

Purpose: To define and describe the procedure for establishing and maintaining a patient's airway and for providing oxygenation and ventilation.

- M B S P**
- I. **Evaluate adequacy of airway, oxygenation and ventilation**
 - A. Protect cervical spine from movement in all trauma patients.
 - B. Verify patent airway (i.e.: clear, free of foreign substances)
 - C. Assess for impaired oxygenation (i.e.: cyanosis, altered LOC, dyspnea)
 - D. Assess for insufficient ventilation (i.e.: rate, depth, abnormal breath sounds)
 - E. Note abnormal noises indicating obstruction (i.e.: crowing, stridor, wheezing or cough)
 - F. Patients with chest pain, altered LOC, significant trauma or other conditions at risk of hypoxia should receive supplemental oxygen.

 - II. **Establish and maintain a patent airway**
 - A. **Manually open the airway**
 1. **Medical patient:** use Head Tilt-Chin Lift, or Head tilt-Jaw Thrust
 2. **Trauma patient:** use Modified Jaw Thrust

 - B. **If unable to establish open airway proceed to Obstructed Airway Procedure.**

 - C. **Clear airway of secretions or emesis:**
 1. Turn patient to the side, if possible, maintaining spinal immobilization in trauma patients.
 2. **Suction** the oropharynx with a large bore suction catheter.
 - a. In general, 15 seconds should be the maximum suction time.
 - b. Suction may take longer if large amounts of secretions or emesis are present in the oropharynx.
 - c. Suction may need to be repeated in order to keep the airway clear until a definitive airway has been placed.

 - D. **Insert a basic airway:**
 1. Oropharyngeal airway (without gag reflex)
 2. Nasopharyngeal airway (with gag reflex)

 - B**
 - E. If permitted by local Medical Control insert a supraglottic airway (COMBITUBE, ETDLA or King LT)

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 - F. **Secure a definitive airway:**
 1. **Establish endotracheal tube placement**
 - a. Maximum of 2 attempts total. Attempts should be generally limited to 30 seconds each.
 - b. With adult cardiac arrest patients, breaks in effective CPR for airway management should be minimized; if intubation attempts have taken more than one (1) minute, a COMBITUBE should be inserted.
 - c. Intubation may be facilitated through use of a gum-elastic Bougie type entotracheal tube introducer.
 3. Oxygenate between attempts.
 4. **If ETT is unsuccessful, or if the intubation is deemed to be technically challenging due to patient anatomy or the situation, insert a supraglottic airway (See section 'I' below)**

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 - G. **Orotracheal Intubation Procedure**
 1. Indications
 - a. Unresponsive
 - b. Unprotected airway
 2. Contraindications
 - a. Unable to open mouth

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AIRWAY/OXYGENATION PROCEDURE

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- b. Conscious, semi-conscious with an intact gag
 - c. Inability to visualize cords while C-spine immobilized
 - d. Inability to access patient to visualize cords
3. Assemble and inspect equipment needed for ET intubation.
 4. Use of stylet, or Gum-Elastic Bougie (bougie) type intubation introducer, is recommended.
 5. Ensure patient is well oxygenated
 6. Use assistant as appropriate.
 7. Position medical patient's head in slightly hyperextended position.
 8. Maintain trauma patient's head in neutral position with manual immobilization during procedure.
 9. Suction may be necessary before tube can be inserted into larynx.
 10. Use Sellick's maneuver to limit vomiting and bimanual pressure to facilitate cord visualization. Bimanual pressure may be accomplished by having the person intubating visualize the airway with the laryngoscope while adjusting the cricoid position with their fingers and then having a helper hold the trachea in the desired spot (where cords are visible) while the intubator introduces the ETT.
 11. Perform direct laryngoscopy.
 12. Gently insert tube (or bougie) down through oropharynx into trachea; visualize tip of tube (or bougie) passing in between cords.
 13. If the bougie is utilized, once through the cords and without letting go, slide the appropriately sized endotracheal tube over the bougie until the centimeter marks on the ETT line up with the patient's teeth with a depth of 23 cm for an adult male and 22 cm for an adult female. It is necessary to use an assistant or to switch hands in order to slide the ETT into place.
 14. Without letting go of tube, inflate cuff to seal airway. Remove the bougie if used.
 15. If available, aspirate using esophageal detection device (EDD) to confirm tube placement.
 16. Auscultate for epigastric sounds first and then breath sounds during ventilation at four lung points (apices & lateral) to assure location of tube.
 17. Reposition tube if breath sounds are unequal or, if breath sounds are not heard, remove tube.
 18. When adequate breath sounds are heard, insert oropharyngeal airway or other bite block and secure.
 19. Assure that ET tube is well secured with a commercial tube holder prior to any patient movement.
 20. Consider immobilization of patient's head to maintain tube position.
 21. Attach bag-valve-mask and assure adequate ventilation.
 22. Re-evaluate breath sounds for tube location following any patient movement.
 23. End Tidal CO₂ Indicator may be used to confirm and monitor tube placement.
 24. Capnography should be used for all intubated patients, if available.
 25. One type of secondary confirmation device is required (EDD, EtCo₂, capnography)

