Respiratory Emergencies Overview

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Objectives

- Use the pathophysiological characteristics of chronic bronchitis and emphysema to distinguish them from other pulmonary disorders.

- Interpret the findings of a physical examination of a person with chronic obstructive pulmonary disease (COPD).

- Explain the physiology or the respiration process

Respiratory

- Anatomy, signs, symptoms, and management of respiratory emergencies, including those that affect the
- • Upper airway
- • Lower airway

Anatomy, physiology, pathophysiology, assessment, and management of

- • Spontaneous pneumothorax
- • Pulmonary edema
- • Asthma
- • Chronic obstructive pulmonary disease
- Environmental/industrial exposure
- • Toxic gas
- • Pertussis
- • Cystic fibrosis
- • Pulmonary embolism
- Pneumonia
- • Viral respiratory infections

Dyspnea

- A. EMS often encounter patients complaining of dyspnea.
  - 1. Dyspnea is feeling short of breath or having difficulty breathing.
- B. Dyspnea can be caused by many different conditions:
  - 1. Common cold
  - 2. Asthma
  - 3. Heart failure
  - 4. Pulmonary embolism
- C. Dyspnea's cause can be difficult to determine.
  - 1. Several different problems may contribute to a patient's dyspnea at the same time.

  - D. Even without a definitive diagnosis, you may still be able to save a patient's life.

