tr>
</tbody>
</table>

Remember, treatment should be adjusted to fit the individual’s needs. Your care provider will develop a home management plan with you. When in doubt, consult your care provider.

The goals of asthma treatment include preventing symptoms, maintaining near-normal lung function and activity levels, preventing recurring exacerbations and hospitalizations, and providing the best medication treatment with the fewest adverse effects. Depending on the frequency and severity of symptoms and exacerbations, a stepwise approach to the treatment of asthma is used to manage the disease. The steps are used to determine combinations of medications to be used (Table 36-1).
Medications used to treat asthma are divided into two categories: quick-relief medications for immediate treatment of symptoms and exacerbations and long-term control medications to achieve and maintain control of the symptoms. The classifications of drugs used to treat asthma include bronchodilators (sympathomimetics and xanthine derivatives) and other antiasthmatic drugs (corticosteroids, leukotriene inhibitors, and mast cell stabilizers). Table 36-2 lists some of the medications used to treat asthma. Many of these drugs can be given either by a nebulizer (tube attached to a wall unit or cylinder that delivers moist air via a face mask) or a metered-dose inhaler ([MDI]; a hand-held plastic device that delivers a premeasured dose). The MDI may have a spacer unit attached that makes it easier for the young child to use (Fig. 36-6).

**Bronchodilators**

Bronchodilators are used for quick relief of acute exacerbations of asthma symptoms. They are short acting and available in pill, liquid, or inhalant form. These drugs are administered every 6 to 8 hours or every 4 to 6 hours by inhalation if breathing difficulty continues. In severe attacks, epinephrine by subcutaneous injection often affords quick relief of symptoms. Some bronchodilators, such as salmeterol (Serevent), are used in long-term control.

Theophylline preparations have long been used in the treatment of asthma. The drug is available in short-acting and long-acting forms. The short-acting forms are given about every 6 hours. Because they enter the bloodstream quickly, they are most effective when used only as needed for intermittent episodes of asthma. Long-acting preparations of theophylline are given every 8 to 12 hours. Some of these preparations come in sustained-release forms. These are helpful in patients who continually need medication because these drugs sustain more consistent theophylline levels in the blood than do short-acting forms. Patients hospitalized for status asthmaticus may receive theophylline intravenously.

**Corticosteroids**

Corticosteroids are anti-inflammatory drugs used to control severe or chronic cases of asthma. Steroids may be given in inhaled form to decrease the systemic effects that accompany oral steroid administration.

**Leukotriene Inhibitors**

Leukotriene inhibitors are given by mouth along with other asthma medications for long-term control and prevention of mild, persistent asthma. Leukotrienes are bronchoconstrictive substances that are released in the body during the inflammatory process. These drugs inhibit leukotriene production, which helps with bronchodilation and decreases airway edema.

**Mast Cell Stabilizers**

Mast cell stabilizers help to stabilize the cell membrane by preventing mast cells from releasing the chemical mediators that cause bronchospasm and mucous membrane inflammation. They are used to help decrease wheezing and exercise-induced asthma attacks. These are nonsteroidal anti-inflammatory drugs and have relatively few side effects. A bronchodilator often is given to open up the airways just before the mast cell stabilizer is used. Children dislike the taste of the medication, but receiving sips of water after the administration minimizes the distaste.

**Chest Physiotherapy**

Because asthma has multiple causes, treatment and continued management of the disease require more than medication. Chest physiotherapy includes breathing exercises, physical training, and inhalation therapy. Studies have shown that breathing exercises to improve respiratory function and to control asthma

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**Check out this tip.**

For the asthmatic child, if exercises can be taught as part of play activities, children are more likely to find them fun and to practice them more often.
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### Table 36-2  MEDICATIONS USED IN THE TREATMENT OF ASTHMA

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Dose Form</th>
<th>Uses</th>
<th>Adverse Reactions/Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bronchodilators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sympathomimetics (Beta-2-receptor Agonists)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>albuterol sulfate</td>
<td>Proventil, Ventolin MDI</td>
<td>Quick relief</td>
<td>Restlessness, anxiety, fear, palpitations, insomnia, tremors</td>
<td></td>
</tr>
<tr>
<td>metaproterenol hydrochloride</td>
<td>Alupent, Metaprel MDI</td>
<td>Quick relief</td>
<td>Tremors, anxiety, insomnia, dizziness, tachycardia</td>
<td></td>
</tr>
<tr>
<td>terbutaline sulfate</td>
<td>Brethine MDI PO</td>
<td>MDI—Quick relief</td>
<td>Tremors, anxiety, insomnia, dizziness, tachycardia</td>
<td></td>
</tr>
<tr>
<td>salmeterol</td>
<td>Serevent MDI PO</td>
<td>PO Long-term control</td>
<td>Headache, tremors, tachycardia</td>
<td></td>
</tr>
<tr>
<td><strong>Theophylline</strong></td>
<td>Slo-Phyllin, Elixophyllin Theo-Dur</td>
<td>PO Timed-release</td>
<td>Long-term control</td>
<td>Nausea, vomiting, headache, nervousness, irritability, insomnia</td>
</tr>
<tr>
<td><strong>Antiasthma Drugs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corticosteroids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>beclomethasone</td>
<td>Beclovent MDI</td>
<td>Long-term control</td>
<td>Throat irritation, cough, nausea, dizziness</td>
<td></td>
</tr>
<tr>
<td>triamcinolone</td>
<td>Azamacort MDI</td>
<td>Long-term control</td>
<td>Throat irritation, cough, nausea, dizziness</td>
<td></td>
</tr>
<tr>
<td><strong>Leukotriene Inhibitors</strong></td>
<td>Singulair PO</td>
<td>Long-term control</td>
<td>Headache, nausea, abdominal pain, diarrhea</td>
<td></td>
</tr>
<tr>
<td><strong>Mast Cell Stabilizers</strong></td>
<td>Intal Intrasal nebulizer</td>
<td>Long-term control</td>
<td>Nasal irritation, unpleasant taste, headache, nausea, dry throat</td>
<td></td>
</tr>
</tbody>
</table>

MDI = metered-dose inhaler

Nursing Process for the Child With Asthma

**Assessment**

Obtain information from the caregiver about the asthma history, the medications the child takes, and the medications for treatment. These exercises teach children how to help control their own symptoms and thereby build self-confidence, which is sometimes lacking in asthmatic children.
taken within the last 24 hours. Ask whether the child has vomited because vomiting would prevent absorption of oral medications. Ask about any history of respiratory infections; possible allergens in the household such as pets; type of furniture and toys; if there is a damp basement (which could contain mold spores); and a history of breathing problems after exercise.

In the physical exam, include vital signs, observation for diaphoresis and cyanosis, position, type of breathing, alertness, chest movement, intercostal retractions, and breath sounds. Note any wheezing.

If the child is old enough and alert enough to cooperate, involve him or her in gathering the history, and encourage the child to add information. Ask questions that can be answered “yes” or “no” to minimize tiring the distressed child.

**Selected Nursing Diagnoses**
- Ineffective Airway Clearance related to bronchospasm and increased pulmonary secretions
- Risk for Deficient Fluid Volume related to water loss from tachypnea and diaphoresis and reduced oral intake
- Fatigue related to dyspnea
- Anxiety related to sudden attacks of breathlessness
- Deficient Knowledge of the caregiver related to disease process, treatment, home care, and control of disease

**Outcome Identification and Planning**
The initial major goals for the child include maintaining a clear airway and an adequate fluid intake and relieving fatigue and anxiety. The family’s goals include learning how to manage the child’s life with asthma. Base the nursing plan of care on these goals.

**Implementation**

**Monitoring Respiratory Function**
Continuously monitor the child while he or she is in acute distress from an asthma attack using pulse oximetry and an electronic monitor. If this equipment is unavailable, take the child’s respirations every 15 minutes during an acute attack and every 1 or 2 hours after the crisis is over. Listening to lung sounds should be done to further monitor the respiratory function. Observe for nasal flaring and chest retractions; observe the skin for color and diaphoresis.

