Pro-Con Debate: Videolaryngoscopy Should Be Standard of Care for Tracheal Intubation

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In this Pro-Con commentary article, we discuss whether videolaryngoscopy (VL) should be the standard of care for tracheal intubation. Dr Aziz makes the case that VL should be the standard of care, while Dr Berkow follows with a challenge of that assertion. In this debate, we explore not only the various benefits of VL, but also its limitations. There is compelling evidence that VL improves first-pass success rates, reduces the risk of intubation failure and esophageal intubation, and has benefits in the difficult airway patient. But VL is not without complications and does not possess a 100% success rate. In the case of failure, it is important to have back-up plans for airway management. While transition of care from direct laryngoscopy (DL) to VL may result in improved airway management outcomes, the reliance on VL may degrade other important clinical skills when they are needed most. If VL is adapted as the standard of care, airway managers may no longer practice and retain competency in other airway techniques that may be required in the event of VL failure. While cost is a barrier to broad implementation of VL, those costs are normalizing. However, it may still be challenging for institutions to secure purchase of VL for every intubating location, as well as back-up airway devices. As airway management care increasingly transitions from DL to VL, providers should be aware of the benefits and risks to this practice change. (Anesth Analg 2023;136:683–8)

GLOSSARY

DL = direct laryngoscopy; **VL** = videolaryngoscopy

In this Pro-Con commentary article, we discuss whether videolaryngoscopy (VL) should be the standard of care for tracheal intubation, for which I will make the case. VL has been clinically available for decades, but made major advancements in 2001, with the introduction of modern video screens, digital technology, and alternate blade designs. Since then, much effort has been applied to determine the clinical efficacy of VL for intubation of adults and children both in the operating room and in emergency environments. Early studies produced mixed results, as the devices were tested against our routine care of direct laryngoscopy (DL). Well-trained anesthesia practitioners were already quite proficient with DL, so it was difficult to demonstrate benefit, as this new technique came with a learning curve requiring experience for maximal efficacy. Now, in 2022, we have moved beyond the learning curve of VL. The evidence clearly supports multiple clinical advantages in the operating room. I am of the firm belief that VL should be the standard of care.

DEFINITIONS

"Standard of care" is a strong term because it carries legal implications. Most commonly, it refers to the reasonable degree of care a person should provide to another person. In law, it is used to determine negligence and potential liability for a tort. I would be unwilling to serve as a consultant expert to testify against a colleague who selected DL as a primary approach because practitioners really should use the tools with which they are most proficient. However, the time has come that every airway practitioner should be proficient with VL. My bias favoring VL has existed for 2 decades, but I had previously acknowledged that the evidence was insufficient to support my claims. That evidence has changed.

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VL technology is diverse, so it is quite difficult to standardize assumptions about the class of devices as a whole. Some VL systems apply hyperangulated blades with or without a channel to guide the tube, while other devices carry a standard geometry blade resembling a Macintosh blade. Evidence of benefit for one device may not translate to another device.

Evidence Supporting Universal VL

Today, many large-scale observational studies, clinical trials, and meta-analyses have demonstrated that VL reduces the risk of tracheal intubation failure, esophageal intubation, hypoxemia, and the number of intubation attempts.[1–6] As multiple intubation attempts are associated with morbidity and mortality,[7] it is imperative that we approach every intubation with the highest chance of success while balancing the need for learners to master skill with a broad range of techniques. Early studies of VL focused on the novice laryngoscopist or the patient predicted to be difficult to intubate by DL. Those with predictors of difficult DL do better with VL in terms of ease of intubation and the number of attempts.[8–10] Others focused their investigation on novices to demonstrate clinical benefit.[11,12]

While these studies were quite positive favoring VL, they focused on narrower populations. Many clinicians now reach for VL over DL for those at risk and when working with learners. However, it remained unclear for some time how to approach more routine airway management, and VL is often reserved only for patients predicted to be difficult to intubate by DL. A recent Cochrane review sheds some important light on this question. Across patient conditions, providers, and environments, VL outperforms DL.[2] Furthermore, all blade designs appear to provide benefit. It remains difficult for me to understand why DL could be any better, especially when comparing DL to standard geometry VL. How can standard geometry VL be worse? Hyperangulated blades likely serve to further augment laryngeal view, and clinical experience can overcome the commonly cited barrier of difficult intubation despite an adequate laryngeal view.

