

# Alternative Airways: The Who, What, Where, When and How



## Understanding the options between the BVM and the ETT

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**T**hink back to the last time you used a BVM (bag-valve mask) on an unresponsive patient while the ambulance headed toward the nearest emergency department. While wiping away the vomit or other bodily fluids, you may have thought, *This isn't nearly as easy as it was in class with the manikins.*

With that experience in mind, if anyone were to ask you if bagging works, you most certainly would say, "Yes." Maybe more so in some cases and less so in others; but does bagging work? Absolutely! And if asked if bagging is your best choice? More than likely you would respond, "Probably not," especially if endotracheal tube (ETT) placement was quick, easy and virtually foolproof. But since ETT placement is typically none of those things, bagging, while an acceptable choice, shouldn't be your only choice. And the good news is that there is indeed a better way... alternative airways!

Also known as extraglottic devices, these airways are inserted into the patient without the need for visualizing the vocal cords. They are effective alternatives to endotracheal intubation as well as bag-mask ventilation. Some of these devices, called supraglottic airways, sit right on top of the vocal cord structures. Others sit in the esophagus and have balloons to seal above and below the ventilation outlets, so the air coming out can only go into the airway. Either design provides an excellent alternative for airway management. But with choices come questions, so let's explore some questions and answers about alternative airways.

### Who: BLS vs. ALS vs. Nurses vs. Physicians

The answer to this question is easy: all of the above. Research shows novices can successfully place a King airway, LMA or i-gel airway. The training and skills required are minimal, and certainly less demanding than bag-mask ventilation or endotracheal intubation.<sup>1-3</sup> So the only barriers to using these alternative airways are local scope of practice, availability, remembering you have them and, occasionally, pride. These devices are in the paramedic and advanced EMT scope of practice in nearly every jurisdiction, and in

the EMT-Basic scope in many. They are stocked in most ambulances, many emergency departments and probably every operating room. In most ORs these devices are more common than intubation. Just ask your last paramedic student about their experience in the OR trying to get live intubations.

### What: The Choices Out There

There are a huge variety of devices available in the alternative airway arena. They may be generally categorized as those that sit above the glottis (supraglottic, see Figure 1) and those that sit behind it (retroglottic, see Figure 2) in the esophagus. Within each of these categories, devices vary by whether they 1) have adult and pediatric sizes, 2) allow the stomach to be emptied or at least vented and 3) have specific design



Figure 1: Laryngeal mask (supraglottic) and associated anatomy. Ambu

modifications that allow an endotracheal tube to be placed through them. With some alternative airways, placing an ETT can be done blindly, but it is preferable to do this with a flexible scope or optical stylet once in the more controlled environment of the ED or OR.

For a list of selected disposable alternative airway devices for prehospital or hospital use, see the accompanying sidebar on page 44. We recommend

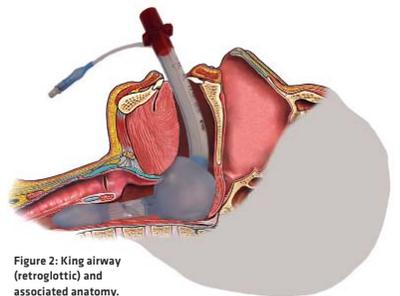


Figure 2: King airway (retroglottic) and associated anatomy. Ambu

devices with gastric venting or access when possible.

**Where: EMS vs. ED, Etc.**

Alternative airways are popular in many EMS services and ORs. Elsewhere—for example, with code teams, ICUs and EDs—their use, while increasing, is still highly variable.

In our experience, ED nurses and physicians are often unfamiliar (and hence uncomfortable) with extraglottic devices that may have been placed prior to the patient's arrival. Many physicians instinctively pull the alternative airway and immediately try to place an endotracheal tube because they assume it provides superior airway management. Though well intentioned, prior to "pulling" the extraglottic device, one should first evaluate whether the airway device is working. If it is, don't mess with success!