Elevate the child’s head. An older child may be more comfortable resting forward on a pillow placed on an over-bed table. Monitor the child for response to medications and their side effects such as restlessness, gastrointestinal upset, and seizures. Use humidified oxygen and suction as needed during periods of acute distress.

**Monitoring and Improving Fluid Intake**
During an acute attack, the child may lose a great quantity of fluid through the respiratory tract and may have a poor oral intake because of coughing and vomiting. Theophylline administration also has a diuretic effect, which compounds the problem. Monitor intake and output. Encourage oral fluids that the child likes. Intravenous (IV) fluids are administered as ordered. IV fluid intake is monitored, and all precautions for parenteral administration are followed. Note the skin turgor and observe the mucous membranes at least every 8 hours. Weigh the child daily to help determine fluid losses.

**Promoting Energy Conservation**
The child might become extremely tired from the exertion of trying to breathe. Activities and patient care should be spaced to provide maximum periods of uninterrupted rest. Provide quiet activities when the child needs diversion. Keep visitors to a minimum, and maintain a quiet environment.

**Reducing Child and Parent Anxiety**
The sudden onset of an asthma attack can be frightening to the child and the family caregivers. Respond quickly when the child has an attack. Reassure the child and the family during an episode of dyspnea.

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**A Personal Glimpse**

The first time I put Bobbie in the hospital it was very scary. I knew the nurses, but I was still afraid for him. I felt like someone was punishing me. I couldn’t leave him for a minute. I was afraid he wouldn’t be alive when I came back. I was also afraid he would be frightened. He was so small, he needed me to protect him, but I couldn’t help him. We were in the hospital every couple of weeks. He would get better then have another attack. It got to the point where I would call the doctor and say that Bobbie was having another attack and they would just send us to admitting. After a few times, I got used to caring for him in the hospital. The nurses taught me how to keep his tent humidified and I could just take care of it myself. Finally I was able to go back to work during the day and care for him on my breaks and time off. It was very difficult each and every time, but we adjusted to hospital life. Although I was afraid for him, I knew he was a fighter and I had to be too. I feel this experience made him a stronger person. He is now 8 years old and has had no severe attacks since he was about 2 years old. He has had a few mild attacks, but it doesn’t affect him or myself.

Tracee

**Learning Opportunity:** Give specific examples of what the nurse could do to support this mother and to help decrease the fear she had when her child was hospitalized.
Teach the child and the caregiver the symptoms of an impending attack and the immediate response needed to decrease the threat of an attack. This knowledge will help them to cope with impending attacks and plan how to handle the attacks. When they are prepared with information, the child and family may be less fearful. Give the child examples of sports figures, entertainers, actors and actresses, and political leaders who have or have had asthma, for example, Olympic track and field athlete Jackie Joyner Kersee and President John F. Kennedy. Others include Jerome Bettis, professional football player; Amy Van Dyken, American swimming champion; Nancy Hoghead, Olympic gold medalist in swimming; Dennis Rodman, NBA basketball player; and Diane Keaton, actress.

**Providing Family Teaching**

Child and family caregiver teaching is of primary importance in the care of asthmatic children. Family caregivers might overprotect the child because of the fear that an attack will occur when the child is with a babysitter, at school, or anywhere away from the caregiver. Asthma attacks can be prevented or decreased by prompt and adequate intervention. Teach the caregiver and child, within the scope of the child’s ability to understand, about the disease process, recognition of symptoms of an impending attack, environmental control, infection avoidance, exercise, drug therapy, and chest physiotherapy.

Teach the caregiver and the child how to use metered-dose inhaler medications and have them demonstrate correct usage (see Family Teaching Tips: How to Use a Metered-Dose Inhaler). Give instructions on home use of a peak flow meter. Urge them to maintain a diary to record the peak flow as well as asthma symptoms, onset of attacks, action taken, and results. Include instructions about administering premedication before the child is exposed to situations in which an attack may occur.

Inform caregivers of allergens that may be in the child’s environment and encourage them to eliminate or control the allergens as needed. Stress the importance of quick response when the child has a respiratory infection. Give instructions for exercise and chest physiotherapy.

Stress to the caregivers the importance of informing the child’s classroom teacher, physical education teacher, school nurse, babysitter, and others who are responsible for the child about the child’s condition. With a physician’s order, including directions for use, the child should be permitted to bring medications to school and keep them so they can be used when needed.

Provide information on support groups available in the area. The American Lung Association has many materials available to families and can provide information about support groups, camps, and workshops (Web site: www.lungusa.org). The Asthma and Allergy Foundation of America (Web site: www.aafa.org) and the National Heart, Lung, and Blood Institute (Web site: www.nhlbi.nih.gov) are also resources.

**Evaluation: Goals and Expected Outcomes**

**Goal:** The child’s airway will remain open.

**Expected Outcomes:** The child’s
- breath sounds are clear with no wheezing, retractions, or nasal flaring.
- skin color is good.

**Goal:** The child’s fluid intake will be adequate.

**Expected Outcomes:** The child’s
- hourly urine output is 30 to 40 mL.
- mucous membranes are moist.
- skin turgor is good.
- weight remains stable.

**Goal:** The child will have increased energy levels.

**Expected Outcomes:** The child
- participates in age-appropriate activities.
- rests between activities.
Goal: The child’s and caregivers’ anxiety and fear related to impending attacks will be minimized.

Expected Outcomes: The child and the caregiver
■ list symptoms of an impending attack.
■ describe appropriate responses.
■ display confidence in their ability to handle an attack.

Goal: The child and the caregiver will gain knowledge of how to live with asthma.

Expected Outcomes: The child and the caregiver
■ verbalize an understanding of the disease process, treatment, and control.
■ interact with health care personnel and ask and answer relevant questions.
■ obtain information and makes contact with support groups.

Test Yourself
✔ What is the most important aspect in the treatment of asthma?
✔ What are the two categories of medications used in the treatment of asthma?
✔ What are the routes of administration for many of the medications used to treat asthma?
✔ Why is chest physiotherapy used in the treatment of asthma?

BACTERIAL PNEUMONIA
Pneumococcal pneumonia is the most common form of bacterial pneumonia in infants and children. Its incidence has decreased during the last several years. This disease occurs mainly during the late winter and early spring, principally in children younger than 4 years of age.

In the infant, pneumococcal pneumonia is generally of the bronchial type. In older children, pneumococcal pneumonia is generally of the lobar type. It is usually secondary to an upper respiratory viral infection. The most common finding in infants is a patchy infiltration of one or several lobes of the lung. Pleural effusion is often present. In the older child, the pneumonia may localize in a single lobe. Immunization with the pneumococcal vaccine (PCV) is currently recommended, beginning at 2 months of age.

H. influenzae pneumonia also occurs in infants and young children. Its clinical manifestations are similar to those of pneumococcal pneumonia, but its onset is more insidious, its clinical course is longer and less acute, and it is usually seen in the lobe of the lung. Complications in the infant are common—usually bacteremia, pericarditis, and empyema (pus in the lungs). The treatment is the same. Immunization with H. influenzae type B conjugate vaccine (HIB) is currently recommended, beginning at 2 months of age.

Clinical Manifestations
The onset of the pneumonic process is usually abrupt, following a mild upper respiratory illness. Temperature increases rapidly to 103°F to 105°F (39.4°C–40.6°C). Respiratory distress is marked with obvious air hunger, flaring of the nostrils, circumoral (around the mouth) cyanosis, and chest retractions. Tachycardia and tachypnea are present, with a pulse rate frequently as high as 140 to 180 beats per minute and respirations as high as 80 breaths per minute.

Generalized convulsions may occur during the period of high fever. Cough may not be noticeable at the onset but may appear later. Abdominal distention caused by swallowed air or paralytic ileus commonly occurs.

Diagnosis
Diagnosis is based on clinical symptoms, chest radiograph, and culture of the organism from secretions. The white blood cell count may be elevated. The anti-streptolysin titer (ASO titer) is usually elevated in children with staphylococcal pneumonia.

