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## **Emergency Airway**

**Alias:** *Airway Management, Airway Intervention, Supraglottic Airway, Intubation, Cricothyroidotomy.*

Effective airway management and ventilation are important lifesaving interventions that all EMS providers must be able to perform. The approach to airway management should generally proceed in a stepwise fashion, from basic to advanced, since basic maneuvers can sustain life until an advanced airway can be established. Providers should use clinical judgment in conjunction with medical direction to determine which interventions are most appropriate for a particular patient.

### **Indications for Airway Management and Ventilation**

1. Airway Management
  - a. Airway obstruction
  - b. Need for positive pressure ventilation (see below)
  - c. Airway protection, such as an unconscious patient without a gag reflex.
  - d. Trauma patient with a Glasgow Coma Score of 8 or less.
2. Positive Pressure Ventilation
  - a. Respiratory or cardiac arrest (including agonal respirations)
  - b. Respiratory failure (inadequate respiratory rate/volume)

### **Contraindications for Airway Management and Ventilation**

1. Presence of a gag reflex may be a contraindication to some specific airway interventions.
2. Specific supraglottic airways may have contraindications due to caustic ingestion or known esophageal varices.

### **MANAGEMENT OVERVIEW**

1. In cases of foreign body airway obstruction, refer to Foreign Body Airway Obstruction section of this protocol.
2. CPAP (when available) should be considered for patients with severe respiratory distress that do not improve with supplemental oxygen administration in accordance with the **CPAP/BiPAP Administration Procedure**.
3. When the airway is not self-maintained, open the airway using basic maneuvers (chin lift or jaw thrust). Patients with a potential cervical spine injury should have a modified jaw thrust performed attempting to minimize neck flexion and extension.
4. Perform oral pharyngeal suctioning as needed to remove body fluids and minimize risk of aspiration. When possible, suctioning should be limited to no more than 15 seconds and should not extend beyond the pharynx.
5. In unconscious patients without a gag reflex, insert a properly sized oropharyngeal airway. Immediately remove upon return of gag reflex.
6. In unconscious patients with gag reflex, consider insertion of a properly sized nasopharyngeal airway, using water-soluble lubrication when available.
7. In patients requiring bag-valve-mask ventilations, consider inserting both oral and nasopharyngeal airways to optimize ventilations.
8. For patients with respiratory arrest or significant respiratory depression (e.g., adult patient with respiratory rate less than 8 per minute) perform bag-valve-mask (BVM) ventilations.
  - a. Note: BVM ventilations should be performed by 2 rescuers whenever possible. Use supplemental oxygen and reservoir system, focusing on adequate chest rise and ventilations that are not too forceful.

9. Ventilate at an appropriate rate. **Avoid hyperventilation.** Generally appropriate rates for ventilation are:
  - a. Adults >8 y/o 10 breaths / minute
  - b. Children 1-8 y/o 20 breaths / minute
  - c. Infants < 1 y/o 25 breaths / minute
10. A pocket mask or face shield is an acceptable alternative for single rescuer ventilations.
11. When caring for patients with stomas, use pediatric masks to achieve seal.
12. For patients with a tracheostomy tube and home ventilator connect BVM (without mask) directly to tracheostomy tube and ventilate at appropriate rates.
13. In the adult patient, providers may consider continuing basic airway management techniques if the airway is able to be maintained adequately.
14. In the pediatric patient (14 or under), providers **must** continue basic airway management, unless the airway is unable to be adequately maintained.
15. MCA-approved supraglottic airways (e.g., Combitube®, King Laryngeal Tracheal Tube or i-gel®) may be used to secure the airways in unconscious patients that do not have a gag reflex.