It is helpful to consider why the alternative airway was placed. It's one thing if it was placed by a BLS crew that had no other

tice required to maintain ETT intubation competency. When the patient arrives at the hospital and is stabilized, the extraglottic device can be carefully exchanged for an ET tube under controlled conditions. In many cases, the ET tube can be placed directly through the extraglottic airway, especially if a flexible fiber-optic/video scope or optical stylet is available.<sup>6-8</sup>

**When: LEMON, MOANS & RODS**

Situations that suggest airway management and/or breathing difficulties are good times to consider using alternative airways. We have found three simple mnemonics to help remember those situations and guide when to use (or not) extraglottic devices.

**LEMON**

The LEMON mnemonic can help the pre-hospital provider determine if an alternative airway might simply be the airway of choice due to the likelihood of a difficult laryngoscopy.

*L*—Look externally (long or short mandible, such as in Pierre Robin syndrome; high, arched palate; short "bull" neck; beard or mustache; large tongue; large incisors).

*E*—Evaluate the 3-3-2 rule (three fingers of mouth opening, three fingers between mentum and hyoid, two fingers between the hyoid and thyroid cartilage).

*M*—Mallampati (score of Class III or IV suggests higher risk of a difficult airway).

*O*—Obstructions (conditions such as angioedema, epiglottitis, supraglottic swelling, smoke inhalation or trauma that lead to the inability to swallow secretions).

*N*—Neck mobility (situations involving cervical spine immobilization or fixation, or rheumatoid arthritis, which impact neck mobility).<sup>9</sup>

**MOANS**

The MOANS mnemonic can help determine if placing an alternative airway device is the preferred choice due to factors that could lead to ineffective bag-mask ventilation.

*M*—Mask seal (e.g., significant facial hair or facial trauma).

*O*—Obesity/obstruction (inability to swallow secretions due to conditions such as angioedema, supraglottic swelling, smoke inhalation).

*A*—Age greater than 55 (age-related decreased structural definition due to facial atrophy that leads to poor mask seal).

*N*—No teeth (consider replacing dentures if available to achieve a better mask seal).

*S*—Stiff lungs requiring increased ventilator pressures (asthma, COPD, ARDS, term pregnancy).<sup>9</sup>

**RODS**

The RODS mnemonic can help determine if the successful placement of a rescue airway may be compromised. In severe cases, the provider may consider a cricothyroidotomy as the airway of choice if endotracheal intubation or placement of an extraglottic device is likely to be unsuccessful or ineffective.

*R*—Restricted mouth opening.

*O*—Obstruction of the upper airway or larynx.

*D*—Distorted or disrupted airway.

*S*—Stiff lungs requiring increased ventilator pressures.<sup>9</sup>

**When: Cardiac Arrest and the Pig Study**

Studies on cardiac arrest outcomes with extraglottic airways vs. traditional endotracheal intubation report a mixed bag of results and have elements some consider to be inherently flawed.

The Resuscitation Outcomes Consortium and AIRWAYS-2 studies focused on large, international multicenter trials to investigate this issue. Their findings suggest that if you are in an EMS system with plenty of experienced intubators who can intubate on the first attempt without interrupting CPR and still carry out all the critical ACLS interventions, then perhaps intubation will prove to be best. But in most of our systems, where manpower is limited and initial intubation success rates are less than 80%–90% even with stopping CPR, we suspect the patient is better off with an extraglottic airway.<sup>10-18</sup>

As a result of a pig study, a concern was raised about alternative airways potentially

**THE MOANS MNEMONIC CAN HELP DETERMINE IF PLACING AN ALTERNATIVE AIRWAY DEVICE IS THE PREFERRED CHOICE.**

option and isn't working well. Then, certainly, pull it! But it's an altogether different scenario if it was placed by a senior paramedic after a failed intubation. In that case, as in so many others, if it's working, leave it! Of course you can imagine all sorts of scenarios that fall between those extremes, but in general, be reluctant to pull any airway device that is successfully oxygenating, ventilating and providing protection against aspiration.<sup>4,5</sup>

Rapid sequence airway is a recently described variant of rapid sequence intubation being seen in emergent situations. RSA calls for the same medications and preparations used for RSI, but instead of placing an endotracheal tube, you place an extraglottic airway—preferably one that allows for gastric suctioning. The advantages are clear, especially considering the amount of prac-



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impacting cerebral perfusion due to inflation of the cuffs on the airways.

