Editorial

Radical evolution: the 2015 Difficult Airway Society guidelines for managing unanticipated difficult or failed tracheal intubation

This month, the Difficult Airway Society (DAS) presents its long-awaited guidelines for the management of unanticipated difficult tracheal intubation [1]. The first (2004) guideline rapidly became one of the most important in the specialty [2]. The society's pre-eminence in this field is underlined by subsequent paediatric [3], obstetric [4] and tracheal extubation guidelines [5], all of which have made important contributions to patient safety. The 2004 DAS Intubation Guidelines may have stood the test of time, but this update seems long overdue, as the new update itself acknowledges, in the light of many new and widespread techniques, notably videolaryngoscopes, and new ideas about surgical front-of-neck access. Even more importantly, led largely by lessons from the 4th National Audit Project (NAP4) [6], much has been learned about how human factors and training are essential to achieve success in difficult airway management. This editorial will consider what's new in the 2015 Guidelines, highlighting aspects we think will importantly change practice, and then discuss the educational and organisational approaches needed to ensure successful adoption.

What's new?

Planning

The guidelines make it clear from the start that a shared plan for failed tracheal intubation should form part of the pre-induction briefing, particularly for urgent surgery. Although it is already part of the World Health Organization (WHO) checklist [7], that 'problems with anaesthesia' should be communicated, the DAS guidelines put flesh on this concept by making it explicit that the whole team should understand the strategy if airway difficulties arise. There must be no assumption that every member of the team will be familiar with the 2015 guidelines and, therefore, the WHO briefing is an important occasion to spell out what might be needed. Specifically, surgeons should realise their help may be needed if a surgical airway becomes necessary. Equally, this is an opportunity to share with the team the likelihood of such an event arising, based on the anaesthetist's airway examination (e.g. an assessment may range from difficult tracheal intubation being very unlikely and unexpected, to one where the clinical signs suggest this is a less-than-remote possibility). This integrates well with the 'effective team' check proposed by NAP5 [8].

However, the new guidelines make, in our view, the common error of repeating the mantra that 'predicting airway difficulty is not completely reliable'. While at one level the statement is self-evidently correct, it is also potentially misleading and based on a misinterpretation of analyses like that of Yentis [9]. Perhaps worthy of separate discussion elsewhere, the more sophisticated point to make, as Yentis made, is that where an anaesthetist regards a patient's airway as 'easy' then it can indeed be confidently predicted that this will be the case, since truly unexpected or serious airway difficulties in airways judged normal are reassuringly very rare. In this sense, therefore, predicting an easy airway is extremely reliable. We believe that the majority of airway difficulties do indeed arise in patients with at least some clinical signs of such; the real problem perhaps being that the significance of these signs were underplayed or not appreciated. However, and this is the point that so often misleads, even a high proportion of patients with those signs in fact turn out, reassuringly, to present a straightforward tracheal intubation; hence the absolute predictive value of tests is poor [9]. We would have preferred some expansion on these

points, further to encourage and underline the importance of routine and documented airway pre-assessment.

First-time success rate

In the new guidelines there is a very clear emphasis on the importance of first-time success rate. This makes sense. If laryngoscopy attempts are to be restricted to a very maximum of four, then it follows that the very first must be in the most optimal conditions. Anaesthetists must therefore ensure that in all their patients, positioning is good from the very start and the description 'positioning of the head and neck were optimised after the failure of first attempt' must disappear from the anaesthetic lexicon. In other words, the need to reposition a patient in whom there has been a failed or difficult intubation is itself a clear admission of poor planning and conduct from the outset. This emphasis has at least two more consequences: for pre-oxygenation; and videolaryngoscopy.

Pre-oxygenation

While proper stress is laid on pre-oxygenation, some readers may be surprised that, although mentioned, methods such as THRIVE (transnasal rapid-insufflation ventilator exchange) that allow prolonged apnoeic oxygenation are not emphasised even more [10]. The logic is inescapable: if difficult airways are truly 'unpredictable' and if oxygenation matters, then it follows that manoeuvres to maximise continued oxygen uptake must be used in all patients. Such has been the positive response and personal experience of anaesthetists who use techniques like THRIVE [11], it is our belief that it will become part of routine practice, and very likely recommended for most if not all adult tracheal intubations in the future.