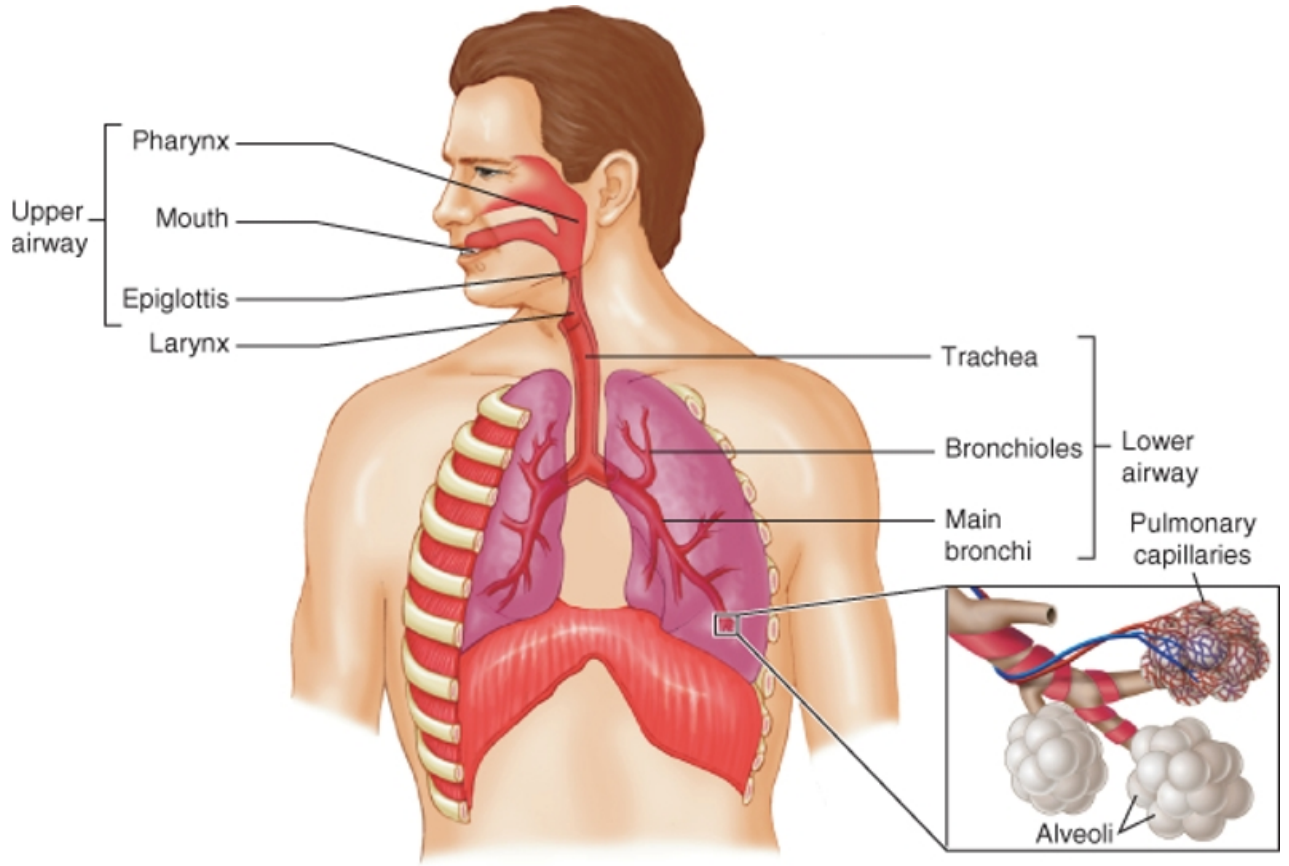
Anatomy of the Respiratory System

- The respiratory system consists of all structures that contribute to breathing, including:
- 1. Diaphragm
- 2. Chest wall muscles
- 3. Accessory muscles of breathing
- 4. Nerves from the brain and spinal cord to those muscles

Upper Airway

- The upper airway consists of all anatomic structures above the vocal cords:
- 1. Nose and mouth
- 2. Jaw
- 3. Oral cavity
- 4. Pharynx
- 5. Larynx (end of the upper airway)

Upper and Lower Airways



Principle Function

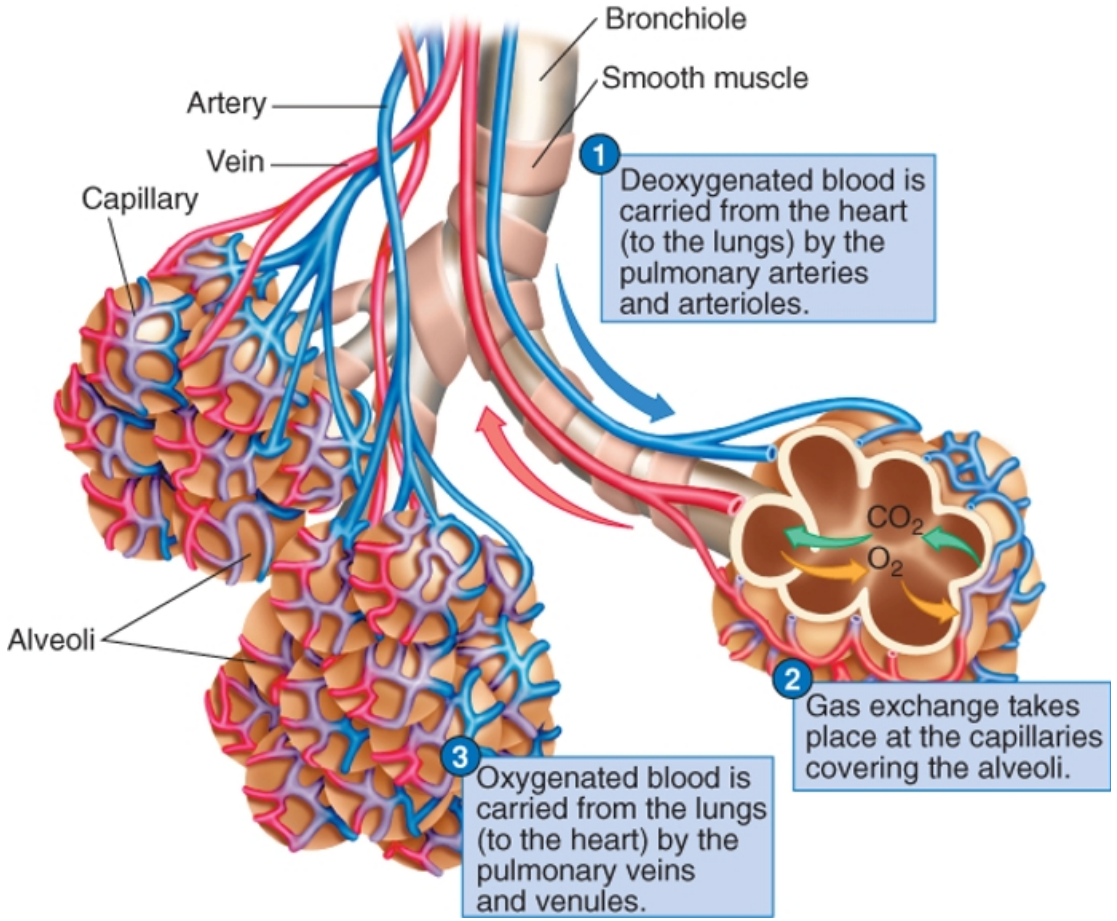
- C. The principal function of the lungs is respiration.
- 1. Respiration is the exchange of oxygen and carbon dioxide.
- D. Air travels through the trachea into the lungs, then on to the:
- 1. Bronchi (larger airways)
- 2. Bronchioles (smaller airways)
- 3. Alveoli
- a. Alveoli are where the actual exchange of oxygen and carbon dioxide takes place.