**MCA Approved Supraglottic Airways**

Combitube®     King Laryngeal Tracheal Tube®     i-gel®

- a. **i-gel® is the only supraglottic airway for MFR use. It does not require cuff inflation and can be used by MFR if approved by the MCA and adopted by the agency.**

**MCA Approval for MFR use of i-gel®  
(Agency Optional)**

Yes     No

16. In cardiac arrest patients, although endotracheal intubation has been considered the gold standard, supraglottic airways are considered equivalent to endotracheal intubation and are appropriate as a first-line advanced airway and should be used early when endotracheal intubation cannot be readily performed without interrupting chest compressions. Use of supraglottic airways in cardiac arrest patients may allow for earlier transition to continuous chest compressions.
17. Each MCA must select at least one state-authorized supraglottic airway for use in their system.
18. Supraglottic airways should be placed in accordance with manufacturer's instructions for use (see appropriate procedure) and must be confirmed by positive end-tidal CO<sub>2</sub> levels by waveform capnography (preferred) or by use of colorimetric qualitative end-tidal CO<sub>2</sub> detectors and by auscultation for absence of gastric sounds and presence of bilateral lung sounds. Additional clinical findings consistent with a properly placed airway include chest expansion, improvement in patient's color, and improvement in pulse oximetry (when available).
19. Supraglottic airway placement should be re-confirmed at frequent intervals throughout the care of the patient, particularly after each patient movement.

*Table 1 Airway Procedures*

PROCEDURE	MFR	EMT	EMT-A (Specialist)	PARAMEDIC
Oropharyngeal Airway	X	X	X	X
Nasopharyngeal Airway	X	X	X	X
Bag-Valve-Mask Ventilation	X	X	X	X
Supraglottic Airway (Individual Agency approval per MCA)	O/SR	X	X	X
Oral Endotracheal Intubation				X
Needle / Surgical Cricothyroidotomy				O/O
<b>X: Approved Intervention</b> <b>O: Optional Intervention per MCA selection</b> <b>SR: Special Requirements =additional education, monitoring and reporting.</b>				

*\* This table indicates the type of airway procedures allowed per level of licensure. Based on jurisdictional need, the MCA may approve the use of the i-gel® supraglottic airway by MFRs. If an MCA opts to allow MFRs in a particular agency to utilize the i-gel® airway, special requirements must be enacted by the MCA including competency assessment, on-going training for MFRs, and PSRO review of every case in which an MFR utilizes a supraglottic airway.*



20. Orotracheal intubation under direct laryngoscopy may be performed in adult patients who are unable to protect their own airway (e.g., no gag reflex), require sustained positive pressure ventilation, and/or are in cardiac arrest.



21. Orotracheal intubation under direct laryngoscopy may be performed in pediatric patients (14 years old and under) who are unable to protect their own airway (e.g., no gag reflex), require sustained positive pressure ventilation, and/or are in cardiac arrest ONLY when basic airway management techniques (e.g., 2-person mask ventilation with oropharyngeal airway) are ineffective. Per MCA selection, may be pre or post-radio.

<p><b><u>MCA Selection</u></b>  <b>Pediatric Intubation</b>  <input type="checkbox"/> Pre-Radio      <input checked="" type="checkbox"/> Post-Radio</p>
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22. Deep tracheal suctioning may be performed when indicated using sterile technique and suctioning only during withdrawal of catheter.

- a. Maximum suction time:
  - i. Adults (>14 years old): maximum 10 seconds
  - ii. Children (1 to 14 years old): maximum 10 seconds
  - iii. Infants (< 1 year old) maximum 5 seconds

23. When approved by local MCA, needle and/or surgical cricothyroidotomy may be performed when airway compromise from injury is present that prevents ventilation with basic techniques and makes intubation impractical in a patient who needs immediate airway management. In cases of complete airway obstruction that cannot be corrected, and in situations when other basic and advanced airway management techniques are unsuccessful in achieving effective ventilation.

- MCA approval of Needle Cricothyroidotomy by Paramedics
- MCA approval of Surgical Cricothyroidotomy by Paramedics
- MCA Commercial Percutaneous Cricothyroidotomy by Paramedics

24. Use of sedation to facilitate advanced airway placement is contraindicated. Sedation for tube tolerance following successful tube placement is indicated in accordance with the **Patient Sedation Procedure**.

