ASTHMA

- **Asthma** is a chronic inflammatory lung disease that results in recurrent episodes of airflow obstruction, but it is usually reversible. The chronic inflammation causes an increase in airway hyperresponsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and cough, particularly at night or in the early morning.

- Although the exact mechanisms that cause asthma remain unknown, triggers are involved.
  - Allergic asthma may be related to allergies, such as tree or weed pollen, dust mites, molds, animals, feathers, and cockroaches.
  - Asthma that is induced or exacerbated during physical exertion is called exercise-induced asthma. Typically, this type of asthma occurs after vigorous exercise, not during it.
  - Various air pollutants, cigarette or wood smoke, vehicle exhaust, elevated ozone levels, sulfur dioxide, and nitrogen dioxide can trigger asthma attacks.
  - Occupational asthma occurs after exposure to agents of the workplace. These agents are diverse such as wood and vegetable dusts (flour), pharmaceutical agents, laundry detergents, animal and insect dusts, secretions and serums (e.g., chickens, crabs), metal salts, chemicals, paints, solvents, and plastics.
  - Respiratory infections (i.e., viral and not bacterial) or allergy to microorganisms is the major precipitating factor of an acute asthma attack.
  - Sensitivity to specific drugs may occur in some asthmatic persons, especially those with nasal polyps and sinusitis, resulting in an asthma episode.
  - Gastroesophageal reflux disease can also trigger asthma.
  - Crying, laughing, anger, and fear can lead to hyperventilation and hypocapnia which can cause airway narrowing.

- The characteristic clinical manifestations of asthma are wheezing, cough, dyspnea, and chest tightness after exposure to a precipitating factor or trigger. Expiration may be prolonged.

- Asthma can be classified as mild intermittent, mild persistent, moderate persistent, or severe persistent.

- Severe acute asthma can result in complications such as rib fractures, pneumothorax, pneumomediastinum, atelectasis, pneumonia, and status asthmaticus. **Status asthmaticus** is a severe, life-threatening asthma attack that is refractory to usual treatment and places the patient at risk for developing respiratory failure.

- Diagnosis: there is some controversy about how to best diagnose asthma. In general, the health care provider should consider the diagnosis of asthma if various indicators (i.e., clinical manifestations, health history, and peak flow variability) are positive.

- Patient education remains the cornerstone of asthma management and should be carried out by health care providers providing asthma care. Desirable therapeutic outcomes include (1) control or elimination of chronic symptoms such as cough, dyspnea, and nocturnal awakenings; (2) attainment of normal or nearly normal lung function; (3) restoration or maintenance of normal levels of activity; (4) reduction in the number or elimination of recurrent exacerbations; (5) reduction in the number or elimination of emergency department visits and acute care hospitalizations; and (6) elimination or reduction of side effects of medications.
Medications are divided into two general classifications: (1) long-term–control medications to achieve and maintain control of persistent asthma, and (2) quick-relief medications to treat symptoms and exacerbations.

- Because chronic inflammation is a primary component of asthma, corticosteroids, which suppress the inflammatory response, are the most potent and effective antiinflammatory medication currently available to treat asthma.
- Mast cell stabilizers are nonsteroidal antiinflammatory drugs that inhibit the IgE-mediated release of inflammatory mediators from mast cells and suppress other inflammatory cells (e.g., eosinophils).
- The use of leukotriene modifiers can successfully be used as add-on therapy to reduce (not substitute for) the doses of inhaled corticosteroids.
- Short-acting inhaled β<sub>2</sub>-adrenergic agonists are the most effective drugs for relieving acute bronchospasm. They are also used for acute exacerbations of asthma.
- Methylxanthine (theophylline) preparations are less effective long-term control bronchodilators as compared to β<sub>2</sub>-adrenergic agonists.
- Anticholinergic agents (e.g., ipratropium [Atrovent], tiotropium [Spiriva]) block the bronchoconstricting influence of parasympathetic nervous system.

One of the major factors for determining success in asthma management is the correct administration of drugs.

Inhalation devices include metered-dose inhalers, dry powder inhalers, and nebulizers.

Several nonprescription combination drugs are available over the counter. An important teaching responsibility is to warn the patient about the dangers associated with nonprescription combination drugs.

A goal in asthma care is to maximize the ability of the patient to safely manage acute asthma episodes via an asthma action plan developed in conjunction with the health care provider. An important nursing goal during an acute attack is to decrease the patient’s sense of panic.

Written asthma action plans should be developed together with the patient and family, especially for those with moderate or severe persistent asthma or a history of severe exacerbations.

### CHRONIC OBSTRUCTIVE PULMONARY DISEASE

- **Chronic obstructive pulmonary disease** (COPD) is a preventable and treatable disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases, primarily caused by cigarette smoking.

- In addition to cigarette smoke, occupational chemicals, and air pollution, infections are risk factors for developing COPD. Severe recurring respiratory tract infections in childhood have been associated with reduced lung function and increased respiratory symptoms in adulthood.

- **α<sub>1</sub>-Antitrypsin deficiency**, an autosomal recessive disorder, is a genetic risk factor that can lead to COPD.

- Aging results in changes in the lung structure, the thoracic cage, and the respiratory muscles, and as people age there is gradual loss of the elastic recoil of the lung. Therefore some degree
of emphysema is common in the lungs of the older person, even a nonsmoker.

- The term chronic obstructive pulmonary disease encompasses two types of obstructive airway diseases, chronic bronchitis and emphysema.
  - **Chronic bronchitis** is the presence of chronic productive cough for 3 months in each of 2 consecutive years in a patient in whom other causes of chronic cough have been excluded.
  - **Emphysema** is an abnormal permanent enlargement of the airspaces distal to the terminal bronchioles, accompanied by destruction of their walls and without obvious fibrosis.

