

UNIT TERMINAL OBJECTIVE

- 5-1 At the end of this unit, the EMT-Intermediate student will be able to utilize the assessment findings to formulate a field impression and implement the treatment plan for the patient with respiratory emergencies.

COGNITIVE OBJECTIVES

At the completion of this unit, the EMT-Intermediate will be able to:

- 5-1.1 Identify and describe the function of the structures located in the upper and lower airway. (C-1)
- 5-1.2 Discuss the physiology of ventilation and respiration. (C-1)
- 5-1.3 Identify common pathological events that affect the pulmonary system. (C-1)
- 5-1.4 Discuss abnormal assessment findings associated with pulmonary diseases and conditions. (C-1)
- 5-1.5 Compare various airway and ventilation techniques used in the management of pulmonary diseases. (C-3)
- 5-1.6 Review the pharmacological preparations that EMT-Intermediates use for management of respiratory diseases and conditions. (C-1)
- 5-1.7 Review the use of equipment used during the physical examination of patients with complaints associated with respiratory diseases and conditions. (C-1)
- 5-1.8 Describe the epidemiology, pathophysiology, assessment findings, and management for the following respiratory diseases and conditions: (C-1)
 - a. Bronchial asthma
 - b. Chronic bronchitis
 - c. Emphysema
 - d. Pneumonia
 - e. Pulmonary edema
 - f. Spontaneous pneumothorax
 - g. Hyperventilation syndrome
 - h. Pulmonary thromboembolism

AFFECTIVE OBJECTIVES

At the completion of this unit, the EMT-Intermediate will be able to:

- 5-1.9 Recognize and value the assessment and treatment of patients with respiratory diseases. (A-2)
- 5-1.10 Indicate appreciation for the critical nature of accurate field impressions of patients with respiratory diseases and conditions. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the EMT-Intermediate will be able to:

- 5-1.11 Demonstrate and record pertinent assessment findings associated with pulmonary diseases and conditions. (P-1)
- 5-1.12 Review proper use of airway and ventilation devices. (P-1)
- 5-1.13 Conduct a simulated history and patient assessment, record the findings, and report appropriate management of patients with pulmonary diseases and conditions. (P-3)

DECLARATIVE

- I. Introduction
- II. Anatomy and physiology review
 - A. Anatomy review
 - 1. Upper airway
 - 2. Lower airway
 - B. Global physiology of the pulmonary system
 - 1. Function
 - a. The respiratory system functions as a gas exchange system
 - b. 10,000 liters of air are filtered, warmed, humidified, and exchanged daily in adults
 - c. Oxygen is diffused into the bloodstream for use in cellular metabolism by the body's 100 trillion cells
 - d. Wastes, including carbon dioxide, are excreted from the body via the respiratory system
 - 2. Physiology
 - a. Ventilation
 - b. Diffusion
 - c. Perfusion
- III. General system pathophysiology, assessment, and management
 - A. Pathophysiology
 - 1. A variety of problems can impact the pulmonary system's ability to achieve its goal of gas exchange to provide for cellular needs and excretion of wastes
 - 2. Understanding these problems globally can enable the EMT-Intermediate to quickly and effectively pinpoint probable causes and necessary interventions
 - 3. Specific pathophysiologies
 - a. Ventilation
 - (1) Upper airway obstruction
 - (a) Trauma
 - (b) Epiglottitis
 - (c) Foreign body obstruction
 - (d) Inflammation of the tonsils
 - (2) Lower airway obstruction
 - (a) Trauma
 - (b) Obstructive lung disease
 - (c) Mucous accumulation
 - (d) Smooth muscle spasm
 - (e) Airway edema
 - (3) Chest wall impairment
 - (a) Trauma
 - (b) Hemothorax
 - (c) Pneumothorax
 - (d) Empyema
 - (e) Pleural inflammation
 - (f) Neuromuscular diseases (such as multiple sclerosis or muscular dystrophy)
 - (4) Problems in neurologic control
 - (a) Brainstem malfunction
 - i) CNS depressant drugs
 - ii) CVA or other medical neurologic condition

