Pulmonary Disease, Chronic Obstructive (COPD): an Overview

Description/Etiology

Chronic obstructive pulmonary disease (COPD) is a preventable, debilitating and potentially life-threatening disease that is defined in the 2017 consensus report by the Global Initiative for Chronic Obstructive Lung Disease (GOLD; referred to as the GOLD report) as “characterized by persistent irreversible respiratory symptoms and airflow limitation due to airway and/or alveolar abnormalities, usually caused by significant exposure to noxious particles or gases” (Vogelmeier et al., 2017; for details of the GOLD report, see http://atsjournals.org/doi/full/10.1164/rccm.201701-0218PP). The chronic inflammation and increasingly obstructed airflow experienced by patients with COPD are not entirely reversible with medication, and patients typically develop chronic bronchitis (i.e., chronic inflammation of the airways that results in excess mucus production, cough, and airway obstruction) and/or emphysema (i.e., progressive, permanent distension and subsequent destruction of the alveoli that results in impaired gas exchange). The onset, presence, severity, and contribution to disease status of chronic bronchitis and emphysema vary widely among persons with COPD; for this reason, the definition of COPD in the GOLD report no longer includes these conditions as being definitive of COPD, but describes them as a variable part of the pathology of COPD (for information regarding chronic bronchitis and emphysema, see Quick Lesson About ... Bronchitis, Chronic and Quick Lesson About ... Emphysema).

The course of COPD is invariably marked by exacerbation characterized by dyspnea, cough, and/or increased mucus production; the average patient with COPD has 1–2 acute exacerbations each year. Patients can experience severe breathlessness with activity, and patients with emphysema can be cachectic, regardless of the adequacy of caloric intake. Potential complications of COPD include respiratory infection, pulmonary hypertension, malnutrition, pneumothorax, cor pulmonale (also called pulmonary heart disease; i.e., right-sided heart failure as a result of long-term lung diseases such as COPD, pulmonary hypertension, and cystic fibrosis), polycythemia, acute and chronic respiratory failure, arrhythmias, depression, nocturnal hypoxia, and disordered sleep.

Diagnosis of COPD is made based on patient history and clinical findings and requires ruling out other lung and heart diseases. Treatment includes education regarding the importance of smoking cessation and initiating strategies for self-management, including improved nutrition and regular physical activity. In addition to a rescue/emergency inhaler for acute symptoms, a maintenance inhaler of a long-acting bronchodilator (e.g., a β2-agonist or anticholinergic) is usually ordered for long-term improvement of airflow. Supplemental oxygen, inhaled corticosteroids, antibiotics, and noninvasive positive pressure ventilation (NPPV) may be ordered for acute exacerbations; about half of exacerbations occur as a result of bacterial respiratory tract infection, and early antibiotic treatment is associated with better patient outcomes. Select patients with advanced emphysema may benefit from surgery to reduce lung volume. Pulmonary rehabilitation (i.e., a program of education and exercise that assists patients in making necessary lifestyle changes) can reduce fatigue, hospitalizations, and mortality, and can lead to improvement in performance of ADLs and in quality of life (QOL). Lung transplantation may be considered for certain patients with very severe COPD (e.g., as demonstrated by having a forced expiratory volume in...
one second [FEV$_1$] of < 25%). For more information on COPD, see the series of related Evidence-Based Care Sheets.

**Facts and Figures**

COPD is the third leading cause of death in the United States and the fourth leading cause of death worldwide. An estimated 32 million persons in the U.S. have been diagnosed with COPD. 14% of adults ages 40–79 years of age in the U.S are affected by COPD which accounts for 16 million outpatient office visits, 500,000 hospitalizations, 120,000–140,000 deaths, and more than $18 billion in direct healthcare costs annually. COPD is more common in African-Americans than in other ethnicities; the estimated prevalence among men is 11.8%, and 8.5% among women. Approximately 80% of cases of COPD are due to cigarette smoking. Use of a maintenance inhaler appears to be underutilized in this patient population; only 22–31% of patients with COPD report regular use.

