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## ***Airway/Oxygenation***

Appropriate airway management is often the most important intervention a pre-hospital care provider makes, as ensuring adequate oxygenation and ventilation is crucial to the survival of every patient. The approach to airway control should proceed in a stepwise fashion, from basic to advanced, since basic maneuvers can sustain life until an advanced airway can be established. All of the following procedures may be performed prior to radio contact.

### **MEDICATIONS VIA THE ENDOTRACHEAL TUBE:**

1. **Medications may not be given via the endotracheal tube unless IV or IO routes of administration are not able to be obtained.**
  - a. If IV or IO routes of administration are not able to be obtained, the following medications may be given via the endotracheal tube:
    - Atropine, Epinephrine
    - Adults – Dosages given via this route need to be 2 to 2.5 times that of the IV dosage.
    - Children – Dosages given via this route need to be 2 to 3 times that of the IV dosage. All dosages for pediatric epinephrine administered ET are 1:1000 concentration.

### **INDICATIONS FOR AIRWAY INTERVENTION:**

1. Airway obstruction
2. Need for positive pressure ventilation
  - a. Apnea or inadequate respiratory effort
  - b. Impending respiratory failure
  - c. Patients who, as a result of trauma, have a Glasgow Coma Score of 8 or less.
3. Airway protection, such as an unconscious patient without a gag reflex.

### **PROCEDURE:**

1. (MFR/BLS/LALS/ALS) Open the airway using the basic maneuvers (chin lift or jaw thrust). Patients with a potential cervical spine injury should not have their neck hyper extended.
2. (MFR/BLS/LALS/ALS) Attempt to ventilate using BVM or other approved device. Provide high flow oxygen.
3. (MFR/BLS/LALS/ALS) In cases of airway obstruction, abdominal thrusts or other interventions as indicated.
4. (BLS/LALS/ALS) Providers may consider continuing basic manual airway maintenance if airway is able to maintained adequately.
5. (LALS/ALS) Endotracheal intubation may be performed via the orotracheal or nasotracheal route. Orotracheal intubation is the preferred method for unconscious patients without a gag reflex. Patients who still have spontaneous respiratory efforts may be nasotracheally intubated.
6. (BLS) Combitube or King airway insertion may be performed in unconscious and apneic

patients. MCA must choose to use one or both of these devices.

7. (LALS/ALS) Combitube or King airway insertion may be performed to secure the airway in unconscious and apneic patients in whom oral and nasal intubations are unsuccessful. In cardiac arrest patients, the Combitube or King airway should be considered early in patients whom oral intubation is perceived to be technically difficult.
  
8. (ALS) In cases where intubation is unsuccessful, where facial trauma precludes the possibility of successful intubation, or in cases of complete airway obstruction unresponsive to dislodging efforts and when basic ventilation efforts are not successful, a cricothyrotomy should be performed. Patients less than age 8 should have a needle cricothyrotomy performed; age 8 or greater should ideally undergo a surgical cricothyrotomy.
  
9. Any intubated patient must have correct tube position verified optimially by use of waveform capnography/capnometry or other MCA approved secondary confirmation device. This should not supplant standard methods of verifying correct tube placement (breath sounds combined with epigastric auscultation, chest rise, etc.). Paramedics must be familiar with the use and limitations waveform capnography/capnometry or other MCA approved secondary confirmation device. Maintain continuous CO<sub>2</sub> monitoring once established.

### **OROTRACHEAL INTUBATION (LALS/ALS)**

#### **Technique for Endotracheal Intubation:**

1. Ventilate the patient with 100% oxygen.
  
2. Gather equipment:
  - appropriate size ETT
  - stylet
  - syringe
  - laryngoscope
  - suction
  - BVM
  - device for securing tube after placement
  - waveform capnography/capnometry or other MCA approved secondary confirmation device
  - pulse oximeter, if available
  
3. Place the laryngoscope blade along the right side of the tongue, moving the tongue to the left as the blade is advanced. Lift the blade anteriorly, using caution to avoid using the teeth as a fulcrum. If using a straight blade, lift the epiglottis with the tip of the blade. If using a curved blade, place the tip anterior to the epiglottis into the vallecula. Proper neck position and external cricoid pressure will facilitate visualization.
  
