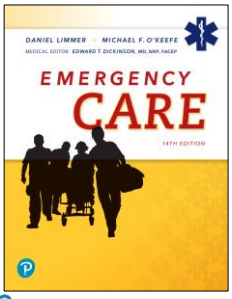
Emergency Care

Fourteenth Edition



Chapter 19

Respiratory Emergencies

Topics

Respiration

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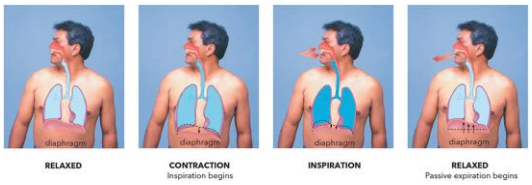
Respiratory Anatomy and Physiology (1 of 4)

- To move air, the respiratory system changes pressure within the chest cavity.
  - Negative pressure is used to move air in and positive pressure is used to move air out.
  - These changes in pressure are generated by contraction and relaxation of the respiratory system muscles.

Respiratory Anatomy and Physiology (2 of 4)



For long description, see slide 111: Appendix 1

The process of respiration.

Respiratory Anatomy and Physiology (3 of 4)

- Inspiration
  - Active process
    - Uses muscle contraction to increase size of chest cavity
  - Intercostal muscles and diaphragm contract.
  - Diaphragm lowers; ribs move upward and outward.
  - Air is pulled into lungs.

Respiratory Anatomy and Physiology (4 of 4)

- Expiration
  - Passive process
  - Rib muscles and diaphragm relax.
  - Size of chest cavity decreases.
  - Air flows out of lungs.

Adequate Breathing (1 of 2)

- Breathing sufficient to support life
- Signs
  - Generally normal mental status and moving air when breathing
  - Ability to speak relatively normally without having to catch their breath
  - Normal color and oxygen saturation typically in normal range

Adequate Breathing (2 of 2)

- May be determined by observing rate, rhythm, quality
  - 12 to 20 breaths/minute for adult
  - 18 to 30 breaths/minute for school-age child
  - 30 to 60 breaths/minute for infant
  - Rhythm usually regular
  - Breath sounds normally present and equal

Inadequate Breathing (1 of 2)

- Breathing not sufficient to support life.
- Signs
  - Rate out of normal range
    - Too fast
    - Slowing and irregular
  - Inability to speak
  - Silent chest

Inadequate Breathing (2 of 2)

- Signs
  - Low oxygen saturation despite supplemental oxygen
  - Agonal respirations
  - Irregular rhythm
  - Diminished or absent lung sounds
  - Poor tidal volume

Pediatric Note (1 of 2)

- Structure of an infant's and child's airway differs from that of an adult.
  - Smaller airway easily obstructed
  - Proportionately larger tongues
  - Smaller, softer, more flexible trachea
  - Less developed, less rigid cricoid cartilage
  - Heavy dependence on diaphragm for respiration

Pediatric Note (2 of 2)

- Signs of inadequate breathing in infants and children
  - Nasal flaring
  - Grunting
  - Seesaw breathing
  - Retractions

Patient Care (1 of 4)

- Inadequate Breathing
  - Assisted ventilation with supplemental oxygen
    - Pocket face mask with supplemental oxygen
    - Two-rescuer bag-valve mask with supplemental oxygen
    - One-rescuer bag-valve mask with supplemental oxygen

Adequate and Inadequate Artificial Ventilation (1 of 2)

- Chest rise and fall should be visible with each breath.
- Adequate artificial ventilation rates
  - 10 to 12 breaths per minute for adults
  - 12 to 20 breaths per minute for infants and children

Adequate and Inadequate Artificial Ventilation (2 of 2)

- Increasing pulse rates can indicate inadequate artificial ventilation in adults.
- Decreasing pulse rates can indicate inadequate artificial ventilation in pediatric patients.

Think About It 1

- How might you recognize the progression from adequate breathing to inadequate breathing in the assessment of your patient?
- How might your patient change during this transition?

Breathing Difficulty

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Breathing Difficulty (1 of 14)

- Patient's subjective perception
- Feeling of labored or difficult breathing
- Amount of distress felt may or may not reflect actual severity of condition.