### FOREIGN BODY AIRWAY OBSTRUCTION

This procedure is intended for situations in which a severe foreign body airway obstruction (FBAO) has occurred. EMS personnel must be able to rapidly initiate treatment in such cases. Note: Sudden cardiac arrest that occurs while a person is eating is frequently dispatched as “choking.” EMS personnel should consider these cases to be potential cardiac arrests.

1. In conscious (responsive) adults and children >1 year of age, deliver abdominal thrusts in rapid sequence until the obstruction is relieved.
2. Administer chest thrusts in conscious patients in place of abdominal thrusts when:
  - a. Abdominal thrusts are ineffective (optional consideration)
  - b. Patient is obese and rescuer is unable to encircle the patient’s abdomen
  - c. Patient is in the later stages of pregnancy (e.g., greater than 20 weeks)
  - d. Patient is under 1 year of age
3. For conscious infants (under 1 year old) with evidence of severe FBAO:
  - a. Deliver repeated cycles of 5 back blows (slaps) followed by 5 chest compressions until the object is expelled or the patient becomes unresponsive.
  - b. Note: Abdominal thrusts are not recommended for infants because they may damage the infant’s relatively large and unprotected liver.
4. If any patient becomes unresponsive or is found unresponsive and is unable to be ventilated using the 2-person bag-valve-mask technique with oropharyngeal airway:
  - a. Start CPR with chest compressions (do not perform a pulse check).
  - b. After 30 chest compressions, open the airway and visually inspect the mouth for a foreign body, remove it but do not perform blind finger sweeps as this may push obstructing objects farther into the pharynx and may damage the oropharynx.
  - c. Attempt to give 2 breaths and continue with cycles of chest compressions and ventilations until the object is expelled.
5. For unconscious patients, while chest compressions are being provided, perform direct laryngoscopy. If foreign body is visible, remove using adult or pediatric Magill forceps.
6. If unsuccessful in visualizing foreign body, consider brief trial of abdominal thrusts while performing direct laryngoscopy.
7. Once FB is removed, if spontaneous respiration does not return, perform endotracheal intubation if able to be readily accomplished or place Supraglottic airway and begin ventilations.



**SPECIFIC AIRWAY PROCEDURES**



**i-gel® Supraglottic Airway**

**\*MFR approved only if approved by the MCA, adopted by the agency, and personnel are trained**

*Table 2 i-gel® Supraglottic Airway Required Documentation*

Size of i-gel® used	Time of attempt(s)
Number of attempts	Suctioning required before placement
Ventilation compliance	Chest rise with ventilation
Capnography Used	ET CO <sub>2</sub> /Capnography reading (serial)
Equality of lung sounds	Absence of epigastric sounds
Method for securing airway	Any complications with procedure
Gastric decompression performed (excluding MFRs)	

**Indications:**

1. Cardiac arrest. Appropriate as first-line advanced airway.
2. Respiratory arrest (including agonal breathing), without gag reflex, not responsive to initial treatment including bag-valve-mask ventilation and naloxone (when indicated)
3. Rescue airway for failed endotracheal intubation (Paramedics only).

**Contraindications:**

1. Responsive patients with a gag reflex.
2. Trismus (limited mouth opening), suspected pharyngo/peri-laryngeal abscess, major facial trauma or oral-pharyngeal mass.
3. Patients in whom caustic substance ingestion is suspected.

**Equipment:**

1. i-gel® O<sub>2</sub> Resus Pack (includes airway, support strap, water-soluble lubricant)
2. Supplies: bag-valve-mask, capnography, suction
3. Use appropriate size for patient based on table below.

*Table 3 i-gel® Quick Reference*

Size	Color	Patient Size	Patient Weight
3	Yellow	Small adult	30-60 kg (~65-130 pounds)
4	Green	Medium adult	50-90 kg (~110-200 pounds)
5	Orange	Large adult	90+ kg (More than 200 pounds)

Source: <http://www.intersurgical.com/info/igel>

Note: Patients with cylindrical necks or wide thyroid/cricoid cartilages may require a larger size i-gel® than would normally be recommended on a weight basis. Equally, patients with a broad or stocky neck or smaller thyroid/cricoid cartilage, may require a smaller size i-gel® than would normally be recommended on a weight basis. Patients with central obesity, where the main weight distribution is around the abdomen and hips, might in practice require an i-gel® of a size commensurate with the ideal body weight for their height rather than their actual body weight.

