Section 22

Pediatric Airway

Memorial EMS
Decatur Memorial EMS
Springfield Memorial EMS

Basic Airway Management of the Pediatric Patient

Establishing and maintaining an open airway and assuring adequate ventilation is a treatment priority with all patients. Proper techniques must be used to assure treatment maneuvers do not inadvertently complicate the patient's condition. Special consideration needs to be given when caring for the pediatric airway due to anatomical difference from adult.

Basic Airway Control

1. Assure an open airway by utilizing with the head tilt/chin lift maneuver or the modified jaw thrust maneuver (without head tilt). The head tilt/chin lift maneuver is NOT to be used if there is any possibility of cervical spine injury.
2. Expose the chest and visualize for chest rise and movement, simultaneously listen and feel for air movement at the mouth and nose. This procedure will need to be done initially and after correcting an obstruction and securing the airway.
3. If the chest is not rising and air exchange cannot be heard or felt:
    a. Deliver two positive-pressure ventilations. If resistance continues, follow AHA sequences for obstructed airway rescue.
    b. Reassess breathing and check for brachial or carotid pulse.
    c. If spontaneous respirations return and a pulse is present, provide supplemental oxygen by non-rebreather mask or assist respirations with bag-valve mask (BVM) at 15 L/min.
    d. If the patient remains breathless and a pulse is present, initiate ventilations with a BVM at 15 L/min at a rate of 20-30 breaths per minute.
    e. If the patient remains breathless and a pulse is not present, initiate CPR and institute the appropriate cardiac protocol.
4. If the patient presents with stridor, 'noisy breathing' or snoring respirations, render treatment for partial airway obstruction in accordance with AHA guidelines:
    a. Reassess effectiveness of the airway maneuver.
    b. If partial airway obstruction progresses to inability to move any air, treat according to AHA guidelines for resolving a complete airway obstruction.
5. Once the obstruction has been corrected
    a. Insert an oropharyngeal airway in the unconscious patient (without gag reflex).
    b. Insert a nasopharyngeal airway in the conscious patient or an unconscious patient with a gag reflex. Note: nasopharyngeal airways are the airway of last resort if the possibility of a head injury exists.

Basic Airway Management of the Pediatric Patient

Basic Airway Control {Continued}

6. Establish the presence of adequacy of breathing by observing the frequency, depth and consistency of respiration. Also, observe the chest wall for any indications of injuries which may contribute to respiratory compromise.
7. Supplemental **oxygen** should be delivered to any patient who exhibits signs of difficulty breathing, sensation of shortness of breath, tachypnea, use of accessory muscles, altered level of consciousness/altered mental status, cyanosis, cardiac symptoms, head injury or any indications of shock.
    a. Supplemental oxygen should be provided by a non-rebreather mask (NRM) at a rate of 10-15 L/min (assuring reservoir bag is inflated).
    b. If patient is unable to tolerate the NRM, administer oxygen via nasal cannula at a rate of 4-6 L/min.
8. **Bag-valve mask ventilation with supplemental oxygen** at 15L/min should be initiated at the rate of 20-30 if respirations are absent or there is evidence of inadequate ventilation.

Critical Thinking Elements

• The pediatric airway varies anatomically from the adult airway. The airway is smaller and more flexible, the tongue is relatively larger and the epiglottis is higher. These differences must be taken into consideration when positioning the head to maintain the airway (i.e. less hyperextension is needed to open the pediatric airway than the adult).

• Mucous, blood, and vomit may easily block the pediatric airway. Therefore, careful attention must be given to clear the airway and appropriate pediatric suction equipment should be available.

• Inadequate maintenance of the patient's airway, inappropriate maneuvers, using inappropriately sized airway equipment and/or failure to recognize an obstructed airway will complicate the patient's condition and can lead to brady-arrythmias/ cardiac arrest.

• Do NOT use the head tilt/chin lift maneuver on a patient with a suspected cervical spine injury.

• Proper facemask seal and sizing during artificial ventilations is imperative to assure adequate ventilation.

• Inadequate oxygen delivery settings (i.e. too low) will complicate the patient's condition.

Pediatric Airway Obstruction Procedure

An airway obstruction is life threatening and must be corrected immediately upon discovery.

1. If the patient has an obstructed airway and is still conscious:
    a. Encourage the child to cough.
    b. Perform 5 abdominal thrusts if the cough is unsuccessful (5 back blows and 5 chest thrusts in the infant).
    c. Repeat until the obstruction is relieved or the patient becomes unconscious.
    d. **Administer oxygen** at 15 L/min if the patient has a partial airway obstruction and is still able to breathe.
2. If the patient is unconscious:
    a. Open the patient's airway and attempt to ventilate.
    b. Reposition the head and reattempt to ventilate if initial attempt is unsuccessful.
    c. Begin CPR.
    d. Remove object if visualized. Do not perform a blind finger sweep of the patient's mouth. Reattempt to ventilate.
    e. Continue CPR if obstruction persists.
    f. EMR, EMT & A-EMT/EMT-I immediately initiate Paramedic intercept.
    g. **Paramedic Only** attempt direct extraction via laryngoscope and Magill forceps.
        i. Use the laryngoscope and examine the upper airway for foreign matter and suction as needed.
        ii. Remove any foreign objects with forceps and suction.
        iii. Re-establish an open airway and attempt to ventilate.
        iv. If the obstruction is relieved, continue with airway control, ventilations, assessment and care.