- A diagnosis of COPD should be considered in any patient who has symptoms of cough, sputum production, or dyspnea, and/or a history of exposure of risk factors for the disease. An intermittent cough, which is the earliest symptom, usually occurs in the morning with the expectoration of small amounts of sticky mucus resulting from bouts of coughing.

- COPD can be classified as at risk, mild, moderate, severe, and very severe.

- Complications of COPD include the following:
  - **Cor pulmonale** is hypertrophy of the right side of the heart, with or without heart failure, resulting from pulmonary hypertension and is a late manifestation of chronic pulmonary heart disease.
  - Exacerbations of COPD are signaled by a change in the patient’s usual dyspnea, cough, and/or sputum that is different than the usual daily patterns. These flares require changes in management.
  - Patients with severe COPD who have exacerbations are at risk for the development of respiratory failure.
  - The incidence of peptic ulcer disease is increased in the person with COPD.
  - Anxiety and depression can complicate respiratory compromise and may precipitate dyspnea and hyperventilation.

- The diagnosis of COPD is confirmed by pulmonary function tests. Goals of the diagnostic workup are to confirm the diagnosis of COPD via spirometry, evaluate the severity of the disease, and determine the impact of disease on the patient’s quality of life. When the FEV₁/FVC ratio is less than 70%, it suggests the presence of obstructive lung disease.

- The primary goals of care for the COPD patient are to (1) prevent disease progression, (2) relieve symptoms and improve exercise tolerance, (3) prevent and treat complications, (4) promote patient participation in care, (5) prevent and treat exacerbations, and (6) improve quality of life and reduce mortality.

- Cessation of cigarette smoking in all stages of COPD is the single most effective and cost-effective intervention to reduce the risk of developing COPD and stop the progression of the disease.

- Although patients with COPD do not respond as dramatically as those with asthma to bronchodilator therapy, a reduction in dyspnea and an increase in FEV₁ are usually achieved. Presently no drug modifies the decline of lung function with COPD.

- O₂ therapy is frequently used in the treatment of COPD and other problems associated with hypoxemia. Long-term O₂ therapy improves survival, exercise capacity, cognitive
performance, and sleep in hypoxemic patients.

- O₂ delivery systems are classified as low- or high-flow systems. Most methods of O₂ administration are low-flow devices that deliver O₂ in concentrations that vary with the person’s respiratory pattern.
- Dry O₂ has an irritating effect on mucous membranes and dries secretions. Therefore it is important that O₂ be humidified when administered, either by humidification or nebulization.

- Three different surgical procedures have been used in severe COPD:
  - Lung volume reduction surgery is used to reduce the size of the lungs by removing about 30% of the most diseased lung tissue so the remaining healthy lung tissue can perform better.
  - A bullectomy is used for certain patients and can result in improved lung function and reduction in dyspnea.
  - In appropriately selected patients with very advanced COPD, lung transplantation improves functional capacity and enhances quality of life.

- Respiratory therapy (RT) and physical therapy (PT) rehabilitation activities are performed by respiratory therapists or physical therapists, depending on the institution. RT and/or PT activities include breathing retraining, effective cough techniques, and chest physiotherapy.
  - Pursed-lip breathing is a technique that is used to prolong exhalation and thereby prevent bronchiolar collapse and air trapping. Often instinctively patients will perform this technique.
  - The main goals of effective coughing are to conserve energy, reduce fatigue, and facilitate removal of secretions. Huff coughing is an effective technique that the patient can be easily taught.
  - Chest physiotherapy consists of percussion, vibration, and postural drainage.

- Weight loss and malnutrition are commonly seen in the patient with severe emphysematous COPD. The patient with COPD should try to keep the body mass index (BMI) between 21 and 25 kg/m².

- The patient with COPD will require acute intervention for complications such as exacerbations of COPD, pneumonia, cor pulmonale, and acute respiratory failure.

- Pulmonary rehabilitation should be considered for all patients with symptomatic COPD or having functional limitations. The overall goal is to increase the quality of life.

- Walking is by far the best physical exercise for the COPD patient. Adequate sleep is also extremely important.

**Cystic Fibrosis**

- Cystic fibrosis (CF) is an autosomal recessive, multisystem disease characterized by altered function of the exocrine glands primarily involving the lungs, pancreas, and sweat glands.

- Initially, CF is an obstructive lung disease caused by the overall obstruction of the airways with mucus. Later, CF also progresses to a restrictive lung disease because of the fibrosis, lung destruction, and thoracic wall changes.

- The major objectives of therapy in CF are to (1) promote clearance of secretions, (2) control infection in the lungs, and (3) provide adequate nutrition.
BRONCHIECTASIS

- **Bronchiectasis** is characterized by permanent, abnormal dilation of one or more large bronchi. The pathophysiologic change that results in dilation is destruction of the elastic and muscular structures supporting the bronchial wall.

- The hallmark of bronchiectasis is persistent or recurrent cough with production of large amounts of purulent sputum, which may exceed 500 ml/day.

- Bronchiectasis is difficult to treat. Therapy is aimed at treating acute flare-ups and preventing decline in lung function.

- Antibiotics are the mainstay of treatment and are often given empirically, but attempts are made to culture the sputum. Long-term suppressive therapy with antibiotics is reserved for those patients who have symptoms that recur a few days after stopping antibiotics.

- An important nursing goal is to promote drainage and removal of bronchial mucus.