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Chronic Obstructive Pulmonary Disease (COPD)

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COPD

- There are two types of COPD: bronchitis and emphysema.
- COPD can be caused by inhalation irritants such as cigarette smoking, pollution, chemicals, or dust (McCance and Huether, 2014).

Why COPD?

- COPD is the third leading cause of mortality in the United States. It is the sixth leading cause of mortality worldwide (McCance and Huether, 2014).
- More than 16.4 million have Chronic Obstructive Pulmonary Disease (American Lung Association, 2021).
- In the United States, COPD is the leading cause of morbidity and mortality (Leonard et al., 2020).
- Patients with COPD are at risk of complications and death after surgery (Lee et at., 2021). Providing information to health care providers can improve the care of patients with COPD who are receiving surgery.
- "Chronic obstructive pulmonary disease is a condition commonly present in older people undergoing surgery and confers an increased risk of postoperative complications and mortality" (Lee, et al., 2021, p. 681).

Risk Factors

According to The American Lung Association (2021), risk factors include:

- Smoking is the #1 risk factor
- Breathing in polluted air
- Exposure to secondhand smoke
- Breathing in chemicals, dust, and fumes
- Alpha-1 deficiency (a genetic disorder)
- Childhood respiratory infections

Signs and Symptoms

- According to World Health Organization (2022), the most common symptoms of COPD are difficulty breathing, chronic productive cough, and increased fatigue.
- COPD causes FVC and FEV1 values to decrease remarkably while residual volume measurements increase.
- Radiographs of the chest may show a flattened chest and lungs will appear overdistended (McCance and Huether, 2014).

Assessment	Common Findings
Appearance	Thin or overweight, barrel-chested, purse-lip breathing, tachypnea, tripod positioning, anxious, accessory muscles assisting breaths, dyspnea, cyanosis
Cough	Dry to productive, persistent
Breath Sounds	Wheezes, Rhonchi
Heart Sounds	Murmur, split S2
Chest X-Ray	Flattened diaphragm, hyperextension of lung fields
Spirometry	Elevated TLC, RV, FRC, RV/TLC ratio; reduced FEV1, FEV1/FVC
ABG	Hypoxemia and/or hypercapnia; chronic compensated metabolic acidosis

Nagelhout and Elisha, 2018, p. 586).

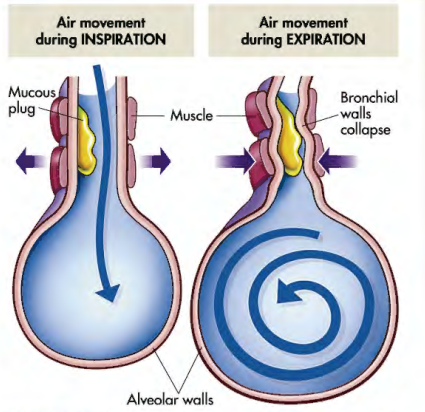
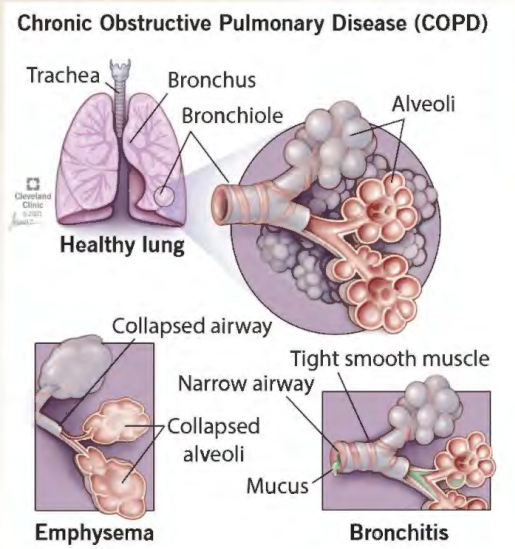


FIGURE 35-15 Mechanisms of Air Trapping in Chronic Obstructive Pulmonary Disease (COPD). Mucous plugs and narrowed airways cause air trapping and hyperinflation on expiration. During inspiration the airways are pulled open, allowing gas to flow past the obstruction. During expiration decreased elastic recoil of the bronchial walls results in collapse of the airways and prevents normal expiratory airflow.