Breathing Difficulty (2 of 14)

1. Assess to be sure that the patient meets the criteria for CPAP.

Breathing Difficulty (3 of 14)

- Onset
  - When did the difficulty breathing begin?
- Provocation
  - What were you doing when this came on?
- Quality
  - Do you have a cough? Are you bringing anything up with it?

Breathing Difficulty (4 of 14)

- Radiation
  - Do you have pain or discomfort anywhere else in your body? Does it seem to spread to any other part of your body?

Breathing Difficulty (5 of 14)

- Severity
  - On a scale of 1 to 10, how bad is your breathing trouble?
- Time
  - How long have you had this feeling?

Breathing Difficulty (6 of 14)

- Observing
  - Altered mental status
  - Unusual anatomy
    - Barrel chest
  - Patient's position
    - Tripod position
    - Sitting with feet dangling, leaning forward

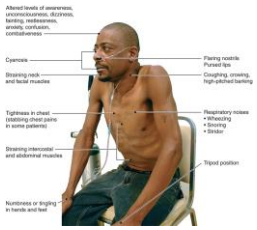
Breathing Difficulty (7 of 14)

- Observing
  - Work of breathing
    - Retractions
    - Use of accessory muscles
    - Flared nostrils
    - Pursed lips
    - Number of words patient can say without stopping

Breathing Difficulty (8 of 14)

- Observing
  - Pale, cyanotic, or flushed skin
  - Pedal edema
  - Sacral edema
  - Oxygen saturation, or SpO_2, reading less than 95 percent on the pulse oximeter

Breathing Difficulty (9 of 14)



For long description, see slide 112: Appendix 2

Signs and symptoms of breathing difficulty.
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Breathing Difficulty (10 of 14)

- Observing
  - Noisy breathing
    - Audible wheezing (heard without stethoscope)
    - Gurgling
    - Snoring
    - Stridor
    - Coughing

Breathing Difficulty (11 of 14)

- Auscultating
  - Lung sounds on both sides during inspiration and expiration

Assessment: Auscultation

6. Reassess the patient's level of distress and vital signs.

Breathing Difficulty (12 of 14)

- Auscultating
  - Wheezes
    - High-pitched sounds created by air moving through narrowed air passages
  - Crackles
    - Fine crackling or bubbling sound heard on inspiration and caused by fluid in alveoli or by opening of closed alveoli

Breathing Difficulty (13 of 14)

- Auscultating
  - Rhonchi
    - Lower-pitched sounds resembling snoring or rattling, caused by secretions in larger airways
  - Stridor
    - High-pitched, upper-airway sounds indicating partial obstruction of trachea or larynx

Breathing Difficulty (14 of 14)

- Evaluating vital sign changes, which may include:
  - Increased or decreased pulse rate
  - Changes in breathing rate
  - Changes in breathing rhythm
  - Hypertension or hypotension

Patient Care (2 of 4)

- Breathing difficulty
  - Assure adequate ventilations.
  - If breathing is inadequate, begin artificial ventilation.
  - If breathing is adequate, use a nonrebreather mask at 15 liters per minute or a nasal cannula at 6 liters per minute.

Patient Care (3 of 4)

4. Use settings as defined in your protocols.

Patient Care (4 of 4)

- Breathing difficulty
  - Place patient in position of comfort.
  - Administer prescribed inhaler.
  - Administer continuous positive airway pressure (CPAP).

Continuous Positive Airway Pressure (CPAP) (1 of 8)

- Continuous positive airway pressure (CPAP) is a form of noninvasive positive pressure ventilation consisting of a mask and a means of blowing oxygen or air into the mask.
  - Blowing oxygen or air continuously at low pressure into airway prevents alveoli from collapsing.
  - Can prevent fluid from entering the alveoli in pulmonary edema

Continuous Positive Airway Pressure (CPAP) (2 of 8)

- Common uses
  - Pulmonary edema
  - Drowning
  - Asthma and COPD
  - Respiratory failure in general

Continuous Positive Airway Pressure (CPAP) (3 of 8)

