Chapter 15
Respiratory Emergencies

Lecture
Medicine

Applies fundamental knowledge to provide basic emergency care and transportation based on assessment findings for an acutely ill patient.
Respiratory

- Anatomy, signs, symptoms, and management of respiratory emergencies, including those that affect the
  - Upper airway
  - Lower airway
Respiratory (cont’d)

• Anatomy, physiology, pathophysiology, assessment, and management of
  – Epiglottitis
  – Spontaneous pneumothorax
  – Pulmonary edema
  – Asthma
  – Chronic obstructive pulmonary disease
National EMS Education Standard Competencies (4 of 5)

Respiratory (cont’d)

• Anatomy, physiology, pathophysiology, assessment, and management of (cont’d)
  – Environmental/industrial exposure
  – Toxic gas
  – Pertussis
  – Cystic fibrosis
  – Pulmonary embolism
Respiratory (cont’d)

- Anatomy, physiology, pathophysiology, assessment, and management of (cont’d)
  - Pneumonia
  - Viral respiratory infections
Introduction

• Patients often complain of dyspnea.
  – Shortness of breath or difficulty breathing
• Can be caused by many different conditions
• Cause can be difficult to determine.
Anatomy of the Respiratory System (1 of 4)

- Respiratory system includes all the structures that contribute to breathing
  - Diaphragm
  - Chest wall muscles
  - Accessory muscles of breathing
  - Nerves to the muscles
Anatomy of the Respiratory System (2 of 4)

• Upper airway consists of structures above the vocal cords.
  – Nose and mouth
  – Jaw
  – Oral cavity
  – Pharynx
  – Larynx
Anatomy of the Respiratory System (4 of 4)

• Principal function of lungs is respiration.
  – Exchange of oxygen and carbon dioxide

• Air travels through trachea into lungs to:
  – Bronchi (larger airways)
  – Bronchioles (smaller airways)
  – Alveoli (where actual exchange takes place)
Physiology of Respiration (1 of 3)

- Respiration process
  - Inspiration
  - Expiration
- Oxygen is provided to the blood.
- Carbon dioxide is removed.
- Takes place rapidly at level of alveoli
Physiology of Respiration (2 of 3)

1. Deoxygenated blood is carried from the heart (to the lungs) by the pulmonary arteries and arterioles.

2. Gas exchange takes place at the capillaries covering the alveoli.

3. Oxygenated blood is carried from the lungs (to the heart) by the pulmonary veins and venules.
Physiology of Respiration (3 of 3)

• In the alveoli:
  – Oxygen passes into capillaries.
  – Carbon dioxide returns to lungs.

• Brain stem senses blood’s carbon dioxide levels.
  – Regulates breathing rate and depth
Pathophysicsology (1 of 2)

- Oxygen exchange can be hindered by:
  - Conditions in the anatomy of the airway
  - Disease processes
  - Traumatic conditions
  - Abnormalities in pulmonary vessels
• Recognize the signs and symptoms of inadequate breathing and know what to do about it.

• Some patients have chronic carbon dioxide retention.
  – Use caution when administering oxygen.
Causes of Dyspnea (1 of 4)

- Patients often have dyspnea or hypoxia with:
  - Pulmonary edema
  - Hay fever
  - Pleural effusion
  - Obstruction of the airway
  - Hyperventilation syndrome
  - Environmental/industrial exposure
  - Drug overdose
Causes of Dyspnea (2 of 4)

• Dyspneic patients may have:
  – Gas exchange obstructed
  – Damaged alveoli
  – Obstructed air passages
  – Obstructed blood flow to the lungs
  – Excess fluid in pleural space
## Causes of Dyspnea (3 of 4)

### 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 a 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 (4 of 4)

- Patients may also complain of chest tightness or air hunger.
- Common with cardiopulmonary diseases.
- Pain can cause rapid, shallow breathing.
  - Breathing deeply causes pain because the chest wall expands.
• Infectious diseases may affect all parts of the airway.