Treatment
The use of anti-infectives early in the disease gives a prompt and favorable response. Penicillin or ampicillin has proved to be the most effective treatment and is generally used unless the child has a penicillin allergy. Cephalosporin anti-infectives are also used. Oxygen started early in the disease process is important. In some instances, a croupette or mist tent is used. Some consider the use of mist tents without constant observation unsafe. Children have become cyanotic in mist tents, with subsequent arrest, because of the difficulty of seeing the child; therefore, a mask or hood is thought to be the better choice. Intravenous fluids are often necessary to supply the needed amount of fluids. Prognosis for recovery is excellent.

NURSING PROCESS FOR THE CHILD WITH PNEUMONIA

Assessment
Conduct a thorough interview with the caregiver. In addition to standard information, include specific data such as when the symptoms were first noticed, the course of the fever thus far, a description of respiratory difficulties, and the character of any cough. Collect data regarding how well the child has been taking nourishment and fluids. Ask about nausea, vomiting, urinary and bowel output, and history of exposure to other family members with respiratory infections.

Conduct a physical exam, including measurement of temperature, apical pulse, respirations (rate, respiratory
effort, retractions [costal, intercostal, sternal, suprasternal, substernal], and flaring of nares) (see Chapter 28). Also note breath and lung sounds (crackles, wheezing), cough (dry, productive, hacking), irritability, restlessness, confusion, skin color (pallor, cyanosis), circumoral (around the mouth) cyanosis, cyanotic nail beds, skin turgor, anterior fontanelle (depressed or bulging), nasal passage congestion (color, consistency), mucous membranes (mouth dry, lips dry or cracked), and eyes (bright, glassy, sunken, moist, crusted). If the child is old enough to communicate verbally, ask questions to determine how the child feels.

**Selected Nursing Diagnoses**

- Ineffective Airway Clearance related to obstruction associated with edema, mucous secretions, nasal and chest congestion
- Impaired Gas Exchange related to inflammatory process
- Risk for Deficient Fluid Volume related to respiratory fluid loss, fever, and difficulty swallowing
- Hyperthermia related to infection process
- Risk for Further Infection related to location and anatomical structure of the eustachian tubes
- Activity Intolerance related to inadequate gas exchange
- Anxiety related to dyspnea, invasive procedures, and separation from caregiver
- Compromised Family Coping related to child’s respiratory symptoms and child’s illness
- Deficient Knowledge of the caregiver related to child’s condition and home care

**Outcome Identification and Planning**

The major goals for the child with pneumonia are maintaining respiratory function, preventing fluid deficit, maintaining body temperature, preventing otitis media, conserving energy, and relieving anxiety. Goals for the family include relieving anxiety and improving caregiver knowledge.

The need for immediate intubation is always a possibility; thus, vigilance is essential. The child’s energy must be conserved to reduce oxygen requirements. The child may need to be placed on infection control precautions, according to the policy of the health care facility, to prevent nosocomial spread of infection. Many children with a respiratory condition need to be placed in a croupette or mist tent, making additional nursing interventions necessary. If IV fluids are ordered, interventions that promote tissue and skin integrity are needed. To ensure that the child does not interfere with the IV infusion site, it may be necessary to prepare restraints. Intravenous administration and the use of restraints are discussed in Chapter 30 (see Nursing Care Plan 36-1: The Child With Pneumonia).

**Implementation**

**Maintaining Airway Clearance**

A humidified atmosphere is provided with an ice-cooled mist tent or cool vaporizer. The moisturized air helps thin the mucus in the respiratory tract to ease respirations. Suction or clear secretions as needed to keep the airway open. Position the child to provide maximum ventilation, and change positions at least every 2 hours. Use pillows and padding to maintain the child’s position. Observe frequently for slumping, which causes crowding of the diaphragm. Avoid use of constricting clothes and bedding. Stuffed toys are not recommended in mist tents because they become saturated and provide an environment in which organisms flourish.

**Monitoring Respiratory Function**

Be continuously alert for warning signs of airway obstruction. Monitor the child at least every hour; uncover the child’s chest and observe the child’s breathing efforts. Observe for tachypnea (rapid respirations), and note the amount of chest movement, shallow breathing, and retractions. Listen with a stethoscope for breath sounds, particularly noting the amount of stridor, which indicates difficult breathing. Oxygen saturation levels are monitored using oximetry. Increasing hoarseness should be reported. In addition, observe for pallor, listlessness, circumoral cyanosis, cyanotic nail beds, and restlessness; these are indications of impaired oxygenation and should be reported at once. Cool, high humidity provides relief. Oxygen may be administered by hood, mist tent, or nasal cannula if the practitioner orders.

**Promoting Adequate Fluid Intake**

It is important to clear the nasal passages immediately before feeding. For the infant, use a bulb syringe. Administer normal saline nose drops to thin secretions about 10 to 15 minutes before feedings and at bedtime. Feed the child slowly, allowing frequent stops with suctioning during feeding, as needed. Avoid overtiring the infant or child during feeding.

Adequate hydration helps reduce thick mucus. Maintaining adequate fluid intake may be a problem for children of any age because the child may be too ill to want to eat. Offer warm, clear fluids to encourage oral intake. Between meals, offer juices and water appropriate for the infant or child’s age. For infants, use a relatively small-holed nipple so he or she does not choke, but does not work too hard. Maintain accurate intake and output measurements. Observe carefully for aspiration, especially in severe respiratory distress. The child may need to be kept NPO to prevent this threat. Parenteral fluids may be administered to replace those lost through respiratory loss, fever, and anorexia. Follow all safety measures for administration of parenteral fluids. Observe patency, placement, site integrity, and flow rate, at least hourly. Fluid needs are determined by the amount...
**CASE SCENARIO:**
CW, a 6-month-old child with pneumonia, has been brought to the hospital from the doctor’s office by his mother. He has a copious amount of thick nasal discharge and has rapid, shallow respirations with substernal and intercostal retractions. His temperature is 101.5°F (39.1°C). His young mother appears very anxious.

**NURSING DIAGNOSIS**
Ineffective Airway Clearance related to infectious process

**GOAL:** The child’s respiratory function will improve and airway will be patent.

**EXPECTED OUTCOMES:**
- The child no longer uses respiratory accessory muscles to aid in breathing.
- The child’s breath sounds are clear and respirations are regular.
- Mucous secretions become thin and scant; nasal passages are clear.

<table>
<thead>
<tr>
<th>Nursing Interventions</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide moist atmosphere by placing him in ice-cooled mist tent.</td>
<td>Moisture helps liquefy and thin secretions for easier respirations.</td>
</tr>
<tr>
<td>Keep nasal passages clear, using bulb syringe.</td>
<td>Open passages increase air flow.</td>
</tr>
<tr>
<td>Monitor respiratory function by observing for retractions, respiratory rate, and listening to breath sounds at least every 4 hours. Monitor more frequently if tachypnea or deep retractions are noted.</td>
<td>Changes in the child’s breathing may be early indicators of respiratory distress.</td>
</tr>
<tr>
<td>Monitor child’s bedding and clothing every 4 hours.</td>
<td>Clothing and bedding can become very wet from mist. Dry clothing and bedding help to prevent chilling.</td>
</tr>
</tbody>
</table>

**NURSING DIAGNOSIS**
Imbalanced Nutrition: Less Than Body Requirements related to inability to suck, drink, or swallow because of congested nasal passages or fatigue from difficulty breathing

**GOAL:** The child will have adequate food and fluid intake to maintain normal growth and development.

**EXPECTED OUTCOMES:**
- The child has an adequate caloric intake as evidenced by appropriate weight gain of 1 oz or more a day.
- The child is able to suck, drink, and swallow easily without tiring.
- Skin turgor returns to normal.