**i-gel® O<sub>2</sub> Pre-Insertion:**

1. Provide bag-valve mask ventilation using 2 person technique with an oropharyngeal airway, avoiding hyperventilation, and performing pharyngeal suctioning as needed.
2. Inspect the packaging and ensure it is not damaged prior to opening.

3. Inspect the device carefully, check that the airway is patent and confirm that there are no foreign bodies or a bolus of lubricant obstructing the distal opening of the airway or gastric channel.
4. Remove the i-gel® O<sub>2</sub>, open the sachet of supplied lubricant and place a small bolus of the lubricant on the base of the inner side of the main shell of the packaging.
5. Grasp the i-gel® O<sub>2</sub> along the integral bite block and lubricate the back, sides and front of the cuff with a thin layer of lubricant. This process may be repeated if lubrication is not adequate. After lubrication has been completed, check that no bolus of lubricant remains in the bowl of the cuff or elsewhere on the device. Avoid touching the cuff of the device with your hands.
6. Ensure the supplementary oxygen port is firmly closed with the integral cap in place.
7. Position the patient's head (ideal position is the sniffing position, but the neutral position can be used especially for suspected spinal injury).
8. Pre-position the airway support strap behind the patient's neck.

**i-gel® O<sub>2</sub> Procedure:**

9. Grasp the lubricated i-gel® O<sub>2</sub> firmly along the integral bite block. Position the device so that the i-gel® O<sub>2</sub> cuff outlet is facing towards the chin of the patient.
10. Introduce the leading soft tip into the mouth of the patient in a direction towards the hard palate.
11. Glide the device downwards and backwards along the hard palate with a continuous but gentle push until definitive resistance is felt.
12. At this point, the tip of the device should be located in the upper esophageal opening and the cuff should be located against the laryngeal framework. The incisors should be resting on the integral bite block.
13. i-gel® O<sub>2</sub> should be secured with the airway support strap provided.
14. Attach bag-valve device and verify placement by ALL of the following criteria:
  - a. Positive end-tidal CO<sub>2</sub> levels by waveform capnography (preferred) or by use of colorimetric qualitative end-tidal CO<sub>2</sub>
  - b. Rise and fall of the chest
  - c. Bilateral breath sounds and absent epigastric sounds
15. If there is any question about the proper placement of the i-gel® O<sub>2</sub> airway, remove the airway, ventilate the patient with BVM and OPA for at least 30 seconds and repeat insertion procedure (maximum of 3 attempts), considering different size.
16. If unsuccessful, return to BVM ventilation and consider alternative advanced airway as authorized by MCA.
17. If successful, continue positive pressure ventilation, avoiding hyperventilation.
18. Consider reinforcing the airway support strap with tape for transport.
19. Continue to monitor the patient for proper airway placement throughout prehospital treatment and transport using waveform capnography.
20. Following successful placement, consider gastric decompression (excluding MFR) using a lubricated 10F (#3 or 4 i-gel) or 12F (#5 i-gel) oral gastric tube, if available.



## Combitube® Airway

*Table 4 Combitube® Airway Required Documentation*

Size and type of Combitube® Airway	Time(s) attempted
Number of attempts	Suction required
Ventilation compliance	Chest rise with ventilation
Absence of epigastric sounds	Which tube used for ventilation
Capnography used	ET CO <sub>2</sub> capnography reading
Equality of lung sounds	Any complications with intubation procedure

### Indications:

For use in unconscious patients with absent gag reflex, that require assisted ventilation. May be used as a rescue device for failed endotracheal intubation or as a primary advanced airway technique. May be preferred over ET intubation in cardiac arrest patients to minimize interruptions in chest compressions.