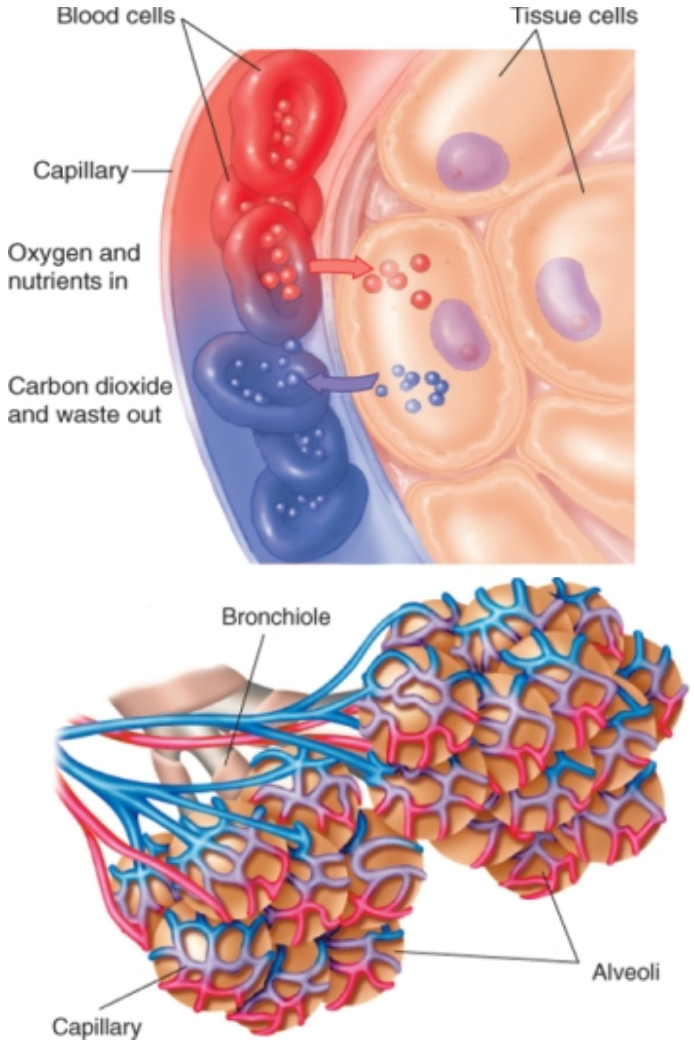
Physiology of Respiration

- A. There are two processes that occur during respiration.
- 1. Inspiration: The act of breathing in, or inhaling
- 2. Expiration: The act of breathing out, or exhaling
- a. Oxygen is provided to the blood and carbon dioxide is removed from it.
- i. In healthy lungs, this exchange of gases takes place rapidly at the level of the alveoli.

