Respiratory Emergencies

Lesson Goal
- Assess and provide timely treatment & transport to patients experiencing respiratory emergencies

Lesson Objectives
- List parts of respiratory system and how they work
- Discuss how patient with breathing problems might present
- Describe emergency medical care of patient with breathing difficulty
Lesson Objectives

- Discuss role of medical control in treatment of patient with breathing difficulty
- Describe emergency medical care of patient with breathing distress
- Discuss when patient with breathing difficulty may need airway management

Lesson Objectives

- List signs of adequate air exchange
- Discuss medications used in prescribed inhaler
- Describe differences in treating infant, child, & adult patients with breathing difficulty

Lesson Objectives

- Discuss differences in upper airway obstruction & lower airway disease in infant and child
- Explain reasons for giving inhaled treatment
Upper Airway

- Nose
- Mouth
- Pharynx
- Larynx
  - Epiglottis
- Trachea

Respiratory System

Lower Airway

- Bronchi
- Bronchiole tubes
- Bronchioles
- Alveolar ducts
- Alveolar sacs
- Alveoli
Lower Airway

- Alveoli create large surface for gas exchange
- Surrounding capillaries allow gas exchange with blood

Anatomy & Physiology—Lower Airway

- Capillaries must be in contact with alveoli
- Air in alveoli must be able to reach alveolar membrane
- Pulmonary circulation

Mechanics of Respiration

- Inspiration
  - Active process
  - Diaphragm & accessory muscles contract
  - Thoracic volume ↑
  - Lung pressure ↓
  - Air enters chest cavity until pressure is equal
Mechanics of Respiration

- Expiration
  - Passive process
  - Diaphragm & accessory muscles relax
  - Thoracic volume ↓
  - Intrathoracic pressure ↑

Mechanics of Respiration

- Obstruction to outflow of air creates need to exhale forcefully

- Forced exhalation—sign of respiratory distress

Gas Exchange

- Gases diffuse from ↑ concentrations to ↓ concentrations

- ↑ O₂ content in alveoli diffuses into pulmonary capillaries

- ↑ CO₂ content in capillaries diffuses into alveoli
Lung Volumes

- Total lung capacity = 5800 mL
- Vital capacity = 4800 mL
  - Residual volume = 1000 mL
- Tidal volume = 500 mL
  - 150 mL remains above alveoli as dead space
  - 350 mL available for gas exchange

Control of Respiration

- Respiratory center in medulla oblongata
- Responds to changes in pH, CO2, & BP

Control of Respiration

- Primary stimulus to breathe: ↑ CO2 levels
- ↑ CO2 level = ↑ respiratory rate to rid excess CO2
- ↓ CO2 level = ↓ respiratory rate to allow slight build up of CO2 to normal levels
Control of Respiration

- Capnography used in field to guide ventilation
- If capnography revealed ↑ CO₂, how would you adjust ventilations?
- If capnography revealed ↓ CO₂, how would you adjust ventilations?

Normal Respiratory Rates

- Adults 12-20/min
- Children 15-30/min
- Infants 25-30/min

Respiratory Assessment

- Adequate breathing indicated by rate, rhythm, & quality
  - Normal breathing—effortless & quiet
  - Chest rises & falls equally
  - Tidal volume—adequate
  - Breath sounds should be heard in all lung fields
Breathing Status Assessment

- Patients in respiratory distress may be restless or seem uncooperative
  - Working hard to get \( \text{O}_2 \)
- Every word or movement ↑ demand for \( \text{O}_2 \)

Breathing Status Assessment

- General appearance
  - Anxiety
  - Overall appearance
  - Transport decision

Respiratory Assessment

- Environment
  - \( \text{O}_2 \) equipment
  - Home nebulizer
  - Medications
Respiratory Assessment

- Patient position
  - Sitting upright
  - Tripod

- Speech
  - Inability to speak in full sentences because of difficulty breathing

- ↓ O₂ to brain affects mental status
  - Confusion
  - Anxiety
  - Sleepiness
  - Aggressive or bizarre behavior
Respiratory Assessment

- Skin color
  - Cyanosis
  - Pallor
  - Mottling

Respiratory Assessment

- Work of breathing
  - Use of accessory muscles causes fatigue
  - Children—also look for open-mouth breathing & nasal flaring

Respiratory Assessment

- Breathing pattern
  - Should be regular
Respiratory Assessment

- Noisy breathing
  - Noisy breathing is obstructed breathing
  - Obstruction interferes with ventilation & gas exchange
    - Gurgling
    - Coughing
    - Wheezing
    - Snoring

Respiratory Assessment

- Rate
  - Bradypnea may result in hypoxia
  - Tachypnea may result in hyperventilation

