Editorial

Time for a breath of fresh air: Rethinking training in airway management

We believe that the way in which we conceptualise 'airway education' needs to change. The last two decades of anaesthetic practice have seen a proliferation of airway devices and techniques, yet training and maintaining skills in airway management have not necessarily kept pace. The traditional model for learning continues to be based on apprenticeship, and this is subject to immense variability based on the skills and interest of the supervising anaesthetist, as well as case-mix and time pressure in the operating theatre [1]. Superimposed on this is the inadvertent consequence of safer working hours thus limiting the number of cases to which trainees are exposed. The ubiquitous use of the supraglottic airway has also reduced opportunities to practice many core skills such as face mask ventilation and laryngoscopy [1, 2]. The consequence of all this is the potential for large gaps in skill sets.

Most airway education commentators now accept that clinical skills for airway management cannot be taught solely on patients [3–5]. Simulation training in airway management is recommended (but not mandated) by the Royal College of Anaesthetists (RCoA) [6] and in the Difficult Airway Society (DAS) guidelines [7]. The recent survey by Lindkær Jensen et al. in this issue of *Anaesthesia* [8] demonstrates that nearly a fifth of UK NHS hospitals still provide no formal, out-of-theatre training in airway management. Furthermore, the education that is provided is limited to trainees in many instances, such that fewer than half of NHS consultants themselves have access to in-house continuing education in airway management. Logically, if in-theatre teaching of airway skills is highly variable and out-of-theatre airway workshops are not universally accessible, expertise cannot be guaranteed in all newly qualified consultants nor maintained in experienced practitioners. This situation is not new, and similar calls to arms have been repeated since the mid 1990s [2, 9, 10].

With the recent release of the DAS 2015 guidelines for unexpected difficult or failed intubation and the subsequent commentaries [7, 11], this survey comes at an opportune time for the anaesthetic community to again reflect on how airway training is conducted. In this editorial, we will challenge the assumption that all anaesthetists need to possess the full range of technical skills for airway management. We will discuss what should constitute core skills and how these might be obtained and maintained using both clinical and workshop forums. Finally, we will explore which other members of the wider 'anaesthesia team' should be trained to help ensure patient safety.

Core technical skills for airway management

Above all other specialties, the anaesthetist is expected to demonstrate not merely competence, but mastery of, airway management skills. Mastery in a technique requires repeated, reflective practice in increasingly novel and challenging situations [12], which requires more time and resources than accomplishment to lesser skill levels but results in better clinical outcomes [13, 14]. Mastery in some specific skills can be difficult to attain, particularly as the number of devices continues to

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outpace the opportunities to learn to use them. Even following adequate training, if such skills are not used frequently, they will inevitably decay [15]. It might therefore be more appropriate that some specialised techniques are limited to a few individuals under the oversight of the department's airway lead. For most other anaesthetists, a more limited repertoire of 'core' techniques in which mastery should be achieved could be prescribed.

Core technical skills would include those that are used frequently across a broad range of contexts, as well as those that may need to be implemented in an unpredictable and time-critical fashion where the opportunity to seek more specialised assistance cannot be relied upon. The core training must therefore include airway assessment, ability to establish an airway using a facemask, supraglottic airway and tracheal tube, basic extubation techniques and emergency airway management.

Conversely, high frequency jet ventilation [16], lung isolation with a double lumen tube or bronchial blocker, and extubation over an exchange catheter [17], are probably already techniques which many anaesthetists would be reluctant to undertake without seeking the assistance of a colleague who practises these more regularly. These represent a specialised set of airway techniques that are applied in more limited and predictable clinical settings. There are other techniques used in the context of difficult airway management, which, while satisfying these same criteria, have historically been considered as core skills that all anaesthetists should possess. These include awake fibreoptic intubation and inhalational induction with the intention of maintaining spontaneous ventilation. Many anaesthetists lack the opportunity to practice these techniques sufficiently frequently to profess mastery. That awake fibreoptic intubation is often overlooked as an option for difficult airway management may in part reflect the discomfort of many anaesthetists with this procedure [18].

If only a few anaesthetists are required to maintain currency in specialised airway techniques, there must exist a robust mechanism for accessing those skills by others. 'Emergency response teams' for airway management have been found to be successful in the US, sometimes including head and neck surgeons; the team supported by ready access to dedicated airway emergency trolleys [19]. It is likely only large institutions could incorporate such systems, but even small institutions could consider the benefits of a core subspecialty of airway experts. Anecdotally, this is the current state of affairs in many hospitals already, where many practitioners 'phone a friend' when anticipating a challenging patient. So, the creation of a response team may merely formalise current informal structures. Care should be taken that involving such specialised assistance does not itself create barriers or delay implementation of these specialised skills.

