

Improving Basic Airway Management – Answers

Jeff Myers, D.O., Ed.M., NREMT-P, FAAEM
Clinical Assistant Professor Emergency Medicine
SUNY-Buffalo, Buffalo, NY
myersj@alum.rpi.edu
<http://ems-ed.photoemsdoc.com/>
716.898.3525

Today's Goal: Improve effectiveness of basic airway maneuvers

The two things the term "Oxygenation" describes are:

- Movement of oxygen into the blood stream
- Provide oxygen to the cells

The two things the term "Ventilation" describes are:

- Movement of air in and out of the lungs
- Removal of carbon dioxide

How are oxygenation and ventilation linked together? Usually (but not always), a decrease in ventilation = a decrease in oxygenation.

In what conditions are they not linked together?

- Carbon dioxide diffuses easier across the alveolar/capillary membrane so in some cases, CO₂ movement may be better than O₂ movement
- In hypoventilation, less CO₂ is moved out of the lungs, which means less can diffuse across from the blood and blood CO₂ levels may rise faster than oxygen levels drop. This occurs in the dependent parts of the lungs
- When applying supplemental oxygen, the airspaces are filled with oxygen and essentially turn the lungs into a giant reservoir bag. With the much higher concentration of oxygen, the patient will be well oxygenated, even if the patient hypoventilates. However, since CO₂ removal depends on ventilation (actual movement of air), blood CO₂ levels may rise even if the patient remains well oxygenated.

How do we clinically assess oxygenation and ventilation?

Oxygenation	Ventilation
<ul style="list-style-type: none">• Pink skin, mucous membranes, & nail beds• Mental status• Pulse oximetry	<ul style="list-style-type: none">• Depth of respiration• Respiratory rate• Mental status• Capnography

What two questions do I ask to determine if I need to intervene?

- Is the patient adequately oxygenated?
- Is the patient adequately ventilated?

What are five reasons to intervene? Please list examples for each reason.

- Non-patent airway.
 - ❖ Massive facial trauma
 - ❖ Copious amount of foreign material

- Inability to maintain a patent airway.
 - ❖ Blood and vomit
 - ❖ Facial trauma
 - ❖ Depressed mental status
- Failure to oxygenate
 - ❖ Severe difficulty breathing (dyspnea)
 - ❖ Impairment of oxygen diffusion
 - Pneumonia
 - Pulmonary edema
 - Pulmonary contusion
- Failure to ventilate
 - ❖ Difficult to maintain an adequate mask seal
 - ❖ Foreign material in the airway
 - ❖ Chest trauma that causes a pneumothorax or rib fractures (hypoventilation due to severe pain)
 - ❖ Upper airway trauma
- Anticipated deterioration in the patient or airway patency.
 - ❖ Intoxicants
 - ❖ Overdose
 - ❖ Facial trauma
 - ❖ Inhalation burns that cause airway edema. Airway edema can occur rapidly, close off the airway, and may not allow placement of an advanced airway.

How can I improve oxygenation?

Non-Rebreather	Bag Valve Mask
Mythbuster: NRB cannot deliver 100% FiO ₂ . Generally, it provides 60%, optimally, it provides approximately 80% Tighten the Seal: <ul style="list-style-type: none"> ○ Nose clip ○ Tighten the elastic band Flow Rate: <ul style="list-style-type: none"> ○ 10 – 15 liters per minute ○ Sufficient to allow reservoir bag to reinflate between inhalations 	<ul style="list-style-type: none"> ○ Blow by is not optimal ○ With a tight face seal Flow Rate: <ul style="list-style-type: none"> ○ 10 – 15 liters per minute

How can I improve ventilation?

- Positioning: sniffing position is a position where there is slight flexion of the neck and extension of the head on the neck. This position is sometimes helped by placing a folded sheet or towel underneath the patient's occiput. For children under approximately 5 – 8 years old, the occiput is proportionally much larger than an adult's. When supine on a flat surface, it causes moderate neck flexion which crimps off the softer pediatric airway. Place a folded sheet or towel under the child's shoulders to raise them up and

effectively place the child in a slight sniffing position.



- Airway adjuncts: Always use! If the patient can tolerate an oral airway, use it. If the patient cannot tolerate the oral airway, place a nasal airway. It is permissible to place **two** (yes two) nasal airways and an oral airway in a difficult to ventilate patient in order to maximize the airway.



- Mask seal: Advocate the C-E position with the hands. Optimally use a two person method if manpower is available.



