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Review Article

To Tube or Not to Tube . . . That Continues to Be the Question

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A B S T R A C T

In the prehospital setting, “to tube, or not to tube” will persist as a probing question - long after this article is published. It is the hope of the authors simply to position a compilation of thoughts to consider in regards to alternate airways vs. endotracheal intubation. Ultimately, it's all about the right care, for the right patient, at the right time!

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“Though airway training often focuses on the acquisition of the component clinical skills (e.g. bag mask ventilation, supraglottic airway [SGA] placement, endotracheal intubation), comprehensive airway management is greater than the sum of its parts, and includes knowledge of the strengths and weaknesses of different techniques and clinical decision making skills to choose the right technique for the right patient at the right time.”¹

For well over 50 years, we have recognized the ABCs of medical care as being airway, breathing, and circulation. We know that managing many life-threatening emergencies starts with airway management and includes options ranging from mouth-to-mouth resuscitation to various airway adjuncts (masks, tubes, and so on) to advanced procedures such as endotracheal intubation or even surgical cricothyroidotomies. The challenge we face is to maximize the positive outcome of our actions when dealing with the options available for airway management. The question that we face is how and when we choose those options based on the technology and available equipment as well as our professional training and relevant experience.

Brigadier General Charles Elwood (Chuck) Yeager knew some things about achieving balance and gaining perspective. During

World War II, Yeager successfully shot down a German fighter jet. Later in his career, he became famous by being the first person to fly faster than the speed of sound—both huge accomplishments in their time. Yeager, when asked about such, was quoted as saying, “Any landing that you can walk away from is a good landing. And if you can use the airplane the next day, it’s an outstanding landing.”² Applying this perspective to airway management and, more specifically, tracheal intubation, it might read something like this—“Getting the tube in the right place is good, and if this increases the patient’s chance of survival, this is outstanding!”

Human life cannot be replaced. Settling for “good” should not be our goal. Rather, we should be consistently providing the highest “outstanding” level of care. Achieving this is more than just competency, even proficiency, in a specific skill. It requires the mastery that comes from education, training, practice, and a constant commitment to improving our systems and ourselves.

Creating Competency, Producing Proficiency, and Maintaining Mastery

It is widely known and routinely accepted that there is a distinct difference between competence and proficiency. We commonly evaluate competence as a 1-time achievement, whereas determining proficiency is something that is maintained over time. The challenge comes in recognizing the difference. The goal is to become and

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remain proficient. It is important to remember that proficiency is achieved through education, hands-on training, and repetitive practice. Each of these will maximize the likelihood of a positive patient outcome through our interventions. As Grissom once wrote, “competency is the bare minimum required for acceptability whereas proficiency implies a level of mastery that is above the minimum.”³ It is the argument of the authors that our stakeholders (ie, our patients) expect proficiency.

An extensive review of the literature reveals that there is no lack of differing definitions and standards for competency in airway management. Is it a matter of a specific number of “successful” intubations? Is it a matter of a ratio of successful intubations versus attempts? Is competency determined by “first-pass” successes? Does competency require experience in both controlled environments and uncontrolled environments? Can competence be assessed and attained through models and mannequins without ever touching a live patient? Following is an exploration of the questions raised. At the end of the day, “while fundamental procedural understanding may be demonstrated through the use of simulation, it is challenging if not impossible to achieve competence without supervised clinical exposure to real patients.”¹

Current research reveals that the number of successful endotracheal intubations needed to gain initial competency can range from 16 to 200 (Appendix 1) and that is just to gain initial competency, never mind proficiency. Additionally, the majority of those intubations were commonly performed in an operating room, which can be described as a more controlled environment compared with emergency medical services (EMS) and critical care transport. Both research and real-life experience reveal that the difficulty of intubation escalates significantly in the prehospital environment. We also know but less frequently acknowledge that “skill fade” is of critical concern as well.^{1,4,5}

Training Targets and Patient Population

Many prehospital care providers, even those experienced in critical care and flight transport, may be infrequently called on to perform emergency intubations in the field. Although these providers performed a limited number of intubations as part of their initial training, the settings, circumstances, and urgency of those intubations were poorly mismatched to their current work conditions. Furthermore, what about the age ranges of the patients we saw during our training experiences? Unless providers are part of dedicated neonatal or pediatric teams, how many were able to intubate school-age children, toddlers, or even infants? Likely, not many, if at all. Unfortunately, the patient populations we serve in reality are not similarly limited. This presents an ongoing challenge when trying to achieve competence, let alone maintain proficiency, in emergency airway management and intubation.

If the research suggests that 16 to 200 successful intubations are needed to gain initial competence, perhaps there should be a minimum number of live intubations required initially and annually? The following insightful response comes from EMS medical director Dr Jeff Jarvis:

I think having a minimum number of live intubations would be great. The question is should it be required? There are a couple of ways to help assess this question from a data standpoint. Look at the number of intubations performed over, say, the past year and correlate it with the first pass success (FPS) rate in any given month. At a system's FPS rate and requirements and look for correlation there.

