Airway and Ventilation
Chapter 10

You Are the Emergency Medical Responder

Your medical emergency response team has been called to the fitness center by building security on a report that an employee complained of having difficulty breathing. You and your partner arrive and find the man conscious but in distress. The patient's chief complaint is difficulty breathing. He says he just "overdid it" on the treadmill. He appears to be out of breath and is having trouble speaking in full sentences. You begin a primary assessment and determine that the patient is in respiratory distress.

What can you do to assist the patient with his breathing?

An Open Airway is the Priority

- Ensuring an open airway is the most important step you can take in caring for a patient because a person cannot breathe without an open airway

- A patient who can speak or cry is conscious, has an open airway, is breathing and has a pulse

Respiratory System Overview

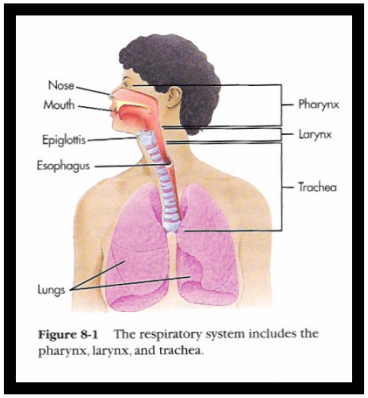


Figure 8-1 The respiratory system includes the pharynx, larynx, and trachea.

- Upper airway tract
  - Begins at the mouth
  - Includes the nose, pharynx and larynx
- Lower airway tract
  - Begins below the level of the vocal cords
  - Includes the trachea, bronchi, bronchioles and alveoli

Pathophysiology

- Breathing difficulties for various reasons
  - Low-oxygen environment
  - Infections
- Choking
- Unconscious, altered LOC, poisoning
- Diseases
  - COPD
  - Emphysema
- Oxygenation – the amount of oxygen in the blood

Respiratory Emergencies*

- Respiratory distress:
  - When someone has difficulty breathing
- Respiratory arrest:
  - The cessation of breathing

➢ By recognizing respiratory distress and taking immediate action, you may prevent respiratory arrest

Causes of Respiratory Distress

- A partially obstructed airway
- Illness
- Chronic conditions, such as asthma
- Electrocution
- Heart attack
- Injury to the head, chest, lungs or abdomen
- Allergic reactions
- Drugs
- Poisoning
- Emotional distress

Signs and Symptoms of Respiratory Emergencies

- Slow or rapid breathing
- Unusually deep or shallow breathing
- Gasping for breath
- Wheezing, gurgling or high-pitched noises
- Unusually moist or cool skin
- Flushed, pale, ashen or bluish skin color
- Shortness of breath
- Dizziness or light-headedness
- Pain in the chest or tingling in the hands, feet or lips
- Apprehensive or fearful feelings

Activity

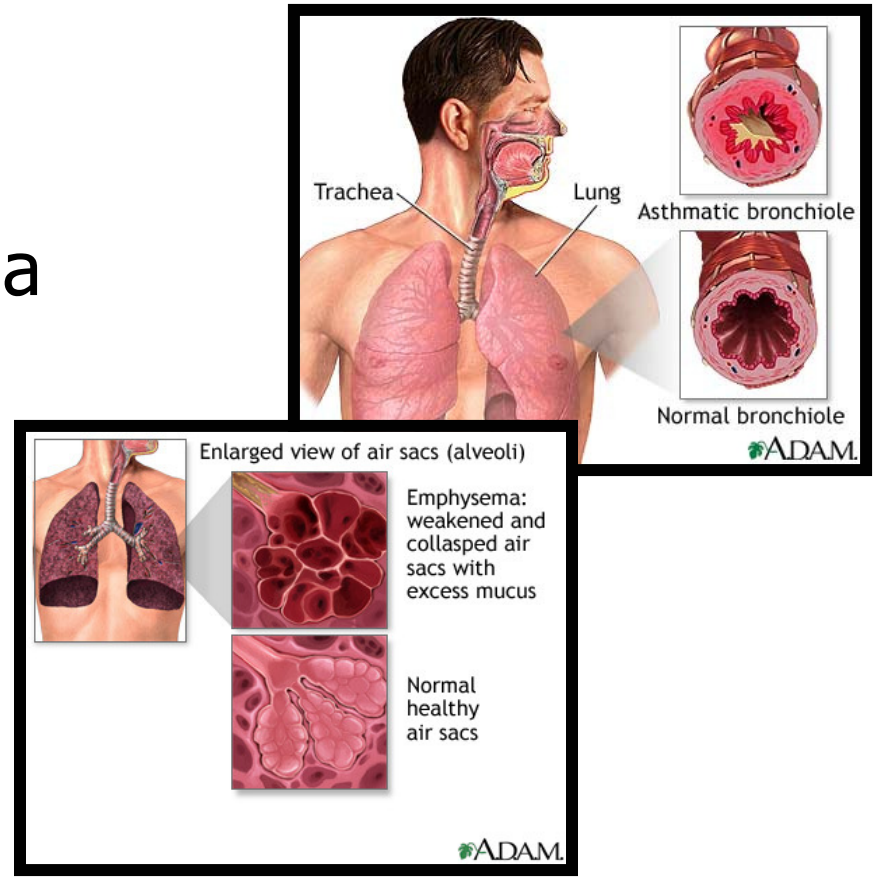
You and your partner are summoned to a local conference center in response to an emergency call. A person who was scheduled to speak at a conference began complaining of difficulty breathing about 10 minutes before he was scheduled to speak. On arrival at the scene, you find the patient sitting on the floor, breathing rapidly. The patient states that all of sudden he began to feel dizzy and his lips started tingling.