- iii) Trauma
 - (b) Phrenic/ spinal nerve dysfunction
 - i) Trauma
 - ii) Neuromuscular diseases
 - b. Diffusion
 - (1) Inadequate oxygen concentration in ambient air
 - (2) Alveolar pathology
 - (a) Asbestosis, other environmental lung diseases
 - (b) Blebs/ bullae associated with chronic obstructive lung disease
 - (c) Inhalation injuries
 - (3) Interstitial space pathology
 - (a) Pulmonary edema
 - i) High pressure (also known as cardiogenic)
 - a) Left heart failure
 - b) Idiopathic pulmonary hypertension
 - ii) High permeability (also known as non-cardiogenic)
 - a) Acute Respiratory Distress Syndrome (ARDS)
 - b) Environmental lung diseases i.e. asbestosis,
 - c) Near-drowning
 - d) Post-hypoxia
 - e) Inhalation injuries
 - c. Perfusion
 - (1) Inadequate blood volume/ hemoglobin levels
 - (a) Hypovolemia
 - (b) Anemia
 - (2) Impaired circulatory blood flow
 - (a) Pulmonary embolus
 - (3) Capillary wall pathology
 - (a) Trauma
- B. Assessment Findings
 - 1. Scene size up
 - a. Pulmonary complaints may be associated with exposure to a wide variety of toxins, including carbon monoxide, toxic products of combustion, or environments which have deficient ambient oxygen (e.g., silos, enclosed storage spaces)
 - b. It is critical to assure a safe environment for all EMS personnel before initiating patient contact
 - c. If necessary, individuals with specialized training and equipment should be utilized to remove the patient from a hazardous environment
 - 2. Initial assessment
 - a. A major focus of the initial assessment is the recognition of life-threat; there are a variety of pulmonary conditions which may offer a very real risk for patient death
 - b. Recognition of life-threat and the initiation of resuscitation takes priority over detailed assessment
 - c. Signs of life-threatening respiratory distress in adults, listed from most ominous to least severe
 - (1) Alterations in mental status
 - (2) Severe cyanosis
 - (3) Absent breath sounds
 - (4) Audible stridor
 - (5) 1-2 word dyspnea

- (6) Tachycardia > 130 beats/ minute
 - (7) Pallor and diaphoresis
 - (8) The presence of retractions/ use of the accessory muscles
3. Focused history and physical examination
- a. Chief complaint
 - (1) Dyspnea
 - (2) Chest pain
 - (3) Cough
 - (a) Productive
 - (b) Non-productive
 - (c) Hemoptysis
 - (4) Wheezing
 - (5) Signs of infection
 - (a) Fever/ chills
 - (b) Increased sputum production
 - b. History
 - (1) Previous experiences with similar/ identical symptoms
 - (a) The patient's subjective description of acuity is an accurate indicator of the acuity of this episode if the pathology is chronic
 - (b) Asking the patient "what happened the last time you had an attack this bad" is an extremely useful predictor of this episode's course
 - (2) Known pulmonary diagnosis
 - (a) If the diagnosis is not known to the EMT-Intermediate, an effort should be made to learn whether it is primarily related to ventilation, diffusion, perfusion, or a combination
 - (3) History of previous intubation is an accurate indicator of severe pulmonary disease, and suggests that intubation may be required again
 - (4) Medication history
 - (a) Current medications
 - (b) Medication allergies
 - (c) Pulmonary medications
 - i) Sympathomimetic
 - a) Inhaled
 - b) Oral
 - c) Parenteral
 - ii) Corticosteroid
 - a) The presence of corticosteroid in the patient's home regimen strongly suggests severe, chronic disease
 - b) Inhaled
 - c) Oral (daily versus during exacerbations only)
 - d) Chromolyn sodium
 - e) Methylxanthines (theophylline preparations)
 - f) Antibiotics
 - (d) Cardiac-related drugs
 - (5) History of the present episode
 - (6) Exposure/ smoking history
 - c. Physical exam
 - (1) General impression
 - (a) Position