**Risk Factors**

Smoking is the primary risk factor for COPD; 80% of COPD in the U.S. is related to cigarette smoking and 20% is related to occupational or other exposure to respiratory irritants, vapors, or fumes (e.g., secondhand smoke, occupational smoke [e.g., firefighting], air pollution, coal dust, cadmium, silica, dust). Additional risk factors include male sex, age ≥ 40 years, severe respiratory infections in childhood, passive exposure to cigarettes smoke, asthma, alcohol consumption, airway hyperactivity, history of pulmonary tuberculosis, intrauterine growth restriction, poor nutrition, and genetic predisposition (e.g., alpha-1 antitrypsin deficiency). Causes of COPD exacerbation include viral and bacterial infections, heart failure, HIV, I.V. drug use, pneumonia, pulmonary embolism, nonadherence to the prescribed regimen for inhaled medications, and inhalation of irritants, including cigarette smoke. Patients with COPD that live in isolated, rural areas are at an increased risk for mortality associated with exacerbation of respiratory symptoms.

**Signs and Symptoms/Clinical Presentation**

Signs and symptoms of COPD include dyspnea, fatigue, chronic cough, increased sputum production, and weight loss. Patients with advanced COPD often present with edema, cyanosis, plethora, and labored breathing. Patients with emphysema develop a barrel chest, cachexia, and pursed-lip breathing.

**Assessment**

› **Patient History**
  - Ask about onset and duration of current symptoms, history of smoking or occupational exposure, allergy, other lung and heart diseases, nasal polyps, alcohol and tobacco use, unintentional weight loss, activity restrictions, fatigue, and sleep patterns and ask about current medications. Obtain additional information from previous chart, if available

› **Physical Findings of Particular Interest**
  - Lung auscultation will identify wheezes, rales, rhonchi, and decreased breath sounds; sputum might be purulent in patients with acute exacerbation and bacterial respiratory tract infection
  - Dyspnea and fatigue can be evident during meals, when walking, and even at rest
  - Capacity for independence with ADLs might be diminished
  - Patients with emphysema can be cachectic

› **Laboratory Tests**
  - In chronic bronchitis, ABGs will show hypercapnia and hypoxia; in emphysema, ABGs usually show normal PaCO$_2$ and can show mild hypoxia
  - CBC can show leukocytosis indicating infection, and elevated Hct, indicating polycythemia
  - Complete metabolic panel can be ordered to establish baseline levels, and to exclude hypokalemia secondary to treatment (e.g., diuretics)
  - B-type natriuretic peptide (BNP) can be ordered if congestive heart failure is suspected
  - Alpha-1 antitrypsin screening can be performed in patients who are < 45 years of age or patients who have a blood relative with COPD
  - Sputum cultures and blood cultures may be ordered if respiratory tract infection is suspected

› **Diagnostic Tests/Studies**
  - A definitive diagnosis of COPD is made with spirometry testing showing airflow obstruction when the forced expiratory volume in 1 second over vital capacity (FEV$_1$/FVC) is less than 70%.
• Chest X-ray of a patient with emphysema may show lung hyperinflation, small heart, and flattening of diaphragm. For the patient with chronic bronchitis, chest X-ray can show lung hyperinflation, increased bronchovascular markings, and cardiomegaly
• Electrocardiogram (ECG) can be ordered to exclude cardiac involvement or pulmonary hypertension
• CT scan can be ordered to confirm diagnosis, and determine treatment
• Echocardiography can be ordered if pulmonary hypertension is suspected

Treatment Goals

› Promote Optimal Respiratory Status and Reduce Risk of Complications
  • Monitor vital signs and assess respiratory system every 4 hours if the patient is stable and more often if patient is unstable according to facility protocol and treating clinician orders; assess skin color, oxygen saturation, and sputum for color and consistency. Administer prescribed oxygen if saturation falls below 88% to maintain saturation > 90% or as ordered (for information, see Food for Thought, below)
  • Encourage fluids and monitor intake (at least 1,200 mL/day if unrestricted); promote optimal nutritional intake and provide dietary supplementation, as ordered. (For information, see Evidence-Based Care Sheet: Pulmonary Disease, Chronic Obstructive (COPD): Nutrition)
  • Maintain elevation of the head of the bed to at least 30°
  • Monitor use of and assist with long-acting bronchodilator inhalers (e.g., β2-agonists and/or anticholinergics) and inhaled corticosteroids, as ordered, to improve airflow and reduce hyperinflation
  – Educate patient to rinse mouth after using inhalers that contain corticosteroids, as appropriate
  • Administer additional bronchodilators, antibiotics, systemic corticosteroids to reduce lung inflammation, and noninvasive positive pressure ventilation (NPPV) to reduce respiratory effort in patients with COPD exacerbation, as appropriate. (For information, see Evidence-Based Care Sheet: Pulmonary Disease, Chronic Obstructive (COPD): Noninvasive Positive Pressure Ventilation)
  – Assist with initiation and maintenance of mechanical ventilation if indicated for patients in refractory respiratory failure
  • Promote uninterrupted rest periods following treatments and procedures
  • Request referral to pulmonary rehabilitation and encourage patients to learn how to improve activity tolerance and perform ADLs with less dyspnea
  • Follow facility pre- and postsurgical protocols if patient becomes a candidate for surgical volume reduction of lungs or lung transplantation; reinforce pre- and postsurgical education and verify completion of facility informed consent documents