Videolaryngoscopy

Similar logic applies here. If it is now essential to maximise the first attempt success rate, and if it is the case that videolaryngoscopes yield higher success in visualising the glottis [12], then it follows that these should become first line devices in most if not all tracheal intubations [13, 14]. The guidelines do state that videolaryngoscopy can be used as first-line, but we would go further with this logic. Reserving use of the device judged optimal for the second tracheal intubation attempt has wasted the first attempt and made the second attempt more difficult (e.g. due to trauma). There may be certain situations (e.g. an already soiled or bloody airway) when direct laryngoscopy may be preferred, and these are of course all big 'ifs' but if this logic applies, then which laryngoscope should be used? The latest research suggests that there is considerable inter-individual (and inter-staff group) differences in performance across devices. Furthermore, it is becoming increasingly apparent that each device may have its particular niche for use in a given situation [14]. Thus, hospitals will probably need to provide a range of videolaryngoscopes. This way, their anaesthetists will be in a position to select the device with which they have the most experience, as not all will be equally familiar with the same device, and select the most appropriate device for the case at hand. Notwithstanding the need for a default device, hospitals that arbitrarily restrict the availability of airway devices for reasons of cost, especially in the face of specific requests from their anaesthetic departments, may now be judged harshly if a critical airway incident arises and its analysis is mapped onto the recommendations of these new guidelines.

Facemask ventilation

Perhaps this is one section where we felt the new 2015 guidelines could have been clearer. They explicitly stress that after pre-oxygenation, mask ventilation with 100% oxygen should commence as soon as possible after induction of anaesthesia. Implicitly, this must mean that mask ventilation should commence before administration of (and certainly before full action of) neuromuscular blockade (NBD). If this is what was meant, then the guidelines should have said so. However, the guidelines then also state that NBD makes mask ventilation easier and that inadequate NBD makes mask ventilation more difficult. Even if this were always true (e.g. there may be subsets of patients in which the reverse is the case [15]), this overlooks the complexity that other drugs, such as some opiates, can make ventilation more difficult [16, 17]. In other words, some attention might have been devoted to the ongoing debate in the literature as to whether mask ventilation should commence before or only after administration of NBDs [18], and

the DAS working group could have brought their consensus to bear in helping to resolve this. However, the guidelines do later concede that at a later stage of airway management 'the anaesthetist will already know how easy or difficult mask ventilation has been'. This alludes to the very important role of mask ventilation (performed both before and after NBD) in providing key information about the state of the airway and its response (or not) to NBDs. Again, an explicit emphasis on the early stages of induction and mask ventilation as a time to obtain information about a rapidly changing airway situation might have been welcome.

Bougies

Perhaps the really important question in difficult airway management is not 'which device should be used' but 'when should the airway be secured before versus after induction'? The new guidelines' comments on the use of bougies help bring this discussion into sharper focus. For many anaesthetists, especially those trained before the advent of videolaryngoscopes, the gum elastic bougie has been the mainstay of difficult airway management. The bougie has been commonly used by some, not only during unexpected difficulties encountered after induction, but also when planning tracheal intubation in a patient previously described as easy to mask ventilate but with a 'grade 3' (or even, for some, a 'grade 4') larynx. We anticipate the new guidelines will change practice importantly in at least two respects.

First, anaesthetists must now make a distinction in their records between grade 3a (where there is a clear gap between the epiglottis and the posterior pharynx) and grade 3b (where there is not). Interestingly, the new guidelines appear to assume that these classifications apply equally well to both the Macintosh and videolaryngoscopes, which may not be the case [19]. Henceforth, simply writing 'grade 3' will be regarded as uninformative and unacceptable documentation (a subsequent anaesthetist may have to assume the worst case scenario of grade 3b). Second, a patient previously described as grade 3b or 4 must now be regarded by definition as having an airway not amenable to bougie-assisted intubation. And if not amenable to bougie-assisted intubation, then the strong implication is that in these patients, securing the airway before induction of anaesthesia is necessary. Increasing rates of awake/sedated (fibreoptic) tracheal intubation in patients classed grade 3b, 4 (and unqualified 'grade 3') seem inevitable, regardless of the previously documented ability to mask ventilate.

We would have preferred also to see more explicit recommendations on type of bougie. Some hospitals, for reasons of cost alone, have tried to replace the gum elastic bougie with alternative types, few of which have undergone any form of formal testing in accordance with DAS' own ADEPT principles [20]. When compared with the gum elastic, the newer single-use bougies perform poorly [21, 22] and also yield much higher pressures at the tip [23], a point of concern in the DAS guidelines. We are unaware of any publications that suggest the gum elastic bougie performs less well than alternatives. The guidelines would have been an excellent opportunity to state, explicitly, that (a) hospitals must stock only those devices that, as ADEPT recommends, have undergone a clinical trial and (b) hospitals must provide a range of bougies, including the gum elastic type, to maximise options available to anaesthetists.