What are possible causes for the patient's condition?

What additional questions would be appropriate to ask?

Specific Respiratory Conditions

- Chronic Obstructive Pulmonary Disease (COPD)
- Asthma
- Pneumonia
- Acute pulmonary edema
- Hyperventilation
- Pulmonary embolism
- Emphysema



Signs of an Open Airway

- Two methods for opening an airway
  - Head tilt / chin lift
  - Jaw thrust
- Chest is rising and falling
- Air is heard and felt coming out of patient's mouth and nose with exhalation
- The conscious patient is able to speak in full sentences without distress
- The conscious patient is speaking in normal tones

Signs of an Inadequate Airway

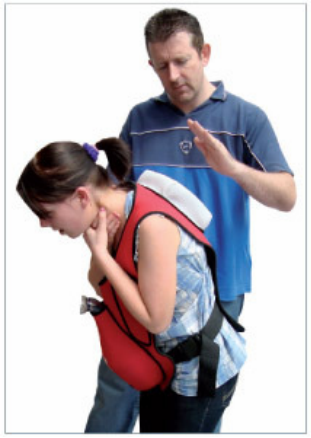
- Visibly unable to catch breath
- Gasping for air
- Abnormal breath sounds - www.easyauscultation.com
  - Grunting / gurgling
  - Stridor – harsh, high-pitched noise
  - Snoring
  - Wheezing
- Apnea – complete absence of breathing

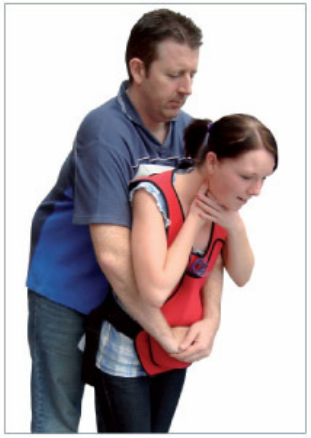
Causes of Airway Obstruction

- Mechanical*
  - Foreign body
    - Solid object, such as food, in adults
    - Large chunks of food and small objects (toy parts or balloons) in children younger than 4 years
- Anatomical*
  - Tongue – most common
  - Swelling due to trauma, infection, asthma, emphysema or anaphylaxis

Techniques to Clear Airway Obstruction

(Will spend time on these next chapter)





- Back blows
- Abdominal thrusts
- Chest thrusts
- Modified CPR for unconscious patients

Techniques to Remove Foreign Material from the Upper Airway

(Will spend time on these next chapter)

- Finger sweeps
  - Only for an unconscious patient
  - Only when foreign matter is seen in a patient's mouth
  - Use the index finger for an adult or child and the little finger for a smaller child and an infant

- Suctioning
- H.A.IN.E.S. – High Arm in Endangered Spine

Signs of Inadequate Breathing

- Rib muscles pulling in on inhalation
- Pursed lip breathing
- Nasal flaring
- Fatigue or sweating
- Excess use of abdominal muscles
- Tripod position
- Deviated trachea
- Abnormal breath sounds (stridor, wheezing, crackles/rales)
- Inadequate depth of breathing
- Too slow or too rapid rate
- Paradoxical breathing
- Irregular respiratory patterns

Signs of Inadequate Oxygenation

- Cyanosis
- Pale, cool, ashen, clammy skin
- Mottling
- Altered mental state, such as restlessness, agitation, confusion or anxiety

When do you use Artificial Ventilations?