Critical Thinking Elements

• Maintain in-line c-spine stabilization using 2 EMTs in patients with suspected cervical spine injury.

• Poor abdominal/chest thrust technique, inappropriate airway maneuvers, and/or failure to recognize an obstructed airway will complicate the patient's condition.

Supraglottic Airway Procedures

(A-EMT/EMT-I / Paramedic ONLY)

A Supraglottic Airway device is an effective airway adjunct when intubation is not available or difficult to perform. Insertion is rapid and easy and does not require specialized equipment or visualization of the larynx. They are latex-free and should be considered safe to use on latex sensitive patients. MEMS currently utilizes the i-Gel as the approved supraglottic airway.

i-Gel

- The i-Gel is an airway device designed for emergency or difficult airway management in the apneic or unresponsive patient without a gag reflex.
- It is the airway of choice in all pediatric cardio/respiratory arrests.
- Consider for all pediatric patients who require more than BVM and OPA/NPA ventilations.
- It is the back-up airway in cases of an unsuccessful intubation attempt.

i-Gel size	**ALS ONLY 1**	**ALS ONLY 1.5**	**ALS/ILS 2**	**ALS/ILS 2.5**
Patient Criteria	**2-5kg** (based on ideal body weight)	**5-12kg** (based on ideal body weight)	**10-25kg** (based on ideal body weight)	**25-35kg** (based on ideal body weight)
Patient Size/color	**Neonate**	**Infant**	**Small Pediatric**	**Large Pediatric**

Contraindications

- Active gag reflex
- Ingestion of a caustic substance (e.g. gasoline, drain cleaner, etc.)
- Tracheostomy (it will be ineffective)

i-Gel Airway Insertion Procedure

1. Don appropriate PPE
2. **Pre-Oxygenate the patient** with 100% Oxygen. Utilize *Apneic Oxygenation Protocol* if time permits.
3. Select the appropriate i-gel size from the chart above. (If > 35 kg ideal body weight use Adult i-Gel sizing)
4. Remove the device from the packaging and check for signs of damage.

Supraglottic Airway Procedures

(A-EMT/EMT-I & Paramedic ONLY)

5. Place water-soluble jelly in the middle of the cradle packaging.
6. Lubricate the back, sides, and tip of the i-Gel's non-inflatable cuff. Ensure no lubricant is inside the cuff.
7. Grasp along the integral bite block and face the cuff towards the patients' chin.
8. Insert the i-Gel into the mouth in the direction of the hard palate.
9. Glide the device down and back along the hard palate with continuous, gentle pressure until resistance is met.
10. Connect the i-Gel to the BVM.
11. **Confirm placement** using *Airway Confirmation Procedure*
12. Secure using a commercial tube-holder.
13. Continuously monitor the patient.

Critical Thinking Elements

● Consider the i-Gel the primary airway of choice for all pediatric patients.

● If unsuccessful in placing a Supraglottic Airway, remove the airway and a second attempt with the device following the same insertion procedures may be made. If this attempt is unsuccessful, immediately revert to the Basic Airway Control Procedures.

● Sizes for the i-Gel are based on ideal body weight for the size of the patient.

● A proficient provider can insert an i-Gel in 5 seconds or less.

● Do NOT administer medications via any Supraglottic Airway Device. It is designed as an airway adjunct only and cannot be utilized as a medication route.

● Warning: In order to avoid the possibility of the device moving up out of position prior to being secured in place, it is essential that as soon as insertion has been successfully completed, the i-Gel is held in the correct position until being secured.

● Warning: Do not apply excessive force on the device during insertion.

● Supraglottic Airways do not prevent the aspiration of gastric contents.

Advanced Airway Procedure

(Paramedic ONLY)

Endotracheal intubation is an effective method of securing the airway. However, if endotracheal intubation is difficult or unsuccessful in one (1) attempt, basic airway control measures should be re-established without delay and maintained throughout transport with no additional attempts made at intubation. The majority of pediatric airway issues can be resolved with basic airway maneuvers only.

Indications

- Endotracheal intubation is an airway device designed for securing the airway in the apneic or unresponsive pediatric patient without a gag reflex.