• Some form of obstruction causes dyspnea.
  – Mucus and secretions obstructing airflow in major passages
  – Swelling of soft tissues in upper airways
  – Impaired exchange of gases in the alveoli
Croup

- Inflammation and swelling of pharynx, larynx, and trachea
- Stridor and seal-bark cough
- Responds well to humidified oxygen
Epiglottitis

- Bacterial infection causing inflammation of epiglottis
- Children are often found in tripod position and drooling
- Position comfortably and provide oxygen.
Respiratory Syncytial Virus (RSV)

• Common cause of illness in young children
• Causes infection in the lungs and passages
• Look for signs of dehydration.
• Treat airway and breathing problems.
• Humidified oxygen is helpful.
Bronchiolitis

- Viral illness often caused by RSV
- Usually affects newborns and toddlers
- Bronchioles become inflamed, swell, and fill with mucus.
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.
Pertussis

- Airborne bacterial infection that mostly affects children under 6
- Patients will be feverish and exhibit a “whoop” sound after a coughing attack.
- Watch for dehydration and suction as needed.
Influenza Type A

• Became pandemic in 2009
• Symptoms include fever, cough, sore throat, muscle aches, headache, and fatigue.
• May lead to pneumonia or dehydration
Tuberculosis (TB)

• Bacterial infection that most often affects the lungs
• Can remain inactive for years
• Patients often complain of fever, coughing, fatigue, night sweats, and weight loss.
• Wear gloves, eye protection, and an N-95 respirator (at a minimum).
Acute Pulmonary Edema

- Heart muscle can’t circulate blood properly.
- Fluid builds up within alveoli and in lung tissue.
  - Referred to as pulmonary edema
  - Usually result of congestive heart failure
  - Most patients have a long-standing history of chronic congestive heart failure.
Acute Pulmonary Edema

Lung capillaries

Alveolar wall

Alveolus

Fluid

Normal

Pulmonary edema
Chronic Obstructive Pulmonary Disease (COPD) (1 of 4)

• Slow process of dilation and disruption of airways and alveoli
• 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.
Chronic Obstructive Pulmonary Disease (COPD) (2 of 4)

• Emphysema is most common type of COPD.
  – Loss of elastic material in the lungs
  – Causes include inflamed airways, smoking.

• Most patients with COPD have elements of both chronic bronchitis and emphysema.
Chronic Obstructive Pulmonary Disease (COPD) (3 of 4)
Chronic Obstructive Pulmonary Disease (COPD) (4 of 4)

- Patients with pulmonary edema will have “wet” lung sounds.
- Patients with COPD will have “dry” lung sounds.
- Can be easily confused with congestive heart failure
Asthma, Hay Fever, and Anaphylaxis (1 of 4)

• Result of allergic reaction to inhaled, ingested, or injected substance
  – In some cases, allergen cannot be identified.

• In some cases, there is no identifiable allergen.
Asthma is acute spasm of smaller air passages (bronchioles).
Asthma affects all ages.
  - Most prevalent in children 5–17 years

Produces characteristic wheezing

Asthma attack may be caused by allergic reaction to foods or allergens or severe emotional distress, exercise, and respiratory infections.
Asthma, Hay Fever, and Anaphylaxis (4 of 4)

• Hay fever causes cold-like symptoms.
  – Allergens include pollen, dust mites, pet dander.

• Anaphylactic reaction can produce severe airway swelling.
  – Total obstruction is possible.
  – Treat with epinephrine, oxygen, and antihistamines.
Spontaneous Pneumothorax

(1 of 2)

• Pneumothorax is accumulation of air in pleural space.
• Most often caused by trauma
• May be caused by medical conditions
  – “Spontaneous pneumothorax”
Spontaneous Pneumothorax
(2 of 2)

• Occurs with lung infections or in weak lungs
• Patient becomes dyspneic.
• Breath sounds may be absent on affected side.
Pleural Effusion

• Collection of fluid outside the lung
• Compresses lung and causes dyspnea
• Can stem from irritation, infection, congestive heart failure, or cancer.
• Upright position eases pain.
Obstruction of the Airway (1 of 2)

- Patient with dyspnea may have mechanical obstruction.
- Treat quickly.
- In unconscious patients, obstruction may be caused by aspiration of vomitus or tongue blocking the airway.
- If patient was eating just before dyspnea, always consider foreign body obstruction.
Obstruction of the Airway (2 of 2)
Pulmonary Embolism (1 of 2)

- 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
Pulmonary Embolism (2 of 2)

• Signs and symptoms include:
  – Dyspnea
  – Tachycardia
  – Tachypnea
  – Varying degrees of hypoxia
  – Cyanosis
  – Acute chest pain
  – Hemoptysis
Hyperventilation (1 of 2)

• Overbreathing to the point that arterial carbon dioxide falls below normal
• May be indicator of life-threatening illness
• Body may be trying to compensate for acidosis
  – Buildup of excess acid in blood or body tissues
Hyperventilation (2 of 2)

