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SPECIAL ARTICLE

Difficult Airway Society 2025 guidelines for management of unanticipated difficult tracheal intubation in adults

Imran Ahmad[1,2,*], Kariem El-Boghdadly[1,2], Helen Iliff[3], Gunjeet Dua[1], Andy Higgs[4], Mike Huntington[5], Fauzia Mir[6], S. A. Reza Nouraei[7,12], Ellen P. O'Sullivan[8], Anil Patel[9], Kate Rivett[10] and Alistair F. McNarry[11]

[1]Department of Anaesthesia and Perioperative Medicine, Guy's and St Thomas' NHS Foundation Trust, London, UK, [2]Centre for Human and Applied Physiological Sciences, King's College London, UK, [3]Health Education and Improvement Wales, Cardiff, UK, [4]Department of Anaesthesia and Intensive Care Medicine, Warrington Teaching Hospitals, Cheshire, UK, [5]Lancashire, UK, [6]Department of Anaesthesia, St George's Hospital, London, UK, [7]The Loxley Centre for Airway Voice and Swallowing, Department of Ear, Nose and Throat Surgery, Queen's Medical Centre, Nottingham, UK, [8]Department of Anaesthesia and Intensive Care Medicine, St James's Hospital, Dublin, Ireland, [9]Department of Anaesthesia, University College London Hospitals, London, UK, [10]London, UK, [11]Departments of Anaesthesia, Western General and St John's Hospital, NHS Lothian, Edinburgh, UK and [12]The Clinical Informatics Research Unit, University of Southampton, Southampton, UK

*Corresponding author. E-mail: drimranahmad1@gmail.com, X @dr_imranahmad; X @elboghdadly; X @ProfEllenO; X @altgm

Summary

Advances in our understanding and practice of airway management necessitate contemporary guidelines for tracheal intubation. The Difficult Airway Society (DAS) therefore produced recommendations to improve the efficacy and safety of tracheal intubation. We conducted a systematic review and a three-round Delphi process to formulate multidisciplinary, evidence-based, expert consensus recommendations. We invited 20 external experts to guide recommendations on emergency front-of-neck airway and engaged DAS members and 16 international airway experts to provide feedback. Twelve members of the guidelines group participated in 65 meetings over 3 years, and 1241 papers were included after a systematic review. Sixty-five recommendations were made in relation to tracheal intubation. These included airway assessment and planning; peroxygenation; postintubation care; rapid sequence induction and intubation; the physiologically difficult airway; obesity; human factors; point-of-care ultrasound; documentation; and education and training. We maintain the concept of a linear algorithm encompassing tracheal intubation (Plan A); supraglottic airway device ventilation (Plan B); facemask ventilation (Plan C); and emergency front-of-neck airway (Plan D). The recommendations prioritise continuous oxygen delivery throughout airway management; maximising the likelihood of successful tracheal intubation at the first attempt; confirmation of ventilation with waveform capnography; progressing through the algorithm in the event of failure; multidisciplinary teamwork; and ongoing education and training. These guidelines are designed to support clinicians in delivering airway management that prioritises efficacy and safety. Overall, we emphasise the importance of maximising the chances of success, rather than the avoidance and management of failure, to improve outcomes for patients undergoing airway management.

Keywords: airway management; emergency front-of-neck airway; laryngoscopy; tracheal intubation; ventilation

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Editor's key points

- Advances in airway management since the last Difficult Airway Society (DAS) guidelines from 2015 necessitate updated guidelines for tracheal intubation in adults. This need for updated guidelines was addressed using a modified Delphi process by multidisciplinary international experts.
- The recommendations maintain the concept of a linear algorithm from tracheal intubation (Plan A), to supraglottic airway device ventilation (Plan B), to facemask ventilation (Plan C), and to emergency front-of-neck airway (Plan D).
- Recommendations include continuous oxygen delivery throughout airway management, confirmation of ventilation with waveform capnography, multidisciplinary teamwork, and ongoing education and training.
- The emphasis is on maximising the likelihood of successful tracheal intubation at the first attempt, rather than avoidance and management of failure.

Guidelines for the management of the difficult airway have now existed for more than 30 years,[1] and the first Difficult Airway Society (DAS) guidelines on management of unanticipated difficult intubation were published in 2004.[2] Despite these and numerous other guidelines from various airway societies and organisations around the world,[3–13] the 7th National Audit Project of the Royal College of Anaesthetists (NAP7) reported that airway and breathing complications remain an important cause of perioperative cardiac arrest.[14,15] The 2015 guidelines responded to the findings of NAP4,[9,16] with a particular emphasis on managing failure. They incorporated concepts of human factors in airway management,[17] and supported the implementation of developing technology such as videolaryngoscopy, second-generation supraglottic airway devices (SADs), and high-flow nasal oxygen (HFNO). They also encouraged a significant change in emergency front-of-neck airway (eFONA) techniques from cannula to scalpel approaches. It is likely that those guidelines improved airway management safety.

