Description/Etiology
Asthma is a chronic disease characterized by reversible obstruction of airflow due to inflammation and narrowing of the airways. Although onset of asthma is usually in early childhood, adult-onset asthma can occur and about half of cases of asthma with childhood onset persist in adulthood.

The exact cause of asthma is unknown. A genetic component is possible because of a strong association between a mutation in the ADAM-33 gene and bronchial hyperresponsiveness/asthma; a family history of asthma has been linked to an increased risk of developing asthma. Certain environmental exposures, psychological factors, and medical conditions (e.g., gastroesophageal reflux disease [GERD]) might increase risk of developing asthma.

Asthma is classified based on symptom frequency and severity in the four levels of mild intermittent, mild persistent, moderate persistent, and severe persistent. Status asthmaticus is characterized by an acute asthma attack of such severity that it is considered a medical emergency because it can lead to respiratory failure and death (for information, see Quick Lesson About ... Status Asthmaticus). The differential diagnosis includes anxiety disorders, heart failure, chronic obstructive pulmonary disease (COPD; for information, see Food for Thought, below), pulmonary embolism (PE), pneumonia, rhinitis, hypersensitivity pneumonitis, Wegner’s granulomatosis, and diffuse interstitial lung disease.

Prognosis is good with treatment, adherence to the medication regimen, and regular use of home monitoring devices (e.g., peak flow meters). Treatment depends on asthma severity and can include inhaled short- and long-acting beta2-agonists (SABAs and LABAs, respectively) to reduce bronchoconstriction and improve breathing; inhaled corticosteroids to reduce inflammation; leukotriene inhibitors (also called leukotriene modifiers and leukotriene receptor antagonists), cromolyn or nedocromil to prevent symptoms (e.g., due to seasonal allergies); and theophylline to relax bronchial smooth muscles. (For more information on asthma, see the series of related Quick Lessons, Evidence-Based Care Sheets, and Nursing Practice & Skills.)

Facts and Figures
Asthma is the most common chronic disease worldwide; it affects an estimated 24 million persons in the United States—including 17 million adults—and 300 million persons worldwide. In the U.S., the prevalence of asthma is 10% in children and 5% in adults.

Before puberty, the male-to-female ratio is 2:1; after puberty, it then becomes 1:1. Most cases of asthma that is diagnosed in patients who are older than 40 years of age occur in women. Occupational factors contribute to an estimated 10–15% of cases of asthma in adults; more than 300 substances have been linked to the development of asthma. In a study of 160 patients with adult-onset asthma in Turkey, 11.3% experienced remission over a 7-years follow-up (Sözener at el., 2015).

Risk Factors
Persons who are at highest risk for adult asthma in the U.S. include those with allergies and women; Blacks are more likely than Whites to require hospitalization and to die from asthma. Risk factors for the development of asthma include premature birth, a family history of asthma, obesity, and maternal smoking during pregnancy. Factors that increase...
risk of asthma and potential triggers of an asthma attack include airway hyperactivity, atopy, allergic hypersensitivity (e.g., allergic rhinitis, eczema, allergic conjunctivitis), allergies (e.g., to pollen, mold, dust mites, cockroaches, animal dander), exposure to certain environmental factors (e.g., cigarette smoke, fumes from strong household cleaners, paint, and scented products, air pollution, ozone, nitrogen oxide [e.g., given off by gas stoves], sulfur dioxide [i.e., a component of smog], cold temperatures, and high humidity), upper respiratory tract infection, strong emotional expressions (e.g., stress, crying, or laughing hard), certain drugs (e.g., aspirin and beta blockers), sulfites (e.g., found in wine and dried fruit), and exercise. Occupations in agriculture, mining, construction, or janitorial work are risk factors for asthma Because of exposure to allergens and fumes.

**Signs and Symptoms/Clinical Presentation**

Signs and symptoms of asthma vary in duration and frequency, lasting from less than 1 hour to several days, or occurring daily, weekly, or monthly. The clinical presentation typically includes chest tightness, wheezing, dyspnea (i.e., difficulty breathing), tachycardia, and nocturnal cough.

**Assessment**

- **Patient History**
  - Ask about personal history of asthma attacks, allergies, hospitalizations, medication use, smoking, and coexisting medical, psychiatric conditions or both and family history of asthma
  - History of allergies and intermittent reactive symptoms are suggestive of asthma, whereas advanced age and history of smoking are more consistent with COPD
- **Physical Findings of Particular Interest**
  - Wheezing, cough, tachycardia, tachypnea, and increased mucus production are usual
- **Laboratory Tests That May Be Ordered**
  - CBC with differential might show an increased number of immature leukocytes (i.e., commonly called a left shift), indicating infection; sputum culture might indicate infection; increased eosinophil count and serum immunoglobulin E (IgE) levels are indicative of allergic reaction
  - Arterial blood gas (ABG) analysis of oxygen concentration, CO2 content, and pH levels will identify asthma severity. Mild asthma is characterized by ↓ PaO2, ↓ PaCO2, and ↑ pH; moderate asthma by normal PaCO2 and pH and ↓ PaO2; and **severe asthma** by ↓ PaO2, ↓ pH, and ↑ PaCO2
- **Other Diagnostic Tests/Studies**
  - Pulmonary function tests identify peak expiratory flow rate (PEFR), forced expiratory volume in 1 second (FEV1), and forced vital capacity (FVC)
  - Chest X-rays might show thoracic hyperinflation; radioallergosorbent tests (RAST) can identify allergens; and echocardiograms can be ordered to assess for heart failure

