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Teaching Airway Skills in the 21st Century



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While anaesthesia has always taken great care to tread the tightrope between training and patient safety, new technologies and innovation in education practices are further improving the risk-to-benefit ratio.

The acquisition and maintenance of airway skills are fundamental for all anaesthetists. A delicate balance exists between allowing the trainee to learn practical techniques and exposing patients to potential harm, a situation which is no greater than during airway management. Clinical pressures, demands on training time and reduced operating capacity since the COVID-19 pandemic have had a major impact on learning opportunities for anaesthetists in training.

In this article, we review some new technologies which are changing how airway management is taught.

Videolaryngoscopy

Videolaryngoscopes are increasingly ubiquitous in anaesthetic departments throughout the UK, with a number of centres transitioning to universal adoption. Aside from the well-

publicised safety benefits, videolaryngoscopes potentially improve airway skill teaching compared to direct alternatives. For novice intubators, the shared view of a videolaryngoscope screen initially allows identification of the relevant anatomy, followed by experiential hands-on practice of direct laryngoscopy with real-time feedback whilst the screen is obscured. Videolaryngoscopy builds confidence and independence as trainees progress, allowing supervisors to maintain situational awareness and remain 'hands-off' as intubation difficulty increases, where they may have otherwise intervened. Even for experienced practitioners, routine use of videolaryngoscopy provides an extra layer of safety when used for the maintenance of direct laryngoscopy skills, as the screen can quickly be deployed in unanticipated difficulty.

Simulation and Virtual/Augmented reality

Virtual reality (VR) technologies, such as headsets and simulators, have seen growing application in airway teaching. While simulation is established in anaesthesia, technological advancements are providing higher fidelity, more immersive and reproducible learning environments for trainees, with greater real-world applicability. VR may address the increasingly limited exposure of trainees to difficult airway experiences when following the classical apprenticeship model, particularly for rare but high-consequence events such as awake fiberoptic intubation and cricothyroidotomy. However, investment may be required for trainees to gain sufficient experience on such models. A trial using VR fiberoptic simulators found the group with a single training session on difficult airway models could not demonstrate improvement when confronted with previously unseen difficult models, compared with controls who had trained on normal models. They anticipated that 5–10 exposures to a specific scenario would be required for proficiency. While this is an exciting area of future development, much work remains to be done as teaching methodology and frameworks 'catch up' with technological advancement. Most published studies to date regarding airway teaching using VR are based in single institutions, with wide variability in outcome measurement and no formalised curricula.

Flipped classrooms and blended learning

Social distancing, cancelled elective activities and significant detracting from usual working schedules during the pandemic necessitated adaptations to airway teaching, which have persisted into current practice. The 'flipped classroom' model is established in medical education and seeks to introduce students to information prior to teaching sessions, create individualised goals, and then dedicate the session itself to skill practice and problem solving. This approach has been effectively used in airway-skill teaching, and pre-course material is now usually delivered using a virtual learning environment.

Tea-trolley teaching

The short and digestible 'tea-trolley' teaching method, first introduced in Bath, is particularly effective for practical airway training. Its first iteration was used to teach fiberoptic intubation and needle cricothyroidotomy as a cheaper and more accessible alternative to existing

courses. Now applied to an array of airway techniques and guidelines, tea-trolley-style teaching has seen significant global adoption with a multitude of advantages: it is adaptable and reproducible to a large number of multidisciplinary staff; it is imbedded in the normal working environment, increasing uptake and engagement; and it captures anaesthetists in non-training roles who are traditionally excluded from formalised teaching.

Human factors/non-technical skills

The implications of failures in non-technical skills (or human factors) surrounding airway management have been highlighted in several high-profile cases, such as those of Elaine Bromley and Glenda Logsdail. Proficiency in non-technical skills, such as situational awareness and task management, are now required at all stages of the UK anaesthesia curriculum. The 4th National Audit Project (NAP4) collated incidents of major airway complications that were later re-analysed in a series of interviews, identifying an average of four human factors issues per case. Following this, a series of recommendations were made, including the introduction of local airway leads (AWLs). Now near universal in UK hospitals, AWLs can ensure updates to guidelines or equipment are disseminated by appropriate training for staff, as well as organising airway morbidity and mortality reviews.

Technology is changing how airway management is taught in both the theatre and classroom settings. Videolaryngoscopy allows the educator to provide real-time modification to trainee technique, while simulators and VR models are increasing in fidelity. Alongside these practical developments, educators should equally emphasise the importance of non-technical skills in the clinical environment. In the changing world of anaesthetic training, it will be of utmost priority to maximise student benefit from increasingly limited clinical opportunity.