<table>
<thead>
<tr>
<th>Nursing Interventions</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear nasal passages immediately before feeding. Teach family caregiver to use bulb syringe.</td>
<td>Infants are obligatory nasal breathers. Clearing eases child’s breathing to permit adequate feeding. Family caregiver can use this technique at home, as needed.</td>
</tr>
<tr>
<td>Administer normal saline nose drops before feedings and at bedtime.</td>
<td>Normal saline nose drops help thin mucous secretions.</td>
</tr>
<tr>
<td>Weigh infant daily in morning before first feeding.</td>
<td>Child will maintain appropriate weight gain.</td>
</tr>
</tbody>
</table>

**NURSING DIAGNOSIS**
Risk for Further Infection (otitis media) related to current respiratory infection and the size and location of child’s eustachian tube

**GOAL:** The child will remain free from further infection and complications of otitis media.

**EXPECTED OUTCOMES:**
- The child shows no signs of ear pain, such as irritability, shaking head, pulling on ears.
needed to maintain body weight with sufficient amounts added to replace the additional losses. Monitor daily weights and accurately record intake and output. Monitor serum electrolyte levels to ensure they are within normal limits. At least once per shift, observe and record skin turgor and the condition of mucous membranes. Observe the child for dehydration; skin turgor, anterior fontanelle (in infants), and urine output are good indicators of dehydration. For the infant, maintain diaper counts and weigh diapers to determine the amount of urine output (1 mL urine weighs 1 g).

Maintaining Body Temperature
Monitor the child’s temperature frequently, at least every 2 hours if it is higher than 101.3°F (38.6°C). If the child has a fever, remove excess clothing and covering. An anti-pyretic medications may be ordered.

Promoting Energy Conservation
During an acute stage, allow the child to rest as much as possible. Plan work so that rest and sleep are interrupted no more than necessary.

Preventing Additional Infections
Turn the child from side to side every hour so that mucus is less likely to drain into the eustachian tubes, thereby reducing the risk for development of otitis media. An infant seat may help facilitate breathing and prevent the complication of otitis media in the younger child. Observe the child for irritability, shaking of the head, pulling at the ears, or complaints of ear pain. Do not give the infant a bottle while he or she is lying in bed. The best position for feeding is upright to avoid excessive drainage into the eustachian tubes.

Reducing the Child’s Anxiety
When frightened or upset and crying, the child with a respiratory condition may hyperventilate, which causes additional respiratory distress. For this reason, maintain a calm, soothing manner while caring for the child. When possible, the child should be cared for by a constant caregiver with whom a trusting relationship has been achieved. Offering support to the child during invasive procedures, such as when an IV is being started,
will help decrease the child’s anxiety. The family can provide the child with a favorite blanket or toy. The family caregiver is encouraged to stay with the child if possible to provide reassurance and avoid separation anxiety in the child. Plan care to minimize interrupting the child’s much-needed rest. Give the child age-appropriate explanations of treatment and procedures.

As the child’s condition improves, provide age-appropriate diversional activities to help relieve anxiety and boredom. Make extra efforts to relieve the child’s feelings of loneliness, especially when infection control precautions are being used.

Promoting Family Coping
Watching a child with severe respiratory symptoms is frightening for the parent or family caregiver. Family caregivers need teaching and reassurance. The parent or caregiver may feel helpless, and these feelings of anxiety and helplessness may be exhibited in a variety of ways. To alleviate these feelings, encourage the caregiver to discuss them. Using easily understood terminology, explain equipment, procedures, treatments, the illness, and the prognosis to the caregiver. Include the caregiver in the child’s care as much as possible and encourage him or her to soothe and comfort the child. Actively listen to caregivers and use communication skills to respond to their worries.

Providing Family Teaching
Provide the caregiver with thorough explanations of the condition’s signs and symptoms. Teach the use of cool humidifiers or vaporizers, including cleaning methods and safety measures to avoid burns when using a steam vaporizer. Explain the effects, administration, dosage, and side effects of medications. To be certain the information was understood, have the parent relate specific facts to you. Write the information down in a simple way so that it can be clearly understood, and determine that the parent can read and understand the written material. When appropriate, observe the caregiver demonstrating care of equipment and any treatments to be done at home. See Family Teaching Tips: Respiratory Infections.

Evaluation: Goals and Expected Outcomes
Goal: The child’s airway will remain clear and patent.
Expected Outcomes: The child’s
■ airway is clear with no evidence of retractions, stridor, hoarseness, or cyanosis.
■ mucous secretions are thin and scant.

Goal: The child’s respiratory function will be within normal limits for age.
Expected Outcomes:
■ The child’s respiratory rate is 20 to 35 breaths per minute, normal range for child’s age, regular, with breath sounds clear.

Family Teaching Tips
RESPIRATORY INFECTIONS
■ Clear nasal passages with a bulb syringe for the infant.
■ Feed the child slowly, allow the infant to breastfeed without tiring.
■ Frequently burp the infant to expel swallowed air.
■ Offer child extra fluids.
■ Leave the child in mist tent except for feeding and bathing (unless otherwise indicated).
■ Soothe and comfort child in mist or croup tent.
■ Follow respiratory infection control precautions and good hand-washing techniques.
■ Discourage persons with infections from visiting child.
■ Use a humidifier at home after discharge.
■ Clean humidifier properly and frequently.

■ The infant no longer uses respiratory accessory muscles to aid in breathing.
■ The child’s oxygen saturation levels are within established limits.

Goal: The child’s fluid intake will be adequate for age and weight.
Expected Outcomes: The child
■ exhibits good skin turgor and moist, pink mucous membranes.
■ has urine output of 1 to 3 mL/kg/hr.

Goal: The child will maintain a temperature within normal limits.
Expected Outcome:
■ The child’s temperature is 98.6°F to 100°F (37°C–37.8°C).

Goal: The child’s energy will be conserved.
Expected Outcome:
■ The child has extended periods of uninterrupted rest and tolerates increased activity.

Goal: The child will be free from complications of otitis media.
Expected Outcomes: The child
■ shows no signs of ear pain such as irritability, shaking of the head, pulling on the ears.
■ does not complain of ear pain.

Goal: The child will experience a reduction in anxiety.
Expected Outcomes: The child
■ rests quietly with no evidence of hyperventilation.
■ cooperates with care, cuddles a favorite toy for reassurance, smiles, and plays contentedly.

Goal: The family caregiver’s anxiety will be reduced.
Expected Outcomes: The family caregivers
cooperate with and participate in the child’s care.
- appear more relaxed, verbalize his or her feelings, and soothe the child.

Goal: The family caregivers will verbalize an understanding of the child’s condition and how to provide home care for the child.

Expected Outcomes: The family caregivers
- accurately describe facts about the child’s condition.
- ask appropriate questions.
- relate signs and symptoms to observe in the child.
- name the effects, side effects, dosage, and administration of medications.

**CYSTIC FIBROSIS**

When first described, cystic fibrosis (CF) was called “fibrocystic disease of the pancreas.” Additional research has revealed that this disorder represents a major dysfunction of all exocrine glands. The major organs affected are the lungs, pancreas, and liver. Because about half of all children with CF have pulmonary complications, this disorder is discussed here with other respiratory conditions.

CF is hereditary and transmitted as an autosomal recessive trait. Both parents must be carriers of the gene for CF to appear. With each pregnancy, the chance is one in four that the child will have the disease. In the United States, the incidence is about 1 in 3,300 in white children and 1 in 16,300 in African American children.

The normal gene produces a protein, cystic fibrosis transmembrane conductance regulator, which serves as a channel through which chloride enters and leaves cells. The mutated gene blocks chloride movement, which brings on the apparent signs of CF. The blocking of chloride transport results in a change in sodium transport; this in turn results in abnormal secretions of the exocrine glands that produce thick, tenacious mucus rather than the thin, free-flowing secretion normally produced. This abnormal mucus leads to obstruction of the secretory ducts of the pancreas, liver, and reproductive organs. Thick mucus obstructs the respiratory passages, causing trapped air and over inflation of the lungs. In addition, the sweat and salivary glands excrete excessive electrolytes, specifically sodium and chloride.