- i) Sitting
 - ii) "Tripod" position
 - iii) Feet dangling
 - (b) Mentation
 - i) Confusion is a sign of hypoxemia or hypercarbia
 - ii) Restlessness and irritability may be signs of fear and hypoxemia
 - iii) Severe lethargy or coma is a sign of hypercarbia
 - (c) Ability to speak
 - i) 1-2 word dyspnea versus ability to speak freely
 - ii) Rapid, rambling speech is a sign of anxiety and fear
 - (d) Respiratory effort
 - i) Hard work indicates obstruction
 - ii) Retractions
 - iii) Use of accessory muscles
 - (e) Color
 - i) Pallor
 - ii) Diaphoresis
 - iii) Cyanosis
 - a) Central
 - b) Peripheral
- (2) Vital signs
 - (a) Pulse
 - i) Tachycardia is a sign of hypoxemia and the use of sympathomimetic medications
 - ii) In the face of a pulmonary etiology, bradycardia is an ominous sign of severe hypoxemia and imminent cardiac arrest
 - (b) Blood pressure
 - i) Hypertension may be associated with sympathomimetic medication use
 - (c) Respiratory rate
 - i) The respiratory rate is not a very accurate indicator of respiratory status unless it is very slow
 - ii) Trends are essential in evaluating the chronic patient.
 - a) Slowing rate in the face of an unimproved condition suggests exhaustion and impending respiratory insufficiency
 - (d) Respiratory patterns
 - i) Eupnea
 - ii) Tachypnea
 - iii) Cheyne-Stokes
 - iv) Central neurogenic hyperventilation
 - v) Kussmaul
 - vi) Ataxic (Biot's)
 - vii) Apneustic
 - viii) Apnea
- (3) Head/ neck
 - (a) Pursed lip breathing
 - (b) Use of accessory muscles

- (c) Sputum
 - i) Increasing amounts suggest infection
 - ii) Thick, green, or brown sputum suggests infection and/ or pneumonia
 - iii) Yellow or pale gray sputum may be related to allergic or inflammatory etiologies
 - iv) Frank hemoptysis often accompanies severe tuberculosis or carcinoma
 - v) Pink, frothy sputum is associated with severe, late stages of pulmonary edema
- (d) Jugular venous distention may accompany right-sided heart failure, which may be caused by severe pulmonary obstruction
- (4) Chest
 - (a) Signs of trauma
 - (b) Barrel chest demonstrates the presence of long-standing chronic obstructive lung disease
 - (c) Retractions
 - (d) Symmetry
 - (e) Breath sounds
 - i) Normal
 - ii) Abnormal
 - a) Stridor
 - b) Wheezing
 - c) Rhonchi (low wheezes)
 - d) Rales (crackles)
- (5) Extremities
 - (a) Peripheral cyanosis
 - (b) Carpopedal spasm may be associated with hypocapnia resulting from periods of rapid, deep respiration
- d. Diagnostic testing
 - (1) Pulse oximetry
 - (a) Used to evaluate or confirm the adequacy of oxygen saturation
 - (b) May be inaccurate in the presence of conditions which abnormally bind hemoglobin, including carbon monoxide poisoning or methemoglobinemia
 - (2) Peak flow
 - (a) Provides a baseline assessment of airflow for patients with obstructive lung disease
 - (3) Capnometry
 - (a) Provides ongoing assessment of endotracheal tube position; end-tidal CO₂ drops immediately when the tube is displaced from the trachea
 - (b) Quantitative versus qualitative
- C. Management
 - 1. Airway and ventilatory support
 - a. Manual airway opening maneuvers
 - b. Oropharyngeal airway
 - c. Nasopharyngeal airway
 - d. Nasal cannula
 - e. Simple oxygen mask

