

The law of unintended consequences: the crutch of video laryngoscopy

The introduction of every new technology has both anticipated and unintended consequences. Sometimes, these consequences are not evident until well after the technology's adoption. For example, after the free availability of Global Positioning System (GPS) technology, countless stories appeared in the lay media of seemingly reasonable people following GPS directions into catastrophic situations.¹ The realisation that technology-reliant systems can fail resulted in the US Navy reintroducing celestial navigation training as a crucial backup technique in 2015, nearly 10 years after halting that training on the basis of GPS availability.^{2,3}

Unanticipated consequences are also frequently seen with medical advances. The adoption of electronic medical records eliminated handwriting error, but increased documentation-related burnout. The development of new antibiotics has saved countless lives, yet costs lives because of antimicrobial resistance. In the fields of anaesthesiology and critical care medicine, the introduction of video laryngoscopy is providing substantial short-term benefit, but probably has potential unanticipated long-term consequences. Video laryngoscopy technology is becoming more ubiquitous each year, and many physicians can now provide anecdotes of lives saved by the availability of this important airway management asset. This tool has been described as a rescue alternative for both adult and paediatric difficult airways,⁴ and also touted as a helpful adjunct for airway education.^{5,6}

The academic debate around superiority between video laryngoscopy and direct laryngoscopy has yielded conflicting data, and might

entirely miss the point—namely, that there are benefits to being fluent in both techniques. The landmark video intubation in small infants trial,⁵ and the subsequent direct versus video laryngoscopy with standard blades for neonatal and infant tracheal intubation with supplemental oxygen trial,⁶ both support the use of video laryngoscopy in anaesthetised infants to optimise first attempt success and decrease severe complications, although other studies in paediatrics have not found differences between the techniques.⁷ Similarly, in adult patients, randomised controlled trials and meta-analyses comparing the two techniques have shown differing outcomes,^{8,9} although a recent meta-analysis suggests video laryngoscopy results in a higher rate of first attempt intubation success.¹⁰

Even considering the conflicting data on intubation success, standard practice has shifted at some academic paediatric centres to the de facto use of video laryngoscopy in the paediatric and neonatal intensive care units, emergency department, and operating rooms.¹¹ Some have advocated for video laryngoscopy to completely replace direct laryngoscopy for first-line tracheal intubation in adults.¹² The goals of such a transition to video laryngoscopy include the perceived ease of procedure, a shared understanding of airway anatomy among team members, the allowance of real-time coaching during laryngoscopy, and the ability to retrospectively review laryngoscopy recordings for education and quality improvement.

At face value, these goals appear sensible and safe. However, is it possible that this is the beginning of a generation of trainees with a suboptimal development of basic laryngoscopy skills because of less direct laryngoscopy exposure? Does the future ubiquity of video laryngoscopy have the potential to improve patient safety in many situations while simultaneously and inadvertently compromising peak

performance in specific situations? Is it possible that the widespread adoption of video laryngoscopy makes medical professionals perform better in routine day-to-day work but worse during specific (and potentially catastrophic) unusual situations? In other words, can medical professionals be certain that expertise in video laryngoscopy alone (with only basic proficiency in direct laryngoscopy) is not inferior to expertise in both techniques?

One stated benefit of video laryngoscopy is that it allows the performance of both direct laryngoscopy and video laryngoscopy, with the added benefit of videoscopic visualisation available on demand. However, mechanics and sometimes blade shape differ between devices, and the availability of the video screen makes a confirmatory glance tempting for even the most experienced laryngoscopist. Another benefit of video laryngoscopy is that the indirect videoscopic view improves the visualisation of airway structures, and can compensate for imperfect patient positioning or poor laryngoscopic skills. Although this particular benefit might facilitate success in a majority of cases, it probably undermines the elite mastery of fundamental laryngoscopy skills.

Ultimately, do these concerns matter, as long as the tube goes in safely? Is the technical mastery of laryngoscopy obsolete if the only meaningful outcome is intubation success? We argue that skilled laryngoscopy technique is helpful to perform an adept (and complication-free) video laryngoscopy, but imperative during video laryngoscopy device failure or unavailability. Technique becomes even more important when troubleshooting a challenging laryngoscopy, and exponentially more so if complicated by mid-procedure camera loss. The ability to successfully intubate an uncomplicated airway with a video laryngoscope might generate a false sense of confidence without the



Published Online
June 26, 2023
[https://doi.org/10.1016/S2213-2600\(23\)00228-X](https://doi.org/10.1016/S2213-2600(23)00228-X)

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associated competence of expert laryngoscopy skills.

Another phenomenon associated with video laryngoscopy is that of so-called group think, with its own potential consequences to consider. Gone are the days where the laryngoscopist narrates airway anatomy, visualises the larynx, and passes the tracheal tube with independent confidence. In teaching settings, there are now many people watching, verbally correcting any untoward blade movement or tube misdirection. Some use this mechanism to strengthen the argument towards universal video laryngoscopy. We propose that the anticipated benefit of this method for immediate patient safety should be balanced with the unanticipated consequence of the lost autonomy of elite airway management. Troubleshooting intubation difficulty and independent understanding of airway anatomy are key principles that can sometimes be taught best by independent trial and error, albeit in the safe, controlled setting of a training programme. Will this affect future patient safety?

Video laryngoscopy as a future standard-of-care appears sensible, safe in some (perhaps most) populations, and is an important tool that should be readily available in every airway armamentarium. However, direct laryngoscopy experience and expertise are essential for transitioning from acceptable competency to universal mastery in airway management. The unanswered question, as outlined earlier, is whether trainees exposed exclusively to video laryngoscopy will perform inferiorly to those exposed to video laryngoscopy and direct laryngoscopy when they encounter complex airways in future practice, both in the presence or absence of a video laryngoscope. There might be a move towards a large shift in educational practice with universal video laryngoscopy, but removing direct laryngoscopy altogether might subject trainees, and their patients, to

numerous unintended consequences. We do not have easy solutions to this conundrum, but respectfully suggest that, in the name of patient safety, a lesson is learned from the US Navy and a way to continue to teach the foundations of this specialty is found.

We declare no competing interests.

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