Specifically at question was whether the cuffs presented a danger by pressing directly or indirectly on the carotid vessels.<sup>19</sup> This concern was recently countered with a case series based on human patients who had CT scans of their neck performed while being ventilated through alternative airways. Neuroradiologists could not identify any mechanical impact on the carotid vessels.<sup>20</sup>

We certainly need more studies on this issue, but for now it appears men are not actually pigs!

If ongoing research continues to reflect positively on the use of extraglottic airways, we envision these devices being used not only in EMS, the OR and the ED, but for cardiac arrests throughout the hospital, not just as backup airways but increasingly as airways of choice in situations where time and training are critical.

Imagine being called for a patient who has suffered a cardiac arrest or similar life-threatening situation. Whether you are an EMS provider, an ED staff member or part of the rapid response team, an alternative airway can be placed immediately without stopping compressions.

Even better, you can decompress the stomach and continue ACLS without becoming distracted by intubation. If there is return of spontaneous circulation, the airway can later be exchanged for an ETT.

#### How: Questions and Answers

##### How do you figure out which size?

- For the King airway, estimate the patient height. (For pediatrics you can also use ideal body weight.) Look at the packaging for sizing information.

- For laryngeal mask airways and i-gels, estimate the patient's ideal body weight (adults and pediatrics). Look at the packaging for sizing information. (An exception is the size 5 LMA Supreme, which is based more on height than weight. Ask a company representative for more information if using this device.)

##### How much air do you need to inflate the device with?

- For the King airway, look at the outside of the package or side of the device for a range. If a range is given, inflate with the range's average volume and attempt ventilation. Adjust the volume in small increments as needed to prevent detectable air leaks and achieve good chest rise. Better yet, use a manometer! (The desired pressure is 40–60 cm H<sub>2</sub>O.)

- For laryngeal mask airways, look at the outside of the package or the device/pilot balloon. If a range is given, inflate with the range's average volume and attempt ventilation. Adjust the volume in small increments as needed to prevent detectable air leaks and achieve good chest rise. Better yet, use a manometer! (The desired pressure is 40–60 cm H<sub>2</sub>O.) If a < symbol is present, start with half of what is recommended and increase as above.

- For i-gels, no inflation is needed.

##### How do you know if the device is in the right spot?

- Supraglottic devices will "seat."
- The LMA Supreme has a fixation tab that can be used to assist in determining the correct depth. This tab should be about one finger's breadth above the lip when device "seats." If it's farther out, a smaller size is most likely needed. If you hit the lip before it seats, a larger size is most likely needed.

- With retroglottic devices, it is easy to oversert. Pay attention to teeth markings. When in doubt, it usually needs to be withdrawn a bit.

##### How do you confirm effective ventilation?

- Use capnography if it's available. When successfully utilized, these devices will have a detectable EtCO<sub>2</sub> reading. Presence of a near-normal EtCO<sub>2</sub> waveform is crucial. If EtCO<sub>2</sub> is not detected, suspect that a retroglottic device is placed way too deep or a Combitube is being ventilated from the incorrect port.

- Chest rise and fall (as opposed to increasing abdominal distention) is important.
- Oxygen saturation readings and/or patient color should be improving (or at least not worsening).

##### How do you secure the airway to make it stay in the right spot?

- With the i-gel and O2 Resus, tape it to the face or use an airway support strap.

- If using a commercial securing device, be aware that not all of them fit all extraglottic devices.

- Although alternative airway devices are much more forgiving than an endotracheal tube, failure to secure can still lead to inadequate and even failed ventilation.