We do not have the ability to require a certain number of live intubations in our (EMS) system, yet we still maintain a 90% FPS rate. There are systems that have mandated minimums and

require OR [operating room] time to make them and have low overall system FPS rates. Based on this, I don't think we can/should make our mandates around a minimum number of intubations. For me this is a pragmatic approach, not a theoretical one. Theoretically, sure . . . we should require a certain number. But we need to recognize the practical impact that will have on many, if not most systems . . . it will remove intubations all together. If that system sucks at intubation, that's probably a good thing. But if they have a documented track record of success and we remove intubation because of our theoretical ideal practice, we have lost an effective method of airway management (personal written communication, February 2022).

Acknowledging Alternative Airways

An additional challenge to maintaining the desired skill level in airway management comes in the expanding variety of equipment available to us. The ever-increasing use of alternate airways (especially in controlled settings) may further limit opportunities for initial and ongoing training. Although this may be better for the patients in that specific arena, it does not reflect the current practice of transport providers. Pairing this with concerns over patient consent and other operational concerns, only compounds this issue.⁴

Additional insights on the evolving and increasing use of alternate airways versus intubation again comes from the Joint Royal Colleges Ambulance Liaison Committee Airway Working Group.⁴

The Committee concluded that pre-hospital tracheal intubation, as currently practiced by paramedics, could not be endorsed. What evidence there is, suggests that this procedure is more likely to be harmful than beneficial. . . It was considered impractical to recommend that all paramedics were trained to an adequate intubation standard and maintain these standards after qualifying. Although these standards have yet to be defined, they are likely to be to a significantly higher standard than that currently practiced and would have parallels with the initial training of doctors entering anesthesia as a specialty. . . For the majority of paramedics, this Committee recommends that tracheal intubation should be withdrawn and greater emphasis placed on airway management using an appropriate supraglottic airway [SGA] device. The importance of training to a high degree of proficiency in basic airway management skills should not be overlooked during training. (Joint Royal Colleges Ambulance Liaison Committee Airway Working Group)

This is certainly compelling at the very least and helps us to put this “sacred cow” into perspective—prehospital endotracheal intubation.

Several years ago, EMS medical director and airway champion Dr Darren Braude and colleagues introduced an alternative pathway to traditional rapid sequence intubation. This is called rapid sequence airway (RSA).^{6,7} The idea behind rapid sequence intubation is to administer a combination and sufficient amount of medications to facilitate the intubation process. The goal is that the patient is not aware of the intubation (ie, being unconscious and hopefully pain free), and their muscles are relaxed enough (ie, paralyzed) to allow the practitioner to successfully intubate the trachea. RSA is a bit different in that it starts with the same goals and uses the same medications, but instead of placing an endotracheal tube (or after 1 unsuccessful attempt at placing an endotracheal tube), a “backup/alternate airway” such as a King airway (Ambu Inc, Columbia, MD), laryngeal mask airway, (Ambu Inc, Columbia, MD) or i-gel (Wokingham, Berkshire, United Kingdom) is placed in order to manage the airway. Research has demonstrated that RSA not only significantly

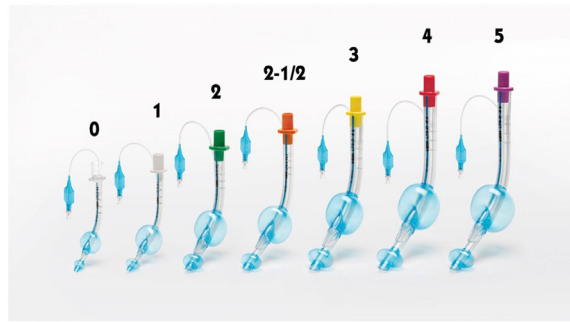


Figure 1. Range of babies to big people King airway sizes. (Reprinted with permission from Ambu USA [www.ambuusa.com].)

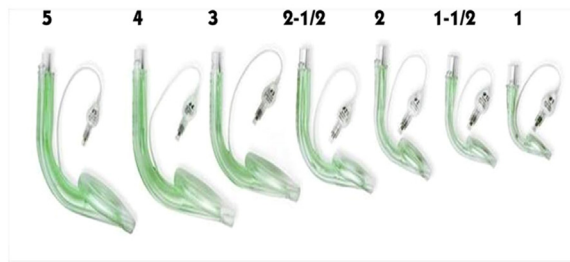


Figure 2. Range of babies to big people Aura Gain (Ambu Inc) laryngeal mask airway sizes. (Reprinted with permission from Ambu USA [www.ambuusa.com].)

decreased times to airway placement and limited hypoxemia but also decreased times to definitive care.^{6,7}

Also remember that the alternate airway can later be exchanged for an endotracheal tube or surgical airway when the patient is in a more controlled and resourced setting, such as an emergency room or operating room. During this exchange, the patient is optimized and, hopefully, oxygenating, ventilating, and, most importantly, alive!