Respiratory Assessment

- Quality
  - Auscultate
    - Are lungs sounds clear and equal?
  - Observe
    - Does chest rise & fall equally?
Pediatric Considerations

- Hypoxia—leading cause of cardiac arrest
- Peds require 2x amount of energy to do same daily body work as adults

Pediatric Considerations

- Pediatric differences
  - Relatively large tongue & epiglottis can easily obstruct airway
  - Smaller diameter airways
  - Less protection because of softer cartilage
  - Infants are nose breathers
  - Immature chest muscles
  - Gastric distention can impair movement of diaphragm
  - Proportionally smaller lung & blood volumes

Inadequate Breathing

- Respirations <10 or >30/min
- Irregular rhythm
- Shallow or deep ventilations
- ↑ effort
- Position
- Skin color
- ↓ or absent breath sounds
- Agonal respirations
Inadequate Breathing

- Noisy respirations
  - Snoring = partial airway obstruction
  - Wheezing = airway constriction
  - Coughing = airway irritation

Respiratory Distress

- Signs & symptoms
  - Restlessness, anxiety, mental status changes
  - Tachycardia (bradycardia in children)
  - Tachypnea or bradypnea
  - Skin color changes
  - Noisy breathing
  - Difficulty speaking
  - Accessory muscle use
  - Abdominal breathing
  - tripod or upright position
  - Pursed-lip/nasal flaring/open-mouth breathing
  - Pulse oximetry reading <95%

Respiratory Distress

- May be difficult for patient to speak

- Focus on most important points

- Consider asking patient to write rather than speak

- Ask yes/no questions as much as possible
Additional Assessment

- Onset
- Provoke/palliate
- Quality
- Radiation
- Severity
- Time

Treatment for Respiratory Distress

- O₂ therapy
  - Never withhold oxygen from a patient who needs it
  - NRB 10-12 lpm
  - NC for patients who cannot tolerate mask

Treatment for Respiratory Distress

- Position
  - Position of comfort
  - If patient tolerates supine position, prepare to ventilate
Treatment for Respiratory Distress

- Ventilation
  - Bag-mask with supplemental O₂
  - Synchronize with patients who have spontaneous breathing
  - Look for:
    - Chest rise & fall
    - Proper rate
    - Heart rate return to normal

Oxygenation vs Ventilation

- No matter how high the oxygen flow, if the lungs are not ventilated, the oxygen does not reach the alveoli

Asthma

- Type of COPD
- Inflammation
- Bronchospasm
- ↑ Mucus production
- Narrowed airways prevent effective exhalation, air becomes trapped, and oxygen exchange is diminished
Asthma

- Triggers
  - Allergies
  - Physical activity
  - Stress
  - Some environments

Asthma

- Presentation
  - Cough
  - Dyspnea
  - ↑ Respiratory rate
  - Wheezing
  - Exhaustion
  - Cyanotic
  - ↓ Heart rate
  - Altered mental status
  - Silent chest

Asthma

- Management
  - Airway
  - $O_2$: NRB @ 15 lpm
  - Ensure adequate ventilation
  - Assist with inhaler if appropriate
Anaphylaxis

- Not all coughing, wheezing, & dyspnea are due to asthma
- Can cause severe respiratory distress
- Some patients with history of anaphylaxis carry epinephrine autoinjector

Anaphylaxis

- Presentation
  - Respiratory distress
  - Hypotension
  - Usually occurs <30 min of exposure to allergen
  - Sitting upright to move
  - Altered mental status
  - Cool, clammy, pale skin
  - Hives
  - Wheezing

Anaphylaxis

- Management
  - Maintain patent airway
  - O₂: NRB @ 15 lpm; ventilate if necessary
  - Upright position
  - Rapid transport
  - Assist with epinephrine autoinjector per local protocols
Pulmonary Edema

- Commonly due to left ventricular failure
- Ineffective pumping allows blood to back up into pulmonary circulation
- Congested pulmonary capillaries leak fluid, interfering with gas exchange

Pulmonary Edema

- Presentation
  - Extreme dyspnea
  - Sitting upright
  - Wet lung sounds (crackles, rales)
  - Pink, frothy sputum

Pulmonary Edema

- Management
  - Maintain patent airway
  - O₂ NRB @ 15 lpm; ventilate if necessary
  - Upright position with legs dangling
  - Rapid transport
Emphysema

- COPD
- Exposure to toxins
- Destruction of alveoli
- Barrel chest appearance, pursed-lip breathing
- Pink appearance

Emphysema

- Presentation
  - Dyspnea
  - Tripod position
  - Thin
  - Pursed lip breathing
  - Rapid, shallow breathing