### Contraindications:

1. Patient with an intact gag reflex
2. Patient under 5 feet tall for a regular adult, 4 feet for Combitube® SA
3. Patients in whom caustic substance ingestion is suspected
4. Presence of a tracheostomy

### Equipment:

1. Combitube® is available in 2 sizes, 41F and 37F (SA)
2. Support equipment: Bag-valve-mask, suction, capnography, securing device
3. Use appropriate size and inflation volumes for patient based on table below

*Table 5 Combitube® Quick Reference*

Patient Height	Combitube® size	Proximal Balloon #1 Inflation Volume	Distal balloon #2 Inflation Volume
>4 Feet Tall	Combitube® SA 37f	50-75 cc (85 cc max)	12cc
>5 Feet Tall	Combitube® 41f	50- 75 cc initially (100cc max)	15cc

**Note: In most patients under 6' the Combitube® SA (37F) is preferred.**

### Procedure for Combitube® Airway Insertion

1. Provide bag-valve-mask ventilation using 2-person technique with an oropharyngeal airway, avoiding hyperventilation, and performing pharyngeal suctioning as needed.
2. Test cuff inflation system by injecting the maximum inflation volume listed in table above for the size of the tube.
3. Deflate cuffs completely before insertion, leaving syringe attached to connector.
4. Lubricate tip of Combitube® with water soluble medical lubricant.

5. Position patient with head/neck in a neutral position (or slightly flexed if no suspected spinal injury).
6. With gloved hand, lift mandible (jaw) forward.
  - Ⓢ a. Alternatively, may use a curved laryngoscope blade to establish path for insertion.
  - b. Insert Combitube® into mouth following the same curvature as the pharynx.
7. Gently advance Combitube® (along midline) deep into the pharynx until the patient's teeth (gums) lie between the two circular ring markings on the outer end of the airway.
  - a. If resistance is felt while advancing, assure the mandible is fully displaced forward.
  - b. Do not forcibly advance the airway against resistance.
  - c. If resistance continues to be felt, withdraw the Combitube® and reinsert.
8. Without holding the Combitube®, inflate the Blue Port #1 (proximal pharyngeal balloon) with 50-75 cc of air using the large syringe. Combitube® may be slightly displaced outward.
9. Inflate the White Port #2 (distal esophageal balloon) with 12 cc of air (Combitube® SA 37 F) or 15 cc of air (Combitube® 41 F) using the small syringe.
10. Attach the bag-valve ventilator to the Blue Tube (#1) and begin ventilations while assessing for placement.
  - a. Confirm positive end-tidal CO<sub>2</sub> levels by waveform capnography (preferred) or by use of colorimetric qualitative end-tidal CO<sub>2</sub>. Assess for chest rise, listen for absence of gastric (stomach sounds), then listen for bilateral breath sounds.
  - b. If chest rises, no gastric sounds and bilateral breath sounds are present and CO<sub>2</sub> detected, continue ventilating through Blue Tube #1. Tube should be in esophagus.
  - c. If chest does not rise and if gastric sounds are present when ventilating through Blue Tube #1, immediately switch to Clear Tube #2. If chest rises, no gastric sounds and bilateral breath sounds are present and CO<sub>2</sub> detected, continue ventilations through Clear Tube #2. Tube should be in trachea.
  - d. If ventilation through either tube does not produce chest rise, absent gastric sounds, bilateral breath sounds and detection of CO<sub>2</sub>, then immediately fully deflate balloon #1 then balloon #2 and remove Combitube®, reinsert oropharyngeal airway and resume 2-person bag-valve mask ventilations prior to re-attempting procedure.
11. If ventilations are successful through Blue Tube #1 but an air leak is detected at the mouth, place additional air into Blue Port #1 in 10 cc increments while ventilating (85 cc maximum for 37 F or 100 cc maximum for 41 F) until air leak resolves.
12. If ventilating successfully through Blue Tube #1 and gastric distension is present, insert suction catheter (provided) through Clear Tube #2, attach suction and decompress stomach, if available.
13. The large pharyngeal balloon generally is sufficient to keep the Combitube® in place during pre-hospital care. Additionally securing the Combitube® with tape or similar means is recommended when extensive patient movement is likely to occur (e.g., during extrication).
14. Constant monitoring of the patency of the airway must be done throughout the care of the patient. End tidal CO<sub>2</sub> monitoring, evaluating chest rise and re-auscultation of gastric and breath sounds should be performed at frequent intervals.
15. Both the pharyngeal and esophageal balloons are at risk for being punctured during insertion from sharp teeth. If either balloon is punctured the device will not work effectively and must be removed. This can be detected by the pilot cuffs being unable to maintain air.
- Ⓢ 16. Combitube® should be removed if patient develops a gag reflex. Alternatively, paramedics may sedate as needed for tube tolerance per **Patient Sedation Procedure**.