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H. **Nasotracheal Intubation Procedure**

1. Indications for use in the breathing patient
 - a. Unable to open the mouth
 - b. Unresponsive patient
 - c. Inability to visualize cords when C-spine immobilized or due to limited patient access.
 - d. Facial Burn
2. Contraindications
 - a. Apneic patient
 - b. Patient with mid-face facial injuries or suspected basilar skull fracture
3. Assemble and inspect equipment needed for intubation.
4. Use assistant as appropriate.
5. Ensure patient is well oxygenated
6. Position medical patient with head slightly hyperextended.
7. Immobilize head of trauma patient in neutral position with manual stabilization throughout procedure.
8. Instill neo-synepherine spray into nares.
9. Lubricate nare by inserting anesthetic jelly (applied to nasopharyngeal airway) and lubricate end of ET tube with anesthetic jelly as needed.
10. Use Sellick's maneuver to limit vomiting
11. Insert tube into nare with bevel against septum, or nasal floor without a stylet.
12. Advance tube along floor of nose.
13. If resistance is met, rotate tube slightly left or right.
14. If no risk of c-spine trauma, head may be flexed, depress trachea or lift jaw to assist in tube placement: BE GENTLE.
15. Listen for breathing, advance tube during inspiration. No sound means tube is not in the trachea.
16. If available, aspirate using esophageal detection device to confirm tube placement.
17. Inflate cuff, attach bag-valve-mask and assure adequate ventilation.
18. Auscultate for bilateral breath sounds at four lung points (apices and lateral) during ventilation and over epigastrium to assure location of tube.
19. If breath sounds not present, remove tube.
20. Hyperventilate patient (1 breath every 3 seconds for 30 seconds) before another attempt is made.
21. Ensure that ET tube is well secured prior to any patient movement.
22. Consider immobilization of patient's head to maintain tube position.
23. Re-evaluate breath sounds for tube location following any patient movement.
24. End Tidal CO₂ Indicator may be used to confirm and monitor tube placement.
25. Capnography should be used for all intubated patients, if available.
26. At least one type of secondary confirmation device is required (EDD, EtCO₂, capnography)