Emphysema

- Management
  - Mild distress. conservative O₂ therapy
    - NC @ 2-6 lpm
  - Sitting position
  - Never withhold oxygen from a patient who needs it. Assist ventilations if respirations decrease or cease
Chronic Bronchitis

- COPD
- Chronic irritation of bronchi results in excess mucus production & coughing
- Excess mucus obstructs bronchioles, interfering with alveolar ventilation

Chronic Bronchitis

- Presentation
  - Cyanosis common
  - Right-sided heart failure with edema
  - Blue appearance
  - Chronic productive cough, wheezing, rhonchi

Chronic Bronchitis

- Management
  - Mild distress: conservative O₂ therapy
    - NC @ 2-6 lpm
  - Sitting position
  - Never withhold oxygen from a patient who needs it. Assist ventilations if respirations decrease or cease
Pulmonary Embolism

- Clot from venous circulation lodges in pulmonary circulation
- Blood cannot reach affected part of lung to be oxygenated
- May be rapidly fatal
- Risk factors

Pulmonary Embolism

- Presentation
  - Sudden-onset respiratory distress without difficulty moving air in and out
  - Hypoxia develops quickly
  - Possible sudden, sharp chest pain

Pulmonary Embolism

- Management
  - Maintain patent airway
  - $O_2$: NRB @ 15 lpm; ventilate if necessary
  - Upright position
  - Rapid transport
Hyperventilation

- Excessively deep, rapid ventilations
- May be due to stress or anxiety
- Excessive CO₂ exhaled
- Patients may experience syncope, which allows respiratory rate to return to normal

Hyperventilation

- Presentation
  - Deep, rapid ventilations
  - Numbness of lips, hands, feet
  - Carpal/pedal spasms
  - Sharp chest pain

Common Respiratory Conditions

- Management
  - Consider pulmonary embolism; initial presentation is similar
  - O₂: NRB @ 15 lpm
  - Coach patient to slow breathing
Airway Obstruction

- Most common cause—tongue
- Head-lift/chin-lift displaces tongue from pharynx

Airway Obstruction

- Presentation
  - Foreign body airway obstruction may occur in children
  - Adults may choke on food and leave table without anyone realizing he or she is choking

Airway Obstruction

- Management
  - Open the airway, attempt to ventilate
  - Abdominal thrusts
Prescribed Inhalers

- Beta agonists
  - Albuterol
  - Metaproterenol
  - Terbutaline
  - Isoetharine

- Parasympatholytic
  - Ipratropium

Prescribed Inhalers

- Side effects
  - ↑ heart rate
  - Anxiety
  - Tremors
Indications for Inhaler Use

- Signs/symptoms of respiratory distress
- Physician-prescribed inhaler
- Medical direction authorization

Skill 17-1: Inhaler Administration

1. Obtain order from medical direction
2. Inhaler should be at least room temperature
3. Verify right medication, right patient, right route
4. Be sure patient is alert enough to use inhaler
5. Check expiration date
6. Confirm how many doses, if any, patient has taken prior to your arrival
7. Shake inhaler vigorously several times
8. Briefly remove supplemental O₂
9. Encourage patient to exhale deeply and place his/her lips around end of device
Skill 17-1: Inhaler Administration

10. As patient inhales, have him/her depress inhaler

11. Instruct patient to inhale as deeply as possible and hold his/her breath for maximum medication absorption

12. Replace supplemental O₂ device

Skill 17-1: Inhaler Administration

13. Reassess VS

14. Allow patient a few normal breaths; repeat as needed per medical direction

15. Be alert for anxiety, tremors, & ↑ heart rate

16. If patient has spacer, allow him/her to use it.

Skill 17-1: Inhaler Administration

Video Clip coming soon
Contraindications for Inhaler Use

- Patient is unable to use device
- Not prescribed for patient
- No permission from medical direction
- Patient has met or exceeded maximum dosage

Pediatric Concerns

- Asthma common in children
- Same indications & contraindications as adults
- May present differently
  - Cyanosis late
  - May cough rather than wheeze

Summary

- Respiratory system provides $O_2$ to cells & transports $CO_2$ to lungs for elimination
- Respiration depends on:
  - Intact airways
  - Functioning nervous system
  - Intact chest wall & diaphragm
  - Adequate circulation
Summary

- Normal respiratory rates
  - Adult: 12-20/min
  - Children: 15-30/min
  - Infants: 25-30/min
- Never withhold O₂ from patient who needs it!

Summary

- Treatment for all causes includes:
  - Ensuring open airway & adequate ventilation
  - Administering supplemental O₂
  - Patients with anaphylaxis may have epinephrine autoinjector
  - Transport required