Prompt declaration of failure

This aspect of the guidelines is the most heartening to read, and we think will have the greatest impact on styles of anaesthesia practice. 'Failure' in this context is clearly – and appropriately – defined as an early decision to abandon attempts at laryngoscopy (at four or fewer attempts) and then immediate placement of a supraglottic airway device (SAD). Such early declaration should make extinct the anaesthetist who claims never to have had a failed tracheal intubation, because such a declaration will become a self-confession of poor practice (i.e. either an admission of an insufficient career number of cases, or persistent failure to adhere to national guidelines, or both).

The guidelines state with clarity that there are now only four options after failure. So important are these that they are worth repeating:

1 Wake the patient up
2 Attempt fibreoptic-assisted (not blind) intubation via SAD
3 Proceed with surgery with SAD
4 Proceed to a surgical airway

Crystallising the options so succinctly makes it very clear to readers that there is simply no longer any scope for a 'fifth' option: that of removing the SAD and making further attempts at laryngoscopy. Such an action – even if it is ultimately successful - must henceforth be regarded as a very serious incident and potentially endangering the patient's life.

The option of 'waking the patient' requires first, that NBDs are reversed promptly, and, only then, anaesthesia turned off to facilitate wake-up (this specific order, amongst other things, to prevent awareness during anaesthesia) [24]. The only assuredly rapid means of reversing non-depolarising blockade is with sugammadex, when rocuronium or vecuronium are used. It follows, therefore, that in a patient in whom difficulty is suspected (albeit judged unlikely), these two become the drugs of choice for paralysis (notwithstanding the possible use of suxamethonium). Furthermore, since vecuronium takes longer to provide complete neuromuscular blockade (required for good mask ventilation; see above) rocuronium will become the rational agent of choice for neuromuscular blockade. Since, as declared in the guidelines, difficulties cannot be predicted with certainty, this choice may logically extend to all patients. And finally, since reversal of blockade may be required promptly, no longer should sugammadex be kept hidden away centrally in some locked cupboard, but available immediately to hand in the anaesthetic/operating room.

The emphasis in the guidelines on surgical front-of-neck access has important implications for training and continuous professional development. Currently, cardiac resuscitation rightly forms part of the regular mandatory training for all anaesthetists across the NHS, requiring annual update. Taking these guidelines at face value, it would seem important that a specific ongoing competency requirement for all anaesthetists should be 'airway management', to include all aspects of these new guidelines and, specifically, refresher training in the surgical airway. The Australian and New Zealand College of Anaesthetists have already made such a move in mandating refresher training in two out of four emergency responses, including can't intubate, can't oxygenate, every three years. In that regard, the range of courses offered by DAS (see http://www.das.uk.com/courses) could or should evolve as the basis for ongoing accreditation in the skills outlined within these guidelines. The remainder of this editorial expands on this last theme.

Implementation of the 2015 DAS Guidelines: cognitive tool or cognitive prosthesis?

James Reason, the psychologist famed for developing the 'Swiss cheese' model of accident causation, identified two methods for the use of cognitive aids in process environments [25]. A cognitive aid may be used as a tool to extend our abilities in challenging environments. The 'cognitive aid as tool' may help us understand and train in the complexities of the system so that we will be ready should an emergency occur. Alternatively, Reason also suggested that cognitive aids could be seen as 'prostheses' or 'mental crutches' to assist us in times when the demands of the situation exceed our capacity to process and select options for action. Within the context of airway management, both 'tool' and 'prosthesis' approaches are needed to support a co-ordinated team approach, rather than an individual operator, as it is increasingly recognised that team interactions may prevent fixation errors [26].

The DAS guidelines as a cognitive tool

For a guideline to be useful as a teaching tool, it must be based on sound contemporary evidence. The new DAS guidelines have certainly quoted extensively from the literature, notwithstanding the understandable paucity of randomised clinical trials in this field, and give our profession a clear picture of the balance of evidence. The guidelines themselves may stimulate new research, and provide hospitals and practitioners with an outline of where they may improve, thereby lifting the overall standard. However, as with any application of evidence-based guidelines, attention is needed as to how the recommendations apply to each individual patient.

The specific context for these guidelines is the unanticipated difficult tracheal intubation in an elective setting. Arguably, different guidelines are appropriate for pre-hospital, intensive care and

emergency department settings. Furthermore, the guidelines assume that safe tracheal intubation is always the primary airway management goal, but intubation is the primary method of airway management for fewer than 40% of general anaesthetics in the UK [6]. This is not to say the guidelines are of no use outside of these circumstances but the limitations and context must be understood and interpreted with the intended use in mind.