**Clinical Manifestations**

Meconium ileus is the presenting symptom of CF in 5% to 10% of the newborns who later develop additional manifestations. Depletion or absence of pancreatic enzymes before birth results in impaired digestive activity, and the meconium becomes viscid (thick) and mucilaginous (sticky). The inspissated (thickened) meconium fills the small intestine, causing complete obstruction. Clinical manifestations are bile-stained emesis, a distended abdomen, and an absence of stool. Intestinal perforation with symptoms of shock may occur. These newborns taste salty when kissed because of the high sodium chloride concentration in their sweat.

Initial symptoms of CF may occur at varying ages during infancy, childhood, or adolescence. A hard, nonproductive chronic cough may be the first sign. Later, frequent bronchial infections occur. Development of a barrel chest and clubbing of fingers (Fig. 36-7) indicate chronic lack of oxygen. The abdomen becomes distended, and body muscles become flabby.

**Pancreatic Involvement**

Thick, tenacious mucus obstructs the pancreatic ducts, causing hypochylia (diminished flow of pancreatic enzymes) or achyilia (absence of pancreatic enzymes). This achyilia or hypochylia leads to intestinal malabsorption and severe malnutrition. The deficient pancreatic enzymes are lipase, trypsin, and amylase. Malabsorption of fats causes frequent steatorrhea. Anemia or rectal prolapse is common if the pancreatic condition remains untreated. The incidence of diabetes is greater in these children than in the general population, possibly because of changes in the pancreas. The incidence of diabetes in patients with CF is expected to increase because of their increasing life expectancy.

**Pulmonary Involvement**

The degree of lung involvement determines the prognosis for survival. The severity of pulmonary involvement differs in individual children, with a few showing only minor involvement. Now more than half of children with CF are expected to live beyond the age of 18 years, with increasing numbers living into adulthood.

Respiratory complications pose the greatest threat to children with CF. Abnormal amounts of thick, viscid mucus clog the bronchioles and provide an ideal medium

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**Figure 36-7** Clubbing of fingers indicates chronic lack of oxygen. (A) Normal angle; (B) early clubbing—flattened angle; (C) advanced clubbing—the nail is rounded over the end of the finger.

A Normal B Early clubbing C Advanced clubbing
for bacterial growth. *Staphylococcus aureus* coagulase can be cultured from the nasopharynx and sputum of most patients. *Pseudomonas aeruginosa* and *H. influenzae* are also found frequently. However, the basic infection appears most often to be caused by *S. aureus*.

Numerous complications arise from severe respiratory infections. Atelectasis and small lung abscesses are common early complications. Bronchiectasis and emphysemia may develop with pulmonary fibrosis and pneumonitis; this eventually leads to severe ventilatory insufficiency. In advanced disease, pneumothorax, right ventricular hypertrophy, and cor pulmonale are common complications. Cor pulmonale is a common cause of death.

**Other Organ Involvement**

The tears, saliva, and sweat of children with CF contain abnormally high concentrations of electrolytes, and most such children have enlarged submaxillary salivary glands. In hot weather, the loss of sodium chloride and fluid through sweating produces frequent heat prostration. Additional fluid and salt should be given in the diet as a preventive measure. In addition, males with CF who reach adulthood will most likely be sterile because of the blockage or absence of the vas deferens or other ducts. Females often have thick cervical secretions that prohibit the passage of sperm.

**Diagnosis**

Diagnosis is based on family history, elevated sodium chloride levels in the sweat, analysis of duodenal secretions (via a nasogastric tube) for trypsin content, a history of failure to thrive, chronic or recurrent respiratory infections, and radiologic findings of hyperinflation and bronchial wall thickening. In the event of a positive sodium chloride sweat test, at least one other criterion must be met to make a conclusive diagnosis.

The principal diagnostic test to confirm CF is a sweat chloride test using the pilocarpine iontophoresis method. This method induces sweating by using a small electric current that carries topically applied pilocarpine into a localized area of the skin. Elevations of 60 mEq/L or more are diagnostic, with values of 50 to 60 mEq/L highly suspect. Although the test itself is fairly simple, conducting the test on an infant is difficult, and false-positive results do occur.

**Treatment**

In the newborn, meconium ileus is treated with hyperosmolar enemas administered gently. If this does not resolve the blockage of thick, gummy meconium, surgery is necessary. During surgery, a mucolytic, such as Mucomyst, may be used to liquefy the meconium. If this procedure is successful, resection may not be necessary.

In the older child, treatment is aimed at correcting pancreatic deficiency, improving pulmonary function, and preventing respiratory infections. If bowel obstruction does occur (meconium ileus equivalent), the preferred management includes hyperosmolar enemas and an increase in fluids, dietary fiber, oral mucolytics, lactulose, and mineral oil.

The overall treatment goals are to improve the child's quality of life and to provide for long-term survival. A health care team is needed, including a primary care provider, a nurse, a respiratory therapist, a dietitian, and a social worker, to work together with the child and family. Treatment centers with a staff of specialists are becoming more common, particularly in larger medical centers.

**Dietary Treatment**

Commercially prepared pancreatic enzymes given during meals or with snacks aid digestion and absorption of fat and protein. Because pancreatic enzymes are inactivated in the acidic environment of the stomach, microencapsulated capsules are used to deliver the enzymes to the duodenum, where they are activated. These enzymes come in capsules that can be swallowed or opened and sprinkled on the child’s food. A powdered preparation is used for infants.

The child's diet should be high in carbohydrates and protein, with no restriction of fats. The child may need 1.5 to 2 times the normal caloric intake to promote growth. These children have large appetites unless they are acutely ill. However, even with their large appetites they can receive little nourishment without a pancreatic supplement. With proper diet and enzyme supplements, these children show evidence of improved nutrition, and their stools become relatively normal. Enteric-coated pancreatic enzymes essentially eliminate the need for dietary restriction of fat.

Because of the increased loss of sodium chloride, these children are allowed to use as much salt as they wish, even though onlookers may think it is too much. During hot weather, additional salt may be provided with pretzels, salted bread sticks, and saltine crackers.

Supplements of fat-soluble vitamins A, D, and E are necessary because of the poor digestion of fats. Vitamin K may be supplemented if the child has coagulation problems or is scheduled for surgery. Water-miscible preparations can be given to provide the needed supplement.

**Pulmonary Treatment**

The treatment goal is to prevent and treat respiratory infections. Respiratory drainage is provided by thinning the secretions and by mechanical means, such as postural drainage and clapping to loosen and drain
secrections from the lungs. Antibacterial drugs for the treatment of infection are necessary as indicated. Some physicians prescribe a prophylactic antibiotic regimen when the child receives the diagnosis of CF. Antibiotics may be administered orally or parenterally, even in the home. With home parenteral administration of antibiotic therapy, a central venous access device is used. Immunization against childhood communicable diseases is extremely important for these chronically ill children. All immunization measures may be used and should be maintained at appropriate intervals.

Physical activity is essential because it improves mucous secretion and helps the child feel good. The child can be encouraged to participate in any aerobic activity he or she enjoys. Activity along with physical therapy should be limited only by the child’s endurance.

Inhalation therapy can be preventive or therapeutic. A bronchodilator drug, such as theophylline or a beta-adrenergic agonist (metaproterenol, terbutaline, or albuterol), may be administered either orally or through nebulization. Recombinant human DNA (DNase, Pulmozyme) breaks down DNA molecules in sputum, breaking up the thick mucus in the airways. A mucolytic, such as Mucomyst, may be prescribed during acute infection. Hand-held nebulizers are easy to use and convenient for the ambulatory child.

Humidifiers provide a humidified atmosphere. In summer, a room air conditioner can help provide comfort and controlled humidity.

Chest physical therapy, a combination of postural drainage and chest percussion, is performed routinely at least every morning and evening, even if little drainage is apparent (Fig. 36-8). Performed correctly, chest percussion (clapping and vibrating of the affected areas) helps to loosen and move secretions out of the lungs. The physical therapist usually performs this procedure in the hospital and teaches it to the family. Chest physical therapy, although time consuming, is part of the ongoing, long-term treatment and should be continued at home.