- f. Non-rebreather mask
 - g. Multi-lumen airway
 - h. Bag-valve-mask
 - i. Suctioning
 - j. Endotracheal tube
 - k. Oxygen powered manually triggered ventilators
 - l. Automatic transport ventilator
 - 2. Circulatory support
 - 3. Pharmacological interventions
 - a. Oxygen
 - b. Sympathomimetic
 - (1) Beta 2 agonists (e.g., albuterol - Proventil, Ventolin, metaproterenol sulfate - Alupent)
 - (2) Epinephrine
 - 4. Non-pharmacological interventions
 - a. Positioning - sitting up
 - b. Back blows
 - 5. Monitoring and devices
 - a. Pulse oximetry
 - b. Peak flow
 - c. Capnometry
 - 6. Transport considerations
 - a. Appropriate mode
 - b. Appropriate facility
 - 7. Psychological support/ communication strategies
- IV. Specific illness
- A. Obstructive airway disease
 - 1. A spectrum of diseases which affect a substantial number of individuals worldwide
 - 2. Diseases include asthma, COPD (which includes emphysema and chronic bronchitis)
 - 3. Epidemiology
 - a. Morbidity/ mortality
 - (1) Overall
 - (2) Asthma - 4-5% of US population
 - (3) 20% of adult males have chronic bronchitis
 - b. Causative factors
 - (1) Cigarette smoking
 - (2) Exposure to environmental toxins
 - (3) Genetic predisposition
 - c. Factors which may exacerbate underlying conditions
 - (1) Intrinsic
 - (a) Stress is a significant exacerbating factor, particularly in adults
 - (b) Upper respiratory infection
 - (c) Exercise
 - (2) Extrinsic
 - (a) Tobacco smoke
 - (b) Allergens (including foods, animal danders, dusts, molds, pollens)
 - (c) Drugs
 - (d) Occupational hazards
 - 4. Pathophysiology overview
 - a. Obstruction occurs in the bronchioles, and may be the result of

- (1) Smooth muscle spasm
 - (a) Beta receptors
- (2) Mucous
 - (a) Goblet cells
 - (b) Cilia
- (3) Inflammation
- b. Obstruction may be reversible or irreversible
- c. Obstruction causes air trapping through the following mechanism
 - (1) Bronchioles dilate naturally on inspiration
 - (2) Dilation enables air to enter the alveoli despite the presence of obstruction
 - (3) Bronchioles naturally constrict on expiration
 - (4) Air becomes trapped distal to obstruction on exhalation
- 5. Specific pathophysiology
 - a. Asthma
 - (1) Reversible obstruction
 - (2) Obstruction caused by a combination of smooth muscle spasm, mucous, and edema
 - (3) Exacerbating factors tend to be extrinsic in children, intrinsic in adults
 - (4) Status asthmaticus - prolonged exacerbation which does not respond to therapy
 - b. Chronic bronchitis
 - (1) Reversible and irreversible obstruction
 - (2) Characterized by hyperplasia and hypertrophy of mucous-producing glands
 - (3) Clinical definition - productive cough for at least 3 months per year for 2 or more consecutive years
 - (4) Typically associated with cigarette smoking, but may also occur in non-smokers
 - c. Emphysema
 - (1) Irreversible airway obstruction
 - (2) Diffusion defect also exists because of the presence of blebs
 - (3) Because blebs have extremely thin walls, they are prone to collapse
 - (4) To prevent collapse, the patient often exhales through pursed lips, effectively maintaining a positive airway pressure
 - (5) Almost always associated with cigarette smoking or significant exposure to environmental toxins
- 6. Assessment findings
 - a. Signs of severe respiratory impairment
 - (1) Altered mentation
 - (2) 1-2 word dyspnea
 - (3) Absent breath sounds
 - b. Chief complaint
 - (1) Dyspnea
 - (2) Cough
 - (3) Nocturnal awakening with dyspnea and wheezing
 - c. History
 - (1) Personal or family history of asthma and/ or allergies
 - (2) History of acute exposure to pulmonary irritant
 - (3) History of prior similar episodes
 - d. Physical findings
 - (1) Wheezing may be present in ALL types of obstructive lung disease