Physiology of Respiration

A close-up view of the exchange of oxygen and carbon dioxide within the alveoli





Alveoli Pathophysiology

- B. The alveoli lie against the pulmonary capillary vessels.
- Oxygen passes into the capillaries
- 1. Oxygen passes freely through tiny passages in the alveolar wall into these capillaries through the process of diffusion.
- a. It is then carried to the heart, which pumps the oxygen throughout the body.
- 2. Carbon dioxide returns to the lungs.
- a. It diffuses back into the alveoli.
- b. It travels back up the bronchial tree and it exits through the upper airways during exhalation.
- C

Brain Stem

- The brain stem senses the level of carbon dioxide in the arterial blood. Regulates breathing rate and depth
- 1. If the level of carbon dioxide drops too low:
- a. The person automatically breathes at a slower rate and less deeply.
- b. As a result, less carbon dioxide is expired and levels in the blood return to normal.
- 2. If the level of carbon dioxide rises above normal:
- a. The person breathes more rapidly and more deeply.
- b. More carbon dioxide diffuses out of the bloodstream and levels in the blood are thus lowered.

Oxygen Exchange cane be hindered by

- A. The proper exchange of oxygen and carbon dioxide can be hindered by:
- 1. Abnormal or pathologic conditions in the anatomy of the airway
- 2. Disease processes
- 3. Traumatic conditions
- 4. Pulmonary vessels, which may have abnormalities that interfere with blood flow

EMS Clinicians

Must be able to:

- 1. Recognize the signs and symptoms of inadequate breathing
- 2. Know what to do about it

Carbon dioxide retention and hypoxic drive

- 1. Patients will sometimes have an elevated level of carbon dioxide in their arterial blood.
- a. Potential causes:
- i. Exhalation process may be impaired by lung disease.
- ii. The body may naturally produce too much carbon dioxide.
- b. If levels stay high for a period of years, the respiratory center in the brain may not function properly.
- i. It could signify chronic carbon dioxide retention.
- ii. The brain gradually accommodates high levels of carbon dioxide and then uses a
- "backup system" to control breathing based on low levels of oxygen, known as hypoxic drive.
- iii. Use caution when administering oxygen to these patients.

Dyspnic Patients May Have

- Be aware that one or more of the following situations may exist in the dyspneic patient:
- 1. Gas exchange between the alveoli and pulmonary circulation is obstructed by fluid in the lung, infection, or collapsed alveoli (atelectasis).
- 2. The alveoli are damaged and cannot transport gases properly across their own walls.
- 3. The air passages are obstructed by muscle spasm; mucus; or weakened, floppy airway walls.
- 4. Blood flow to the lungs is obstructed by blood clots.
- 5. The pleural space is filled with air or excess fluid, so the lungs cannot properly expand.

Cause of Dyspnea

Table 15-2 Signs and Symptoms of Inadequate Breathing

- The patient reports difficulty breathing or shortness of breath.
- The patient has an altered mental status associated with shallow or slow breathing.
- The adult patient appears anxious or restless; the pediatric patient appears sleepy or listless.
- The respiratory rate is too fast or too slow (see Table 15-1).
- The breathing rhythm is irregular.
- The skin is pale, cool, clammy, or cyanotic.
- Adventitious breath sounds are heard, including wheezing, gurgling, snoring, crowing, or stridor (harsh, high-pitched, barking sounds).
- Decreased or noisy breath sounds are heard on one or both sides of the chest.
- The patient cannot speak more than few words between breaths. Ask the patient "How are you doing?" If the patient cannot speak at all, he or she most likely has a respiratory emergency.
- You observe accessory muscle use, retractions, or labored breathing.
- The patient has unequal or inadequate chest expansion.
- The patient is coughing excessively.
- The patient is sitting up, leaning forward with his or her palms flat on the bed or the arms of the chair. This is called the tripod position because the patient's back and both arms are working together to support the upper body.
- The patient has pursed lips (pursed lip breathing) or nasal flaring.