(McCance and Huether, 2014, p. 35)

Pathophysiology

- Inhalation of irritants, such as smoking or air pollution, cause inflammation and the release of cytokines. As a result, neutrophils, macrophages, and lymphocytes infiltrate the bronchial wall.
- Chronic bronchitis is a proliferation of tracheobronchial mucous glands of the subepithelial layer. There is excessive airway mucus and an increase in the thickening of the airway. Thickening of the airway and mucus cause air trapping. Obstruction of the airways eventually causes a ventilation-perfusion mismatch and hypoxemia.
- Emphysema can also be caused by a mutation of the α1-antitrypsin gene or inhalation of irritants. Emphysema causes hyperinflated bronchiole due to the breakdown in the elastin of the pulmonary cells. The breakdown of elastin is caused by antiproteases, oxidative stress, and apoptosis of cells. Loss of alveolar cells leads to decreased surfactant (McCance and Huether, 2014). Destruction of the parenchyma causes decreased surface area of the alveoli and loss of elastic recoil of the chest.
- Injury and inflammation of the alveoli increase the resistance to airflow (Nagelhout and Elisha, 2018).



(Cleveland Clinic, 2022)

Significance of Pathophysiology

- Emphysema and chronic bronchitis lead to air trapping. Air trapping causes hyperexpansion of the lunger and leads to hypercapnia and hypoventilation. Air trapping may cause the patient to require mechanical ventilation (McCance and Huether, 2014).
- The most common feature of COPD is increased obstruction leading to decreased FEV1 (Nagelhout and Elisha, 2018).
- Due to COPD, less oxygen gets to the tissues and less carbon dioxide can't be removed. As the disease progresses shortness of breath makes being active more challenging (American Lung Association, 2021).

Treatment

- Non-invasive ventilation (NIV) decreases readmissions in patients discharged with NIV and improves survival, mortality, and decreases intubations (Leonard et al., 2020).
- High flow nasal therapy (HFNT) is shown to be beneficial for stable COPD patients (Cortegiani et al., 2020).
- Respiratory exercises to improve lung function include inspiratory muscle training (IMT), expiratory muscle training (EMT), diaphragmatic breathing (DB), and Liuzijue (Yun et al., 2020).
- Patients who have frequent exacerbations may require corticosteroids to reduce acute respiratory illnesses (Keller, 2020).
- Smoking Cessation can slow the progress of COPD.
- B2- agonists and anticholinergics are used to promote bronchodilation. (Nagelhout and Elisha, 2018).

Diagnostics

- **Spirometry:** FEV1/FVC ratio is decreased, and expiratory flow rates are decreased with COPD. COPD patient's lung measurements show an increased RV and increased FRC.
- **Arterial Blood Gas:** The ABG is used to determine the severity of decreased gas exchange.
- **Radiography:** Hyperlucency of the lungs and hyperinflation will be seen in COPD. If a bullae is seen it is indicative of emphysema (Nagelhout and Elisha, 2018).

Implications for Nursing Care

Nurses play a vital role in helping patients live a quality life with COPD. The following list is nursing implications for improving patient care:

- Demonstrate how to perform pursed lip breathing
- Counsel patient about nutritional changes to improve illness
- Educate patients on the importance of vaccines to prevent flu, pneumonia, and COVID-19
- Teach patient about respiratory hygiene
- Educate patients about early signs of infection (Nagelhout and Elisha, 2018)
- Educate patient on oxygen safety
- Screen and refer patients to pulmonary rehabilitation
- Monitor and notify the physician of any signs of depression or anxiety (Grundry, 2020).

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Help patients quit smoking with a three-step approach

1. Gather information about the patient's current smoking history.
2. Educate the patient that the best way to stop smoking is by medication and specialized support.
3. Support the patient by building their confidence, giving information, and notifying the physician (Grundry, 2020).

Perioperative Considerations

- Before surgery physicians should utilize The National Institute of Health and Care Excellence guidance to encourage smoking cessation, pulmonary rehabilitation, and optimization of comorbidities (Lee et al., 2021).
- The GOLD strategies are the most known and accepted treatment guidelines in the world for COPD (Keller et al., 2020). The GOLD strategies can be a guide to treatment in the perioperative setting.
- The BRODE score can be used to assess patients before surgery (Nagelhout and Elisha, 2018).

Conclusion

- Due to the high prevalence of COPD, nurse anesthetists are likely to encounter patients with COPD of varying severities. The patients may range from being undiagnosed and untreated to receiving maximal medical support (lee et al., 2021).
- Knowing how to treat and prepare COPD patients for surgery can prevent complications and mortality.
- Chronic obstructive pulmonary disease is a common, preventable, and treatable disease that providers must understand and treat effectively. There is no cure for COPD, however early diagnosis and treatment by a provider can slow the progression and decrease symptoms (World Health Organization, 2022).

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