In the ensuing years, clinical practice and evidence have evolved. Patients requiring airway management are increasingly complex,[18] data demonstrating safety and efficacy of airway management techniques have emerged, and understanding of risks such as unrecognised oesophageal intubation have become apparent.[19–30] Evidence on the benefits of tools such as videolaryngoscopy,[20,23,31] point-of-care ultrasound,[32–34] and HFNO[25] have also been established. The concepts of peroxygenation and physiologically difficult airways have subsequently been introduced.[10,19,25,35] Recent years have also seen a number of other specific guidelines for safe airway management, such as the critically ill patient,[10] awake tracheal intubation (ATI)[3] and COVID-19.[6] The accumulation of all of these changes and developments warranted updated guidelines on the management of unanticipated difficult tracheal intubation.

We therefore developed these guidelines using the best available evidence to support expert consensus recommendations. In addition to specific and technical recommendations following a linear algorithm, we highlight several key themes to maximise the likelihood of successful tracheal intubation, rather than the avoidance and management of failure, to improve outcomes for patients undergoing airway management.

Methods

These guidelines followed the Appraisal of Guidelines for Research And Evaluation 2 (AGREE 2) reporting checklist.[36] We convened a multidisciplinary group from across the UK and Ireland, including anaesthetists from both teaching and district general hospitals with a range of areas of expertise, a surgeon, a resident doctor, an operating department practitioner, and a lay representative. To support the development of recommendations, we conducted a systematic review adhering to the Preferred Reporting Items for Systematic Reviews And Meta-Analyses (PRISMA) recommendations.[37] Given the need to assess contemporary evidence since the DAS 2015 guidelines, we only sought studies published after completion of that initial search (2012 onwards).[9] Full results and details of the review are shown in Supplementary File 1.

Data from included studies were synthesised, and consensus from all 12 members of the guideline group was sought to formulate guideline recommendations using a three-round Delphi method. The first round entailed an initial proposed long list of recommendations, which were each reviewed and rated for content and clarity. Recommendations with which ≥70% of the guideline group agreed were included unchanged, and those with 50–69% agreement were revised or harmonised based on comments from all members. Recommendations with <50% agreement were excluded. A second Delphi round of rating was then conducted using the same methodology, with all members receiving fully anonymised results and comments from the first round. Finally, a third round involving discussion and further revision was undertaken. The level of evidence used to make each recommendation was based on a modified Oxford Centre for Evidence-Based Medicine system (A–D).[3] Full results and levels of evidence for all recommendations are shown in Supplementary File 2.

Given the uncertainty regarding eFONA techniques, an expert panel process was conducted to help inform recommendations made by the DAS intubation guidelines group. Anaesthetists, intensivists, and surgeons experienced in eFONA and related procedures were invited to participate. After distribution of specific clinical practice proposals, two discussion panel meetings were held in which members of the DAS intubation guidelines group did not participate. This process adhered to the Scientific Evaluation and Review of Claims in Health Care (SEaRCH™) recommendations.[38] In total, 20 experts were invited, of which 17 (85%) attended the first meeting and 11 (55%) attended the second.

Over the 3 years of guideline development, the group met 35 times for in-person all-day meetings and 30 times for virtual meetings. In October 2022, we invited DAS members and followers of the DAS social media accounts to provide feedback regarding the 2015 guidelines, receiving 94 responses that informed recommendations. Elements of the guidelines were also presented at the DAS Annual Scientific Meetings in 2023 and 2024, and key principles of the final recommendations were presented virtually to the DAS members for comment. The draft manuscript was also reviewed by 16 international experts with clinical or academic experience related to difficult airway management. All comments were reviewed by the guideline group. The final draft was then reviewed by the DAS committee for ratification.

Disclaimer

These guidelines are not intended to represent a minimum standard of practice, nor are they to be regarded as a substitute for good clinical judgement. They are also not expected to account for all possible clinical scenarios, but aim to provide a framework for decision-making. In this document, 'airway manager' is any clinician responsible for tracheal intubation, including anaesthetists, intensive care physicians, and emergency and pre-hospital physicians.