Causes of Dyspnea

- Dyspnea can be caused by many medical problems.
- 1. If the brain is deprived of oxygen, a patient may not be alert enough to complain.
- a. Altered mental status may be a sign that the brain is dysfunctional because of severe hypoxia.
- 2. Patients often have difficulty breathing and/or hypoxia with the following medical conditions:
- a. Pulmonary edema
- b. Hay fever
- c. Pleural effusion
- d. Obstruction of the airway
- e. Hyperventilation syndrome
- f. Environmental/industrial exposure
- g. Carbon monoxide poisoning
- h. Drug overdose

Causes of Dyspnea

- C. Besides shortness of breath, a patient with dyspnea may also report:
- 1. Chest tightness
- 2. Air hunger
- D. Dyspnea is a common complaint in patients with cardiopulmonary diseases.
- 1. Congestive heart failure causes the heart to pump inefficiently and deprives the body of oxygen.
- a. Pulmonary edema is a condition associated with congestive heart failure.
- E. Severe pain can cause a patient to experience rapid, shallow breathing without the presence of a primary pulmonary dysfunction.
- 1. In some patients, breathing deeply causes pain because it causes expansion of the chest wall.

Upper of Lower Airway Infection

- F. Upper or lower airway infection
- 1. Infectious diseases causing dyspnea may affect all parts of the airway.
- a. Some cause mild discomfort.
- b. Some require aggressive respiratory support.
- c. Oxygenation is a problem of inadequate oxygen delivery to the tissues.
- 2. The problem causing dyspnea is always some form of obstruction:
- a. Mucus and secretions obstructing airflow in major passages (cold, diphtheria)
- b. Swelling of soft tissues in upper airways (epiglottitis, croup)
- c. Impaired exchange of gases in the alveoli (pneumonia)
- 3. Be diligent about the use of appropriate PPE when in contact with patients who have infectious diseases.

RSV – you already had a Croup / Epiglottis Lecture

- Respiratory syncytial virus
- a. Respiratory syncytial virus (RSV) is a common cause of illness in young children.
- b. Causes an infection in the lungs and breathing passages
- c. Highly contagious
- d. Look for signs of dehydration.
- e. Treat airway and breathing problems as appropriate.
- i. Humidified oxygen is helpful if available.
- Note it is not just for kids. Have seen recent years elderly population with this

Bronchiolitis

- Viral illness often caused by RSV
- •Usually affects newborns and toddlers
- •Bronchioles become inflamed, swell, and fill with mucus.
  - Provide oxygen therapy and frequently reassess for signs of respiratory distress.

Pneumonia

- a. General term that refers to an infection of the lungs
- b. Often a secondary infection that begins after an upper respiratory tract infection
- c. Can be caused by a virus or bacterium, or by a chemical injury or direct lung injury

Pneumonia

- •Bacterial pneumonia will come on quickly and result in high fever.
- •Viral pneumonia presents more gradually and is less severe.
- •Especially affects people who are chronically ill
- •Assess temperature and provide airway support and supplemental oxygen.

Signs and Symptoms of Pneumonia

- i. Rapid or labored breathing (in children)
- ii. Blue or gray lips or fingernails
- iii. Fever
- iv. Dry skin
- v. Decreased skin turgor
- vi. Exertional dyspnea
- vii. Productive cough
- viii. Chest discomfort and pain
- ix. Headache
- x. Nausea and vomiting
- xi. Musculoskeletal pain
- xii. Weight loss
- xiii. Confusion
- xiv. Diminished breath sounds

Pertussis

- •Airborne bacterial infection that mostly affects children under 6
  - Highly contagious – droplet transmission
- •Patients will be feverish and exhibit a “whoop” sound after a coughing attack.
  - Coughing spells can last more than a minute
  - May turn red or purple
- •Watch for dehydration and suction as needed.
- Pertussis in adults – can cause a severe respiratory infection

Influenza Type A

- •Became pandemic in 2009
  - Global scale
  - Animal respiratory disease that mutated to infect humans
- •Symptoms include fever, cough, sore throat, muscle aches, headache, and fatigue.
- •May lead to pneumonia or dehydration

Tuberculosis

Bacterial infection that most often affects the lungs

- Cal also be found in almost any other organ

Can remain inactive for years

Patients often complain of fever, coughing, fatigue, night sweats, and weight loss.