**Home Care**

The home care for a child with CF places a tremendous burden on the family. This is not a one-time hospital treatment and there is no prospect of cure to brighten the horizon. Each day, much time is spent performing treatments. Family caregivers must learn to perform chest physical therapy, how to operate respiratory equipment, and administer IV antibiotics, when necessary. The child’s diet must be planned with additional enzymes regulated according to need. Great care is needed to prevent exposure to infections.

Family caregivers must guard against overprotection and against undue limitation of their child’s physical activity. Somehow, caregivers must preserve a good family relationship, also giving time and attention to other members of the family.

Physical activity is an important adjunct to the child’s well-being and is necessary to get rid of secretions. Capacity for exercise is soon learned, and the child can be trusted to become self-limiting as necessary, especially if given an opportunity to learn the nature of the disease. The child may find postural drainage fun when a caregiver raises the child’s feet in the air and walks the child around “wheelbarrow” fashion.

Providing as much normalcy as possible is always desirable. Hot-weather activity should be watched a little more closely, with additional attention to increased salt and fluid intake during exercise.

Caring for a child with CF places great stress on a family’s financial resources. The expense of daily medications, frequent clinic or office visits, and sometimes lengthy hospitalizations can be devastating to an ordinary family budget, even with medical insurance coverage. The Cystic Fibrosis Foundation (www.cff.org), with chapters throughout the United States, is helpful in providing education and services. Some assistance may be available through local agencies or community groups.

**Nursing Process for the Child With Cystic Fibrosis**

**Assessment**

The collection of data on the child with CF varies, depending on the child’s age and the circumstances of the admission. Conduct a complete parent interview that includes the standard information, as well as data concerning respiratory infections, the child’s appetite and eating habits, stools, noticeable salty perspiration, history of bowel obstruction as an infant, and family history for CF, if known. Also determine the caregiver’s knowledge of the condition.

When collecting data about vital signs, include observation of respirations, such as cough, breath sounds, and barrel chest; respiratory effort, such as retractions and nasal flaring; clubbing of the fingers; and signs of pancreatic involvement, such as failure to thrive and steatorrhea. Examine the skin around the rectum for irritation and breakdown from frequent foul stools. Involve the child in the interview process by asking age-appropriate questions, and determine the child’s perception of the disease and this current illness.

**Selected Nursing Diagnoses**

- Ineffective Airway Clearance related to thick, tenacious mucus production
- Ineffective Breathing Pattern related to tracheobronchial obstruction
Figure 36-8 Positions for postural drainage.
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■ Risk for Infection related to bacterial growth medium provided by pulmonary mucus and impaired body defenses
■ Imbalanced Nutrition: Less Than Body Requirements related to impaired absorption of nutrients
■ Anxiety related to hospitalization
■ Compromised Family Coping related to child’s chronic illness and its demands on caregivers
■ Deficient Knowledge of the caregiver related to illness, treatment, and home care

Outcome Identification and Planning
As already stated, much depends on the reason for the specific admission and other factors discussed in Nursing Diagnoses. The child’s age and ability for self-expression affect any goal setting the child can do. The major goals for the child include relieving immediate respiratory distress, maintaining adequate oxygenation, remaining free from infection, improving nutritional status, and relieving anxiety. The caregivers’ primary goal may include relieving problems related to this admission. However, other goals may include concerns about stress on the family related to the illness, as well as a need for additional information about the disease, treatment, and prevention of complications.

Implementation
Improving Airway Clearance
Mucus obstructs the airways and diminishes gas exchange. Monitor the child for signs of respiratory distress, while observing for dyspnea, tachypnea, labored respirations with or without activity, retractions, nasal flaring, and color of nail beds. Perform aerosol treatments. Teach the child to cough effectively. Examine and document the mucus produced, noting the color, consistency, and odor. Send cultures to the laboratory, as appropriate. Increase fluid intake to help thin mucous secretions. Encourage the child to drink extra fluids and ask the child (or the caregiver if the child is too young) what favorite drinks might be appealing. Intravenous fluids may be necessary. Provide humidified air, either in the form of a cool mist humidifier or mist tent, as prescribed.

Improving Breathing
Maintain the child in a semi-Fowler’s position, with the upper half of the body elevated about 30 degrees, or high Fowler’s position, with the upper half of the body elevated about 90 degrees, to promote maximal lung expansion. Pulse oximetry may be used. Maintain oxygen saturation higher than 90%. Administer oxygen as
ordered if the oxygen saturation falls below this level for an extended period. Administer mouth care every 2 to 4 hours, especially when oxygen is administered. Perform chest physical therapy every 2 to 4 hours, as ordered. If respiratory therapy technicians or physical therapists do these treatments, observe the child after the treatment to determine effectiveness and if more frequent treatments may be needed. Supervise the child who can self-administer nebulizer treatments to ensure correct use.

Conserve the child’s energy. Plan nursing and therapeutic activities so that maximal rest time is provided for the child. Note dyspnea and respiratory distress in relation to any activities. Plan quiet diversional activities as the child’s physical condition warrants. Help the child and family to understand that activity is excellent for the child not in an acute situation. Teach them that exercise helps loosen the thick mucus and also improves the child’s self-image.

Preventing Infection
The child with CF has low resistance, especially to respiratory infections. For this reason, take care to protect the child from any exposure to infectious organisms. Good hand-washing techniques should be practiced by all; teach the child and family the importance of this first line of defense. Practice and teach other good hygiene habits. Carefully follow medical asepsis when caring for the child and the equipment. Monitor vital signs every 4 hours for any indication of an infectious process. Restrict people with an infection, such as staff, family members, other patients, and visitors, from contact with the child. Advise the family to keep the child’s immunizations up to date. Administer antibiotics as prescribed, and teach the child or caregiver home administration, as needed. Also, teach the family the signs and symptoms of an impending infection so they can begin prophylactic measures at once.

Maintaining Adequate Nutrition
Adequate nutrition helps the child resist infections. Greatly increase the child’s caloric intake to compensate for impaired absorption of nutrients and to provide adequate growth and development. In addition to increased caloric intake at meals, provide the child with high-calorie, high-protein snacks, such as peanut butter and cheese. Low-fat products can be selected, if desired. Administer pancreatic enzymes with all meals and snacks. In addition, multiple vitamins and iron may be prescribed. Reinforce the need for these supplements to both the child and the family. The child also may require additional salt in the diet. Encourage the child to eat salty snacks. If the child has bouts of diarrhea or constipation, the dosage of enzymes may need to be adjusted. Report any change in bowel movements. Weigh and measure the child. Plot growth on a chart so that progress can easily be visualized.

Reducing the Child’s Anxiety
Provide age-appropriate activities to help alleviate anxiety and the boredom that can result from hospitalization. Choose activities such as reading or arts and crafts according to age. Schoolwork may help ease some anxiety. Some older children may enjoy a video game, if available, but watch the child for overexcitement. Encourage the family caregiver to stay with the child to help diminish some of the child’s anxiety. Allow the child to have familiar toys or mementos from home. Stay with the child during acute episodes of coughing and dyspnea to reduce anxiety. Give the child age-appropriate information about CF. Quiz the child in a relaxed, friendly manner to help determine what the child knows and what teaching may be needed. Learning about CF can be turned into a game for some children, making it much more enjoyable.

Providing Family Support
The family with a child who has CF is faced with a long-term illness and may have already seen deterioration in the child’s health. Give the family and the child opportunities to voice fears and anxieties. Respond with active-listening techniques to help authenticate their feelings. Provide emotional support throughout the entire hospital stay. Demonstrate an interest and willingness to talk to the family; do not make family members feel as though they are intruding on time needed to do other things. As the nurse, you are the person who can best provide overall support.