4. For infants and children, a straight blade is usually used. Use a cuffed endotracheal tube when practical.
  
5. The tube should be advanced past the cords until the proximal portion of the balloon (if present) is passed 2 to 3 cm. beyond the vocal cords. Intubation attempts should be

limited to less than 30 seconds each. A maximum of three attempts may be made prior to considering alternative airway techniques, e.g. Combitube, King, bag valve mask, etc. In cardiac arrest patients, the Combitube or King airway should be considered early in patients whom oral intubation is perceived to be technically difficult.

6. If using a cuffed tube, inflate the balloon with up to 10 cc's of air as necessary. As a guide, pediatric cuffs are recommended to be kept below 20mm Hg pressure.
7. Confirm adequate tube placement by auscultation of bilateral breath sounds and absence of gurgling over the stomach. Ensure you are hearing ventilation through the tube and not spontaneous sounds around the tube. As a general rule, the tube should be at 21 cm. at the gum line for adult females and 23 cm. for adult males. Confirm tube placement with an waveform capnography/capnometry or other MCA approved secondary confirmation device. Document all the above confirmation techniques for each oral intubation. Maintain continuous CO<sub>2</sub> monitoring once established. For documentation purposes an attempt is defined as: anytime an ET tube passes patient's lips.

### NASOTRACHEAL INTUBATION (LALS/ALS)

Included

Not included

#### **Contraindications:**

1. Patients without spontaneous respiratory effort.
2. Relative contraindication - Known bleeding disorder.

#### **Technique for Nasotracheal Intubation:**

1. Ventilate patient with 100% oxygen.
2. Gather equipment:
  - nasal pharyngeal airway
  - appropriate size ETT
  - syringe
  - laryngoscope
  - suction
  - BVM
  - device for securing tube after placement
  - waveform capnography/capnometry or other MCA approved secondary confirmation device
3. Liberally lubricate nares and the distal portion of the tube. If available, lidocaine jelly on a nasal pharyngeal airway should be used while preparing the patient equipment for the procedure. Secure BVM-tube adapter to the tube with firm pressure prior to beginning procedure.
4. Insert ET tube into nares against septum.
5. Advance tube posteriorly, using gentle pressure.

6. If resistance is met, cephalad traction or rotation of the tube may facilitate passage, or alternatively, a smaller tube may be required.
7. Slight flexion of the head or lifting of the jaw (if C-spine is not a concern) may facilitate passage.
8. Listen for air movement through the tube. When sound is loudest, observe the respiratory pattern of the patient and briskly advance the tube at the beginning of an inspiration.
9. Inflate the balloon unless it is clear that the tube is not yet in the airway. If the tube is not in correct position pull back to the point described in “H” above and repeat the procedure in “H”.
10. Confirm adequate tube placement by auscultation of bilateral breath sounds and absence of gurgling over the stomach. Ensure you are hearing ventilation through the tube and not spontaneous sounds around the tube. Confirm tube placement with an waveform capnography/capnometry or other MCA approved secondary confirmation device. Document all the above confirmation techniques for each nasal intubation. As a general rule, the nasotracheal tube should protrude from the nose no more than 1-2 cm when in the correct position. Maintain continuous CO2 monitoring once established.

### SUPRAGLOTTIC COMBITUBE AIRWAY (BLS/LALS/ALS)

- |                                       |
|---------------------------------------|
| <input type="checkbox"/> Included     |
| <input type="checkbox"/> Not included |

#### **Indications for Combitube Airway use:**

1. Patient is unconscious and apneic.
2. (LALS/ALS) Supraglottic airway may be considered in place of ET attempts, but should be considered if ET attempts are unsuccessful
3. In cardiac arrest patients, the Combitube airway should be considered early in patients whom oral intubation is perceived to be technically difficult.