- Severe cases – Short of Breath Cough Productive Sputum Bloody Sputum and Chest Pain

Wear gloves, eye protection, and an N-95 respirator (at a minimum).

Tuberculosis

- Prevalence is higher in homeless people, prison inmates, and nursing home residents.
- TB is also found in persons who abuse intravenous drugs or alcohol, or those with HIV
- If you suspect your patient may have active TB, you need to wear, at a minimum, gloves, eye protection, and an N-95 respirator.

Acute Pulmonary Edema

Heart muscle can't circulate blood properly.

- Left side cannot remove blood rom the lung as fast as the right delivers

Fluid builds up within alveoli and in lung tissue.

Referred to as pulmonary edema

Usually result of congestive heart failure

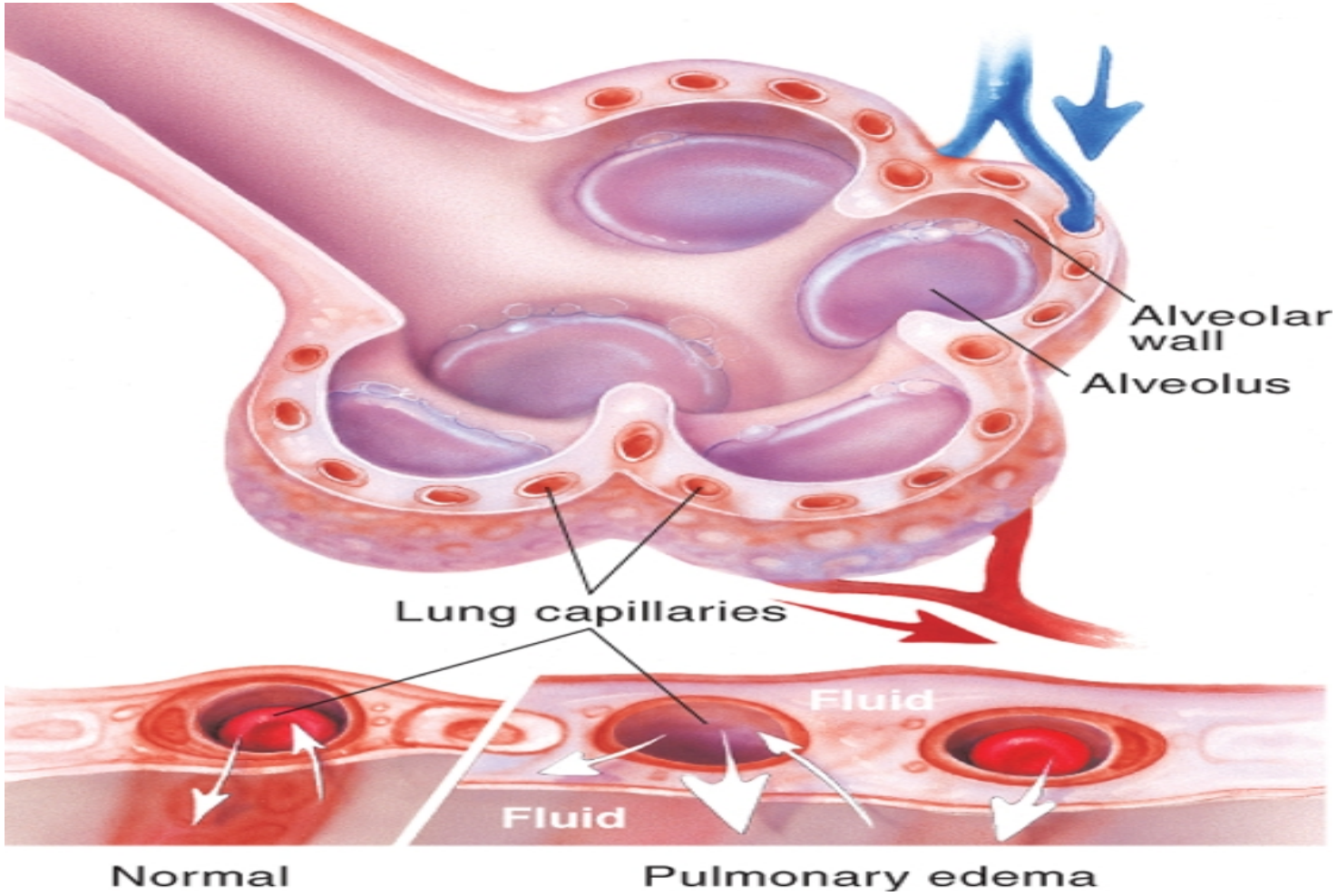
- Typically experiences dyspnea with rapid shallow respirations
- Severe cases frothy pink sputum at mouth and nose