Perhaps what is most important is that our capacity to predict difficult DL is remarkably poor in the apparently normal population.[13] Our bedside tests come with poor predictive capacity, and most of our difficult DL encounters are unanticipated. In a large, prospective trial evaluating the efficacy of screening tools, Nørskov et al[14] observed that 89% to 91% of difficult tracheal intubations were not predicted. Therefore, the practice of applying VL only for those patients predicted to be difficult to intubate fails to address our major source of challenge. The application of "universal VL" has been introduced and described by some practices.[15] The "routine" airway management is most often applied with standard geometry VL, while those with features or history of difficulty may apply a hyperangulated blade. This "recipe" has been tested clinically and stands to reduce the incidence of multiple attempts at laryngoscopy.[16]

Skill Degradation

Some may argue that VL degrades our clinical experience with DL. I remember hearing the same arguments about the use of ultrasound guidance for central venous access and peripheral nerve blocks. Do we really care that the landmark-based central line has gone away? Have we not advanced patient care by reducing carotid artery and pleural punctures? Do we really think that our residents need to discriminate a posterior cord twitch from a medial cord twitch, or is it not just better to watch local anesthetic infiltrate around the brachial plexus? We now have an ultrasound for every central venous cannulation and peripheral nerve block. Cost barriers to VL have continued to diminish over these 2 decades. Even still, we need to advocate for the safest approach to airway management. If our surgeons can justify the purchase of a robot to improve their surgical navigation, we can certainly justify the use of VL for the patient rendered apneic after induction of anesthesia. I often hear the concern, "What are you going to do when you don't have VL?" My first answer is to get a VL system for every location where intubation is performed. My second answer is to maintain DL skills with standard geometry VL.

Barriers

Of course, VL can fail, and alternate approaches to tracheal intubation are necessary. Predictors of difficulty or failure with VL have been identified.[17,18] For those predictors that overlap with those for difficult DL, special caution is warranted when considering an airway management plan. I do remain concerned that our clinical skill set with awake tracheal intubation has declined. While VL can effectively be used in the awake or sedated patient, it does not replace awake flexible scope intubation. It is imperative that this skill is practiced. That said, the patient with predictors of difficult VL is likely more difficult to intubate with DL. DL is not the solution. It will maintain a major role in our airway management history books and museums, but its role in the operating room is … history.

Do We Need a Standard of Care for Airway Management?

While there is no question that VL has many advantages, I do not believe that a single method of tracheal intubation should be considered the standard of care. For a single technique to be the standard of care, this would imply that the use of an alternate technique,

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such as DL or awake flexible scope intubation, would not be considered a standard of care. Not even VL has a 100% success rate, and one of the main underlying messages of all the published airway algorithms is to always have a back-up plan. If we declare VL the standard of care, airway managers may not practice and use other methods of intubation, such as DL or flexible scope intubation, regularly enough to remain proficient and skilled. In the event that VL fails, it may be difficult to successfully implement a back-up plan, and then, the situation becomes a failed intubation. VL can fail due to equipment, operator, or patient factors, and for these reasons, alternate plans must always be available. The standard of care, in my opinion, should be that all airway managers be prepared with a primary as well as a back-up plan for airway management. While VL may be a widely chosen primary airway strategy, it should not be the only strategy.