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- I. **If ET intubation cannot be achieved in two (2) attempts or if the intubation is deemed to be technically challenging due to patient anatomy or the situation; (For use by Basic EMT's only with approval from local medical control)**
1. **Insert a supraglottic airway according to manufacturer's guidelines**
 2. **Esophageal Tracheal Double Lumen Airway (ETDLA or COMBITUBE)**
 - a. Contraindicated when:
 - gag reflex present
 - patient under 5 feet tall (Under 4' with the Small Adult [SA] model)
 - history of corrosive ingestion
 - history of esophageal disease
 - Allergy or sensitivity to latex (The pharyngeal balloon contains latex)
 - b. Precautions:
 - Take appropriate universal precautions, including facial protection, as expulsion of stomach contents can occur through the # 2 tube if the initial placement is in the esophagus.
 - May be used in trauma; take care to prevent movement of the c-spine.
 - When facial trauma has resulted in sharp, broken teeth or dentures; remove dentures and exercise extreme caution when passing the ETDLA into the mouth to prevent the cuff from tearing.
 2. **Procedure for ETDLA/COMBITUBE Insertion**
 - a. Assemble and inspect equipment.
 - b. Ensure patient is well oxygenated
 - c. Use assistant as appropriate.
 - d. Have suction ready.
 - e. Place head of medical or trauma patient in neutral alignment, with manual stabilization throughout procedure for trauma patient.
 - f. Lift tongue and lower jaw upward with one hand.
 - g. With other hand, hold ETDLA so that it curves in the same direction as the curve of pharynx. Insert the tip into the mouth and advance gently until the printed ring is aligned with the teeth.
 - h. DO NOT force the tube. If resistance is met, withdraw the tube, reposition the head (or jaw, in the case of trauma) and reattempt.
 - i. Inflate the large pharyngeal balloon (blue #1 cuff) with 100cc air (85cc in the SA model).
 - j. Inflate distal balloon (white # 2 cuff) with 15cc of air (10cc in the SA model).
 - k. If available, aspirate using esophageal detection device to confirm tube placement.
 - l. Begin ventilation through the longer blue connecting tube. If auscultation of breath sounds is positive and auscultation of gastric insufflation is negative, continue ventilation. (Also confirm by watching for chest rise.)
 - m. IF NECESSARY, if auscultation of breath sounds is negative, and gastric insufflation is positive, immediately begin ventilation through the shorter clear connecting tube. Confirm tracheal ventilation by auscultation of breath sounds and absence of gastric insufflation.
 - n. Remove syringes and monitor that cuffs remain inflated.
 - o. Capnography should be used when a COMBITUBE/ETDLA is in place, if available.

3. Procedure for ETDLA/COMBITUBE Removal

- a. The tube should not be removed unless:
 - i. Tube placement cannot be verified
 - ii. The patient no longer tolerates the tube
- b. Have suction equipment ready.
- c. Log-roll the patient to the side.
- d. Deflate pharyngeal cuff using # 1 pilot balloon. The pilot balloons should completely collapse when deflated.
- e. Deflate the distal cuff using the # 2 pilot balloon.
- f. Gently remove the COMBITUBE while suctioning.

4. Special Notes:

- a. There may be occasions following the insertion of the COMBITUBE where auscultation of breath sounds is negative AND gastric insufflation is negative. This may result from advancing the COMBITUBE too deeply into the airway, causing the pharyngeal balloon to push the epiglottis over the tracheal opening. This essentially creates a partial airway obstruction, making ventilation difficult. If this occurs, deflate the pilot balloons and pull the tube back about 2-3cm and then reinflate the pilot balloons. This will re-seat the pharyngeal balloon higher in the airway.
- b. It is normal for the COMBITUBE to rise slightly out of the mouth as the pharyngeal balloon is being inflated. Do not attempt to prevent the COMBITUBE from rising while the balloon is being inflated.
- c. Remove any Combitube if you cannot determine which port is appropriate or if ventilation becomes more difficult after insertion.
- d. The COMBITUBE should be stored in its original container. This assures that all of the necessary components are present. This protects the balloons and cuffs; it also insures that the proper size syringes are readily available.
- e. If air leaks around the pharyngeal balloon, up to 20cc of additional air may be added to it (# 1 pilot balloon). Do not add additional air to the distal cuff (# 2 pilot balloon).
- f. The COMBITUBE must be left in place when a patient is pronounced dead in the field.
- g. The COMBITUBE is a single use device and should be discarded after use.
- h. Upon arrival to a hospital, the large syringe should be brought into the emergency department to facilitate the decompression of the pharyngeal balloon for intubation or airway access.
- i. If the COMBITUBE has been placed in the TRACHEA, "ET" medications may be administered down the shorter, white #2 tube.
- j. If the COMBITUBE has been placed in the ESOPHAGUS, the tube may NOT BE USED FOR MEDICATION ADMINISTRATION.
- k. **If a COMBITUBE has been placed in the ESPOHAGUS, and a peripheral IV cannot be established, the COMBITUBE should remain in place and an IO should be established for venous access.**

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- K. **To clear airway of secretions, or emesis:**
1. Turn the patient to the side, if possible; maintain spinal immobilization in the trauma patient.
 2. **Suction** the oropharynx with a large bore, rigid or flexible catheter.
 - a. Hyperventilate patient prior to, and in between, suctioning periods *
 - b. Suction the oropharynx for a maximum of 15 seconds. Suction may take longer if large amounts of secretions or emesis are present in the oropharynx.
 3. If the patient's lower airway needs to be suctioned:
 - a. Sterile technique must be used.
 - b. Use a flexible catheter down an ET tube for less than 10 sec.