Most patients have a long-standing history of chronic congestive heart failure. - Can be controlled with medications

- .Not all patients with pulmonary edema have heart disease.

i. Inhaling large amounts of smoke or toxic chemical fumes, traumatic injuries to the chest, and exposure to high altitudes can produce pulmonary edema.

This figure shows fluid filling the alveoli in pulmonary edema.



COPD

Slow process of dilation and disruption of airways and alveoli

- COPD is an umbrella term used to describe a few lung diseases, including emphysema and chronic bronchitis (ongoing irritation of the trachea and bronchi).

Caused by chronic bronchial obstruction

May be the result of lung and airway damage from infection or inhalation of toxic gases

Tobacco smoke can create chronic bronchitis.

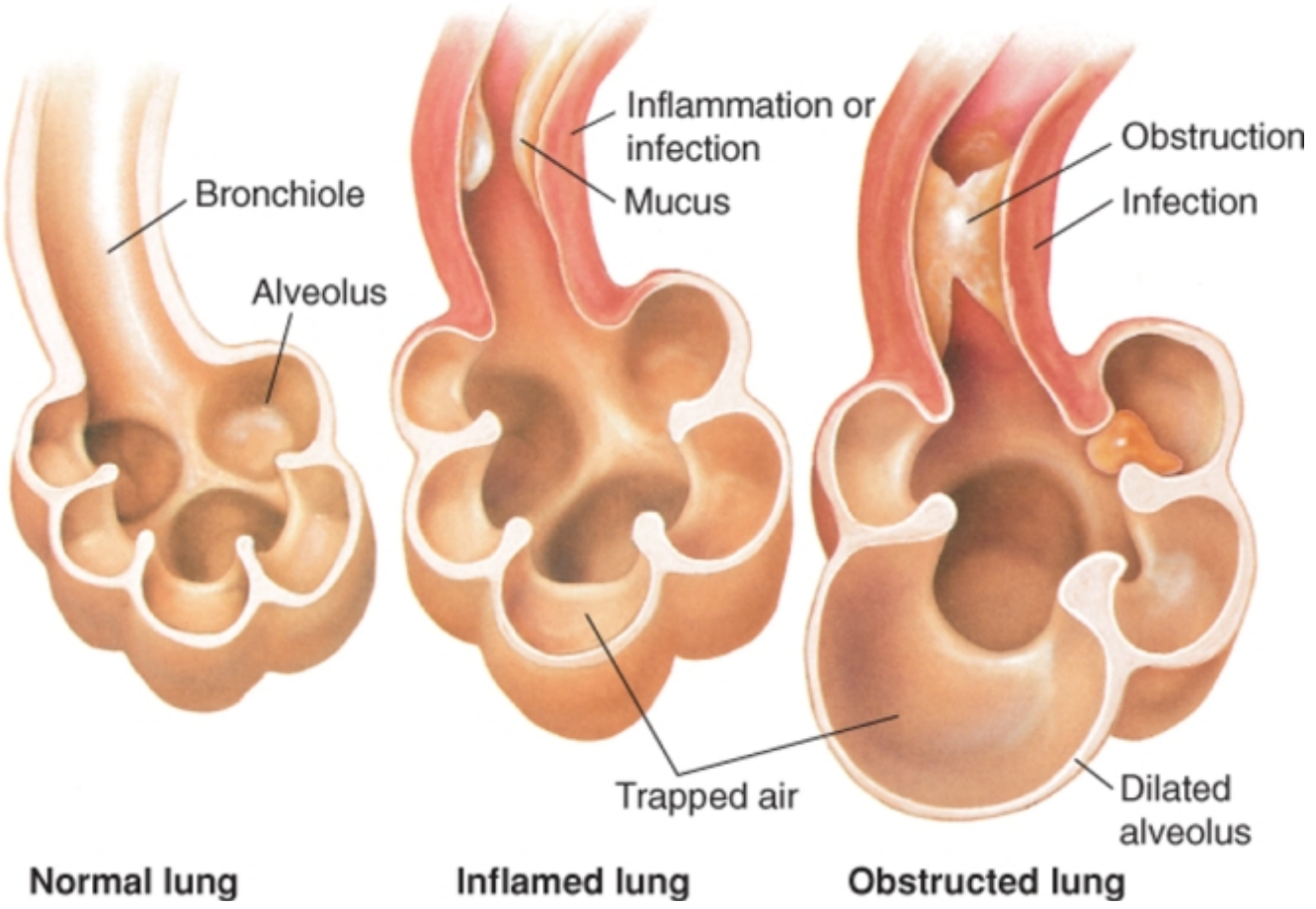
- Bronchial Irritant
- Excessive mucous = obstructed small airways and alveoli
  - Airways become weakened
  - Chronic Oxygenation becomes as problem – can lead to right heart failure and fluid build up
    - Pneumonia easily develop
    - Repeated irritation causes scarring and some dilations in alveoli – leads to COPD