## King LTS-D® Supraglottic Airway

*Table 6 King ® Supraglottic Airway Required Documentation*

Size and type of King ® airway used	Time(s) attempted
Number of attempts	Suctioning required before placement
Ventilation compliance	Chest rise with ventilation
Equality of Lung Sounds	Absence of Epigastric Sounds
Capnography used	ET CO <sub>2</sub> capnography reading
Method for Securing Airway	Any Complications with Intubation Procedure
Gastric decompression performed	

### Indications:

For use in unconscious patients without gag reflex, that require ventilation. May be used as a rescue device for failed endotracheal intubation or as a primary advanced airway technique. Consider in cardiac arrest patients to minimize interruptions in compressions.

### Contraindications:

1. Responsive patients with a gag reflex
2. Patients who are under 4 feet
3. Patients in whom caustic substance ingestion is suspected.

### Equipment:

1. King LT-D ®: Disposable King Airway that does not have gastric access.
2. King LTS-D ®: Disposable King Airway that provides gastric access to allow for gastric decompression using an 18F gastric tube (preferred for adults).
3. Supplies: Water-soluble lubricant, bag-valve-mask, capnography, securing device.
4. Use appropriate size and inflation volumes for patient based on table below.

*Table 7 King Airway ® Quick Reference*

Size	Patient Criteria	Connector Color	Inflation Volume LT-D	Inflation Volume LTS-D
3	4-5 ft.	Yellow	45-60 ml	40-55 ml
4	5-6 ft.	Red	60-80 ml	50-70 ml
5	Greater than 6 ft.	Purple	70-90 ml	60-80 ml

Source: <https://www.narescue.com/media/custom/upload/File-1443546141.pdf>

### King LTS-D ® Procedure:

1. Provide bag-valve-mask ventilation using 2-person technique with an oropharyngeal airway, avoiding hyperventilation, and performing pharyngeal suctioning as needed.
2. Test cuff inflation system by injecting the maximum inflation volume listed in table above for the size of the tube.
3. Deflate cuffs completely before insertion, leaving syringe attached to connector.

4. Lubricate the beveled distal tip and posterior aspect of the tube avoiding introduction of lubricant in or near the ventilatory openings.
5. Position the patient's head (ideal position is the sniffing position but the neutral position can be used).
6. Holding the King ® at the connector, hold the patient's mouth open and apply chin lift unless contraindicated due to trauma and/or spinal immobilization,
7. With the King ® rotated laterally 45-90 degrees, 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.
8. As the tip passes under tongue rotate tube back to midline (blue orientation line faces chin).
9. Without exerting excessive force, advance the King ® until base of connector aligns with teeth or gums.
10. Inflate the cuff based on the listed volumes for the tube size used.
11. Attempt ventilation. If resistance is met and/or no chest rise occurs, carefully withdraw the airway approximately 1 cm at a time while attempting to ventilate. When airway is in supraglottic position, patient should easily ventilate and chest should rise and fall.
12. Attach bag, valve device and verify placement by ALL of the following criteria:
  - a. Positive end-tidal CO<sub>2</sub> levels by waveform capnography (preferred) or by use of colorimetric qualitative end-tidal CO<sub>2</sub>.
  - b. Rise and fall of chest
  - c. Bilateral breath sounds
  - d. Absent epigastric sounds
13. Secure the airway, preferably with a commercial tube holding device appropriate for the King Airway ®.
14. If there is any question about the proper placement of the King Airway ®, deflate the cuffs and remove the airway, ventilate the patient with BVM for 30 seconds and repeat insertion procedure or consider other airway management options.
15. Continue to monitor the patient for proper airway placement throughout prehospital treatment and transport.
16. Following successful placement, consider gastric decompression using a lubricated 18F gastric tube, if available.
17. King Airway® should be removed if patient develops a gag reflex. Alternatively, paramedics may sedate as needed for tube tolerance per **Sedation Procedure**.