Providing Family Teaching
Evaluate the family’s knowledge about CF to determine their teaching needs. The family may need to have all the information repeated or may need clarification in just a few areas. Provide information for resources such as the Cystic Fibrosis Foundation, the American Lung Association (www.lungusa.org), and other local organizations. The family may have questions about genetic counseling and may need referrals for counseling.

Evaluation: Goals and Expected Outcomes
Goal: The child’s airway will be clear.
Expected Outcomes: The child
- effectively clears mucus from the airway and the airway remains patent.
- cooperates with chest physical therapy.
Goal: The child will exhibit adequate respiratory function.
Expected Outcomes: The child
- rests quietly with no dyspnea; the respiratory rate is even and appropriate for age.
- maintains oxygen saturation above 90%.
Goal: The child will remain free of signs and symptoms of infection.
Expected Outcomes:
- The child’s vital signs are within normal limits for age.
- The child and family follow infection-control practices.
Chapter 36  

The Child With a Respiratory Disorder

Goal: The child's nutritional intake will be adequate to compensate for decreased absorption of nutrients and to provide for adequate growth and development.

Expected Outcomes:
- The child demonstrates weight gain appropriate for age.
- The child exhibits normal growth as indicated by growth chart.

Goal: The child's anxiety will subside.

Expected Outcome:
- The child engages in age-appropriate activities and appears relaxed.

Goal: The family caregivers will verbalize feelings related to the child's chronic illness.

Expected Outcome:
- The family caregivers verbalize fears, anxieties, and other feelings related to the child's illness.

Goal: The family caregivers will verbalize an understanding of the child's illness and treatment.

Expected Outcomes:
- The family caregivers explain CF and describe treatments and possible complications.
- The family caregivers become involved in available support groups.

Tuberculosis is caused by Mycobacterium tuberculosis, a bacillus spread by droplets of infected mucus that become airborne when the infected person sneezes, coughs, or laughs. The bacilli, when airborne, are inhaled into the respiratory tract of the unsuspecting person and become implanted in lung tissue. This process is the beginning of the formation of a primary lesion.

Clinical Manifestations

Primary tuberculosis is the original infection that goes through various stages and ends with calcification. Primary lesions in children are generally unrecognized. The most common site of a primary lesion is the alveoli of the respiratory tract. Most cases arrest with the calcification of the primary infection. However, in children with poor nutrition or health, the primary infection may invade other tissues of the body, including the bones, joints, kidneys, lymph nodes, and meninges. This is called miliary tuberculosis. In the small number of children with miliary tuberculosis, general symptoms of chronic infection, such as fatigue, loss of weight, and low-grade fever, may occur accompanied by night sweats.

Secondary tuberculosis is a reactivation of a healed primary lesion. It often occurs in adults and contributes to the exposure of children to the organism. Although secondary lesions are more common in adults, they may occur in adolescents. Symptoms resemble those in an adult, including cough with expectoration, fever, weight loss, malaise, and night sweats.

Diagnosis

The tuberculin skin test is the primary means by which tuberculosis is detected. A skin test can be performed using a multipuncture device that deposits purified protein derivative intradermally (tine test) or by intradermal injection of 0.1 mL of purified protein derivative. Both tests are administered on the inner aspect of the forearm. The site is marked and read at 48 and 72 hours. Redness, swelling, induration, and itching of the site indicate a positive reaction. Persons with a positive reaction are further examined by radiographic evaluation. Sputum tests of young children are rarely helpful because children do not produce a good specimen. Screening by means of skin testing is recommended for all children at 12 months, before entering school, and in adolescence. Screening is recommended annually for children in high-risk situations or communities including children in whose family there is an active case; Native Americans; and children who recently immigrated from Central or South America, the Caribbean, Africa, Asia, or the Middle East. Other high-risk children are those infected with human immunodeficiency virus, those who are homeless or live in overcrowded conditions, and those immunosuppressed for any reason.

Test Yourself

✔ What two immunizations have decreased the incidence of bacterial pneumonia in children?
✔ What major organs are affected by CF?
✔ What is the dietary treatment for CF?
✔ For what type of infection is the child with CF most susceptible?

PULMONARY TUBERCULOSIS

Tuberculosis is present in all parts of the world and is the most important chronic infectious disease in terms of illness, death, and cost (Starke, 2006). The incidence of tuberculosis in the United States had declined steadily until about 1985. In the years since, there has been an increase in the number of cases reported in the United States. Several factors contribute to this increase; one factor is the number of people who have human immunodeficiency virus and have become infected with tuberculosis.

Cultural Snapshot

In some cultures, it is common for many people to live together in one home or in a close living arrangement. Respiratory illness is easily spread from person to person when people live in close contact with each other.
Treatment

Drug therapy for tuberculosis includes administration of isoniazid (INH), often in combination with rifampin. Although INH has been known to cause peripheral neuritis in children with poor nutrition, few problems occur in children whose diets are well balanced. Rifampin is tolerated well by children but causes body fluids such as urine, sweat, tears, and feces to turn orange-red. A possible disadvantage for adolescents is that it may permanently stain contact lenses. Rifamate is a combination of rifampin and INH. Other drugs that may be used are ethambutol, streptomycin, and pyrazinamide.

Drug therapy is continued for 9 to 18 months. After drug therapy has begun, the child or adolescent may return to school and normal activities unless clinical symptoms are evident. An annual chest radiograph is necessary from that time on.

Prevention

Prevention requires improvements in social conditions such as overcrowding, poverty, and poor health care. Also needed are health education; medical, laboratory, and radiographic facilities for examination; and control of contacts and persons suspected of infection.

A vaccine called bacilli Calmette-Guérin (BCG) is used in countries with a high incidence of tuberculosis. It is given to tuberculin-negative persons and is said to be effective for 12 years or longer. Mass vaccination is not considered necessary in parts of the world where the incidence of tuberculosis is low. After administration of BCG vaccine, the skin test will be positive, so screening is no longer an effective tool. The use of BCG vaccine remains controversial because of the effect it has on screening for the disease, as well as the questionable effectiveness of the vaccine.

Key Points

➤ An infant or child’s respiratory system, because of its small size and underdeveloped anatomic structures, is more prone to respiratory problems. Smaller structures lead to a greater chance of obstruction and respiratory distress. As the child grows, the use of the thoracic muscles takes the place of the use of the diaphragm and abdominal muscles for breathing.

➤ The most common complication of acute nasopharyngitis (common cold) is otitis media.

➤ Avoiding or removing allergens is the best way to prevent allergic rhinitis. Antihistamines and hyposensitization may be helpful for some patients.

➤ The child with tonsillitis may have a fever, sore throat, difficulty swallowing, hypertrophied tonsils, and erythema of the soft palate. Exudate may be visible on the tonsils. Treatment of tonsillitis consists of analgesics, antipyretics, and antibiotics. Surgical removal of the tonsils and adenoids may be indicated.

➤ The most common complication of a tonsillectomy is hemorrhage or bleeding. The child must be observed, especially in the first 24 hours, after surgery and in the fifth to seventh postoperative days for unusual restlessness, anxiety, frequent swallowing, or rapid pulse. Vomiting bright, red-flecked emesis or bright red oozing or bleeding may indicate hemorrhage. If noted, these should be reported immediately.

➤ Spasmodic laryngitis may be of infectious or allergic origin. An attack is often preceded by a runny nose and hoarseness. The child awakens after a few hours of sleep with a bark-like cough; respiratory difficulty; stridor; and may be anxious, restless, and hoarse. Humidified air is used to decrease the laryngospasm. A low dose of an emetic may be used to reduce spasms of the larynx. Acute laryngotraceobronchitis is often caused by the staphylococcal bacterium. The child may become hoarse and have a barking cough and elevated temperature. Breathing difficulty, a rapid pulse, and cyanosis may occur. Antibiotics are given and the child is placed in a croupette or mist tent with oxygen. Epiglottitis is an acute inflammation of the epiglottis and is not commonly seen.