When you determine the patient has a pulse but no breathing.

Artificial Ventilation Methods

- Mouth-to-mouth
- **Mouth-to-mask**
- Mouth-to-nose breathing
- Mouth-to-stoma breathing
- **Bag-Valve-Mask resuscitator (BVM)**

Artificial Ventilation

- Various mechanical means to help patients breath
- Why does artificial ventilations increase an individuals chance of survival?
  - The air we breath is composed of many substances, the most important is oxygen, which accounts for 21% of the air we breath
  - Exhaled air is composed of 16%, more than enough to sustain life

Artificial Ventilations

- Assemble resuscitation mask
- Seal the mask
- Open the airway (Head Tilt/Chin Lift or Jaw Thrust)
- Blow in the mask about 1 second, just enough to see chest rise. (**Gastric distention**)
- Adult – 1 ventilation every 5 seconds,
- Child – 1 ventilation every 3 seconds
- Give ventilation about 2 minutes
- Reassess for breathing and pulse

Artificial Ventilation

- If the patient vomits when providing ventilations, quickly turn the patient onto the side, supporting the head and neck and turning the body as a unit; after vomiting has stopped, clear the patient's airway using a finger sweep and suction if necessary and then turn the patient onto the back and continue ventilations.
- Dentures help to support the patient's mouth and cheeks, making it easier to seal the resuscitation mask.
- Ventilations may need to be provided through the nose if the patient's mouth is injured.

BVM Resuscitator Ventilations

- Three-part device: a bag, a valve and a mask
- Advantages:
  - Increased oxygen blood levels
  - Ability to be connected to emergency oxygen
  - Increased effectiveness of ventilations when used correctly by two rescuers
  - Protection against disease transmission and inhalation hazards
  - Useful with advanced airway adjuncts
- Disadvantage?
  - Must have Two rescuers

You Are the Emergency Medical Responder

While waiting for emergency medical services personnel to arrive, you complete a SAMPLE history and secondary assessment. You have helped the patient into a position of comfort for breathing when he suddenly loses consciousness and stops breathing. He has a pulse.

What care should you provide now?

Open airway and give ventilations. Give 1 ventilation about every 5 seconds.

Airway Management
Chapter 11

You Are the Emergency Medical Responder

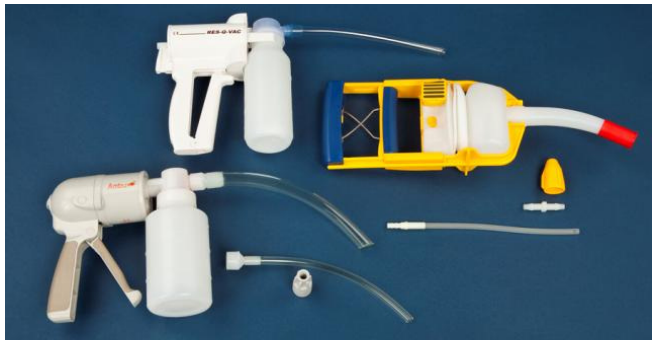
As border security in the immediate vicinity and trained as an emergency medical responder (EMR), you respond to a call at one of the docks for an unconscious adult who collapsed for no apparent reason. You size-up the scene and notice that a middle-age male is lying prone on the floor and not moving. You discover that the patient's chest does not rise when you attempt ventilations.

What do you think is the problem?

What do you do next?