## Orotracheal Intubation



*Pediatric Orotracheal Intubation should not be performed unless unable to ventilate by any other means (including BVM and basic airway adjuncts).*

*Table 8 Orotracheal Intubation Required Documentation*

ET tube size	Number of attempts
Visualization of vocal chords	Suction required
ET Tube measurement (cm) at teeth	Chest rise with ventilation
Ventilation compliance	Bulb syringe check documented if used
Capnography used	ET CO <sub>2</sub> capnography reading
Equality of lung sounds	Absence of epigastric sounds
Method for securing ET tube	Any complications encountered

1. Ventilate the patient with 100% oxygen using BVM and 2-person technique.
2. Gather equipment:
  - a. Appropriate size ETT with stylet
  - b. Syringe
  - c. Laryngoscope with blades
  - d. Suction
  - e. Bag-valve-mask (BVM)
  - f. Commercial device for securing tube after placement
  - g. Waveform capnography (preferred) or colorimetric capnometry for confirmation
  - h. Pulse oximeter, if available
3. If no suspicion of cervical spine injury, position patient with head elevated and extended.
4. If cervical spine injury suspected, have 2nd person stabilize head and neck in neutral position.
5. Perform direct laryngoscopy:
  - a. If using a curved blade, place the tip anterior to the epiglottis into the vallecula.
  - b. If using a straight blade, directly lift the epiglottis with the tip of the blade.
  - c. For infants and children less than 4-6 years old, a straight blade is recommended.
  - d. For commercial video laryngoscopy systems (approved by MCA and the Division), follow manufacturer's instructions for use regarding placement.
6. In the adult patient the ET tube should be advanced through the cords until the proximal portion of the balloon is passed 2 to 3 cm beyond the vocal cords. Unless otherwise contradicted by auscultation, the tube should be 21 cm at the incisors (or corner of the mouth) in females and 23 cm in males.
7. In pediatric patients, the ET tube should be advanced to the depth recommended based on patient's weight. In general the ET tube should be advanced to a depth that is approximately 3 times the size of the ET tube (e.g., a 4.0 tube should be advanced to ~12 cm).
8. In general, attempts should be limited to less than 30 seconds each.
9. No more than two attempts should be made prior to considering a Supraglottic airway and/or continuing with basic airway management techniques.
10. In cardiac arrest patients, limit interruptions of compressions to no more than 10 seconds.
11. If using a cuffed tube, inflate the balloon.



12. Confirm tube placement with positive end-tidal CO<sub>2</sub> levels by waveform capnography (preferred) or by use of colorimetric qualitative end-tidal CO<sub>2</sub>, by absence of gastric sounds and by presence of bilateral breath.
13. Document the procedure including all the above confirmation techniques for each oral intubation attempt. Maintain airway monitoring once established.
  - a. For documentation purposes an oral attempt is defined as anytime an ET tube passes patient's lips.
14. Airway placement should be re-confirmed at frequent intervals throughout the care of the patient, particularly after each patient movement.

