Chapter 22
Respiratory Emergencies

Chapter Goal
- Use assessment findings to formulate field impression & carry out treatment plan for patient with respiratory emergencies

Learning Objectives
- Identify & describe function of structures in upper & lower airway
- Discuss physiology of ventilation & respiration
- Identify common pathological events affecting pulmonary system
- Discuss abnormal assessment findings associated with pulmonary diseases & conditions
Learning Objectives

- Compare various airway & ventilation techniques used in management of pulmonary diseases
- Review pharmacological preparations EMT-Is use for management of respiratory diseases & conditions
- Review equipment used during physical examination of respiratory complaint patients

Learning Objectives

- Identify assessment findings & management for
  - Bronchial asthma
  - COPD
  - Chronic bronchitis
  - Emphysema
  - Pneumonia
  - Pulmonary edema
  - Spontaneous pneumothorax
  - Hyperventilation syndrome

Introduction

- Acute
- Chronic
- Can be life-threatening
Anatomy & Physiology

Respiratory system

Respiration
- Inhaling O₂ & exhaling CO₂

Ventilation
- Exchange of CO₂

Oxygenation
- Exchange of O₂

Diffusion

Anatomy & Physiology

- O₂ diffuses from alveolar air to capillary blood
- CO₂ diffuses from capillary blood into alveoli
- Perfusion
  - Oxygenated blood pumped to tissues; waste returned to lungs

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General Respiratory System

- Pathophysiology
  - Respiratory abnormalities
    - Primarily affecting ventilation
      - Upper airway obstruction
      - Lower airway obstruction
      - Impaired chest wall movement
      - Problems with neurological control
  - Diffusion-related conditions
    - Inadequate O₂ in ambient air
    - Alveolar pathology
    - Interstitial space pathology
  - Perfusion-related factors
    - Inadequate blood volume or hemoglobin levels
    - Impaired circulatory blood flow
    - Chest wall pathology

General Respiratory System

- Assessment
  - Major focus—signs of life-threatening distress
    - Alterations in mental status
    - Severe cyanosis
    - Absent breath sounds
    - Audible stridor
    - 1- or 2-word dyspnea
    - HR > 130 bpm
    - Pallor; diaphoresis
    - Retractions/accessory muscle use
General Respiratory System

- Assessment
  - Focused history & physical examination
    - Has patient had similar or identical experience before?
    - "What happened the last time you had an attack this bad?"
    - Does patient have known pulmonary diagnosis?
    - Has patient ever required intubation or other pressure-assisted ventilation?
    - What medications does patient take?
    - Get details of present episode
    - Determine any possible toxic exposures

General Respiratory System

- Assessment
  - Focused history & physical examination (cont'd)
    - General impression
      - Position
      - Mentation
      - Ability to speak
      - Respiratory effort
      - Skin color & appearance

General Respiratory System

- Assessment
  - Focused history & physical examination (cont'd)
    - Vital signs
      - Pulse
      - BP
      - Respiratory rate
      - Respiratory pattern
Assessment

Focused history & physical examination (cont’d)

- Head & neck
  - Pursed lip breathing
  - Retractions
  - JVD
  - Sputum

Chest—observe for:

- Symmetry
- Signs of trauma
- Barrel chest
- Retractions
- Auscultate lungs
General Respiratory System

Assessment
- Focused history & physical examination (cont’d)
  - Extremities
    - Peripheral cyanosis
    - Carpopedal spasm

Assessment
- Focused history & physical examination (cont’d)
  - Diagnostic testing
    - Clinical impression
    - Potentially helpful tests
      - Pulse oximetry
      - Peak flow
      - Capnometry

Management
- Manual airway maneuvers
- Oropharyngeal/nasopharyngeal airway
- Nasal cannula/simple face mask/nonrebreather mask
- Multihumen airway
- Bag-mask device
- Suctioning
- ET Tube
- O₂-powered manually triggered/automatic transport ventilator
- Position of comfort
- Administer medications as indicated
- Continually monitor patient
- Transport to appropriate facility
Obstructive Airway Disease

- Epidemiology & causes
  - 4%-5% of U.S. population have asthma
  - Nearly 20% of adult males have chronic bronchitis
  - Most common cause of COPD—cigarette smoking
  - Factors exacerbating underlying conditions
    - Stress
    - Infection
    - Exercise
  - External stimuli
    - Tobacco smoke
    - Allergens
    - Drugs
    - Occupational hazards

Obstructive Airway Disease: Pathophysiology

- Obstruction—usually result of:
  - Smooth muscle spasm
  - Mucus
  - Inflammation

Obstructive Airway Disease: Pathophysiology

- COPD
  - Bronchioles dilate naturally on inspiration
  - Air enters alveoli
  - Bronchioles constrict on expiration
  - Air becomes trapped distal to site of obstruction during exhalation
Obstructive Airway Disease: Asthma