**Treatment Goals**

- **Promote Symptomatic Relief and Reduce Risk of Complications**
  - Monitor vital signs, intake and output, pulmonary function test results, pulse oximetry, and ABG test results; frequently assess for complications (e.g., respiratory distress, steroid myopathy, pneumothorax, and hypoxia)
  - Administer prescribed medications; monitor treatment efficacy and for side effects
    - Short-term management typically includes SABAs (e.g., bronchodilators [e.g., albuterol, levalbuterol] or subcutaneously injected terbutaline) to rapidly reduce bronchoconstriction in cases of intermittent asthma
    - Long-term management for persistent asthma may include inhaled corticosteroids (e.g., methylPREDNISolone or predniSONe) to reduce inflammation, LABAs (e.g., salmeterol, formoterol, salmeterol with fluticasone, or formoterol with budesonide), leukotriene inhibitors (e.g., zafirlukast, zileuton, and montelukast) as alternative or adjunctive treatment, cromolyn and nedocromil to prevent symptoms before exercise or exposure to known allergens, and methylxanthines (e.g., theophylline) to reduce bronchoconstriction
    - Monoclonal antibodies therapy (e.g., Omalizumab), an anti-IgE antibody administered by subcutaneous injection that acts systemically by influencing the immunopathogenesis of asthma; can be prescribed in cases of moderate or severe persistent asthma that is not controlled by inhaled corticosteroids
  - Patients with severe asthma may benefit from anasthmaspecialist consultation for consideration of additional treatment
  - Provide frequent nebulized beta2-agonist and ipratropium, aminophylline I.V. drip, and intubation and mechanical ventilation for patients who are not responding to other treatment, as ordered
Educate and Provide Emotional Support

- Assess patient’s anxiety level and coping ability; provide emotional support and explain the importance of using accessory muscles (e.g., diaphragmatic and pursed-lip breathing) to breathe when necessary. Educate about asthma pathophysiology, potential complications, treatment risks and benefits, correct use of bronchodilators and spacers, and individualized prognosis.

Food for Thought

- Asthma signs and symptoms can worsen before and during menses (commonly called premenstrual asthma).
- It can be difficult to distinguish between asthma and COPD, particularly in older adults and smokers, and 15–20% of older adults with obstructive airway disease have a mixed COPD-asthma phenotype that is called asthma-COPD overlap syndrome (ACOS).
- Obesity has been linked to the development of asthma and worse asthma control.
- In a study of 1,227 adults treated for asthma exacerbation at 48 emergency departments in 23 U.S. states, researchers found that obese patients were 69% more likely than normal-weight patients to require hospitalization (Hasegawa et al., 2014).
- Investigators in a study of 22 obese adults with asthma reported that weight loss was associated with significant improvements in asthma severity, airway hyperresponsiveness, asthma control, lung function, and quality of life (Pakhale et al., 2015).
- Researchers in an observational cross-sectional study of 4791 individuals found in morbidly obese individuals (i.e., body mass index > 40 kg/m2) that prevalence of asthma was 4.57% and the quality of life (QOL) was impaired among the asthmatic obese individuals. External environmental stimuli (e.g., smoke, dust, foul weather, pollution and perfume fragrances) and the worst impairment may potentiate systemic pulmonary inflammation, thus leading to hyperresponsivity of the airways and episodes of bronchospasm (Baltieri et al., 2017).
- Researchers in a population-based study of 447,801 adults in the U.S. found that foreign-born adults were 48% less likely than adults born in the U.S. to have ever had asthma and 50% less likely to currently have asthma; however, risk of developing asthma increased with duration of residence in the U.S., with foreign-born adults who lived in the U.S. for more than 10 years being 28% more likely to have ever had asthma and 70% more likely to currently have asthma than those who lived in the U.S. for 4 or fewer years (Silverberg et al., 2014).
- Recent pilot study results suggest that the rigorous deployment of a dietary intervention providing complete meals in a healthy diet (i.e., characterized by higher intake of fruits, vegetables, whole grains, lean meats, fish, nuts, and omega-3 fatty acids) may improve symptoms and lung function in patients with asthma (Brigham et al., 2017).

Red Flags

- LABAs might increase risk of asthma-related death; they should only be used in conjunction with another long-term asthma medication (e.g., inhaled corticosteroids) by patients with asthma not adequately being controlled with other controller medicines.
- Factors that are associated with increased asthma-related morbidity and mortality include age > 65 years, frequent and severe signs and symptoms, illicit drug use, lower socioeconomic status, and the presence of comorbidities (e.g., cardiovascular disease, obesity).
- Live attenuated influenza vaccine (LAIV) is contraindicated in adults who have asthma.

What Do I Need to Tell the Patient/Patient’s Family?

- Provide the patient with written information on asthma, if available, and educate on the correct use of inhalers, medications, peak flow home monitoring devices, and coughing techniques.
- Educate regarding the importance of adhering to the prescribed treatment regimen and continued medical surveillance, monitoring daily signs and symptoms, avoiding triggers (e.g., smoking and secondhand smoke, cold air, aspirin, sulfites, dairy, nuts, stress, intense exercise, cockroaches, pet dander, mold, dust mites), and covering upholstered furniture and vents.
- Recommend finding additional information from the Asthma and Allergy Foundation of America at http://www.aafa.org.

References