- (2) Retractions and/ or use of accessory muscles
 - e. Diagnostic testing
 - (1) Pulse oximeter to document degree of hypoxemia and response to therapy
 - (2) Peak flow to establish baseline airflow
 - 7. Management
 - a. Airway and ventilatory support
 - (1) Intubation as required
 - (2) Assisted ventilation may be necessary
 - (3) High flow oxygen
 - b. Circulatory support
 - (1) Intravenous therapy may be necessary to
 - (a) Improve hydration
 - (b) Thin and loosen mucous
 - c. Pharmacological interventions
 - (1) Beta 2 agonists
 - d. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - (3) Continue monitoring
 - (4) Contact medical direction
 - e. Psychological support/ communication strategies
- B. Pneumonia
 - 1. Epidemiology
 - a. Incidence
 - (1) Fifth leading cause of death in the US
 - (2) Not a single disease, but a group of specific infections
 - b. Risk factors
 - (1) Cigarette smoking
 - (2) Alcoholism
 - (3) Exposure to cold
 - (4) Extremes of age (old or young)
 - 2. Anatomy and physiology review
 - a. Cilia
 - b. Causes and process of mucous production
 - 3. Pathophysiology
 - a. Ventilation disorder
 - b. Infection of lung parenchyma
 - (1) Most commonly bacterial
 - (2) May also be viral or fungal
 - c. May cause alveolar collapse (atelectasis)
 - d. Localized inflammation/ infection may become systemic, leading to sepsis and septic shock
 - e. Community acquired versus hospital acquired
 - 4. Assessment findings
 - a. Typical pneumonia
 - (1) Acute onset of fever and chills
 - (2) Cough productive of purulent sputum
 - (3) Pleuritic chest pain (in some cases)
 - (4) Pulmonary consolidation on auscultation
 - (5) Location of bronchial breath sounds

- (6) Rales
 - b. Atypical pneumonia
 - (1) Non-productive cough
 - (2) Extra- pulmonary symptoms
 - (3) Headache
 - (4) Myalgias
 - (5) Fatigue
 - (6) Sore throat
 - (7) Nausea, vomiting, diarrhea
 - (8) Fever and chills
- 5. Management
 - a. Airway and ventilatory support
 - (1) Intubation may be required
 - (2) Assisted ventilation as necessary
 - (3) High flow oxygen
 - b. Circulatory support
 - (1) Intravenous access
 - (2) Administration of IV fluids
 - (a) Improve hydration
 - (b) Thin and mobilize mucous
 - c. Pharmacological interventions
 - (1) Beta 2 agonists may be required if airway obstruction is severe or if the patient has accompanying obstructive lung disease
 - d. Non-pharmacological interventions
 - (1) Cool if high fever
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- C. Pulmonary edema
 - 1. Not a disease, but a pathophysiological condition
 - a. High pressure (cardiogenic)
 - b. High permeability (non-cardiogenic)
 - 2. Epidemiology
 - a. Risk factors vary based on type
 - (1) High pressure (cardiogenic)
 - (a) Acute myocardial infarction
 - (b) Chronic hypertension
 - (c) Myocarditis
 - (2) High permeability (non-cardiogenic)
 - (a) Acute hypoxemia
 - (b) Near-drowning
 - (c) Post cardiac arrest
 - (d) Post shock
 - (e) High altitude exposure
 - (f) Inhalation of pulmonary irritants
 - (g) Adult Respiratory Distress Syndrome (ARDS)
 - 3. Anatomy and physiology review
 - 4. Pathophysiology
 - a. Diffusion disorder