Emphysema

- Most common type of COPD
- a. Emphysema is the loss of elastic material in the lungs as a result of chronic stretching of the alveoli.
- b. Smoking can directly destroy the elasticity of the lung tissue.

- Most patients with COPD have elements of both chronic bronchitis and emphysema
  - a. Most patients will chronically produce sputum, have a chronic cough, and have difficulty expelling air from their lungs, with long expiration phases and wheezing.

This figure shows damage to the alveoli characteristic of COPD.



Wet lungs versus dry lungs

Patients with pulmonary edema will have “wet” lung sounds.

- Rales / Rhonchi

Patients with COPD will have “dry” lung sounds.

- Wheezes

Can be easily confused with congestive heart failure

- Do not assume that all COPD patients have wheezing and all congestive heart failure patients have rales.

- Patients with COPD:
- i. Wheeze because of bronchial constriction
- ii. Present with shortness of breath
- iii. Breathing gets progressively worse
- iv. Have trouble breathing on exertion
- v. Have chronic coughing and thick sputum
- vi. Are usually long-term smokers with a thin, barrel-chest appearance.
- vii. Often have a slower onset of symptoms
- Patients with congestive heart failure experience a fluid overload in the lung, which may develop quickly from a failing pump.

Pulmonary Embolism

- •An embolus is anything in the circulatory system that moves from its point of origin to a distant site and lodges there, obstructing subsequent blood flow in that area.
- a. Circulation can be cut off completely or partially.
- b. Emboli can result in a serious, life-threatening condition.
- c. Emboli can be fragments of blood clots in an artery or vein that break off and travel through the bloodstream.
- d. They can also be foreign bodies that enter the circulation, such as a bubble of air.
- A blood clot that circulates through the venous system
- –Circulation cut off partially or completely
- –Significantly decreases blood flow
- –If large enough, can cause sudden death
  - Can be the result of Damage to the lining of vessels, blood clotting issues, slow blood flow in extremities – typically those on bedrest

Signs and Symptoms

- Signs and symptoms of pulmonary emboli include the following:
- i. Dyspnea
- ii. Tachycardia
- iii. Tachypnea
- iv. Varying degrees of hypoxia
- v. Cyanosis
- vi. Acute chest pain
- vii. Hemoptysis
- c. With a large enough embolism, complete obstruction of the output of blood from the right side of the heart can result in sudden death.