Suctioning

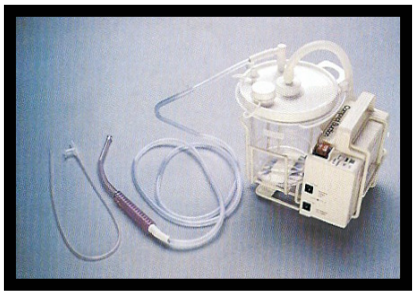
- Process of removing foreign matter, such as mucus, fluid or blood, from a patient's upper airway
- Two types of devices
  - Mechanical: electrically powered
  - Manual: hand powered; no energy source



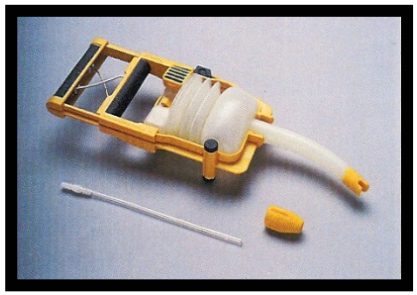
- Use of sterile suction catheters of appropriate size

DVD Segments

Using Mechanical and Manual Suctioning Device

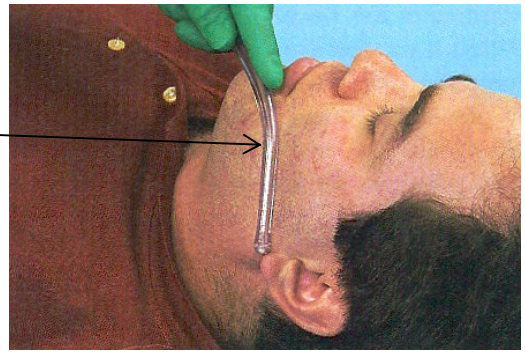


Suctioning Clear Victim's Airway



- Steps for Suctioning
  1. Turn head to side or roll body if head, neck, or back injury suspected
  2. Open victim's mouth
  3. Sweep large particles of debris out of the mouth (Only on unconscious patient)
  4. Measure distance of insertion *(earlobe to corner of mouth)*
  5. Insert suction device into back of mouth and suction on the way out
  6. No more than -

  Adults – 15 sec; Child – 10 sec; Infant – 5 sec

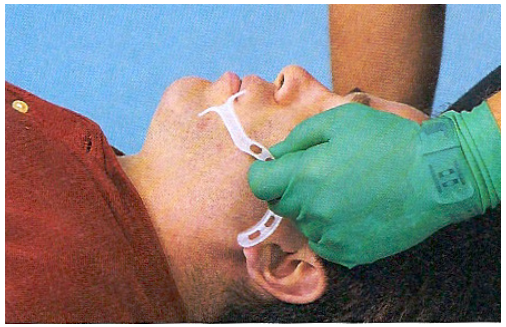


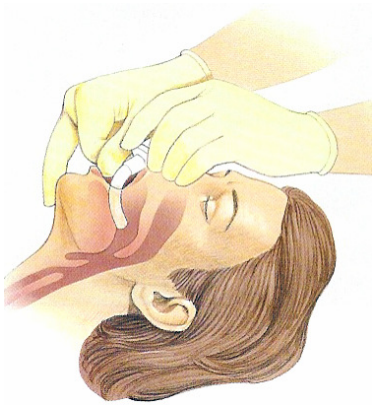
Airway Adjuncts

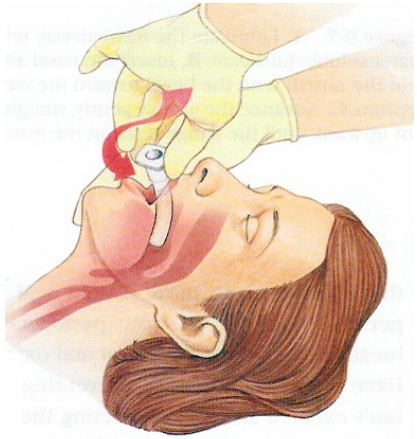
- Mechanical airway adjuncts
  - Oral (Oropharyngeal) airways (OPAs)
  - Nasal (Nasopharyngeal) airways (NPAs)
- They keep the tongue (the most common cause of airway obstruction) away from the back of the throat.
- OPAs are only for unconscious, unresponsive patients with ***no*** gag reflex

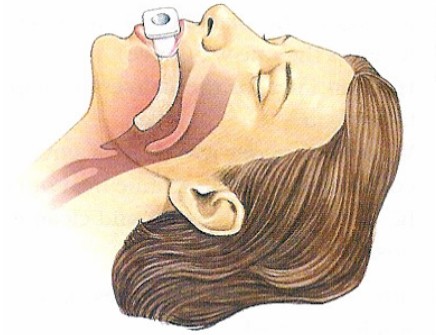
Inserting An Oral Airway

- Select airway or proper size
  - Victim's earlobe to corner of mouth
- Open victim's mouth using a crossed finger technique
- Insert airway with curved end along roof of mouth
- Advance airway gently until resistance is felt
- Rotate airway ½ turn
- Flange should rest on lips
- *Immediately* remove airway if patient begins to gag.