Contraindication

- Active gag reflex
- Suspected Epiglottis

Endotracheal Intubation Procedure

1. Implement basic airway measures in accordance with the *Basic Airway Control Procedure*.
2. **Initiate Oxygen** based on *Apneic Oxygenation Protocol*.
3. Only one intubation attempt is permitted. Consider the pediatric Bougie for this intubation. If unsuccessful return immediately to using a BVM with OPA or NPA and then consider Supraglottic Airway placement.
4. Select the proper tube size (based on patient size) and attach a 10mL syringe, if appropriate. (May need adult size for larger pediatric patients.)
5. Confirm placement using *Airway Confirmation Procedure*

Ave. Age	0-12 mos.	1-2 yrs.	3-4 yrs.	5 yrs	6-7 yrs	8-11 yrs.	≥12 yrs.
Wt. in kg.	3-9 kg	10-13 kg	14-16 kg	16-20 kg	18-25 kg	24-32 kg	32-54 kg
Blade size	0-1 Miller	1 Miller	2 Miller	2 Miller	2 Miller	2 Miller/ Macintosh	3 Miller/ Macintosh
ET tube	3-4.0 NC	4.0 NC	4.5 NC	5.0 NC	5.5 NC	6.0 Cuffed	6.5 Cuffed
Distance to upper lip	7-10.5 cm	11-12cm	12.5-13.5cm	14-15 cm	15.5-16.5cm	17-18 cm	18.5-22 cm

Advanced Airway Procedure

(Paramedic ONLY)

Video Laryngoscopy

As an alternative to direct laryngoscopy, video laryngoscopes may be used. Follow the manufacturer directions specific to the particular video laryngoscope. Video laryngoscopy is not ideal for situations in which the camera may become obscured such as blood in the pharynx or excessive secretions, recent emesis, or hematemesis or hemoptysis. Many video laryngoscopes are advantageous for intubating while c-spine precautions must be maintained or if an anterior larynx is expected. Whenever using a video laryngoscope as a primary method of intubation, direct laryngoscopy must be also immediately available. Endotracheal tube placement should be confirmed just as with direct laryngoscopy.

Airway Control in the Trauma Patient

Any type of airway manipulation may be dangerous during airway control of the suspected spinal injury patient. Maintain in-line stabilization.

1. A minimum of two (2) trained rescuers is needed to assure adequate SMR.
2. One rescuer will apply manual in-line stabilization by placing the rescuers hands about the patient's ears with the little fingers under the occipital skull and the thumbs on the face over the maxillary sinuses.
3. The rescuer performing airway placement should be at the head.
4. Maintain the patient's head in a neutral position and perform endotracheal intubation without cervical manipulation.

Prohibited Advanced Airway Control Procedures

Attempting difficult and unfamiliar procedures poses a danger to the patients those procedures are being performed on. Certain procedures that are used in the hospital setting are not approved for prehospital personnel in the Memorial EMS System. These include:

- Nasotracheal Intubation
- Percutaneous Transtracheal Ventilation
- Cricothyrotomy/Surgical Airway

Critical Thinking Elements

- If intubation attempt fails (1 attempt), switch to basic airway control immediately and then consider a Supraglottic Airway.
- The definition of an "attempt" is the introduction of a laryngoscope past the teeth and concluded when the laryngoscope was removed from the mouth, regardless of whether or not an endotracheal tube was inserted.
- If an intubated patient deteriorates, consider: Displacement of the tube, Obstruction of the tube, Pneumothorax, and Equipment failure (mnemonic - DOPE

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Airway Confirmation Procedure

(EMT, A-EMT/EMT-I, and Paramedic)

Consistency in airway placement confirmation methods and the documentation of such is a priority in the Memorial EMS System. The following are provider-level specific requirements to confirm Supraglottic Airway and Endotracheal Tube placement. All SGA and ETT's placed or attempted will be reviewed via the MEMS CQI Process. Failure to document in this manner will be actionable by the EMS System.

EMT Care

A "confirmed airway" at the EMT level is defined as established bilateral breath sounds and absent epigastric noises when BVM ventilations are performed and one of the following:

- Continuous waveform capnography (if equipped)
- + Colormetric device color change purple to gold (eg "Easycap")
- Chest rise and fall
- Condensation/fogging in the tube
- Clinical improvement (eg skin color, VS, level of responsiveness)

These findings should be reassessed and documented following any major move of the patient, including but not limited to:

- Placing patient on a backboard or CPR device
- Loading patient in an ambulance/ transferring care to higher level
- Unloading the patient at the hospital/ transferring care to E.D. staff

A-EMT/EMT-I Care Paramedic Care

A "confirmed airway" at the A-EMT/EMT-I and Paramedic level is defined as established bilateral breath sounds and absent epigastric noises when BVM ventilations are performed and continuous waveform capnography. These must be performed and documented at the A-EMT/EMT-I and Paramedic level. Further supporting documentation may include any of the following:

- Visualization of tube passing chords (ETT only)
- + Colormetric device color change purple to gold (eg "Easycap")
- Chest rise and fall
- Condensation/fogging in the tube
- Clinical improvement (eg skin color, level of responsiveness)

Airway Confirmation Procedure {Continued}

ALL LEVELS

These findings should be reassessed and documented following any major move of the patient, including but not limited to:

- Placing patient on a backboard or CPR device
- Loading patient in an ambulance/ transferring care to higher level
- Unloading the patient at the hospital/ transferring care to E.D. staff

Critical Thinking Elements

- Any patient receiving respiratory assistance is considered unstable and will have vital signs documented every 5 minutes.
- Failure to place and document capnography on patients with airways in place is both unsafe practice and actionable by the EMS System.