Concerns have even been raised about the appropriateness of teaching 'can't intubate, can't oxygenate' (CICO) rescue techniques to all anaesthetists routinely. In a recent editorial, Baker et al. have suggested that a disproportionate focus on this rare, emergency situation may in fact divert training away from more important skills required to prevent these emergencies in the first place [20]. Current teaching may be promoting a mindset wherein implementation of CICO rescue overshadows basic preventative strategies. Paradoxically, these factors could conspire to generate more frequent, inappropriate CICO responses. Can't intubate, can't oxygenate is of course a rare event, but its occurrence is unpredictable and can complicate even straightforward, elective procedures with the risk of serious harm or death. It must therefore remain part of generic teaching, but the question is one of emphasis. Recent publications have highlighted the importance of creating a situation of 'readiness' in advance of a CICO declaration, in order for it to be performed rapidly when an emergency truly arises [21]. Thus, 'priming' for CICO rescue that includes the preparation of equipment and personnel [22, 23] should be being initiated much more frequently than performing the CICO rescue techniques themselves, and in turn, priming increases opportunities for clinicians to improve familiarity and preparedness for these procedures [22].

Non-technical skills as core skills

Additionally, non-technical skills such as decision-making and communication are essential for all anaesthetists, and of at least equal importance in preventing errors

arising from 'fixation' or 'loss of situational awareness' [21]. Fixation errors are common in stressful circumstances, and in airway management this often translates to multiple intubation attempts or being unaware of the passage of time [24]. Teaching anaesthetic assistants, nurses and Operating Department Practioners the expected algorithms and including them in simulation sessions can help sharing of situational information and prevent fixation. Assertiveness and closed-loop communication may also improve team communication and coordination [25].

In the case of Elaine Bromiley, the nurses present were aware of the gravity of the situation and knew that a surgical approach to the airway was required [26]. Had the nurses made their concerns heard, and the anaesthetists and surgeon invited and listened to suggestions, it would be reasonable to speculate the outcome may have been different. Deficits in non-technical skills are by no means isolated to this particular incident. In a re-analysis of twelve cases from the 4th National Audit Project examining airway management complications (NAP4) [27], Flin et al. found all twelve had at least one human factors' contribution to the event [28]. Cognitive, communication and teamwork failures featured prominently. As with technical skills for infrequent emergency events, these skills cannot be effectively derived and maintained based solely on routine clinical practice [29, 30]. At present, it is not clear that these non-technical skills are included in all airway training programs.

In other high reliability industries such as aviation, pilots are also expected to use cognitive aids to respond to emergencies [31]. Yet, in contrast to the healthcare setting, the checklists they use are always provided with explanations and opportunities for familiarisation [32]. These are important aspects of how checklists and guidelines are introduced, disseminated and taught. Training in use of cognitive aids such as the Vortex approach [22] or those derived from the DAS algorithm [7] should become integral to clinical practice. A well-designed cognitive aid improves technical performance of tasks [33], individuals' non-technical skills [34] and the ability of teams to coordinate and communicate [35]. Mechanisms for these improvements may be due to reductions in personal stress and a shared understanding of the situation by the team [32].

Rethinking clinical teaching

Baker et al.'s concerns that training in more fundamental clinical skills may be being neglected seem valid [20]. Studies have highlighted the inability of anaesthetists and other clinicians to accurately identify the cricothyroid membrane by palpation [36, 37]. Since this relies in part on the ability to correctly identify the thyroid cartilage, this deficit also has implications for correctly measuring the thyromental distance and thus performing a basic airway assessment. As with airway assessment, few would dispute that pre-oxygenation and facemask ventilation are core skills that all anaesthetists should possess. Since the use of supraglottic airways has become widespread, opportunities for structured teaching and practice of facemask ventilation have become more limited [2]. Trainees faced with challenging facemask ventilation may, in the context of production pressure, be instructed to proceed to insert a supraglottic airway early rather than troubleshoot any difficulty. In contrast, being encouraged to persist and use strategies such as oral or nasopharyngeal airway adjuncts, holding the mask with two hands or repositioning, can lay a solid foundation of escalating supports that they can draw on in a crisis situation.

Videolaryngoscopy provides another example of how more effective use could be made of clinical time for teaching. Studies have shown a more rapid acquisition of intubation skills when a conventional geometry videolaryngoscope is used initially [38]. This accelerated skills progression is perhaps because there is a greater opportunity for feedback on the technique to obtain and recognise the ideal glottic view compared with traditional techniques. Furthermore, recording of the intubation may also provide another opportunity for review of the technique by the trainee and structured feedback [14]. Rather than necessarily teaching direct laryngoscopy first, an approach that utilises videolaryngoscopy as the initial training tool should be considered.