› Provide Emotional Support and Educate
  • Assess patient/family anxiety level, coping ability, and for knowledge deficits regarding COPD; provide emotional support and education about COPD pathophysiology, treatment risks and benefits, lifestyle changes, the importance of adherence to the prescribed treatment regimen, and individualized prognosis
  • Request referral to a social worker for identification of local resources, including in-home services, smoking cessation programs, pulmonary rehabilitation programs, support groups, and education programs on COPD self-management, including nutrition
  • Educate about the “huff” cough technique, which involves leaning forward and exhaling sharply with a “huff” sound, then inhaling by taking rapid short breaths in succession (called “sniffing”) to clear airways of secretions and prevent mucus return to smaller airways
  • Teach patients how to perform a controlled cough to clear secretions: after using a bronchodilator, inhale deeply, hold breath for a few seconds, and then cough twice

Food for Thought

› Cystic fibrosis, bronchiectasis, and asthma were previously classified as types of COPD but are now classified as chronic pulmonary disorders
› An estimated 18–62% of older adults with COPD have clinically significant signs and symptoms of depression. Untreated depression is associated with a poor prognosis, compromised QOL, and 45% increase in costs of care. Nonetheless, only one-third of patients with COPD receive appropriate treatment for depression (Naqvi et al., 2016)
› Patients with COPD were historically referred to as blue bloaters (i.e., patients with chronic bronchitis who have a bluish tint to the skin as a result of chronic hypoxemia and hypercapnia) or pink puffers (i.e., patients with emphysema who have adequate oxygen saturation but are breathless and cachectic with a pink skin color)
› Administering supplemental oxygen to patients who have hypoxemia at rest has been shown to increase survival, decrease hospitalizations, and improve QOL. The increase in survival is directly proportional to the number of hours a day that oxygen is administered (Chesnutt et al., 2017)

› The BODE index (ie., body mass index, degree of obstruction, dyspnea and exercise intolerance) is a better predictor of hospitalization and death than FEV1

› Authors in a retrospective cohort study of 14,350 smokers with COPD found that the use of varenicline and bupropion do not increase the risk of cardiovascular disorder, depressive mood or self harm compared with nicotine replacement therapy (Kotz et al., 2017)

Red Flags

› Smoking with oxygen nearby is extremely flammable and dangerous (Brooks, 2018)

› Authors of a systematic review concluded that the correlation between tuberculosis and COPD was underestimated, as patients with a history of tuberculosis are 3 times more likely to be diagnosed with either COPD or bronchiectasis (Byrne et al., 2015)

› Jugular vein distention, hepatomegaly, and peripheral edema are signs of cor pulmonale

› Exacerbations become more frequent and severe as COPD progresses

› Dyspnea can be extremely uncomfortable and distressing for patients and their families at the end of life. Palliative care is important for the effective management of dyspnea

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

› As appropriate, emphasize the importance of smoking cessation; encourage attending a smoking cessation program and/or asking the treating clinician about medication, nicotine patches or gum, and counselling to promote smoking cessation

› Recommend vaccination against Haemophilus influenzae to reduce the risk of acute exacerbations, and educate that patients with COPD should receive annual influenza vaccination as well as the pneumococcal vaccine

› Encourage adherence to the prescribed treatment regimen and educate regarding the importance of continued medical surveillance and seeking immediate medical attention for new or worsening signs and symptoms

› Suggest that family members consider genetic counseling and testing for Alpha-1 antitrypsin deficiency

› Educate to avoid common airway irritants (e.g., hairspray, spray deodorant, and spray paint) and to exercise regularly because it typically makes breathing easier

› Educate using a vaporizer or humidifier in the home and drinking plenty of fluids to help loosen mucus

› Recommend that overweight or obese patients—especially patients who have sleep disturbances—lose weight and encourage talking with the treating clinician about evaluation of sleep disturbances and weight loss strategies

› Educate regarding the safe use and storage of portable oxygen containers in the home care setting, if applicable

References