Airway Obstructions

- **Anatomical** obstruction from—
  - The tongue
  - Swollen tissues of the mouth, tongue or throat
- **Mechanical** obstruction from—
  - Foreign objects, such as food or toys
  - Fluids, such as vomit

Foreign Body Airway Obstruction (FBAO)

- Universal sign: a conscious person who is clutching the throat
- Mild or partial FBAO
  - Ability to move some air to and from the lungs
  - Forcibly coughing, which is encouraged
- Severe FBAO
  - Inability to cough, speak, cry or breathe
  - Immediate action is necessary

DVD

Conscious Choking – Adult and Child, Infant

Measures to Relieve FBAO / Choking

- Conscious Adult/Child patient
  1. Obtain Consent
  2. If Patient is coughing forcefully, Encourage continued forcible coughing
  3. If patient cannot cough, speak, cry or breathe, have someone get more advanced medical personnel.
  4. 5 Back blows
  5. 5 Abdominal thrusts (adults and children)
     - Chest thrusts (for infants, pregnant women and patients too large to reach around)
  6. Continue until,
     - Object is forced out
     - Patient begins to cough forcefully or breathe
     - Patient becomes unconscious

Measures to Relieve FBAO / Choking

- Conscious Infant
  1. If infant cannot cough, cry or breathe, carefully position the infant face-down along your forearm.
     - Support head and neck, Lower infant onto your thigh, keeping infant's head lower than chest.
  2. Give 5 Back Blows,
     - Use heel of hand, blows between infant's shoulder blades.
  3. Position infant face-up along forearm
  4. Give 5 chest thrusts.
     - 2 or 3 fingers on center of chest just below nipple line, compress about 1 ½ inches
  5. Continue until,
     - Object is forced out
     - Infant begins to cough or breathe
     - Patient becomes unconscious

Measures to Relieve FBAO / Choking

- Unconscious patient
- Modified CPR
- DVD, Unconscious Choking Adult, Child and Infant

Scenario

While attending a picnic, you notice that a 4-year-old boy begins coughing very forcibly while eating a hot dog. His mother appears frantic and begins shouting for help. As a trained EMR, you respond to the mother's call for help.

What must you do first?

Which skills would be appropriate to use?

You Are the Emergency Medical Responder

You reposition the patient's airway and attempt 2 ventilations, but the chest still does not rise.

How would you respond?

After a few minutes of care, the patient's chest begins to rise and fall with the ventilations, but he is not breathing on his own.

How would you continue to provide care for the patient?

Emergency Oxygen
Chapter 12

You Are the Emergency Medical Responder

A 45-year-old man is experiencing chest pain. When help arrives you learn that the onset of pain started about 30 minutes ago as a mild, squeezing sensation. The pain is now severe and he is gasping for breath. You, as the responding member of your company's emergency response team, recognize that these signs and symptoms suggest a serious cardiac condition. You complete a primary assessment, physical exam and SAMPLE history. The patient has no known history of hypertension or heart disease. While waiting for an ambulance to arrive, you help the patient get into the most comfortable position for breathing, keep him from getting chilled or overheated and ask him to remain still. You open a nearby window to circulate fresh air into the stuffy room.

What else can you do to help?

Emergency oxygen is oxygen delivered to a patient from an oxygen cylinder through a delivery device to a nonbreathing or breathing patient who is not receiving adequate oxygen from the environment. Supplying emergency oxygen can be beneficial when someone has a breathing or cardiac emergency.