- Contraindications
  - Severely altered mental status
  - Lack of normal, spontaneous respiratory rate
  - Inability to sit up
  - Hypotension/shock

Continuous Positive Airway Pressure (CPAP) (4 of 8)

- Contraindications
  - Nausea and vomiting
  - Chest trauma
  - Shock
  - Upper GI bleeding or recent gastric surgery
  - Conditions preventing good mask seal

Continuous Positive Airway Pressure (CPAP) (5 of 8)

- Side effects
  - Hypotension
  - Pneumothorax
  - Increased risk of aspiration
  - Drying of corneas

Continuous Positive Airway Pressure (CPAP) (6 of 8)

- Explain procedure to patient.
- Start with low-level CPAP.

Patient Care: Using CPAP 1

2. Explain the device to the patient. The mask and snug seal may initially cause the patient to feel smothered and anxious.

Continuous Positive Airway Pressure (CPAP) (7 of 8)

- Reassess patient's mental status, vital signs, and dyspnea level frequently.
- Raise CPAP level if no relief within a few minutes.

Patient Care: Using CPAP 2

5. Reassess and monitor the patient.

Continuous Positive Airway Pressure (CPAP) (8 of 8)

- If patient deteriorates, remove CPAP and begin ventilating with bag mask.

Patient Care: Using CPAP 3

6. Discontinue CPAP and ventilate the patient if breathing becomes inadequate.

Respiratory Conditions

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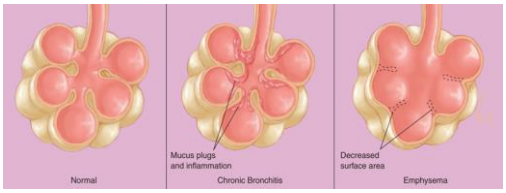
Chronic Obstructive Pulmonary Disease (COPD) (1 of 3)

- Broad classification of chronic lung diseases
  - Includes emphysema, chronic bronchitis, and many undetermined respiratory illnesses
- Overwhelming majority of cases are caused by cigarette smoking.

Chronic Obstructive Pulmonary Disease (COPD) (2 of 3)

- Chronic bronchitis
  - Bronchiole lining inflamed
  - Excess mucus produced
  - Cells in bronchioles that normally clear away mucus accumulations are unable to do so.

COPD: Chronic Bronchitis



For long description, see slide 113: Appendix 3

Chronic bronchitis and emphysema are chronic obstructive pulmonary diseases.

Chronic Obstructive Pulmonary Disease (COPD) (3 of 3)

- Emphysema
  - Alveoli walls break down.
    - Surface area for respiratory exchange is greatly reduced.
  - Lungs lose elasticity.
  - Results in air laden with carbon dioxide being trapped in lungs, reducing effectiveness of normal breathing

Asthma (1 of 2)

- Chronic disease with episodic exacerbations
- During attack, small bronchioles narrow (bronchoconstriction); mucus is overproduced.
- Results in small airway passages practically closing down, severely restricting air flow

Asthma (2 of 2)

- Airflow mainly restricted in one direction
- Inhalation
  - Expanding lungs exert outward pull, increasing diameter of airway and allowing air flow into lungs.
- Exhalation
  - Opposite occurs and air becomes trapped in lungs.

Pulmonary Edema (1 of 5)

- Abnormal accumulation of fluid in alveoli
- Patients with congestive heart failure (CHF) may experience difficulty breathing because of this.

Pulmonary Edema (2 of 5)

- Pressure builds up in pulmonary capillaries.
- Fluid crosses the thin barrier and accumulates in the alveoli.
- Fluid occupying lower airways makes it difficult for oxygen to reach blood.
- Patient experiences dyspnea.

Pulmonary Edema (3 of 5)

- Common signs and symptoms
  - Dyspnea
  - Anxiety
  - Pale and sweaty skin
  - Tachycardia
  - Hypertension
  - Respirations are rapid and labored.
  - Low oxygen saturation

Pulmonary Edema (4 of 5)

- Common signs and symptoms
  - In severe cases, gurgling may be heard even without auscultation every time the patient breathes, and on auscultation, crackles or sometimes wheezes may be audible.
  - Patients may cough up frothy sputum, usually white, but sometimes tinged pink.

