


Pediatric Airway

Memorial  
**EMS**

The logo graphic for Memorial EMS, featuring a stylized, multi-layered geometric shape that resembles a staircase or a series of parallel lines forming a right-angled triangle, pointing upwards and to the right.

## 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-arrhythmias/ cardiac arrest.
- Do NOT use the head tilt/chin lift maneuver on a patient with a suspected cervical spine injury.
- Proper facemask seal 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. Repeat step c if obstruction persists.
  - f. **BLS & ILS** immediately initiate ALS intercept.
  - g. **ILS & ALS** 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  
 (ILS & ALS ONLY)**

A Supraglottic Airway device is an effective airway adjunct when intubation is not available or difficult to perform. Insertion is rapid & 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 iGEL and The King LTS-D as the approved supraglottic airways. As Kings are used or expire, they will be replaced with the iGEL.

**King LT-D**

- The King LT-D is an airway device designed for emergency or difficult intubation in the apneic or unresponsive patient without a gag reflex.

**Contraindications**

- Active gag reflex
- Ingestion of a caustic substance (e.g. gasoline, drain cleaner, etc.)
- Known or suspected esophageal disease (e.g. esophageal varices)
- Tracheostomy (will be ineffective with esophageal placement)

**KING Airway Insertion Procedure**

1. Pre-oxygenate/ventilate utilizing a bag-valve mask (BVM) at 15 L/min according to the *Basic Airway Control Procedure*.
2. Choose the correct size: (May need adult size for larger pediatric patients.)

King LT-D Size	0	1	2	2.5
Connector Color	ALS ONLY Clear	ALS ONLY Pink	ILS/ ALS Green	ILS/ ALS Orange
Patient Criteria	< 5 kg	5-12 kg	35-45 inches Or 12-25 kg	41-51 inches Or 25-35 kg
Cuff Volume	10 mL	20 mL	25-35 mL	30-40 mL

3. Test cuff inflation system by injecting the maximum recommended volume of air into the cuffs. Remove all air from both cuffs prior to insertion.
4. Apply a water-based lubricant (e.g. K-Y or Surgilube) to the beveled distal tip and posterior aspect of the tube. Avoid introducing lubricant in or near the ventilatory openings.
5. Position the head in the “sniffing position” if possible. It can also be inserted with the head in the neutral position if following c-spine precautions/c-collar in place.

## Supraglottic Airway Procedures (ILS & ALS ONLY)

### KING Airway Insertion Procedure {Continued}

6. Hold the KING LT-D at the connector with the dominant hand. With the non-dominant hand, hold mouth open and apply chin lift.
7. With the KING LT-D rotated laterally 45-90° (such that the blue orientation line is touching the corner of the mouth), introduce tip into the mouth and advance behind the base of the tongue. **Never force the tube into position** and do not take longer than **20 seconds** for the attempt!



8. As the tube tip passes over the tongue, rotate the tube back to midline (blue orientation line faces chin).
9. Without exerting excessive force, advance the KING LT-D until the proximal opening of gastric access lumen is aligned with teeth or gums.
10. Inflate the cuffs with the minimum volume necessary to seal the airway (see chart).
11. Attach BVM. Gently bag the patient while assessing ventilations. Simultaneously withdraw the airway **very slowly** until ventilation is easy & free-flowing.



**Supraglottic Airway Procedures  
(ILS & ALS ONLY)**

**KING Airway Insertion Procedure {Continued}**

12. Confirm placement using *Airway Confirmation Procedure 21.E.1*
13. Secure using a commercial tube-holder
14. The gastric access lumen allows the insertion of up to an 18 Fr diameter gastric tube into the esophagus & stomach. Lubricate the gastric tube prior to insertion (**ALS** only).



**Supraglottic Airway Procedures  
 (ILS & ALS ONLY)**

**iGel**

- The iGel 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.

**Contraindications**

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

iGel 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

**iGel 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 iGel sizing)
4. Remove the device from the packaging and check for signs of damage.
5. Place water-soluble jelly in the middle of the cradle packaging.
6. Lubricate the back, sides, and tip of the iGel’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 iGel 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.



## Supraglottic Airway Procedures (ILS & ALS ONLY)

### iGel Airway Insertion Procedure (Cont.)

10. Connect the iGel to the BVM.
11. Confirm placement using *Airway Confirmation Procedure 21.E.1*
12. Secure using a commercial tube-holder.
13. Continuously monitor the patient.
14. (**ALS only**) Insert appropriately sized gastric tube if time permits.
  - a. Use a 12Fr gastric tube for iGel sizes #2- #5
  - b. Use a 10Fr gastric tube for iGel size #1.5

### Critical Thinking

- **Consider the iGel 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 iGel are based on ideal body weight for the size of the patient.
- A proficient provider can insert an iGel 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 iGel is held in the correct position until being secured.*
- **Warning:** *Do not apply excessive force on the device during insertion.*
- It is not necessary to insert fingers or thumbs into the patients' mouth during the iGel insertion process.
- Supraglottic Airways do not prevent the aspiration of gastric contents.