- **Pathophysiology**
  - Chronic inflammation of lower airway
  - Airways narrow
  - Bronchospasm
  - ↑ Mucus production
  - Edema
  - Inflammatory cell proliferation

Obstructive Airway Disease: Asthma

- **Epidemiology**
  - Unknown why some have asthma and others do not
  - Heredity plays a role
  - Can begin at any age; most common in children & young adults

- **Classification of asthma**
  - Extrinsic
  - Intrinsic

Obstructive Airway Disease: Asthma

- **Causes of asthma**
  - **Status asthmaticus**
    - Severe, prolonged attack
    - Sudden onset
    - Requires immediate transport
    - Be prepared to intubate
Obstructive Airway Disease: COPD

- Progressive, irreversible
- ↓ Inspiratory & expiratory capacity
- Chronic bronchitis
  - Excess mucus production
- Emphysema
  - Lung tissue damage with loss of recoil of lung

Obstructive Airway Disease: COPD

- Pathophysiology
  - Chronic bronchitis
    - Overgrowth of airway mucous glands
    - Excess mucus blocks airway
  - Emphysema
    - Destruction of walls of alveoli
    - Air is trapped within lungs

Obstructive Airway Disease: COPD

- Pathophysiology (cont’d)
  - Cor pulmonale—severe COPD
    - Right side of heart may fail because of effort required to move blood through diseased lung

- Causes
  - Cigarette smoking
  - Industrial inhalants
    - Coal dust
    - Air pollution
    - Tuberculosis
Obstructive Airway Disease

Assessment findings:
- Patients may report:
  - New cough or change in previous cough pattern & sputum production
  - No longer taking medications
  - Use of home oxygen or CPAP/BiPAP
  - Use of home nebulizer
  - ↑ Dyspnea with activity
- Patient may be found in tripod position
- Breathing loud; wheezing present
- No wheezing but short of breath—ominous sign

Other signs & symptoms:
- Shortness of breath; tachypnea
- Coughing
- Tightness in chest
- Cyanosis
- Anxiety, agitation
- Diaphoresis; pallor
- Cigarette stains on fingertips
- Tachycardia
- Hypotension
- Hyperinflated (barrel) chest
- Use of accessory muscles
- Audible abnormal breath sounds
  - ↓ O₂ saturation

If cor pulmonale present:
- Neck vein distention
- Abdominal bloating
- Leg edema
Obstructive Airway Disease

Management

- Perform endotracheal intubation if:
  - Patient cannot maintain airway
  - Ventilatory assistance needed
  - Severe respiratory distress present
  - Significant cyanosis present
  - Significant hypotension present
Obstructive Airway Disease

- **Management**
  - Respiratory distress but breathing adequately
    - Administer high-concentration humidified O₂
    - Place patient in position of comfort
    - Provide calm & reassurance
  - Provide timely transport
  - Monitor vital signs, including pulse oximetry, frequently
  - Monitor ECG
  - Treat bronchospasm
    - Bronchodilator
    - Epinephrine
  - Initiate IV
  - Notify receiving facility early if ventilatory support needed

Pneumonia

- **Epidemiology**
  - Risk factors
    - Cigarette smoking
    - Alcoholism
    - Cold exposure
    - Extremes of age
    - Compromised immune systems

- **Pathophysiology**
  - Infection of lung parenchyma
  - May be bacterial, viral, or fungal
  - May lead to sepsis
  - May cause atelectasis
Pneumonia

Assessment findings

Typical
- Acute onset of fever, chills
- Productive cough
- Pleuritic chest pain
- Crackles & signs of consolidation may be present

Atypical
- Nonproductive cough
- Headache
- Myalgia
- Fatigue
- Sore throat
- Nausea, vomiting, diarrhea
- Fever, chills (continuous)

Management

- Consider patient contagious; act accordingly
- Airway, ventilatory support
- High-concentration O₂; may require intubation
- IV fluids per local protocol
- Reduce body temperature
- Consider beta-2 agonists per local protocol
- Monitor patient during transport
- Provide psychological support

Pulmonary Edema

Epidemiology

- Lungs fill with fluid in interstitial spaces, alveoli, or both
- Pathophysiological condition
Pulmonary Edema

- **Anatomy & physiology**
  - High pressure (cardiogenic):
    - Acute myocardial ischemia
    - Heart valve disease
    - Chronic hypertension
    - Myocarditis
  - High permeability (noncardiogenic):
    - Acute hypoxemia
    - Near-drowning
    - Cardiac arrest
    - Shock
    - High altitude exposure
    - Inhalation of pulmonary irritants
    - ARDS