##### How long can you leave an alternative airway in place?

- In most EMS systems this is not an issue—simply leave it in. When care of the patient has been transferred to the ED staff, they will follow their own protocol.

- Manufacturers recommend removing or exchanging the extraglottic device for an ETT after a few hours.

- There are reports of military cases where the devices have been left in place for several days without complications.<sup>21</sup>

##### How do you exchange an extraglottic airway for an ETT?

- First of all, if it's working, consider leaving it alone!

- For the King airway, don't try the bougie trick. This is no longer recommended by the manufacturer. Make sure the patient is well oxygenated and the stomach is emptied. Then deflate the balloon and sweep the device over to the left side of the mouth. This technique usually allows enough working room to intubate while keeping the suction going and the esophagus blocked. And now there's just one hole available!

- For the Combitube and Easy Tube, deflate the proximal pharyngeal balloon, but leave the distal esophageal balloon inflated. Sweep the device all the way to the left of the mouth as with the King airway.

- For the LMA Supreme, no good option is readily available. Oxygenate the patient as well as possible, empty the stomach, then pull the device out. An exceptionally proficient practitioner can work around it with a video device, but this method is not generally recommended.

- For the air-Q, it is reasonable to try blind intubation using the manufacturer's



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# Selected Disposable Airway Devices Applicable to Prehospital or Hospital Use

## Disposable supraglottic airways:



**1 Ambu Aura-i laryngeal mask**—Blind intubation through the device is possible, but intubation success rates are higher through the device with use of a flexible scope or optical stylet. Infant, pediatric and adult sizes (2 kg and up).

**2 Ambu AuraGain laryngeal mask**—Gastric access to vent the stomach in all sizes. Blind intubation through the device is possible, but intubation success rates are higher through the device with use of a flexible scope or optical stylet. Infant, pediatric and adult sizes (2 kg and up).

**3 i-gel O2 Resus**—Gastric access to vent the stomach. Supplemental O<sub>2</sub> port for passive oxygenation. Manufacturer only recommends intubation through the device with a fiber-optic scope. Pediatric and adult sizes (30 kg and up) for EMS.

**4 i-gel**—Gastric access to vent the stomach except infant size 1. Manufacturer only recommends intubation through the device with a fiber-optic scope. Pediatric and adult sizes (30 kg and up) for EMS; infant, pediatric and adult sizes (2 kg and up) for anesthesia.

**5 LMA Fastrach**—No gastric access. Success rates for blind intubation through the device are high. Pediatric and adult sizes (30 kg and up).

**6 LMA Supreme**—Gastric access to vent the stomach in all sizes. Intubation through the device is not possible without special tools and expertise. Infant, pediatric and adult sizes (2 kg and up).

**7 air-Q Blocker masked laryngeal airway**—Gastric access to vent the stomach in all sizes. Blind intubation through the device is possible, but manufacturer recommends intubation through the device with a fiber-optic scope. Pediatric and adult sizes (30 kg and up).

**8 air-Q masked laryngeal airway**—No gastric access. Blind intubation through the device is possible, but manufacturer recommends intubation through the device with a fiber-optic scope. Infant, pediatric and adult sizes (4 kg and up).

## Disposable retroglottic airways:

**9 Combitube**—Gastric access to vent the stomach. For patients over 4 feet (1.2 m) tall.

**10 Easy Tube**—Gastric access to vent the stomach. For patients over 3 feet (1 m) tall.

**11 King Laryngeal Tube**—Gastric access to vent the stomach currently in sizes 3–5, but coming soon in pediatric sizes to the U.S. Intubation is not possible through the device without special tools/expertise. Pediatric and adult sizes (currently 35 inches or 89 cm and up), but infant sizes coming soon to the U.S.



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recommended technique. Using a flexible fiber-optic scope or optical stylet is generally preferred.