## Advanced Airway Procedure (ALS 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.

### 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 Epiglottitis

### 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.

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**Advanced Airway Procedure**  
**(ALS ONLY)**

**Endotracheal Intubation Procedure {Continued}**

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.)

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

5. Insert stylet and bend to the approximate configuration of the pharynx (some stylets used for video laryngoscopes do not bend).
6. Lubricate the ETT with a water-soluble lubricant.
7. Have suction, BVM, stethoscope, colormetric end-tidal CO<sub>2</sub> detector/capnography and commercial ETT holder readily available.
8. Pick up the laryngoscope handle with your left hand and the appropriate blade with your right hand.
9. Holding the blade parallel to the handle, attach the blade to the handle by inserting the U-shaped indentation of the blade into the small bar at the end of the handle. When the indentation is aligned with the bar, press the blade forward and snap into place.
10. Lower the blade until it is at a right angle to the handle. The light should come on. If it does not, see if the bulb is tight and/or the batteries need to be replaced (This should be done on a daily basis so you do not have to spend valuable time fixing it at the scene of a call).
11. Suction the pharynx as needed.
12. Pre-oxygenate the patient with high concentration oxygen prior to intubation attempt.
13. Insert the blade into the mouth on the right side, moving the tongue to the left. Follow the natural contour of the pharynx, lifting the tongue (not prying) until you can see the glottic opening.
  - a) If you are using a straight blade (Miller), insert it until you can see the epiglottis. With the tip of the blade, lift up on the epiglottis so that you can visualize the vocal cords and glottic opening. If needed, have someone gently press down on the cricoid cartilage (Sellick Maneuver) so that you can see the cords well.

**Advanced Airway Procedure  
(ALS ONLY)**

**Endotracheal Intubation Procedure {Continued}**

- b) If you are using a curved blade (Macintosh), insert the tip into the vallecula and lift up. This will lift the epiglottis and expose the vocal cords and glottic opening. If needed, have someone gently press down on the cricoid cartilage (Sellick Maneuver) so that you can see the cords well.
  - c) As an alternative to direct laryngoscopy, video laryngoscopes may be used. You should follow the manufacturer directions specific to the particular video laryngoscope you are using. Some hyper-angulated video laryngoscopes are inserted into the mouth at midline and are lifted up instead of forward to visualize the glottic opening. Other video scopes have traditional Macintosh or Miller shaped blades with video assist allowing direct or indirect laryngoscopy with the same device. Video laryngoscopes should be used with proprietary stylets in the endotracheal tube as recommended by the manufacturer. 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.
14. After visualizing the glottic opening, grasp the ETT with your right hand and advance the tube from the right corner of the mouth. Insert the tube into the glottic opening between the vocal cords, just far enough to pass the cuff of the tube past the opening.
  15. Inflate the cuff with 10mL of air.
  16. Confirm placement using *Airway Confirmation Procedure 21.E.1*
    - a) If you have inserted the ETT too far, it will usually go into the right main stem bronchus. Therefore, if you hear breath sounds only on the right, you should pull the tube back ½ inch at a time until you hear bilateral breath sounds. Inflate the cuff with 10mL of air.
    - b) If you hear no breath sounds, you are in the esophagus and must remove the ETT immediately. Ventilate patient and continue basic airway control measures.
  17. Secure using a commercial tube-holder

## Advanced Airway Procedure (ALS ONLY)

### Endotracheal Intubation Procedure {Continued}

18. Frequently reassess breath sounds to be sure that the ETT is still in place.
19. Ventilate the patient at a rate of 12 times per minute.
20. If intubation is unsuccessful after one (1) attempt, proceed to *Supraglottic Airway Procedure* or *Basic Airway Control Procedure*.

### 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 special attention to spinal precautions.
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 actually trying to pass the ET tube through the vocal chords.
- If intubated patient deteriorates, consider: **D**isplacement of the tube, **O**bstruction of the tube, **P**neumothorax, and **E**quipment failure (mnemonic - DOPE).

## Airway Confirmation Procedure (BLS, ILS, and ALS)

Consistency in airway placement **confirmation** methods and the **documentation** of such is a priority in our 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.

### BLS Care

A “confirmed airway” at the BLS level is defined as established bilateral breath sounds/ 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

### ILS Care

### ALS Care

A “confirmed airway” at the ILS and ALS level is defined as established bilateral breath sounds/ absent epigastric noises when BVM ventilations are performed and **continuous waveform capnography**. These must be performed and documented at the ILS and ALS 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)

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