➤ Bronchiolitis/RSV is caused by a viral infection. Dyspnea occurs as well as a dry and persistent cough, extremely shallow respirations, air hunger, and cyanosis. Suprasternal and subcostal retractions are present with respirations as high as 60 to 80 breaths per minute. Diagnosis is made from clinical findings confirmed by laboratory testing (enzyme-linked immunosorbent assay [ELISA]). The child is hospitalized, placed on contact transmission precautions, and treated with high humidity by mist tent, rest, and increased fluids. Ribavirin (Virazole), an antiviral drug, may be used.

➤ An asthma attack can be triggered by a hypersensitive response to allergens; foods such as chocolate, milk, eggs, nuts, and grains; exercise; or exposure to cold or irritants such as wood-burning stoves, cigarette smoke, dust, and pet dander. Infections, stress, or anxiety can also trigger an asthma attack.

➤ During an asthma attack, the combination of smooth muscle spasms, which cause the lumina of the bronchi and bronchioles to narrow; edema; and increased mucus production causes respiratory obstruction.
The goals of asthma treatment include preventing symptoms, maintaining near-normal lung function and activity levels, preventing recurring exacerbations and hospitalizations, and providing the best medication treatment with the fewest adverse effects. Nursing care is focused on maintaining a clear airway, maintaining an adequate fluid intake, and relieving fatigue and anxiety.

Bacterial pneumonia is usually caused by pneumococcal or *H. influenzae* bacterium. The onset is usually abrupt, following a mild upper respiratory illness. Symptoms may include a high temperature, respiratory distress with air hunger, flaring of the nostrils, circumoral cyanosis, and chest retractions. Tachycardia and tachypnea are present, with a pulse rate as high as 140 to 180 beats per minute and respirations as high as 80 breaths per minute. Anti-infectives, such as penicillin or ampicillin, have proved to be the most effective in the treatment of pneumonia. If the child has a penicillin allergy, cephalosporin anti-infectives are also used. Nursing care is focused on maintaining respiratory function, preventing fluid deficit, maintaining body temperature, preventing otitis media, conserving energy, and relieving anxiety.

CF causes the exocrine (mucous-producing) glands to produce thick, tenacious mucus, rather than thin, free-flowing secretions. These secretions obstruct the secretory ducts of the pancreas, liver, and reproductive organs.

The sweat chloride test, which shows elevated sodium chloride levels in the sweat, is the principal diagnostic test used to confirm CF. Family history, analysis of duodenal secretions for trypsin content, history of failure to thrive, chronic or recurrent respiratory infections, and radiologic findings also help diagnose the disorder.

The most common and serious complications of CF arise from respiratory infections, which may lead to severe respiratory concerns.

Pancreatic enzymes given with meals and snacks are used in the dietary treatment of children with CF. The child’s diet is high in protein and carbohydrates, and salt in large amounts is allowed. The use of chest physiotherapy, antibiotics, and inhalation therapy help in the prevention and treatment of respiratory infections.

Tuberculosis can be detected by doing a tuberculin skin test using purified protein derivative. When a person has a positive reaction to the skin test, additional evaluation using radiography is done to confirm the disease. INH and Rifampin are used to treat tuberculosis and are given for 9 to 18 months.
Workbook

NCLEX-STYLE REVIEW QUESTIONS

1. The nurse is doing teaching with the caregivers of a child who has had a tonsillectomy the previous day and is being discharged. The nurse would reinforce that which of the following should be reported immediately to the child’s physician?
   a. The child complains of a sore throat on the third postoperative day.
   b. The child refuses to leave the ice collar on for more than 10 minutes.
   c. The child vomits dark, old blood within 4 hours after being discharged.
   d. The child has frequent swallowing around the sixth day after surgery.

2. A toddler with a diagnosis of a respiratory disorder has a fever and decreased urinary output. When planning care for this child, which of the following goals would be most appropriate for this toddler?
   a. The child’s anxiety will be reduced.
   b. The child’s fluid intake will be increased.
   c. The child’s caregivers will talk about their concerns.
   d. The child’s caloric intake will be adequate for age.

3. The nurse is teaching a group of caregivers of children who have asthma. The caregivers make the following statements. Which of these statements indicates a need for additional teaching?
   a. “We need to identify the things that trigger our child’s attacks.”
   b. “I always have him use his bronchodilator before he uses his steroid inhaler.”
   c. “We will be sure our child does not exercise to prevent attacks.”
   d. “She drinks lots of water, which I know helps to thin her secretions.”

4. A child with cystic fibrosis will have which of the following interventions included in the child’s plan of care?
   a. Maintain a flat lying position when in bed.
   b. Provide low protein snacks between meals.
   c. Perform postural drainage in the morning and evening.
   d. Teach infection control procedures when hospitalized.

5. After discussing the disease with the caregiver of a child with cystic fibrosis, the caregiver makes the following statements. Which of these statements indicates a need for additional teaching?
   a. “It is good to know that my other children won’t have the disease.”
   b. “I will be sure to give my child the medication every time she eats.”
   c. “It is important to let my child play with the other kids when she is at school.”
   d. “When she exercises, I will feed her a salty snack.”

6. The nurse is completing the intake and output record for a toddler who has a respiratory infection. The dry weight of the child’s diaper is 38 g. The child has had the following intake and output during the shift:
   Intake: 3 oz of apple juice
   ½ serving of pancakes
   5 oz of milk
   4 saltine crackers
   ¼ cup of chicken soup
   2 oz of gelatin
   130 cc of IV fluid
   Output: Diaper with urine weighing 87 f
   Diaper with stool only weighing 124 f
   Diaper with urine weighing 138 f
   Diaper with urine weighing 146 f
   Diaper with urine weighing 95 f
   a. How many milliliters should the nurse document as the child’s total intake?
   b. How many milliliters should the nurse document as the child’s urinary output?

STUDY ACTIVITIES

1. Draw a diagram to explain the heredity pattern of cystic fibrosis.

2. Research your community to find sources of help for families with children who have cystic fibrosis. What support groups and organizations are available that you might recommend to families of children with cystic fibrosis? Discuss with your peers what you found and make a list of resources to share.

3. Go to the following Web site: www.lungusa.org. Find the section on Asthma and on the drop down menu, click on “Asthma & Children.” Click on “Early Warning Signals: Asthma Always Gives a Sign.”
   a. List six areas covered on this site that you could share with a family of a child with asthma.
   b. What five suggestions are given in the area covering “What to Listen For?”
   c. Read the section on “How to Listen.”
   d. Describe how you listen to the breath sounds in a child with asthma.
   e. What are five emergency signs that require immediate treatment?
CRITICAL THINKING: WHAT WOULD YOU DO?

1. Sandy calls the 24-hour pediatric health line at 10:30 p.m. about her 2.5-year-old child Jared. Jared had gone to bed at his usual bedtime of 8:00 p.m. after an uneventful evening. He had awakened with a bark-like cough, respiratory difficulty, and a high-pitched harsh sound on inspiration.
   a. What questions would you ask this mother to further clarify Jared's situation?
   b. What would you suggest Sandy should do to decrease Jared's symptoms?
   c. What would you tell Sandy to watch for that might indicate Jared needs emergency attention?

2. Rachel, a 6-year-old girl, is brought to the clinic with a dry hacking cough, wheezing, and difficulty breathing. Rachel is coughing up thick mucus. Her parents are with her and are extremely anxious about Rachel's condition. The pediatrician examines Rachel, and a diagnosis of an acute asthma attack is made.
   a. What other findings might have been noted during a physical exam of Rachel?
   b. What will most likely be done to treat Rachel's current condition?
   c. What medications might have been given?
   d. What would you teach Rachel's parents about prevention of additional attacks?

3. Dosage calculation: A toddler with a diagnosis of cystic fibrosis is being treated with the bronchodilator Theophylline. The child weighs 32 lb. The usual dosage of this medication is 4 mg/kg/dose every 6 hours. Answer the following:
   a. How many kilograms does the child’s weigh?
   b. How many milligrams per dose will be given?
   c. How many doses will the child receive in a day?
   d. How much Theophylline will be given in a 24-hour period?