Overall Success Rates

No single airway device to date has demonstrated a 100% success rate. While there is good evidence that first-pass success rate, especially in the setting of airway difficulty, is improved with VL, other studies are less conclusive. Some studies have demonstrated similar overall success rates and glottic views when comparing DL to VL.[8,19] A recent meta-analysis by Hansel et al[2] found no difference in overall success rates with VL versus DL when >1 attempt was required. Another meta-analysis found no evidence that the use of VL reduced time to intubation.[1] A meta-analysis by Griesdale et al[20] that included 17 studies and 1788 patients found no difference in time to tracheal intubation or success rates when comparing the Glidescope and DL in expert hands. A frequent source of VL failure using a hyperangulated blade is due to difficulty with endotracheal tube placement despite a good view of the glottis and vocal cords.[17,19] The study by Michailidou et al[19] reported that 40% of failed intubations with VL were due to inability to pass the tube compared to a 21% failure rate when DL was performed. Similarly, the study by Aziz et al[8] found intubation failure in the setting of an adequate laryngeal view to occur more frequently with VL compared to DL (54% vs 35%). So why should a method that does not always perform better compared to another method such as DL become the standard of care?

Costs

While cost may not be a factor everywhere, in many institutions around the world, limited budgets may exist. It is much more cost-effective to purchase DL systems for every operating room and location where airway management is performed than to purchase VL systems, which are 10 to 1000× more expensive, depending on the system selected. The average DL system and handle costs range from $20 to $700 (blades with a fiberoptic light source and rechargeable handles explain the higher cost range), while VL costs vary from $35 for a simple single-use disposable device to $20,000 to $30,000 for a complete reusable system with a video screen.

In addition, if a reusable VL system is purchased, some of that equipment will need to be cleaned and sterilized after use. In order for the VL system to be immediately available for every case, that requires the manpower to provide cleaning in a timely manner, or extra back-up video systems that could be used while cleaning occurs, which adds additional cost. And what if the institution will not budget for VL for case, manpower is required for timely processing, or duplicate systems may need to be purchased every location plus DL and flexible intubation scopes? Then there are no immediately available back-up plans to put into use if VL fails. And if a patient presents to the operating room suite who requires an awake intubation, the necessary equipment and skills may not be available. While the concept of a VL system in every operating room seems ideal, it may not be achievable in many hospitals and could result in deprioritization for purchase of alternate airway devices.

VIDEOLARYNGOSCOPY LIMITATIONS

Because VL has limitations, some of which can potentially cause harm, and in some cases, an alternate device may be superior, I do not think it makes sense to give it the designation of the standard for airway management. As an example, in the case of a morbidly obese patient with sleep apnea and an unstable cervical spine, an awake flexible scope intubation is most likely the safest choice for airway management.

In addition to the issues related to difficulty with endotracheal tube placement despite a Cormack-Lehane grade I view of the larynx, other complications related to VL have been described. There have been several case reports of injury to the palate and tonsillar pillars during blind advancement of the endotracheal tube during VL, predominantly with hyperangulated blades and styleted tubes.[21–24] Of note, many of these injuries were not detected until extubation or reexamination of the airway for another reason. Greer et al,[24] who published a review of these types of injuries, suggest that they may occur due to the blind spot in the back of the mouth that cannot be visualized by VL, as well as the use of the rigid stylets that are provided with some VL systems. These risks are smaller with airway devices that are placed under direct vision.

VL has other limitations as well. Like any device that uses a video screen, battery or screen failure can occur during use, and secretions or blood can obscure the video on the screen. Poor connectivity between the blade and the cable can also result in loss of

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Table. Advantages and Disadvantages of VL

Pro: VL standard of care	Con: VL should not be standard of care
Improves tracheal intubation success rate; may reduce hypoxemia	Not universally successful; still requires a back-up plan
Reduces esophageal intubation risk	Does not replace flexible scope intubation
Eases intubation difficulty	May prolong intubation; may increase hypoxemia
Costs are normalizing	Risk of pharyngeal injury
Advantages when teaching trainees	More expensive compared to DL
	May reduce skills with other airway devices

Abbreviations: DL, direct laryngoscopy; VL, videolaryngoscopy.

functionality. And in the prehospital setting, where airway management may be performed outdoors, sun glare can be a factor.[25] In all of these scenarios, an alternate airway device might be more successful.