- Can result in alkalosis
  - Buildup of excess base in body fluids
- Can cause symptoms of panic attack:
  - Anxiety
  - Dizziness
  - Numbness
  - Tingling or painful spasms of the hands/feet
Environmental/Industrial Exposure

- Pesticides, cleaning solutions, chemicals, chlorine, and other gases can be released.
- Carbon monoxide
  - Odorless
  - Highly poisonous
  - Produced by fuel-burning appliances and smoke.
- Do not put yourself at risk.
Scene Size-up

- **Scene safety**
  - Use standard precautions and PPE.
  - Consider possibility of infectious disease or toxic substance.

- **Mechanism of injury/nature of illness**
  - If in question, ask why 9-1-1 was activated.
  - Question the patient, family, and/or bystanders to determine NOI.
Primary Assessment (1 of 5)

- Identify immediate life threats.
- Form a general impression.
  - Note age and position of patient.
  - Use AVPU scale.
  - Ask patient about chief complaint.
Primary Assessment (2 of 5)

- Airway and breathing
  - Make sure airway is patent and adequate.
  - Assess rate, rhythm, and quality.
  - Ask the following questions:
    - Is the air going in?
    - Does the chest rise and fall with each breath?
    - Is the rate adequate for the victim’s age?
Primary Assessment (3 of 5)

- Assess breath sounds
  - Check breath sounds on the right and left sides of the chest.
  - Abnormal sounds include wheezing, rales, rhonchi, and stridor.
Primary Assessment (4 of 5)

- **Circulation**
  - Evaluate for shock and bleeding.
  - Assess capillary refill in infants and children.
  - Assess perfusion by evaluating skin color, temperature, and condition.
  - Reassess life threats.
Primary Assessment (5 of 5)

• Transport decision
  – If condition is unstable and there is possible life threat:
    • Address the life threat.
    • Proceed with rapid transport.
History Taking (1 of 2)

• Investigate chief complaint.
  – Objective and subjective observations
  – Report pertinent negatives.

• Find out what the patient has done for the breathing problem.

• SAMPLE history
History Taking (2 of 2)

- OPQRST assessment
  - Onset, provocation/palliation, quality, radiation/region, severity

- PASTE assessment
  - Specific for patients with dyspnea
  - Progression, associated chest pain, sputum, talking tiredness, exercise tolerance
Secondary Assessment (1 of 2)

- More in-depth assessment of body systems:
  - Respiratory
  - Cardiovascular
  - Skin
  - Blood pressure
  - Neurologic

- Proceed only after addressing life-threats.
Secondary Assessment (2 of 2)

• Look for signs of COPD
  – Patient older than 50 years of age
  – History of lung problems
  – Active or former cigarette smoker
  – Tightness in chest
  – Constant fatigue
  – Barrel-like appearance to chest
  – Use of accessory muscles
  – Abnormal breath sounds
Reassessment

• Repeat the primary assessment.
  – Assess for changes in condition.

• Interventions may include:
  – Oxygen via nonrebreathing mask at 15 L/min
  – Positive-pressure ventilations
  – Airway management techniques
  – Positioning in high-Fowler’s position or position of choice
  – Assisting with respiratory medications
Emergency Medical Care (1 of 3)

- Administer supplemental oxygen.
- Some patients may need CPAP or BVM.
- Patient may have metered-dose inhaler (MDI) or small-volume nebulizer.
- Consult medical control and make sure medication is indicated.
• Contraindications
  – Patient unable to coordinate inhalation
  – Inhaler not prescribed to patient
  – Permission not obtained from medical control
  – Not permissible by local protocol
  – Maximum prescribed dose already reached
  – Medication is expired
  – Other contraindications specific to medicine
Emergency Medical Care (3 of 3)

• Most medications are used to relax the muscles that surround the air passages in the lungs.