Pulmonary Edema (5 of 5)

- Treatment
  - Assess for and treat inadequate breathing.
  - High-concentration oxygen
  - If possible, keep patient's legs in dependent position.
  - CPAP may be used to push fluid back out of lungs and into capillaries.

Think About It 2

- Might it be possible for a patient to have multiple respiratory disorders?
- Could a person with an underlying diagnosis of COPD also have pulmonary edema?

Pneumonia (1 of 4)

- Infection of one or both lungs caused by bacteria, viruses, or fungi
- Results from inhalation of certain microbes
- Microbes grow in lungs and cause inflammation.

Pneumonia (2 of 4)

- Signs and symptoms
  - Shortness of breath with or without exertion
  - Coughing
  - Fever and severe chills
  - Chest pain (often sharp and pleuritic, worsening on inhalation)

Pneumonia (3 of 4)

- Signs and symptoms
  - Headache
  - Pale, sweaty skin
  - Fatigue
  - Confusion

Pneumonia (4 of 4)

- Treatment
  - Care mostly supportive
  - Assess for and treat inadequate breathing.
  - If the patient is hypoxic, administer supplemental oxygen.
  - In some EMS systems, EMTs apply CPAP to these patients.
  - In some cases, pneumonia can be severe enough to cause inadequate breathing, and will require artificial respirations.

Spontaneous Pneumothorax (1 of 3)

- Lung collapses without injury or other obvious cause.
- Higher risk for this condition
  - Patients with COPD and history of smoking at highest risk
  - Tall, thin people

Spontaneous Pneumothorax (2 of 3)

- Signs and symptoms
  - Sharp, pleuritic chest pain
  - Shortness of breath
  - Easily tired
  - Low oxygen saturation, cyanosis
  - Tachycardia
  - Fast breathing
  - Decreased or absent lung sounds on side with injured lung
  - With worsening, JVD and hypotension

Spontaneous Pneumothorax (3 of 3)

- Treatment
  - Contact ALS immediately if pneumothorax is suspected and patient has significant respiratory distress.
  - Administer oxygen.
  - CPAP contraindicated
  - Transport for definitive care, as patients frequently require a small catheter or larger chest tube.

Pulmonary Embolism (1 of 3)

- Blockage in blood supply to lungs
- Commonly caused by deep vein thrombosis (DVT)
- Common reasons for DVT
  - Lying down or sitting in the same position for an extended period
  - Having active cancer
  - Having a limb immobilized in a cast

Pulmonary Embolism (2 of 3)

- Signs and symptoms
  - Sharp, pleuritic chest pain
  - Shortness of breath
  - Anxiety
  - Coughing
  - Tachycardia
  - Tachypnea
  - Lightheadedness/dizziness
  - Pain and swelling in one or both legs
  - Hypotension and cardiac arrest

Pulmonary Embolism (3 of 3)

- Treatment
  - Difficult to differentiate in field
  - Administer oxygen and treat patient like anyone else with shortness of breath.
  - Transport to definitive care.

Epiglottitis (1 of 3)

- Infection causing swelling around and above the epiglottis
- In severe cases, swelling can cause airway obstruction.

Epiglottitis (2 of 3)

- Signs and symptoms
  - Sore throat, painful or difficult swallowing
  - Tripod position
  - Sick appearance
  - Muffled voice
  - Fever
  - Drooling
  - Stridor

Epiglottitis (3 of 3)

- Treatment
  - Keep patient calm and comfortable.
  - Do not inspect throat.
  - Administer high-concentration oxygen if possible without alarming patient.
  - Transport.

Croup (1 of 3)

- Caused by a group of viral illnesses that result in inflammation of the larynx, trachea, and bronchi
- Tissues in the airway (particularly the upper airway) become swollen and restrict the passage of air.