#### **Contraindications to Combitube Airway use:**

1. Patient with an intact gag reflex
2. Patient under 5 feet tall for a regular adult, 4 feet for small adult tube
3. Patients with known esophageal disease (e.g. esophageal varices)
4. Patients with suspected caustic substance ingestion
5. Presence of a tracheostomy

**Technique for Combitube Airway Insertion:**

1. (BLS) For cardiac arrest patients, prior to attempting a Combitube airway follow the protocol for General Cardiac Arrest. Also refer to the AED protocol.
2. (BLS) The Combitube airway should be placed when convenient to minimize the interruption of CPR.
3. (BLS/LALS/ALS) Ventilate the patient prior to Combitube insertion (avoid hyperventilation).
4. Gather equipment:
  - Combitube Airway
  - Suction
  - BVM
  - Device for securing the tube after placement
5. Insert the thumb of a gloved hand into the patient's mouth, grasping the tongue and lower jaw between the thumb and index finger, and lift upward.
6. With the other hand, hold the Combitube airway with the curve in the same direction as the curve of the pharynx. Insert the tip into the mouth and advance carefully behind the teeth to the appropriate depth for the device. CAUTION: Do not force the Combitube airway. If it does not advance easily, re-direct it or withdraw it and re-insert.
7. If the Combitube airway is not successfully placed within 30 seconds, remove it and Ventilate the patient for 30 seconds using basic methods before re-attempting insertion.
8. Inflate the cuffs of the Combitube airway according to the manufacturer's recommendations.
9. Ventilation and Combitube placement confirmation:
  - Begin ventilation through the longer (distal) tube. Watch for chest rise. If auscultation of breath sounds is positive and auscultation of gastric air sounds is negative, continue ventilation.
  - If no chest rise, negative lung sounds, and/or positive gastric air sounds with ventilation through the distal tube, begin ventilation through the shorter (proximal) tube. Confirm ventilation with chest rise, presence of auscultated lung sounds, and absence of gastric air sounds.
  - If there is no chest rise or positive lung sounds through either tube, remove the device, ventilate the patient for 30 seconds, and repeat the insertion/inflation/ventilation procedures.
  - Continue to ventilate the patient through the tube which resulted in lung sounds using a BVM.
  - ALS – Confirm combitube placement with waveform capnography/capnometry or other MCA approved secondary confirmation device. Maintain continuous CO<sub>2</sub> monitoring once established.
10. If two consecutive attempts at Combitube airway placement fail to result in a proper placement and ventilation, do not attempt placement again. Ventilate the patient using basic methods and equipment.

### **KING SUPRAGLOTTIC AIRWAY (BLS/LALS/ALS)**

<input type="checkbox"/> Included
<input type="checkbox"/> Not included

#### **Indication for King Supraglottic Airway**

1. An alternative to endotracheal intubation for airway management in patients 35 inches tall or greater to secure a patent airway and deliver ventilations.

#### **Contraindications for King Supraglottic Airway**

1. Responsive patients with an intact gag reflex.
2. Patients with known esophageal disease.
3. Any patients that have ingested caustic substances.
4. Patients who are less than 35 inches tall or less than 12 kg.

#### **Technique for King Supraglottic Airway Placement**

1. Assemble airway equipment while continuing ventilations.
  - a. Choose the correct tube size based on the patient's height.
    - 35 – 45 inches (12 – 25 kg) = size 2
    - 41 – 51 inches (25 – 35 kg) = size 2.5
    - 4 to 5 feet tall = size 3
    - 5 to 6 feet tall = size 4
    - Greater than 6 feet tall = size 5
2. Apply chin lift and introduce the King airway in to the corner of the mouth.
3. Advance tip under the base of the tongue while rotating the tube back to midline.
4. Without excessive force, advance the tube until the base of the connector is aligned with the patient's teeth or gums.
5. Inflate cuff based on tube size.
  - a. Size 2 = 25 – 35 ml
  - b. Size 2.5 = 30 – 40 ml
  - c. Size 3 = 50 ml
  - d. Size 4 = 70 ml
  - e. Size 5 = 80 ml
6. Attach the BVM. While gently bagging slowly withdraw the tube until ventilation is easy to administer a large tidal volume with minimal airway pressure.
7. Adjust cuff inflation, if necessary, to obtain an airway seal at peak ventilation pressure.