- **Pathophysiology**
  - Changes in high-pressure pulmonary edema:
    - Ischemia
    - Ventricle unable to pump blood adequately
    - ↑ Ventricular pressure
    - ↑ Pulmonary venous pressure
    - Vessels leak fluid into interstitial space
    - Cough & lymphatic drainage fail to drain excess fluid
    - Fluid accumulation
    - Significant interstitial fluid cause alveoli to rupture & fill with fluid
Pulmonary Edema
Fluid leaks into interstitial space

Pathophysiology
- In high-permeability pulmonary edema, alveolar-capillary membrane disrupted by:
  - Severe hypotension
  - Severe hypoxemia
  - High altitude
  - Environmental toxins
  - Septic shock

Assessment findings
- Acute onset of shortness of breath
- History of:
  - Chest pain
  - Hypoxic episodes
  - Shock
  - Chest trauma
  - Toxic gases
  - High altitude
Pulmonary Edema

- Management
  - Airway, circulatory support
  - High-concentration O₂ preferred if patient will tolerate
  - Assist ventilation and intubate as required
  - Initiate IV per local protocol
  - Position patient upright with legs dangling
  - Provide calm & reassurance
  - Pharmacological management
    - Nitroglycerin
    - Furosemide (Lasix)
    - Morphine sulfate

Pulmonary Thromboembolism

- Epidemiology
  - Blockage of pulmonary artery
  - Combination of 2 processes
    - Formation of venous thrombus
    - Fragment breaks off into venous circulation
  - 50,000 deaths annually

Pulmonary Thromboembolism: Risks

- Risks
  - Obesity
  - Cancer
  - Fractures
  - Pregnancy
  - Surgery
  - Blood disease
  - Infection
Pulmonary Thromboembolism

Assessment findings

- Life-threatening:
  - Cardiac arrest
  - Syncope
  - Altered mentation
  - Severe cyanosis
  - Profound hypotension

- Signs/symptoms of smaller emboli:
  - Sudden, unexplained chest pain
  - Respiratory distress
  - Wheezing, hemoptysis
  - Anxiety
  - Hypotension
  - Shock
    - Unexplained tachycardia
    - Swelling, pain-arm, leg
Pulmonary Thromboembolism

- Management
  - Airway, ventilatory support
  - IV fluids
  - Watch for shock
  - ECG monitor
  - Position of comfort

Spontaneous Pneumothorax

- Sudden accumulation of air in pleural space
- Caused by rupture of weak area on lung surface
- Tension pneumothorax may develop

Spontaneous Pneumothorax

- Epidemiology
  - Rupture of congenital bleb
    - Young, tall, thin male smokers
  - Less common causes:
    - Menstruation
    - Connective tissue lung disease
    - COPD
Spontaneous Pneumothorax

Assessment findings

- Sudden onset of sharp chest pain on affected side
- Shortness of breath
- Tachypnea
- Patient may be coughing, anxious, or agitated
- Signs/symptoms of tension pneumothorax
  - Respiratory distress
  - Weak pulse
  - Cyanosis
  - Hypotension
  - Tenderness on side of lung involved
  - Discolored nail beds
  - Tracheal deviation
  - Subcutaneous emphysema

Management

- Airway & ventilatory support; high-concentration O₂
- IV fluids
- ECG monitor
- Position of comfort; consider lying patient with affected side down
- Watch for tension pneumothorax

Hyperventilation Syndrome

- Respiratory rate greater than required

Causes:

- ↑ Frequency of breathing
- ↑ Volume of air moved
- Both

- ↑ Intake of O₂; ↑ elimination of CO₂
Hyperventilation Syndrome: Pathophysiology

Many disease states cause hyperventilation.

Assessment findings
- Chest pain
- Dizziness, faintness
- Numbness, tingling
- Tightness in throat
- Spasm of fingers, toes
- Altered mental status
- Abnormal lung sounds
- Tachycardia

Management
- Assume there is an underlying cause
- Administer O₂ via nasal cannula; monitor pulse oximetry
- If isolated anxiety suspected, ask patient to control breathing
- Do not have patient breathe into paper bag
- Do not plug portals of mask
- If chest pain present:
  - Monitor ECG
  - Initiate IV
Summary

- Respiratory system responsible for filtering, warming, humidifying, & exchanging more than 10,000 L air/day
- Chronic & acute respiratory problems can present as life threatening
- Abnormalities of ventilation, diffusion, or perfusion (or combination of these) can lead to respiratory problems

Summary

- Ensure safe environment for EMS personnel before initiating patient contact
- Major focus of initial assessment: recognition of life-threatening conditions
- Focused history & physical examination is aimed at patient’s specific respiratory complaints
- Specific conditions may be difficult to diagnose

Summary

- Common respiratory problems include:
  - Obstructive airway
  - Pneumonia
  - Pulmonary edema
  - Pulmonary thromboembolism
  - Spontaneous pneumothorax
  - Hyperventilation syndrome