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- b. High pressure (cardiogenic)
 - (1) Left-sided heart failure
 - (2) Increase pulmonary venous pressure
 - (3) Increase in hydrostatic pressure
 - (4) Engorgement of pulmonary vasculature
 - (5) Failure of cough and lymphatics to drain fluids
 - (6) Excessive accumulation of fluid in the interstitial space
 - (7) Widening interstitial space impairs diffusion
 - (8) In severe cases, fluid may accumulate in the alveoli
 - c. High permeability (non-cardiogenic)
 - (1) Disruption of the alveolar-capillary membranes caused by
 - (a) Severe hypotension
 - (b) Severe hypoxemia (post drowning, post cardiac arrest, severe seizure, prolonged hypoventilation)
 - (c) High altitude
 - (d) Environmental toxins
 - (e) Septic shock
 - (2) Disrupted membranes leak fluid into the interstitial space
 - (3) Widened interstitial space impairs diffusion
5. Assessment findings
- a. High pressure (cardiogenic)
 - (1) Refer to Cardiac Emergencies unit
 - b. High permeability (non-cardiogenic)
 - (1) History of associated factors
 - (a) Hypoxic episode
 - (b) Shock (hypovolemic, septic, or neurogenic)
 - (c) Chest trauma
 - (d) Recent acute inhalation of toxic gases or particles
 - (e) Recent ascent to high altitude without acclimatizing
 - (2) Dyspnea
 - (3) Orthopnea
 - (4) Fatigue
 - (5) Reduced exercise capacity
 - (6) Pulmonary rales, particularly in severe cases
 - c. Diagnostic testing
6. Management
- a. High pressure (cardiogenic)
 - (1) Airway and ventilatory support
 - (a) Intubation as necessary
 - (b) Assisted ventilation as necessary
 - (c) High flow oxygen
 - (2) Circulatory support
 - (a) Avoid fluid excess; monitor IV flow rates carefully
 - (3) Pharmacological interventions
 - (a) Nitroglycerine
 - (b) Furosemide
 - (c) Morphine sulfate
 - (4) Non-pharmacological interventions
 - (a) Position the patient in an upright position with legs dangling
 - (5) Transport decisions

- (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological support/ communication strategies
 - b. High permeability (non-cardiogenic)
 - (1) Airway and ventilatory support
 - (a) Intubation as necessary
 - (b) Assisted ventilation as necessary
 - (c) High flow oxygen
 - (2) Circulatory support
 - (a) Avoid fluid excess; monitor IV flow rates carefully
 - (3) Pharmacological interventions
 - (4) Non-pharmacological interventions
 - (a) Position the patient in an upright position with legs dangling
 - (b) Rapid removal from any environmental toxins
 - (c) Rapid descent in altitude if high altitude pulmonary edema (HAPE) is suspected
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological support/ communication strategies
- D. Pulmonary thromboembolism
 - 1. Epidemiology
 - a. Incidence
 - (1) Responsible for 50,000 death annually
 - (2) 5% of sudden deaths
 - b. Morbidity/ mortality
 - (1) Less than 10% of pulmonary emboli result in death
 - c. Risk factors
 - (1) Recent surgery
 - (2) Pregnancy
 - (3) Oral contraceptives
 - (4) Infection
 - (5) Cancer
 - (6) Sickle cell anemia
 - (7) Long bone fractures
 - (8) Prolonged inactivity
 - (9) Bedridden
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Perfusion disorder
 - b. Deep vein stasis
 - c. Injury to vein wall
 - d. Hypercoagulability
 - e. Platelet aggregation
 - f. Embolism size
 - g. Embolism location in the legs
 - h. Embolism location in the lungs
 - i. Complete loss of perfusion in some area of lungs
 - j. Other causes of pulmonary circulation obstruction
 - (1) Air

- (2) Fat
 - (3) Foreign objects
 - (4) Venous catheters
 - (5) Amniotic fluid
 - 4. Assessment findings - depend on size and location of the clot
 - a. Evidence of significant life-threatening embolus in a proximal location
 - (1) Altered mentation
 - (2) Severe cyanosis
 - (3) Profound hypotension
 - (4) Cardiac arrest
 - b. Chief complaint
 - (1) Chest pain
 - (2) Dyspnea
 - (3) Cough (typically non-productive)
 - c. History
 - (1) Sudden onset
 - (2) Identification of risk factors
 - d. Physical findings
 - (1) Normal breath sounds or, in severe cases, rales
 - (2) Pleural friction rub
 - (3) Tachycardia
 - (4) Clinical evidence of thrombophlebitis (found in less than 50%)
 - (5) Tachypnea
 - (6) Hemoptysis (fairly rare)
 - 5. Management - prevention has major role in management
 - a. Depends on the size of the embolism
 - b. Airway and ventilatory support
 - (1) Intubation as necessary
 - (2) Positive pressure ventilation as necessary
 - (3) High flow oxygen
 - c. Circulatory support
 - (1) CPR as necessary
 - (2) IV therapy; hydration based on clinical symptoms
 - d. Pharmacological interventions
 - e. Non-pharmacological interventions
 - (1) Support body systems
 - (2) Most severe cases will be managed as a cardiac arrest of unknown origin
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - g. Psychological support/ communication strategies
- E. Spontaneous pneumothorax
 - 1. Epidemiology
 - a. Incidence
 - (1) 18 per 100,000
 - b. Morbidity/ mortality
 - (1) 15-20% partial pneumothorax may be well tolerated
 - c. Risk factors
 - (1) Males
 - (2) Younger age