Every patient is not the same, and the factors that contribute to difficulty are not always the same. Therefore, it stands to reason that one size does not fit all as far as which airway device will be most successful in each individual patient. If this argument is used, having a standard of care for choice of airway device does not make sense, as every patient's airway and physiology are different.

Time to Tracheal Intubation

Several studies have demonstrated that the time to successful tracheal intubation is longer with VL compared to DL.[8,26,27] While the time differences measured in these studies are not large (10–20 seconds), in the physiologically difficult patient with poor oxygen reserves or high oxygen demands, those seconds may count. Yeatts et al[26] randomized trauma patients to either VL or DL and found that in patients with head injury, the group randomized to VL demonstrated higher mortality rates and a higher incidence of hypoxemia. In these groups of patients, a faster technique that reduces the risk of hypoxemia during airway management may be preferred.

VL use outside the operating room, in locations such as the emergency department and intensive care unit settings, has been studied widely.[28–30] Some studies show increased first-pass success with VL, while others show no difference between VL and DL. A study by Hypes et al[29] found an increased risk of complications in the intensive care unit when more than one attempt at VL was required, and Arulkumaran et al[30] found a higher incidence of hypotension when VL was used. In these classes of patients with physiological difficulty, the technique that works the fastest and with the best success should be chosen, and that technique may depend on both provider skills as well as training more than the specific device chosen.

Skill Acquisition and Impact on Back-Up Plans

There has been concern that the overreliance on VL may negatively impact acquisition and competency of other tracheal intubation techniques, such as flexible scope intubation and even DL. A recent case report described a significant cervical spine injury causing paralysis in a patient with ankylosing spondylitis who was intubated via VL because the provider was more familiar with that technique.[31] Of note, the intubation described in this report was difficult, requiring a bougie and 2 attempts due to "difficulty exposing the epiglottis."

An article by Treki and Straker[32] pointed out that it is important to recognize the limitations of VL and to maintain as well as teach trainees alternate airway skills. These authors also state that "for successful airway management, a preformulated strategy with a clear algorithmic plan" is needed, and this requires "knowledge of and skills with multiple airway tools as well as an understanding of the advantages and shortcomings of these devices." An overreliance on any one airway device may lead to less competence and familiarity with alternate techniques, which may result in lower success rates and longer time to intubation if this alternate technique is required as a back-up plan.

Several airway algorithms, such as the American Society of Anesthesiologists Difficult Airway Guidelines,[33] the Vortex Approach,[34] and the Difficult Airway Society Guidelines,[35] recommend to not make multiple attempts with a single device if it has failed, as well as to be aware of the passage of time. All of these algorithms stress the importance of having back-up plans and alternate airway devices immediately available should the primary method fail. The concept of having a single airway device as the standard of care goes against these recommendations and poses the risk of lower success rates with back-up devices that are no longer used and practiced regularly.

CONCLUSIONS

The use of VL has grown substantially, and appropriately so. Studies clearly show that it reduces the risk of difficulty during airway management.[1–6,8–12] However, it is not universally successful, and alternate approaches to tracheal intubation need to be mastered. The use of DL alone, without video enhancement, may become the least applied airway management approach in our future; however, that does not mean it should not continue to be considered as an option. Dr Richard Levitan wrote in his editorial, "Video laryngoscopy, regardless of blade

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shape, still requires a back-up plan," that "safety is about redundancy," and recommended that the airway manager should always have 2 methods to oxygenate, 2 methods to intubate, and 2 methods to ventilate should intubation fail. He recommended that the 2 intubation methods be DL plus VL or other type of imaging device.[36] And there will continue to be patients for whom an awake intubation technique should be considered as the primary strategy for airway management. While the evidence suggests an advantage of VL as the primary intubation method of choice for asleep intubation, it remains important to stress that it should not be the only method of choice, and that having back-up plans for failed ventilation, oxygenation, and intubation must always be part of any airway management plan.

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