

Maximising the benefit of new technologies in airway management

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The 21st century has seen significant advances in airway equipment – next-generation supraglottic airways,^[1,2] single-use flexible bronchoscopes,^[3] innovative front of neck airway devices^[4] and apparatus for facilitating tubeless oxygenation techniques,^[5] among others. Videolaryngoscopy is one such technology that has been widely implemented. However, just as Jorm and O'Sullivan^[6] warned against the 'seductiveness of new technologies' when exploring the potential impact of laptops and smartphones on anaesthetists' performance in operating theatres, airway managers must be mindful that with any new technology, there are pearls and pitfalls to maximising its benefits in patients.

The advantages of new devices in improving patient safety were recognised in the All India Difficult Airway Association (AIDAA) guidelines in 2016,^[7] which advocated both access to a videolaryngoscope and appropriate training in its use. For patients to fully benefit from any new airway technology, both the operator and wider airway management team must be appropriately trained.^[8] Since the publication of the AIDAA guidelines,^[7] evidence supporting videolaryngoscopy has become overwhelming, with many studies demonstrating its efficacy in improving first-pass success inside and outside the operating theatre.^[9-12] For individual clinicians to translate these advantages to their practice, they must have

immediate access to a videolaryngoscope and be familiar with its use. If Nørskov's finding that 93% of difficult intubations are unanticipated is generalisable to global practice,^[13] airway managers should use videolaryngoscopy regularly, if not routinely.

Unfortunately, as Shruthi *et al.*^[14] reported, access to videolaryngoscopes has not been universal, with availability limited to under half of the survey respondents, and even when there was device availability, access was restricted to consultants at several institutions (largely due to cost concerns). By the time of the VL-iCUE survey,^[15] reanalysis of the 484 respondents practising in India showed 195 (40%) expected to use videolaryngoscopy routinely and 277 (57%) expected to use a videolaryngoscope at least sometimes after the coronavirus disease pandemic. Only 11/120 (9%) departments acquiring new devices during the pandemic received no training. These findings suggest an increase in videolaryngoscopy availability, utilisation and training, with the anticipated benefit of improving safety in airway management.

These trends are positive, but the challenge of optimising patient safety does not end there. Airway managers should avoid being *seduced by new technology*; simply awaiting the arrival of the next device or newest model will not improve patient

outcomes. Successful airway management relies upon a team of individuals working cohesively to achieve a common goal, using a shared mental model. Airway managers must prioritise establishing how best to enable their team to deliver safe airway management with the resources currently available to them.

With videolaryngoscopy, this would appear relatively straightforward. To acquire the necessary device skills and maximise patient benefit, airway managers must first practise with their locally available videolaryngoscope in elective non-complex cases, before employing the technique in situations where conventional laryngoscopy might prove difficult or in the emergency setting. However, practice alone does not necessarily improve performance;^[16] as such, Ericsson^[17] succinctly describes how expert performance is linked to deliberate practice. This concept generates related questions – how to define a videolaryngoscopy teacher, how much experience must they have and by whom should they be accredited? Inevitably, this could introduce unwanted complexity and likely limit the amount of practical teaching delivered in the workplace.

We recommend a more pragmatic approach. The priority during every airway management episode is safe and effective patient oxygenation; this requires a patient-specific airway management strategy, shared with and agreed by the airway management team. It should comprise a number of rescue plans in case the primary airway technique should fail.^[18] At times, this comprehensive airway strategy will require the utilisation of new technologies, but this should not take precedence over thorough airway assessment and the development of a series of appropriate and deliverable plans. Similarly, just as airway managers should never assume that novel technology or devices can replace important airway management practices focussed around tailoring the chosen airway management technique to the patient's anatomy, pathology and physiological (in)stability; neither can technology replace a clinician's need for proficiency in fundamental life-saving airway skills such as facemask ventilation.

Simulation training involving the entire multidisciplinary team (low or high fidelity) can facilitate training in decision-making, communication, teamwork and other non-technical aspects of performance, especially when conducted in the team's own clinical environment.

This accepted need for strategic planning^[19] must extend to device use. An airway manager cannot expect to deliver optimal performance (or clinical benefit) in a crisis with a device with which they have minimal experience. Human beings are not machines; therefore, the airway management strategy must take into account changing personnel, their varying skill and relative (un)familiarity with certain techniques and equipment. Consider hyperangulated videolaryngoscopy, the benefit of which has again been recently demonstrated.^[20] If the team is inexperienced in the correct technique and uses an inappropriately matched adjunct not conformed to the blade shape, a relatively simple airway can be transformed into a difficult or impossible one.^[21]

We cannot rely upon national organisations or institutes to be responsible for delivering all necessary education and training on videolaryngoscopy to guarantee proficiency and expertise. Only the clinicians at their individual hospitals know the specific requirements and resources available to them, the local skill mix and which airway management plans (primary and rescue) are deliverable there. An Airway Lead appointed in every hospital (much like the UK system) could help coordinate airway training and disseminate national and international recommendations at individual institutions, with education delivery contextualised by the Airway Lead's unique knowledge of local requirements and resources.^[22] Standardisation and rationalisation of equipment (limiting the number of different videolaryngoscopy devices available) across all areas where airway management occurs within a single hospital, and ideally replicated across multiple hospitals within the same region, can also assist in promoting familiarity and expertise.^[23]

In conclusion, the technological developments of the 21st century have the potential to contribute to significant improvements in airway management and patient safety. However, technology must not be considered in isolation, but rather it must be coupled with high-quality airway team training and education that promotes full understanding of the equipment (and its limitations). We must continue to embrace new technology as it has the capacity to revolutionise our patients' care, but every airway manager must ensure that they and their team are appropriately trained in the equipment that is available at their institution.

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