Training methods and resources

The potential formats of airway training workshops using part-task trainers, manikins, animal and

cadaveric specimens are now familiar, and have been covered extensively elsewhere [39]. All of these training modalities have drawbacks and should be used to their best advantages. Only after appropriate training has been undertaken should patients be used for training, with full, informed consent [40].

Airway management is one of the anaesthetic profession's core areas of expertise and should surely be a fundamental skill set for trainees and consultants. It of concern that 16 of 78 respondents to Lindkær Jensen et al.'s questionnaire listed a 'lack of interest', or did not consider out-of-theatre airway training as necessary [8]. The responses also noted a lack of time, experienced trainers and suitable manikins as contributors to the deficiencies. For trainees, protected teaching may be available, but consultant sessions are more difficult to organise without constructive job planning. If the anaesthetic community believes that obtaining and maintaining expertise in airway management is important, it is their responsibility to persuade managers to support time and resources for equipment and training of the educators. Making some or all of these things mandatory for employers may expedite this process.

Additional effort will be required for those seeking specialised airway skills. One suggestion is that those wishing to be airway leads should undertake additional training in the form of a surgical placement. These placements could involve head and neck surgery, assisting and perhaps performing tracheostomies and nasendoscopies under guidance.

Who else should be included?

Airway management in the operating theatres has a lower incidence of adverse events than in other clinical areas. Estimates of a 40- and 50-fold higher risk of hypoxic brain injury and death have been suggested in the emergency department and intensive care units, respectively [41]. Anaesthetists called to assist in these areas are frequently confronted with different equipment, procedures and staff training. The education of medical and nursing staff within specialties typically occurs in isolation. This may lead to divergent terminology, attitudes, and strategies to manage a failed airway when different specialties converge to manage a crisis. To counteract this, interprofessional training involving staff from all acute care areas should be undertaken. If this is not possible, at the very least training and equipment should be standardised across a hospital's acute care areas. Training together allows different professional groups from different clinical environments to create a shared understanding or 'mental model' of difficult airway problems. Military psychologists have shown that teams that have shared mental models have better team processes, are more adaptable, and have improved outcomes than those without this understanding [42].

Training in collaboration with other disciplines also increases opportunities for the exchange of ideas. A salient example of this is the process of apnoeic oxygenation, which has the potential to significantly extend the time to critical desaturation during difficult airway management [43]. Despite having become firmly embedded in emergency medicine and pre-hospital care practice in some countries [44], apnoeic oxygenation is yet to find an established place in anaesthetic care, with many anaesthetists probably still unaware of such techniques.

In summary, if anaesthetists are to continue to be regarded as the airway management experts, a fundamental shift must occur in the way that we train and retain our skills. Lindkær Jensen et al.'s paper is a reminder that addressing this must become a priority.

Competing interests

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NC is the creator of the 'Vortex approach' but has no financial interest in this material which is licensed under a Creative Commons Attribution- NonCommercial-NoDerivatives 4.0 International License.

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Editorial

Position, position, position – terminology during stomach ultrasound in pregnant women

The estate agents' mantra 'Location, location, location' indicates the paramount importance of a property's geographical situation – many other aspects of a building may be changed, but this is immutable. Body position is crucial for many physiological functions, especially the stomach, however confusion in terminology is widespread. This is especially pertinent when interpreting research in pregnant women, as clinicians already use a number of modifications of body position to reduce supine aortocaval compression.

Anaesthetists have an interest in the volume (and type) of stomach contents, as these may be regurgitated or vomited peri-operatively, and aspirated into the lungs. Ultrasound can be used to image the stomach, and various quantitative and qualitative measurements have been used to assess stomach contents. However, gastric contents move freely under the influence of gravity, and hence these investigations should be carried out in precisely defined positions to allow reliable imaging and consistent measurement.

In probably the first published study using ultrasound to image the stomach, Bolondi et al. used a single measurement of antral cross-sectional area to investigate stomach emptying in non-pregnant subjects. They used the supine position in all subjects, but in about half of the subjects they also compared this to measurements in an unspecified 'upright' position, noting that food contents move into the antrum in the latter position [1].

The antrum is also physically dependent in the right lateral decubitus position, and the correlation between volume of stomach contents and antral cross-sectional area is

Table 1 Threshold values for antral cross-sectional area indicating a volume of stomach contents that incurs risk during general anaesthesia.

Area	Group	Investigator	Position
> 320 mm^2	Non-obstetric	Bouvet et al. [5]	Semirecumbent
	Obstetric	Bataille et al. [6]	Semirecumbent
> 340 mm^2	Non-obstetric	Bouvet et al. [7]	Semirecumbent
> 1030 mm^2	Obstetric	Arzola et al. [8]	Semirecumbent-right lateral

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