### Cricothyroidotomy

**NOTE: If MCA selects Commercial Percutaneous Cricothyroidotomy; training program must be submitted with this protocol.**

*Table 9 Cricothyroidotomy Required Documentation*

Type of cricothyroidotomy attempted	Indication for cricothyroidotomy
Number of attempts	Times attempted
Ventilation compliance	Previous advanced airway attempts
ET CO <sub>2</sub> Capnography reading	Chest rise with ventilation
Equality of lung sounds	Post cricothyroidotomy pulse oximetry
Any complications with procedure	

The cricothyroid membrane is located subcutaneously between the thyroid cartilage ("Adam's apple") and cricoid cartilage. There are three methods for performing a cricothyroidotomy: surgical cricothyroidotomy, needle cricothyroidotomy, and percutaneous cricothyroidotomy using a state and local MCA-authorized commercial kit. 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 a large bore (> 14 ga) IV catheter inserted percutaneously and requires a commercial transtracheal jet insufflation device for optimal use. The percutaneous cricothyroidotomy uses a commercial kit to perform the cricothyroidotomy.



Patients less than age 8 may have a needle cricothyroidotomy performed or a percutaneous cricothyroidotomy using an approved pediatric kit. Patient's age 15 or greater may undergo a needle, surgical, or commercial percutaneous cricothyroidotomy, **as approved by local medical control.**

### Indications for Cricothyroidotomy:

1. Total airway obstruction not relieved by other methods.
2. Airway compromise from injuries that prevent ventilation with basic techniques and makes intubation impractical in a patient who needs immediate airway management.
3. Inability to intubate or effectively manage with basic ventilation techniques or supraglottic airway.


### Contraindications for Cricothyroidotomy:

1. Ability to ventilate by any other method.

**Technique for Surgical Cricothyroidotomy:**

1. Gather necessary equipment in addition to that needed for oral intubation:
  - a. Antiseptic solution
  - b. Scalpel
  - c. Tracheal hook (recommended)
  - d. Gum elastic bougie (recommended)
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 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 a ~1 cm horizontal incision through the lower portion of the membrane.
6. Enlarge the hole and advance the ET tube into the airway, and inflate the balloon.
  - a. Care should be taken to assure tube is inserted into the trachea and not a false passage.
  - b. When available, use a tracheal hook to displace the inferior aspect of the membrane anteriorly so as to facilitate tube placement.
  - c. When available, insert a gum elastic bougie through the incised membrane and advance until resistance is felt at the level of the carina. Then advance the ET tube over the bougie (recommended technique).
7. Verify correct placement using usual techniques, including end tidal CO<sub>2</sub> detection.
8. Maintain continuous CO<sub>2</sub> monitoring once established.
9. Apply dressing to area.

**Technique for Needle Cricothyroidotomy:**

1. Gather necessary equipment:
  - a. Antiseptic solution
  - b. Transtracheal jet insufflation device 50 psi (required for adults)
  -  c. For pediatric patients under 5 y/o use a ventilation system using a 3 mm ET tube adapter connected directly to the catheter Luer lock and to bag-valve device. This system provides only temporary limited oxygenation.
  - d. IV catheter (≥ 14 gauge) and syringe (5-10 cc). Do not use needle safety catheters that do not allow for connection of a syringe.
2. Identify cricothyroid membrane.
3. Prep the site with antiseptic solution.
4. Connect the IV catheter to a syringe.
5. Stabilize the larynx and re-identify the cricothyroid membrane.
6. Direct the IV catheter posteriorly and inferiorly at an angle of ~45 degrees to the skin.
7. Insert the IV catheter through the skin, maintaining negative pressure on the syringe. Entry of air and loss of resistance signifies entry into the larynx.
8. Advance the catheter into the larynx and retract the needle.
9. Caution must be used to ensure the catheter does not bend.
10. Ventilate using a commercial transtracheal jet insufflation device, as indicated.
11. Deliver 100% O<sub>2</sub> at 20 bursts/minute with Inspiratory/Expiratory of 1:2.

**Technique for Percutaneous Cricothyroidotomy Using Approved Commercial Kit:**

**Note: Only state and local MCA approved commercial percutaneous cricothyroidotomy kits may be used.**

1. Prepare necessary equipment.
2. Follow Instructions for use provided by device manufacturer.