There are additional techniques and technologies such as bougies, video laryngoscopes, and the SALAD (Suction Assisted Laryngoscopy Airway Decontamination) technique that with proper training can make intubation more successful.⁸⁻¹⁰ However, if competency and proficiency are already an issue and if training rarely reflects the challenges encountered in the field, perhaps it is time to consider a different approach. If a provider only performs endotracheal intubation a few times during training and then maybe a few times a year after that, perhaps the focus should be shifted to successfully managing the airway and providing optimal patient care with an alternate airway. In short, the question we should be considering is where we get the biggest “bang for the buck.” Is it nobler that our patient care should suffer through the tenuous success of a rigorous procedure, or should we arm ourselves with choices and by doing so better assist our patients before they shuffle off this mortal coil?

Evaluating Equipment

Alternate airway sizes range from babies to big people. Additionally, they also have gastric access ports to allow for gastric decompression as well. [Figures 1 to 3](#) show several alternate airway options and size ranges that are currently listed and available on the market.

Bagging and Back to Basics

From the anesthesia perspective, an insightful quote regarding the crucial role of “bagging” comes from Dr Michael Murphy. “I spent five

years in anesthesia residency. . . The first week they taught us how to put people to sleep. The second week they taught us how to wake people up. The rest of the time, we learned how to bag-mask ventilate!” (personal written communication, January 2023). The crucial importance of “basic bagging” is further reiterated by a recent National Association of EMS Physicians (NAEMSP) airway management position statement, which states “It must be recognized . . . that training and use of SGAs cannot substitute for training and competent use of bag-valve-mask ventilation by all types of EMS clinicians.”¹¹

For many years, there has been ongoing research and discussions about bag-mask ventilation versus alternate airways versus intubation, especially in cases of cardiac arrest. Although not the focus of this article, this warrants acknowledgment and comment.¹²⁻¹⁵ Bag-valve-mask ventilation may be considered a basic EMS skill, and in skilled hands, it can be very effective. However, we must not overlook the key word in the previous sentence—skilled.

A skilled practitioner is one who has had sufficient training and ongoing, repetitive practice to perform a task successfully despite the environment. Components of being skilled in bag-valve masking are realized when correctly selecting equipment, properly positioning the device, and adequately squeezing the bag with the necessary amount of pressure and with the correct timing. A poorly sized or ill-fitting mask, ventilations that are too shallow or too deep, using 2 hands instead of 4 (more are better), or a rate that is too slow or (as frequently happens) too fast can all lead to less than optimal patient ventilation and likely patient harm.

Beyond the Basics

There is certainly no question that artificial ventilation via a bag-valve mask is tough, but successfully intubating in the prehospital or transport environments is arguably tougher. In various countries



Figure 3. Range of babies to big people i-gel airway sizes. (© Copyright Intersurgical Limited 2023.) (www.intersurgical.com)

throughout the world, this fact has been the topic of discussion for years. In many places, only critical care/flight crews are credentialed to perform prehospital intubation, and prehospital intubation only occurs after verification of initial and ongoing competency with many, many tubes successfully placed in many, many patients in a variety of environments. If those criteria have not been met, an alternate airway is the technique that is used.

In the prehospital setting “to tube or not to tube” will persist as a probing question long after this article is published. It is the hope of the authors simply to position a compilation of thoughts to consider in regard to endotracheal intubation. NAEMSP literature on airway management shares the following insights regarding this topic):

While endotracheal intubation (ETI) has been central to advanced prehospital airway management for over 30 years, ETI efforts are not always successful or possible. In addition, there may be situations where ETI efforts are anticipated to be difficult or futile. To ensure that every patient has a patent airway, alternate airways (non-ETI airway management devices) should be available to all prehospital rescuers that perform ETI.¹⁶

Unless initial competency and ongoing proficiency with intubation can be demonstrated, especially in the prehospital environment, we envision and research suggests a greatly increased initial use of alternate airways. Ultimately, it is all about the right care for the right patient at the right time! “When it comes to airway management, treatment decisions should be centered on patient outcomes and not a desire to perform a procedure for the sake of the intervention. The clinician should ask oneself ‘which airway intervention will provide the greatest opportunity of survival?’ with each encounter and consider the right airway for the right patient.”¹

Appendix 1. Research Review Regarding the Number of Suggested Successful Intubations for 80% to 90% Initial Intubation Competency

At least 50 intubations¹⁷
 200 intubations¹⁸
 35 intubations¹⁹
 Minimum of 75 intubations²
 57-80 intubations²⁰
 79 ± 47 intubations²¹
 At least 16 intubations²²
 At least 35 intubations²³
 At least 30 intubations²⁴
 At least 75-100 intubations²⁵
 At least 22 intubations²⁶
 At least 75 intubations²⁷
 At least 50-60 intubations⁴
 At least 25 intubations²⁸
 At least 25-30 intubations²⁹
 At least 50 intubations³⁰

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