Airways and Resuscitators

CRC 330
Cardiorespiratory Care
University of South Alabama
Causes of Upper Airway Obstruction

- CNS depression - anesthesia, drug overdose
- Cardiac arrest
- Loss of consciousness
- Foreign body or tumor
Manual Maneuvers to Open the Airway

- Head tilt
- Jaw thrust (preferred in trauma)
- Triple airway maneuver: chin lift, head tilt, separation of teeth

Fig. 1. The effect of the triple airway manoeuvre aided by an oral pharyngeal airway.
Indications for Oral and Nasal Airways

- Upper airway obstruction secondary to any of the causes of upper airway obstruction
- Provide easier access for suctioning than by suctioning through the uninstrumented airway
- Emergency airway access
- Airway control during short surgical procedures
Oral Airways

- Berman
  - Flange at the mouth
  - I beam support
- Guedel
  - Flange at the mouth
  - Open channel
- Properly sized, will hold the tongue off the posterior pharynx
Oral Airway Sizing

- To choose the proper size, hold the airway against the side of the patient’s face. It should extend from the corner of the patient’s mouth to the angle of the jaw.
Oral Airway Insertion

- Open mouth with cross finger technique. Insert airway with tip pointing up to avoid pushing tongue backward.
- Rotate airway tip slowly downward until its curve matches the curve of the tongue.
- The flange of the airway should rest against the patient’s lips.
Oral Airways

- Should only be used in unconscious patients as gagging/vomiting is induced
- Once placed, may be taped for security
- Sometimes used as a bite block in patients who tend to bite the endotracheal tube
- True bite blocks are preferred when necessary
Nasal Airways

- **Construction**
  - Soft rubber, silicone, or PVC
  - Proximal flange, distal bevel
  - Varying lengths and diameters

- **Purpose**
  - Maintain patent airway
  - Frequent suctioning
  - Facilitate insertion of other tubes
Nasal Airways

- **Advantage**
  - Better tolerated by semiconscious patients

- **Contraindicated in**
  - Nasal trauma, basilar skull fractures, nasal trauma, and bleeding disorders

- **Hazards**
  - Sinusitus, otitis media, gastric insufflation, meningeal intubation, airway occlusion, tissue necrosis, and bleeding
Nasal Airways

- **Insertion**
  - Size = nare to earlobe + 2.5 cm.
  - Inspect the nose to determine the larger nare
  - Lubricate the airway with water soluble lubricant
  - Insert along the floor of the nose until the flange rests at the nare; tip at base of tongue
  - Need not be taped
  - Change daily
Nasal Airway Position
Esophageal-tracheal Combitube

- Double-lumen tube
  - One with proximal holes
  - One with a distal opening
- If the wrong lumen is ventilated, the patient is not ventilated
- An emergency, non-hospital airway
Esophageal-tracheal Combitube

- Inserted blindly, may intubate the esophagus or trachea
- Inflate both cuffs
  - Attempt to ventilate through the shorter tube
  - Observe for chest expansion
  - Switch to longer tube if no ventilation
- Prepare for suctioning as tube is removed
Laryngeal Mask Airway

- A cuffed mask fit over the larynx
- A tube from the mask, exiting the mouth for attachment to anesthesia devices
Laryngeal Mask Airway

- Used when pressure will be < 20 cm H₂O
- Vomiting, aspiration, leaks
- Alternative to intubation, short cases, not for airway care during CPR
Resuscitation bags

- Indications
  - Emergency ventilation: during CPR, prior to initiation of MV
  - Hyperoxygenation during suctioning, extubation, changing trach tube
  - Maintain ventilation during interruptions in ventilation: electrical failure, ventilator circuit change
  - During transport
Standards for construction and performance of resuscitators

- American Society for Testing and Materials (ASTM), AMA, ISO, AARC CPG
- Must deliver 100% (AMA), 85% with 15 lpm O\textsubscript{2} (ASTM)
- No valve malfunction at flows up to 30 lpm
- If vomit jams the valve, it must be capable of being cleared and reassembled within 20 seconds
- 15 mm ID and 22 mm OD fitting for ETTs and masks
Standards for construction and performance of resuscitators

- Must remain functional after 1 meter drop on concrete
- Operator must be able to readily override pressure limit
- Ped/neo bags must have a 40 cmH₂O popoff
- Compliance is good because manufacturers know that these standards are widely known
Resuscitator construction

- Self-inflating bag
  - reusable or disposable
  - once squeezed, stiff enough to reinflate
  - pulls-in oxygen during reinflation
  - must work in high and low ambient temperatures
  - most have a volume of 1.1 – 2.2 L (adult), 0.2 – 0.9L for pediatric/neonatal bags
  - 1-handed, should deliver >600 mL (adult), 70-300 mL (child), 20-70 for neonates
  - variables: leaks, airway patency, # hands, coordination to avoid gastric insufflation
Resuscitator construction

- **Bag inlet valve**
  - One-way valve
  - opens when the bag is inflating
  - placed between the reservoir and the bag

- **Patient valve**
  - Opens to the patient when bag is squeezed
  - Spring-loaded disc or ball
  - Duckbill valve
  - Diaphragm valve
Resuscitator Construction

FIGURE 34-20 Components of a bag-valve device.

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Resuscitator construction

- **Reservoir**
  - increase the FiO₂ to 1.0
  - corrugated hose or bag that attaches adjacent to the bag inlet valve
  - use a high O₂ flow

- **PEEP valves**
  - spring loaded diaphragm
  - displaced by the pressure of exhalation, down to the desired level of PEEP
  - usually up to 15 cmH₂O
  - use whenever the PEEP being used is > 5 cmH₂O
Increasing the DO₂

- Slow the reinflation rate; restrict with your hands
- Increase the oxygen flow, may use flush, assure that valve doesn't jam
- Slow the compression rate
- Add reservoir tubing
Hazards and Troubleshooting

- Unrecognized equipment failure
  - Chest does not rise
  - Valve failure
- Gastric inflation
  - Low flow, 500 mL, 1:2 I:E
- Barotrauma
- Hyperventilation
- Decreased venous return
Gas powered resuscitators

- Mainly for field use
- Pressure limited, 40 cmH₂O
- May be used as demand valves
- Patient receives a breath by pressing a button or lever, or by starting a breath
- Deliver 100% O₂, flow < 40 lpm
- Associated with high Paw, gastric insufflation with mask use
- Hudson Lifesaver, Robertshaw demand valve
Bag-mask ventilation

- Select a mask that fits from the bridge of the nose to the lower lip
- Securely attach the mask to the bag
- Assure at least 15 lpm oxygen flow to the bag
- Oral airway preferable
- Apply top of mask to the bridge of the nose
Bag-mask ventilation

- Apply base of mask below the lower lip
- Hold the mask securely against the face with thumb and forefinger
- Maintain head tilt with other three fingers
- Preferable to have one rescuer hold the mask while the other bags
- Provides adequate ventilation until intubation
Resuscitator Use

- Squeeze bag to observe chest rise (400-500 mL) over 1 second
- During CPR, 2 breaths over 3 sec., unsynchronized
- 8-10 bpm, 6-8 bpm in COPD
- >12 bpm not recommended
Other ventilation devices

- Flow inflating bags
  - Mostly for neonates
  - Mapleson circuits, can provide CPAP
  - Do not have a nonrebreathing valve
Other Ventilation Devices

- Mouth to mask devices
  - Mouthpiece, nonrebreathing valve and mask
  - Isolate the rescuer from the patient
  - Oxygen may be added to increase DO$_2$
  - Provide adequate ventilation until intubation