8. Assess for proper tube placement.
  - a. Assess breath sounds.
  - b. Assure chest rise and fall
  - c. **(ALS)** Confirm combitube placement with waveform capnography/capnometry or other MCA approved secondary confirmation device. Maintain continuous CO<sub>2</sub> monitoring once established.
  - d. Continue to reassess that tube is properly placed and that patient ventilation is easy and free flowing with chest rise and adequate breath sounds.
  - e. If at anytime the provider is unsure of proper placement – deflate cuff, remove and use BVM for ventilation.

### CRICOTHYROTOMY (ALS)

<b>Surgical</b>	<b>Needle</b>
<input type="checkbox"/> Included	<input type="checkbox"/> Included
<input type="checkbox"/> Not included	<input type="checkbox"/> Not included

The cricothyroid membrane is located subcutaneously between the thyroid cartilage ("Adam's apple") and cricoid cartilage. There are two methods for performing a cricothyrotomy - the standard surgical approach and needle cricothyrotomy. The surgical technique uses a scalpel blade to create an opening in the cricothyroid membrane through which an endotracheal tube is inserted. The needle technique uses an angiocath inserted percutaneously. Needle cricothyrotomy is used for children less than age 8.

#### **Indications for Cricothyrotomy:**

1. Total airway obstruction not relieved by other methods.
2. Airway compromise from injuries that make oral or nasal intubation impractical.
3. Inability to ventilate and inability to intubate.

#### **Technique for Surgical Cricothyrotomy:**

1. Gather necessary equipment in addition to that needed for oral intubation
  - antiseptic solution
  - scalpel
2. Identify cricothyroid membrane
3. Prep the site with antiseptic solution
4. While stabilizing the larynx with one hand, use the opposite hand to make a 3-4 cm. **vertical incision** through the skin in the midline over the cricoid membrane.
5. After identification of the cricoid membrane, use the scalpel to make approximately a 1cm. **horizontal incision** through the lower portion of the membrane.
6. Enlarge the hole, place the ET tube into the airway, and inflate the balloon.

7. Verify correct placement using usual techniques, including waveform capnography/capnometry or other MCA approved secondary confirmation device. Maintain continuous CO<sub>2</sub> monitoring once established.

**Technique for Needle Cricothyrotomy:**

1. Gather necessary equipment:
  - antiseptic solution
  - BVM or jet insufflation valve-type device
  - Needle (14 gauge)
2. Identify cricothyroid membrane.
3. Prep the site with antiseptic solution.
4. Connect the angiocath to a syringe.
5. Stabilize the larynx and identify the cricothyroid membrane.
6. Direct the angiocath caudally at an angle of less than 45 degrees to the skin.
7. Insert the angiocath through the skin, maintaining negative pressure on the syringe. Entry of air and loss of resistance signifies entry into the larynx.
8. Advance the cannula into the larynx and remove the angiocath.
9. Caution must be used to ensure the catheter does not bend.
10. The patient may be ventilated using a commercially available pressure device, or via a BVM connected to the adapter top of a number 3 endotracheal tube.
11. Deliver 100% O<sub>2</sub> at 20 bursts/minute with Inspiratory/Expiratory (I:E) of 1:2.

**NOTES:** BVM use through an angiocath may deliver insufficient quantities of oxygen. Air may be forced out through the nose and mouth in addition to the lungs and may also blow secretions out of the patient's nose and mouth.