- Dentures: In general, dentures provide facial support and allow an adequate mask seal. Loose fitting dentures may not provide sufficient support and may obstruct the airway. In that case, they should be removed and kept with the patient (don't lose the dentures!). In either case, when an advanced airway is going to be attempted, remove the dentures prior to the attempt.
- Facial features: facial hair, micronathia (small mandible), or macronathia (larger mandible) may all affect the ability to adequately seal the mask. The mask size or position may need to be adjusted.
- Facial size: a mismatch occurs when the patient's face is large and the provider's hands are small or when the patient's face is small and the provider's hands are large. One solution is to adjust hand position. Another is to use a two handed technique.
- Ventilation Volume: Make sure the patient has an adequate chest rise with each ventilation. If able to auscultate the breath sounds during bag mask ventilation, assess for adequate aeration, especially at the bases.

Assisting Ventilation: When assisting ventilations, time the squeeze to the patient's inhalation. This requires a significant amount of attention by the provider managing the airway. The crew chief or crew leader probably should not perform this if sufficient manpower exists, but rather focus on total patient management

What are the pros and cons about suctioning?

- Pros: suctioning removes foreign material from the airway
- Cons: suctioning removes oxygen from the preoxygenated patient

The take home message about suctioning is: Limit suctioning to what is necessary to clear the airway and insure adequate ventilation

What are the key points when assisting an advanced provider?

- Provide excellent oxygenation and ventilation
- Excellent ventilation and oxygenation buys time to prepare equipment and place an advanced airway. One study showed that an adequately preoxygenated patient (either 2 minutes on a high flow oxygen, coaching the patient to take in 8 vital capacity breaths, or 8 – 12 ventilations with a BVM) with good lungs can last paralyzed and not breathing for up to 8 minutes before the pulse oximetry reading falls below 90%!

Supraglottic Airways:

Supraglottic airways are blindly placed into the middle portion of the airway and occlude the esophagus and the pharynx, indirectly ventilating the trachea. They are generally straightforward to use with less experience required to become proficient with these devices as compared with endotracheal intubation. It is important to note that they do not protect the airway from foreign material as good as an endotracheal tube. Three common devices currently in use include the King LTS-D airway (www.kingsystems.com), the laryngeal mask airway (www.vitaid.com), and the combitube (www.airwaycarnival.com/COM.htm).

Below are a few articles that discuss the use of these devices by non-paramedics.

- Guyette FX, Rittenberger JC, Platt T, Suffoletto B, Hostler D, Wang HE. Feasibility of basic EMTs to perform selected advanced life support interventions. *Prehospital Emergency Care* 2006 10(4):518-521.
- Lefrancois DP, Dufor DG. Use of the esophageal tracheal combitube by basic EMTs. *Resuscitation* 2002 52(1):77-83.
- Ochs M, Vilke GM, Chan TC, Moats T, Buchanan J. Successful prehospital airway management by EMT-Ds using the combitube. *Prehospital Emergency Care* 200 4(4):333-337
- Rumball C, MacDonald D, Barber P, Wong H, Smecher C. Endotracheal intubation and esophageal tracheal combitube insertion by regular ambulance attendants: a comparative trial. *Prehospital Emergency Care* 2004 8(1):15-23.
- Rumball CJ, MacDonald D. The PTL, combitube, laryngeal mask, and oral airway: a randomized prehospital comparative study of ventilatory device efficiency and cost-effectiveness in 470 cases of cardiopulmonary arrest. *Prehospital Emergency Care* 1997 1(1):1-10.
- Russi C, Miller L. An out of hospital comparison of the King LT to endotracheal intubation and esophageal-tracheal combitube in a simulated difficult airway patient encounter. *Academic Emergency Medicine* May 2007 14(5 suppl):S22 (free at http://www.aemj.org/cgi/reprint/14/5_Supplement_1/S22-a-a).

Continuous Positive Airway Pressure:

Continuous Positive Airway Pressure (CPAP) is a technique gaining popularity in use by paramedics to non-invasively support patients in severe respiratory distress. CPAP utilizes a tightly fitting mask on the patient's face to provide a constant pressure during both the inhalation and exhalation phases of the respiratory cycle. The pressure during inhalation helps move air into the lungs. The pressure against the patient's exhalation splints open the lower airways that typically close off during exhalation. In many respiratory diseases, the patient expends a significant amount of effort during inhalation just in opening up the lower airways, effort the patient cannot afford to waste! Many studies support the use of CPAP in many respiratory conditions, for example acute pulmonary edema, severe asthma or COPD exacerbations, and respiratory failure from pneumonia, both decreasing the need for intubation, but significantly decreasing length of stay in the ICU and hospital.

While there are currently no studies that examine non-paramedic EMS providers using CPAP for patients in respiratory distress, I predict that within the next several years we will see research supporting use of CPAP by non-paramedic EMS providers.