- With other supraglottic devices, blind intubation with or without a bougie is generally not recommended. Intubation is very easy when using a flexible fiber-optic scope. One study found that with use of a scope, anesthesia trainees with minimal fiber-optic scope experience were just as successful as experienced anesthesiologists at placing ETs through LMAs.<sup>22</sup> See Figure 3.



**Figure 3: Intubation with flexible scope through alternative airway.**  
Ambu

**Can you hook these airways up to a ventilator?**

- Yes! They do it all the time in ORs, and it's common for many flight and ground medical transport agencies.

**Can you perform diagnostic imaging (x-ray/CT/MRI) with them in place?**

- Extraglottic devices don't mess up imaging, and they can mean fewer delays in getting the patient to imaging areas.

**Can you do cricothyrotomies with alternative airways in place?**

- Absolutely! Hands down the prettiest cries we've ever seen were performed with alternative airways in place. The patients were alive (bonus), with reasonable sats and EtCO<sub>2</sub>s, just with alternative airways.

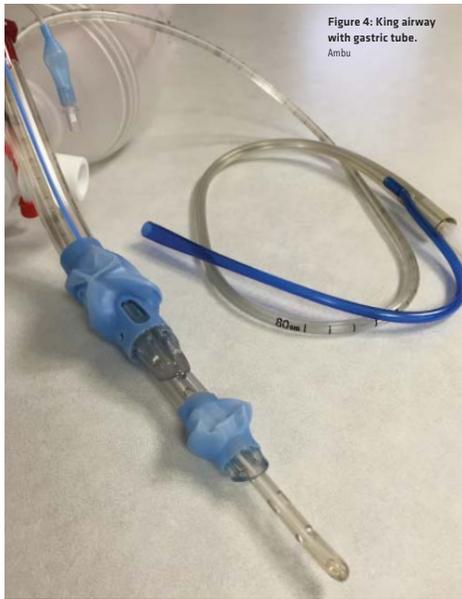
**Can you use alternative airways on patients with pierced tongues?**

- There have been no reports to the contrary. There is only one published case report of a patient with tongue jewelry who had a laryngeal mask airway placed. Anesthesia noted the jewelry was there and placed the airway with no complications.<sup>23</sup>

**Can an extraglottic airway be used when gastric decompression is needed?**

- If you can shove the really big tube down into their airway, putting a smaller one down a predetermined hole is beyond easy. In New Mexico EMT-Bs can place a gastric tube through an alternative airway that has a channel intended for that purpose. This is far easier than inserting a gastric tube through the nose or mouth. We are only applying suction, not instilling fluids or medications. If we get it wrong, it is unlikely to result in any harm.

- Even if your system does not allow gastric decompression, the patient can partially "self-decompress" air or liquids through the gastric access tube.



**Figure 4: King airway with gastric tube.**  
Ambu

- With medical director approval, we suggest "preloading" the King airway or laryngeal mask airway with the gastric tube prior to insertion. This means placing the gastric tube into the alternative airway before putting the alternative airway into the patient. It's so much easier to pass the gastric tube if it's preloaded, and you're more likely to remember to use it!

We believe the chances of your patient aspirating are far less with alternative airways than with traditional bag-mask ventilation or even intubation (unless you have first-pass success). The odds are even better if you can decompress the stomach. See Figures 4, 5.



**Figure 5: Laryngeal mask with gastric tube.**  
Ambu

**Which One?**

Bagging does work, and intubation is traditionally considered the preferred advanced airway management technique. But numerous alternatives exist. There are a variety of styles of extraglottic devices to choose from, and the devices offer a variety of helpful features, from pediatric sizes and gastric decompression to features that support the exchange of the extraglottic airway for an ET tube.

Extraglottic airways are applicable in virtually all circumstances and locations where airway management is needed, and their placement is generally much easier than bagging or intubation. They are also known to provide excellent patient ventilation. Efficient use of time and personnel combined with effective airway management sounds like a winner all around. But remember, it's imperative to know the ins and outs of the alternative airways you carry. ☺

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