The evidence presented to support the default front-of-neck approach of a scalpel technique is from pre-hospital care and emergency medicine, and not elective settings by anaesthetists, as is conceded by the authors. It has been suggested that the transition to a front-of-neck approach using a cannula technique first may be less challenging for anaesthetists who are much more likely to be familiar with this equipment [26]. Furthermore, evidence from simulation studies of thousands of anaesthetists has provided conflicting data, suggesting that cannula techniques are superior in trained hands [27]. In practical terms, there may be separate circumstances where each technique is superior, and both cannula and scalpel techniques do have a failure rate. Although there is an emphasis on scalpel techniques in these guidelines, clinicians should be familiar with both methods, and when to use them, and this is where training across a range of techniques becomes important.

Practical implementation of guidelines can be difficult, and must be effected by a combination of familiarity, training for the events and provision of an accessible form of the guidelines during an emergency [28].

The DAS guidelines as a cognitive prosthesis

Cognitive aids are devices to help remember a sequence of actions during an event and prevent omissions. Their use in emergencies would seem to be ideal as they can help the prompt application of complex guidelines when there are time pressures and an excess of information for the team to manage [29, 30]. Designs of cognitive aids must be mindful of the context in which they are used. A cognitive aid that requires too much attention or is overly complex will distract the user or team, and may worsen performance [29]. The ideal cognitive aid does not require any device or poster, but is easily recalled with a mnemonic or simple diagram. Perhaps the most widely used cognitive aid in critical care is the 'ABC' of resuscitation, a simple reminder of priorities and actions. The ABC mnemonic has been in use for over fifty years and persists because it requires few additional resources and likely improves the function of individuals and teams during emergencies [31, 32].

The algorithm accompanying the 2015 DAS guidelines retains the familiar design and structure of the original 2004 version, usefully addressing both rapid sequence and unanticipated elective situations within a single scheme. This familiar structure acts as a valuable aid for memory in a crisis. Arguably, the algorithm remains complex and difficult to read and follow during an emergency, but evidence suggests this may be overcome by the use of a dedicated 'reader' during the crisis, i.e. a person assisting the leader and other team members by reminding them of the tasks prompted by a checklist or algorithm [33].

The need for a prompt declaration of 'failure' in the guidelines is most welcome, and signals a 'transition phase' in team behaviour from supraglottic solutions towards infraglottic approaches. Cognitive and social barriers exist to declaring this transition phase, such as adverse hierarchies preventing junior staff from speaking up, punitive cultures that apply if 'failure' is declared, and a loss of situation awareness of clinicians during the crisis [26]. Each of these factors requires counter-measures, and guidelines can assist in the development and training of these measures and as a reminder during the crisis. It must not, therefore, be assumed these guidelines will automatically be followed; training in techniques such as assertiveness is essential. Nevertheless, a statement visible on a cognitive aid reminding teams that a declaration of failure is required may make such a decision easier and improve information sharing.

Specifying a maximum number of attempts at tracheal intubation, SAD insertion and facemask ventilation is useful to ensure excessive time is not wasted in persisting with a failed approach. Although the guidelines offer a definition, defining an 'attempt' within the team during an airway emergency may remain difficult. The individualised strategy of airway management should be

discussed with the team before beginning an intervention, and this should include a conversation about how 'failure' of a technique will be declared. This strategy is perhaps more in line with the 'vortex approach' described by Chrimes and Fritz that advocate an 'optimal' attempt at each non-surgical technique before failure is declared [34].

Summary

There is little doubt that these guidelines incorporate advances made in airway management since 2004. They will change day-to-day practice of anaesthesia, as outlined above, from pre-operative airway assessment, to integrating the WHO team briefing, to the use and provision of equipment and drugs, and the recording of information on the anaesthesia chart. They will inform the later analysis of any critical airway incidents, especially as documentation and postoperative management are addressed, and they will encourage training in a range of techniques. Taken together, not quite a revolution but certainly a very 'radical evolution'.

Assessment of the utility of the new guidelines should consider if they can be used as tools to enhance knowledge and training, or in addition as a prosthesis to bridge the gap between the requirements of and our abilities during emergencies. Formal testing may reveal which aspects of their design, complex as it is, may distract from, rather than enhance, airway management during crises.

All guidelines represent a standard of care or a normative approach to a clinical problem. As such, they not only help guide clinicians, but they also provide the broader community with the opportunity to improve standards, to ensure equipment is available, and that training for the skills and processes required are in place to ensure successful adoption.

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