Croup (2 of 3)

- Signs and symptoms
  - Loud, barking cough
  - Hoarse voice
  - Associated breathing difficulty typically resolves when the child moves to an upright position.
  - Inadequate breathing, indicated by signs of hypoxia (cyanosis, altered mental status, etc.)
  - Signs of significant breathing difficulty (inspiratory stridor)

Croup (3 of 3)

- Treatment
  - If signs of inadequate breathing are present, initiate artificial respirations and transport immediately.
  - If the patient is in respiratory distress but is breathing adequately, call advanced life support (ALS) and initiate gentle transport.
  - Consider supplemental oxygen if the patient is hypoxic.
  - Allow the patient to remain in a position of comfort.

Bronchiolitis (1 of 3)

- Small airways become inflamed because of viral infection.
- Most common cause is the respiratory syncytial virus, or RSV.

Bronchiolitis (2 of 3)

- Signs and symptoms
  - Commonly associated with other cold-like symptoms such as a runny nose, fever, and general illness
  - Symptoms typically progress over a few days and worsen to include respiratory distress.
  - Common for multiple children in the house to be sick with similar symptoms
  - Can cause significant respiratory distress and progress to inadequate breathing

Bronchiolitis (3 of 3)

- Treatment
  - Artificial ventilation may be necessary.
  - If the patient is hypoxic or shows signs of hypoxia, treat with supplemental oxygen.
  - Consider using a bulb syringe to suction the nose if it is obstructed by mucus.
  - Clearing the nose of an infant can significantly improve minute ventilation.

Cystic Fibrosis (1 of 3)

- Genetic disease typically appearing in childhood
- Causes thick, sticky mucus accumulating in the lungs and digestive system
- Mucus can cause life-threatening lung infections and serious digestion problems.

Cystic Fibrosis (2 of 3)

- Signs and symptoms
  - Coughing with large amounts of mucus
  - Fatigue
  - Frequent occurrences of pneumonia
  - Abdominal pain and distention
  - Coughing up blood
  - Nausea
  - Weight loss

Cystic Fibrosis (3 of 3)

- Treatment
  - Patient or caregiver often best resource for baseline assessment of patient.
  - Patient or caregivers can often guide treatment.

Viral Respiratory Infections (1 of 3)

- Infection of respiratory tract
- Common in adults, affecting more than 17 billion people each year

Viral Respiratory Infections (2 of 3)

- Signs and symptoms
  - Often starts with sore or scratchy throat with sneezing, runny nose, and fatigue
  - Fever and chills
  - Infection can spread into lungs, causing shortness of breath.
  - Cough can be persistent.
    - May produce yellow or greenish sputum

Viral Respiratory Infections (3 of 3)

- Supportive treatment
  - Supplemental oxygen for hypoxia
  - Bronchodilators for wheezing
- Infection is viral and cannot be helped by antibiotics.
- Good hygiene can prevent viral respiratory infections.

The Prescribed Inhaler

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The Prescribed Inhaler (1 of 5)

- Metered-dose inhaler
- Provides a metered (exactly measured) inhaled dose of medication
- Most commonly prescribed for conditions causing bronchoconstriction

The Prescribed Inhaler (2 of 5)

Prescribed Inhaler

The Prescribed Inhaler (3 of 5)

- Before administering inhaler
  - Ensure right patient, right time, right medication, right dose, right route.
  - Check expiration date.
  - Shake inhaler vigorously.
- Patient alert enough to use inhaler
  - Use spacer device if patient has one.

The Prescribed Inhaler (4 of 5)

3. Ensure the five “rights”: 1. Right patient; 2. Right time; 3. Right medication; 4. Right dose; 5. Right route.

Spacer Device

A spacer between the inhaler and patient makes the timing during inhaler use less critical.

The Prescribed Inhaler (5 of 5)

- To administer inhaler:
  - Have patient exhale deeply.
  - Have patient put lips around opening.
  - Press inhaler to activate spray as patient inhales deeply.
  - Make sure patient holds breath as long as possible so that medication can be absorbed.

The Small-Volume Nebulizer

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The Small-Volume Nebulizer (1 of 3)

- Medications used in metered-dose inhalers can also be administered by a small-volume nebulizer (SVN).
- Nebulizing
  - Running oxygen or air through liquid medication
- Patient breathes vapors created.