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- L. **When all previous methods of opening the airway have failed:**
1. **Needle Cricothyroidotomy**
 - a. Indications
 - 1) **To be performed ONLY after on-line medical control contract.**
 - 2) Only used when absolutely all methods of opening and maintaining an airway have failed, and ventilations with pocket mask or BVM are inadequate.
 - b. Precautions
 - 1) Bleeding is common.
 - 2) Do not stray from the midline due to the proximity of large vessels.
 - 3) Attempt on a child < 8 years old should be done only with the direction of Medical Control.
 - c. Procedure
 - 1) Prepare equipment:
 - 10 or 12 gauge IV catheter
 - 10-12 cc syringe
 - High flow oxygen source (50 PSI)
 - Oxygen tubing adapted to fit IV catheter, or jet insufflation device. (O2 tubing connected to a three way IV extension set then connected to the catheter)
 - 2) Expose neck and identify trachea, palpate prominent thyroid notch anteriorly. Palpate cricoid cartilage inferiorly. The space between the cricoid and thyroid cartilages is the cricothyroid membrane.
 - 3) Stabilize the trachea by holding the thyroid cartilage between thumb and fingers of one hand.
 - 4) Insert the largest available IV catheter attached to a syringe through the skin just above the cricoid cartilage, and pierce the cricothyroid membrane.
 - 5) As soon as the trachea is entered as demonstrated by aspiration of air, angle to 45 degrees inferiorly and slide needle out as you advance IV catheter. Re-aspirate to re-check position.
 - 6) Ventilate with a 50 PSI source to achieve chest rise with a one to two ratio of ventilation to exhalation.
 - 7) Dress wound, stabilize catheter.

III. When airway is patent, support oxygenation and ventilation.

A. **If patient's breathing is inadequate** (i.e.: too fast, too slow, too shallow, retractions, cyanosis, or decreased LOC):

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1. Ventilate patient at appropriate rate for age. (See special notes)
 - a. Pocket mask** with one-way valve with 15 lpm oxygen attached (preferred method).
 - b. Bag-Valve-Mask (BVM) with 15 lpm attached
 - c. If neither is available, mouth-to-mouth with barrier shield may be used.
 - d. The use of manually triggered positive pressure breathing devices (Demand Valve) is prohibited.

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B. **If patient is breathing adequately** and oxygen is indicated:

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1. A low concentration (20-40%) may be administered by nasal cannula at 2-6 lpm (COPD patients should receive 1-2 liters of oxygen when in mild to moderate distress. When in severe distress, administer high concentration of oxygen but be prepared to assist with ventilations).
2. A moderate concentration (40-60%) may be administered by:
 - a. Simple face mask at 6-10 lpm
 - b. Partial re-breathing mask at 6-10 lpm
3. A high concentration (60-90%) may be administered by:
 - a. Non-rebreathing mask at 15 lpm
4. Peds: a pediatric simple face mask at 5 lpm delivers 60-80% oxygen concentration when held firmly in place on infants and small children (Held 2 inches from face it delivers 40%).

IV. Special Considerations

A. Pulse Oximetry

1. Use pulse oximetry to evaluate patient oxygenation before and after management as possible.

B. Capnography

1. Use capnography, if available, for all intubated patients and optionally for non-intubated respiratory distress patients.

V. Special Notes:

	Respiratory Rate
Infant	30-60/min
Toddler	24-40/min
Preschooler	22-34/min
School aged child	18-30/min
Adolescent	12-16/min
Adult	10-20/min

* A two-person BVM technique is preferred in order to maintain a seal and supply an adequate tidal volume.

** Use of pocket mask with one-way valve and supplemental oxygen is preferable to the use of Bag-Valve-Mask.