• Common side effects of inhalers:
  – Increased pulse rate
  – Nervousness
  – Muscle tremors
Treatment of Specific Conditions (1 of 12)

• Upper or lower airway infection
  – Administer humidified oxygen (if available).
  – Do not attempt to suction the airway or place an oropharyngeal airway.
  – Position comfortably.
  – Transport promptly.
• Acute pulmonary edema
  – Provide 100% oxygen.
  – Suction if necessary.
  – Position comfortably.
  – Provide CPAP if indicated and allowed by protocol.
  – Transport promptly.
Treatment of Specific Conditions (3 of 12)

- Chronic obstructive pulmonary disease
  - Assist with prescribed inhaler.
  - Watch for side effects from overuse.
  - Position comfortably.
  - Transport promptly.
Asthma

- Be prepared to suction.
- Assist asthma patient with prescribed inhaler.
- Provide aggressive airway management, oxygen, and prompt transport.
- A prolonged asthma attack that is unrelieved may progress into an emergency known as status asthmaticus.
Hay fever
- Unlikely to need emergency treatment

Anaphylaxis
- Remove the offending agent.
- Maintain the airway.
- Transport rapidly.
- Administer epinephrine.
Treatment of Specific Conditions (6 of 12)

• Spontaneous pneumothorax
  – Provide supplemental oxygen.
  – Transport promptly.
  – Monitor carefully.

• Pleural effusion
  – Fluid removal must be done in hospital.
  – Provide oxygen.
  – Transport promptly.
Treatment of Specific Conditions (7 of 12)

- Obstruction of airway
  - Partial obstruction
    - Provide supplemental oxygen and transport.
  - Complete obstruction
    - Clear obstruction and administer oxygen.
  - Transport rapidly to emergency department.
Treatment of Specific Conditions (8 of 12)

- **Pulmonary embolism**
  - Supplemental oxygen is mandatory.
  - Position comfortably.
  - If hemoptysis is present, clear airway immediately.
  - Transport promptly.
• Hyperventilation
  – Complete primary assessment and gather history.
  – Do not have patient breathe into paper bag.
  – Reassure the patient and provide supplemental oxygen.
  – Transport promptly.
Treatment of Specific Conditions (10 of 12)

• Environmental/industrial exposure
  – Ensure patients are decontaminated.
  – Treat with oxygen, adjuncts, and suction based on presentation.
Treatment of Specific Conditions (11 of 12)

• Foreign body aspiration
  – Clear the airway.
  – Provide oxygen and transport.

• Tracheostomy dysfunction
  – Position comfortably.
  – Suction to clear the obstruction.
  – Provide oxygen.
Treatment of Specific Conditions (12 of 12)

• Asthma
  – Provide blow-by oxygen.
  – Use MDIs.

• Cystic fibrosis
  – Genetic disorder that affects the lungs and digestive system
  – Suction and oxygenate as needed.
1. The process in which oxygen and carbon dioxide are exchanged in the lungs is called:
   A. respiration.
   B. ventilation.
   C. metabolism.
   D. inhalation.
Answer: A

Rationale: Respiration is defined as the exchange of gases between the body and its environment. The exchange of oxygen and carbon dioxide in the lungs is called pulmonary (external) respiration. The exchange of oxygen and carbon dioxide at the cellular level is called cellular (internal) respiration.
1. The process in which oxygen and carbon dioxide are exchanged in the lungs is called:
   
   A. respiration.  
   **Rationale:** Correct answer
   
   B. ventilation.  
   **Rationale:** Ventilation is the exchange of air between the lungs and the environment.
1. The process in which oxygen and carbon dioxide are exchanged in the lungs is called:

   C. metabolism.
   **Rationale:** Metabolism is the series of processes by which food is converted into the energy and products needed to sustain life.

   D. inhalation.
   **Rationale:** Inhalation is the active, muscular part of breathing.
2. Which of the following respiratory diseases causes obstruction of the lower airway?

A. Croup
B. Asthma
C. Epiglottitis
D. Laryngitis
Answer: B

Rationale: Asthma is a lower airway disease that causes the bronchioles in the lungs to constrict (bronchospasm), resulting in various degrees of obstruction. Croup, epiglottitis, and laryngitis cause swelling, inflammation, and varying degrees of obstruction of the upper airway.
2. Which of the following respiratory diseases causes obstruction of the lower airway?

A. Croup
   **Rationale:** This causes an upper airway obstruction.

B. Asthma
   **Rationale:** Correct answer
Review (2 of 2)

2. Which of the following respiratory diseases causes obstruction of the lower airway?

C. Epiglottitis
   **Rationale:** This causes an upper airway obstruction.

D. Laryngitis
   **Rationale:** This causes an upper airway obstruction.
3. Which of the following diseases is potentially drug resistant and is thought to be transmitted by coughing?
   A. Tuberculosis
   B. Croup
   C. Diphtheria
   D. Epiglottitis
Answer: A

Rationale: Tuberculosis is a bacterial infection spread by cough. It is dangerous because many strains are resistant to antibiotics.
3. Which of the following diseases is potentially drug resistant and is thought to be transmitted by coughing?