The Small-Volume Nebulizer (2 of 3)

- Produces continuous flow of aerosolized medication that can be taken in during multiple breaths over several minutes
- Gives patient greater exposure to medication

The Small-Volume Nebulizer (3 of 3)

Have the patient seal the lips around the mouthpiece and breathe deeply and then hold the breath for 2 to 3 seconds, if possible. Continue until the medication is gone from the chamber.

Chapter Review

Chapter Review (1 of 6)

- Respiratory emergencies are common complaints for EMTs. It is important to understand the anatomy, physiology, pathophysiology, assessment, and care for patients experiencing these emergencies.

Chapter Review (2 of 6)

- Patients with respiratory complaints (which are closely related to cardiac complaints) may exhibit inadequate breathing. Rapid respirations indicate serious conditions, including hypoxia, cardiac and respiratory problems, and shock.

Chapter Review (3 of 6)

- Very slow and shallow respirations are often the endpoint of a serious condition and are a precursor to death.

Chapter Review (4 of 6)

- The history usually provides significant information about the patient's condition. In addition to determining a pertinent past history and medications, determine the patient's signs and symptoms with a detailed description including OPQRST and events leading up to the episode.

Chapter Review (5 of 6)

- Important physical examination points include checking the patient's work of breathing, inspecting accessory muscle use, gathering pulse oximetry readings, assuring adequate and equal lung sounds bilaterally, examining for excess fluid (lungs, ankles, and abdomen), and gathering vital signs.

Chapter Review (6 of 6)

- Several medications are available that may help correct a patient's difficulty in breathing.

Remember (1 of 3)

- Determine if the patient's breathing is adequate, inadequate, or absent.
- Choose the appropriate oxygenation or ventilation therapy.

Remember (2 of 3)

- Consider whether to assist a patient with or administer respiratory medications.
  - Do I have protocols and medications that may help this patient?
  - Does the patient have a presentation and condition that may fit these protocols?

Remember (3 of 3)

- Consider whether to assist a patient with or administer respiratory medications.
  - Are there any contraindications or risks to using medications in my protocols?

Questions to Consider (1 of 2)

- What would you expect a patient's respiratory rate to do when the patient gets hypoxic? Why?
- What would you expect a patient's pulse rate to do when the patient gets hypoxic? Why?
- List the signs of inadequate breathing.

Questions to Consider (2 of 2)

- Would you expect to assist a patient with their prescribed inhaler when they are experiencing congestive heart failure? Why or why not?
- List some differences between adult and infant/child respiratory systems.

Critical Thinking

- A 72-year-old female complains of severe shortness of breath. Her husband notes she is confused. You note a respiratory rate of 8 breaths/minute and cyanosis. Patient has a history of COPD and CHF. Discuss the treatment steps to assist this patient.

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Appendix 1

The position of the diaphragm in each of the four images is as follows.

- In relaxed stage, the diaphragm is in a neutral position.
- In contraction stage, the diaphragm is slightly contracted. A text reads, inspiration begins.
- In inspiration stage, the diaphragm has contracted to expand the lungs.
- In the final relaxed stage, the diaphragm is relaxed and rising, allowing air to flow out of the lungs. A text reads, passive expiration begins.

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Appendix 2

Labels indicating, Altered levels of awareness, unconsciousness, dizziness, fainting, restlessness, anxiety, confusion, combativeness. Cyanosis, pale or blue tinged lip and nose area. Flaring nostrils and pursed lips. Straining neck and facial muscles. Coughing, crowing, or high pitched barking sounds. Tightness in chest, stabbing chest pains in some patients. Respiratory noises such as wheezing, snoring, or stridor. Straining or contracted intercostal and abdominal muscles. Numbness or tingling in hands and feet. Sitting in the tripod position.

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Appendix 3

First image labeled, normal has 5 clear, well defined air sacs. Second image labeled, chronic bronchitis has slightly deformed air sacs containing mucus plugs and showing reddened inflammation on some of the sac lining. Third image labeled, Emphysema has no clearly defined air sacs, which indicates a decreased surface area.

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