Indications for the Use of Emergency Oxygen

- For a nonbreathing patient in many breathing emergencys
- The use of oxygen in breathing adults, children and infants depends on the number of breaths per minute
  - Adult: <12 or >20 breaths per minute
  - Children: <15 or >30 breaths per minute
  - Infants: <25 or >50 breaths per minute
- Properly sized equipment and flow for delivery
- All patients in respiratory distress/arrest
- For suspected CO poisoning and all smoke inhalation cases

Emergency Oxygen Components

- Oxygen cylinder

- Pressure regulator and flowmeter

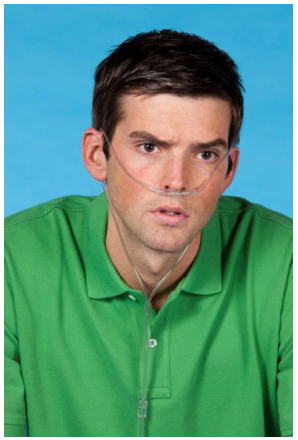
- Delivery device

Types of Oxygen Delivery Systems

- Variable-flow-rate oxygen systems
  - Able to adjust flow rate
  - Require equipment assembly
- Fixed-flow-rate oxygen systems
  - Set flow rate, usually 15 LPM
  - No assembly required

Oxygen Delivery Devices

- Nasal cannula



- Non-rebreather mask

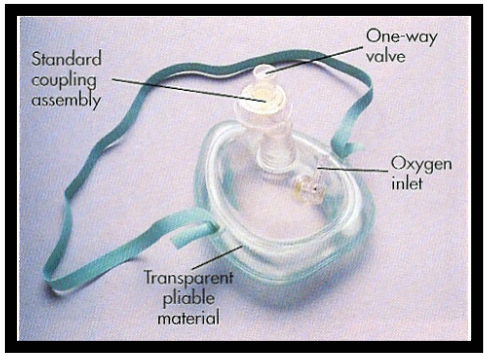
- Resuscitation mask

- BVM

Nasal Cannula

- For use only on breathing patients, delivering emergency oxygen through the patient's nostrils
- Commonly used for patients with only minor breathing difficulty or for those who have a history of respiratory medical conditions; also useful for patients who cannot tolerate a mask over their face
- Flow rate of 1 to 6 LPM
- Peak oxygen concentration of approximately 44 percent

Resuscitation Mask with Oxygen Inlet



- For nonbreathing patient or someone who is breathing but still needs emergency oxygen
- Flow rate of 6 to 15 LPM
- Peak oxygen concentration of 55 percent at 6 LPM
- Peak oxygen concentration of 35 percent when used on a nonbreathing patient during ventilations

Non-Rebreather Mask

- For delivery of high concentrations of oxygen to breathing patients
- Face mask with attached reservoir bag and one-way valve
- Flow rate at 10 to 15 LPM
- Peak oxygen concentration up to 90 percent with a high oxygen flow rate

Bag Valve Mask (BVM)

- For breathing and nonbreathing patients
- Flow rate at 15 LPM or greater
- Peak oxygen concentration of 90 percent or more when flow rate at 15 LPM or more

Activity

While providing care to a patient in a motor-vehicle crash, your assessment reveals that the patient's respiratory rate is 30 breaths per minute. The patient also has a history of pneumonia. You determine that the patient would benefit from emergency oxygen.

What is the most appropriate type of oxygen delivery device to use?

Safety Precautions

- Be sure oxygen is flowing before applying the delivery device
- Do not use oxygen around flames or sparks including smoking materials
- Do not use grease, oil or petroleum products to lubricate or clean the regulator
- Do not stand oxygen cylinders upright unless secured
- Do not drag or roll cylinders
- Do not carry a cylinder by the valve or regulator

Safety Precautions (cont.)

- Do not hold on to protective valve caps or guards when moving or lifting cylinders
- Do not deface, alter or remove any labeling or markings on the oxygen cylinder
- Do not attempt to mix gases in an oxygen cylinder or transfer oxygen from one cylinder to another
- Do not defibrillate someone when around free-flowing oxygen or gasoline
- Never refill an oxygen cylinder

DVD
Oxygen Delivery

You Are the Emergency Medical Responder

The 45-year-old man who was experiencing chest pain and difficulty breathing is now slightly cyanotic (skin has a bluish color), is gasping for air and is breathing 26 times per minute.

What breathing devices could you use to help this patient?

After a couple of minutes, the man complains of having a mask on his face but is still gasping for air.

How would you change your care for this patient?