A. Tuberculosis  
**Rationale:** Correct answer

B. Croup  
**Rationale:** Croup is an inflammatory condition of the larynx and trachea, marked by a cough, hoarseness, and difficulty in breathing.
3. Which of the following diseases is potentially drug resistant and is thought to be transmitted by coughing?

C. Diphtheria  
**Rationale:** Diphtheria is caused by a bacterium that attacks the membranes of the throat.

D. Epiglottitis  
**Rationale:** Epiglottitis is an acute bacterial infection of the epiglottis.
4. All of the following are causes of acute dyspnea, EXCEPT:
   A. asthma.
   B. emphysema.
   C. pneumothorax.
   D. pulmonary embolism.
Answer: B

Rationale: Emphysema—a form of COPD—is a chronic respiratory disease; therefore, it presents with progressively worsening dyspnea. Asthma, pulmonary embolism, and pneumothorax are all acute conditions; therefore, they typically present with an acute onset of dyspnea.
4. All of the following are causes of acute dyspnea, EXCEPT:

A. asthma.
   **Rationale:** Asthma is an acute condition with a sudden onset of dyspnea.

B. emphysema.
   **Rationale:** Correct answer
4. All of the following are causes of acute dyspnea, EXCEPT:

C. pneumothorax.  
**Rationale:** Pneumothorax is an acute condition with a sudden onset of dyspnea.

D. pulmonary embolism.  
**Rationale:** Pulmonary embolism is an acute condition with a sudden onset of dyspnea.
Review

5. Bronchospasm is MOST often associated with:
   5. asthma.
   6. bronchitis.
   7. pneumonia.
   8. pneumothorax.
Answer: A

Rationale: Asthma—a reactive airway disease—is caused by bronchospasm (sustained constriction of the bronchioles). Common triggers to an acute asthma attack include environmental allergens, stress, and temperature changes.
5. Bronchospasm is MOST often associated with:

A. asthma.  
**Rationale:** Correct answer

B. bronchitis.  
**Rationale:** Bronchitis is the inflammation of the mucous membrane in the bronchial tubes of the lungs.
5. Bronchospasm is MOST often associated with:

C. pneumonia.  
**Rationale:** Pneumonia is an inflammation of one or both lungs.

D. pneumothorax.  
**Rationale:** Pneumothorax is the presence of air or gas in the pleural cavity surrounding the lungs, causing pain and difficulty in breathing.
6. A sudden onset of difficulty breathing, sharp chest pain, and cyanosis that persists despite supplemental oxygen is MOST consistent with:

A. severe pneumonia.
B. myocardial infarction.
C. a pulmonary embolism.
D. a spontaneous pneumothorax.
Answer: C

Rationale: Signs of an acute pulmonary embolism include a sudden onset of difficulty breathing, sharp (pleuritic) chest pain, and cyanosis that persists despite the administration of high-flow oxygen. Patients who are immobile for prolonged periods of time (eg, confined to a hospital bed) are prone to a pulmonary embolism.
6. A sudden onset of difficulty breathing, sharp chest pain, and cyanosis that persists despite supplemental oxygen is MOST consistent with:

A. severe pneumonia.
   **Rationale:** This is an acute bacterial or viral infection associated with a fever, cough, and productive sputum.

B. myocardial infarction.
   **Rationale:** A heart attack is associated with chest pain, sudden onset of weakness, nausea, sweating, and discomfort.
6. A sudden onset of difficulty breathing, sharp chest pain, and cyanosis that persists despite supplemental oxygen is MOST consistent with:

C. a pulmonary embolism.  
**Rationale:** Correct answer

D. a spontaneous pneumothorax.  
**Rationale:** This is when air escapes into the pleural cavity.
7. Albuterol, a beta-2 agonist, is the generic name for:
   A. Alupent.
   B. Metaprel.
   C. Brethine.
   D. Ventolin.
Answer: D

Rationale: Albuterol is the generic name for Ventolin (Proventil). Albuterol is a beta-agonist, which dilates the bronchioles, and is commonly used to treat patients with asthma and other reactive airway diseases.
7. Albuterol, a beta-2-agonist, is the generic name for:

A. Alupent.
   **Rationale:** This is the trade name for metaproterenol, also a beta-2 agonist.

B. Metaprel.
   **Rationale:** This is the trade name for metaproterenol, also a beta-2 agonist.
7. Albuterol, a beta-2-agonist, is the generic name for:

    C. Brethine.
    **Rationale:** This is the trade name for terbutaline, also a beta-2 agonist.

    D. Ventolin.
    **Rationale:** Correct answer
8. An acute bacterial infection that results in swelling of the flap that covers the larynx during swallowing is called:

A. croup.
B. laryngitis.
C. epiglottitis.
D. diphtheria.
Answer: C

Rationale: Epiglottitis—a potentially life-threatening illness—is an acute bacterial infection that causes swelling of the epiglottis (the flap that covers the larynx during swallowing). It is characterized by a sudden onset of high fever, difficulty breathing, stridor, drooling, and varying degrees of hypoxemia.
8. An acute bacterial infection that results in swelling of the flap that covers the larynx during swallowing is called:

A. croup.
   Rationale: This is an inflammatory condition of the larynx and trachea, marked by a cough, hoarseness, and difficulty in breathing.

B. laryngitis.
   Rationale: This is an inflammation of the larynx, usually accompanied by hoarseness and coughing.
8. An acute bacterial infection that results in swelling of the flap that covers the larynx during swallowing is called:

   C. epiglottitis.
   **Rationale:** Correct answer

   D. diphtheria.
   **Rationale:** This is caused by a bacterium that attacks the membranes of the throat.
9. A 70-year-old man recently had a heart attack and now complains of severe difficulty breathing, especially when lying flat. He is coughing up pink, frothy secretions. This patient is MOST likely experiencing:

A. acute right heart failure.
B. severe left heart failure.
C. an acute onset of bronchitis.
D. an acute pulmonary embolism.
Answer: B

Rationale: As a result of his recent heart attack, the left side of this patient’s heart has been severely damaged. The left side of the heart is responsible for pumping oxygenated blood to the rest of the body. When it fails to do this, blood backs up into the lungs, resulting in pulmonary edema. Signs of pulmonary edema include dyspnea (especially when lying flat); rapid and shallow respirations; and, in severe cases, coughing up of pink, frothy sputum.
9. A 70-year-old man recently had a heart attack and now complains of severe difficulty breathing, especially when lying flat. He is coughing up pink, frothy secretions. This patient is MOST likely experiencing:

A. acute right heart failure.
   **Rationale:** Acute heart failure causes a backup of blood into the systemic circulatory system and typically causes symptoms of peripheral edema in the hands and feet.

B. severe left heart failure.
   **Rationale:** Correct answer
9. A 70-year-old man recently had a heart attack and now complains of severe difficulty breathing, especially when lying flat. He is coughing up pink, frothy secretions. This patient is MOST likely experiencing:

C. an acute onset of bronchitis.
   **Rationale:** This is an acute inflammation of the lungs associated with a cough, increased sputum, fever, and tachypnea.

D. an acute pulmonary embolism.
   **Rationale:** This is a blood clot in the lungs and is seen as dyspnea, acute chest pain, cyanosis, tachypnea, and coughing up of blood.
10. Which of the following patients is breathing adequately?

A. 36-year-old man with cyanosis around the lips and irregular respirations

B. 29-year old woman with respirations of 20 breaths/min, who is conscious and alert

C. 22-year-old man with labored respirations at a rate of 28 breaths/min and pale skin

D. 59-year-old woman with difficulty breathing, whose respirations are rapid and shallow
Answer: B

Rationale: Adequate breathing in the adult is characterized by a respiratory rate between 12 and 20 breaths/min, good chest rise (indicates adequate tidal volume), unlabored breathing effort, nonaltered mental status, and good perfusion to the skin (ie, pink, warm, dry).
10. Which of the following patients is breathing adequately?

A. 36-year-old man with cyanosis around the lips and irregular respirations  
   **Rationale:** A patient with irregular respirations is not breathing adequately. Cyanosis is a sign of hypoxia.

B. 29-year old woman with respirations of 20 breaths/min, who is conscious and alert  
   **Rationale:** Correct answer
10. Which of the following patients is breathing adequately?

   C. 22-year-old man with labored respirations at a rate of 28 breaths/min and pale skin
   **Rationale:** The normal adult rate of respirations is 12–20 breaths/min.

   D. 59-year-old woman with difficulty breathing, whose respirations are rapid and shallow
   **Rationale:** A patient with adequate breathing has a normal rate and an unlabored breathing effort.