- (3) Thin body mass
 - (4) History of COPD (secondary spontaneous pneumothorax)
 - 2. Assessment findings
 - a. Chief complaint
 - (1) Shortness of breath
 - (2) Chest pain
 - (3) Sudden onset
 - b. Physical findings
 - (1) Typically minor
 - (a) Pallor
 - (b) Diaphoresis
 - (c) Tachypnea
 - (2) Severe
 - (a) Altered mentation
 - (b) Cyanosis
 - (c) Tachycardia
 - (d) Decreased unilateral breath sounds
 - (e) Local hyperresonance to percussion
 - (f) Subcutaneous emphysema
 - 3. Management
 - a. Airway and ventilatory support
 - (1) Intubation as necessary
 - (2) Assisted ventilation as necessary
 - (3) Oxygen - administration levels based on symptoms and pulse oximetry
 - (4) Watch for the development of a tension pneumothorax
 - b. Circulatory support
 - (1) IV initiation if severe symptoms present
 - c. Pharmacological interventions
 - (1) Not typically necessary; treat symptomatically
 - d. Non-pharmacological interventions
 - (1) Position of comfort/ best ventilation
 - (2) Needle decompression if progression to a tension pneumothorax occurs
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- F. Hyperventilation syndrome
 - 1. Epidemiology
 - a. Incidence is unknown
 - 2. Pathophysiology
 - a. Tachypnea without physiologic demand for increased oxygen causes respiratory alkalosis
 - b. Tachypnea caused by anxiety resulting in respiratory alkalosis
 - c. Carbon dioxide is washed out and carbonic acid is reduced
 - (1) Shift in the acid/ base balance occurs toward base
 - 3. Assessment findings
 - a. Chief complaint
 - (1) Dyspnea
 - (2) Chest pain
 - b. Physical findings

- (1) Rapid breathing with high minute volume
- (2) Varying depending on cause of syndrome
- (3) Carpopedal spasms
- c. Caution there are multiple causes of tachypnea that are not hyperventilation syndrome but cause increased oxygen demand
 - (1) Hypoxia
 - (2) High altitude
 - (3) Pulmonary disorders
 - (4) Pneumonia
 - (5) Pulmonary emboli, vascular disease
 - (6) Bronchial asthma
 - (7) Cardiovascular disorders
 - (8) Congestive heart failure
 - (9) Hypotension/ shock
 - (10) Metabolic disorders
 - (11) Acidosis
 - (12) Hepatic failure
 - (13) Neurologic disorders
 - (14) Central nervous system infection, tumors
 - (15) Drugs
 - (16) Fever, sepsis
 - (17) Pain
 - (18) Pregnancy
- 4. Management
 - a. Depends on cause of syndrome
 - b. Airway and ventilatory support
 - (1) Oxygen, rate of administration based on symptoms and pulse oximetry
 - (2) If anxiety hyperventilation is confirmed (especially based on patient's prior history) coached ventilation/ rebreathing techniques might be considered
 - c. Circulatory support
 - (1) Intervention rarely required
 - d. Pharmacological interventions
 - (1) Intervention rarely required
 - e. Non-pharmacological interventions
 - (1) Intervention rarely required
 - (2) Patients with anxiety hyperventilation will require psychological approaches to calm them
 - (3) Have them mimic your respiratory rate and volume
 - (4) Do not place bag over mouth and nose
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - g. Psychological support/ communication strategies
 - (1) Depend on cause of hyperventilation