Airway assessment

Assessment is essential to airway management, enabling identification of patients with potentially difficult facemask ventilation, SAD insertion or ventilation, tracheal intubation, or eFONA.[16] Although data suggest that anticipating difficult airway management remains challenging,[39,40] history, examination, and appropriate investigations can help identify a potential difficult airway, and facilitate the formulation of an individualised airway strategy (a series of plans). This should also account for the context of airway management such as urgency, timing, location, equipment availability, staffing, and access to appropriate help.[41] Crucially, findings of the airway assessment need to be acted upon, and the earlier airway assessment is performed, the more time there is for the strategy to be formulated, equipment to be obtained, and multidisciplinary communication to occur.

Numerous bedside screening tests have been used to facilitate risk assessment of difficult airway. In general, bedside assessments alone have been shown to be poor screening tools to rule out difficulty, but of these, the upper lip bite test appears to have the greatest diagnostic accuracy.[42,43] Combining multiple bedside tests will likely improve the sensitivity of predicting difficulty.[44] A history of obstructive sleep apnoea and snoring appear to be more reliable predictors of difficult airway management.[45–47] There remains uncertainty if obesity in isolation is an independent risk factor,[46] although people living with obesity were over-represented in airway complications in NAP4 and NAP7.[14,16] Perhaps the most reliable predictor is a previous history of difficult airway management.[48] Patients might carry difficult airway alert cards, but medical records should be reviewed for further information.[48] Identification of the cricothyroid membrane by visual assessment, palpation, or ultrasound should be conducted during airway assessment, ideally with the neck in a fully extended position, to facilitate decision-making before an eFONA scenario arises. This should inform the eFONA technique.

Investigations reportedly have a potential value in predicting difficulty and guiding airway management, including point-of-care ultrasound,[34,49–51] virtual endoscopy,[52] nasendoscopy,[53,54] awake videolaryngoscopic assessment,[55] computed tomography,[56] and three-dimensional printing.[57] These tools are not available to all clinicians or for all patients, and therefore they are rarely relied on exclusively in current clinical practice. Nasendoscopy, in particular, has significant potential to help guide airway management.[58] It can be rapidly, safely, and easily performed, and clinicians should consider gaining further skills in this technique.

Ultrasound assessment of airway parameters has increasingly been shown to help risk stratify airway management difficulty.[59–65] Although the evidence is favourable, we recognise this might not be deliverable in practice currently. Widespread use of this technique can be seen as aspirational, requiring validated educational training programmes.

Assessment also includes screening for a physiologically difficult airway,[19] which accounts for an increased risk of complications from airway management, such as hypoxaemia and pulmonary aspiration, and also haemodynamic complications.

In specific circumstances, airway assessment scoring systems have been shown to be of particular value. This includes the HEAVEN criteria in pre-hospital care[66,67] and the MACOCHA score in critical care (Supplementary File 3).[68]

Recommendations

- **Airway assessment should be performed before induction of anaesthesia.**
- **Assessment should include history, examination with bedside tests, and, when appropriate, review of relevant investigations. The physiologically difficult airway should also be considered.**

Planning and strategy

A preformulated airway strategy is fundamental to airway management, and should take into account the findings of the airway assessment.[16] Failure to do so may be associated with adverse outcomes.[16,48,69–71] The strategy should consider any anticipated difficulty in facemask ventilation, SAD insertion or ventilation, tracheal intubation, eFONA, and physiological status (Fig. 1). Consideration should also be given to patient positioning, equipment, personnel, location, timing, plans for failure of any of the proposed techniques, and communication with the wider team. Specific plans should be shared with the anaesthetic assistant, and any concerns discussed at the team brief.

Compared with asleep techniques, ATI is associated with lower failure and complication in patients with anticipated difficult airway management.[72,73] In planning airway management, any predicted difficulty should alert clinicians to consider performing ATI with a flexible bronchoscope or videolaryngoscope, or a tracheostomy (Fig. 2).[3]

Airway management performed out of hours or in the nonoperating theatre environment is associated with increased risk.[14] Planning in these scenarios should account for clinical urgency, timing, and location (moving the patient to an anaesthetic room or operating theatre, or not transferring from their current location). Senior input should be sought early given the recognised risks.[14] Checklists can be useful in these settings to improve guideline adherence, reduce the number of tasks that are omitted, and optimise teamworking.[74–77]

Recommendations

- **The airway management strategy should address any anticipated difficulty in A) tracheal intubation; B) SAD insertion or ventilation; C) facemask ventilation ; and D) emergency front-of-neck airway.**
- **The airway management strategy should be guided by any history of previous difficulty.**

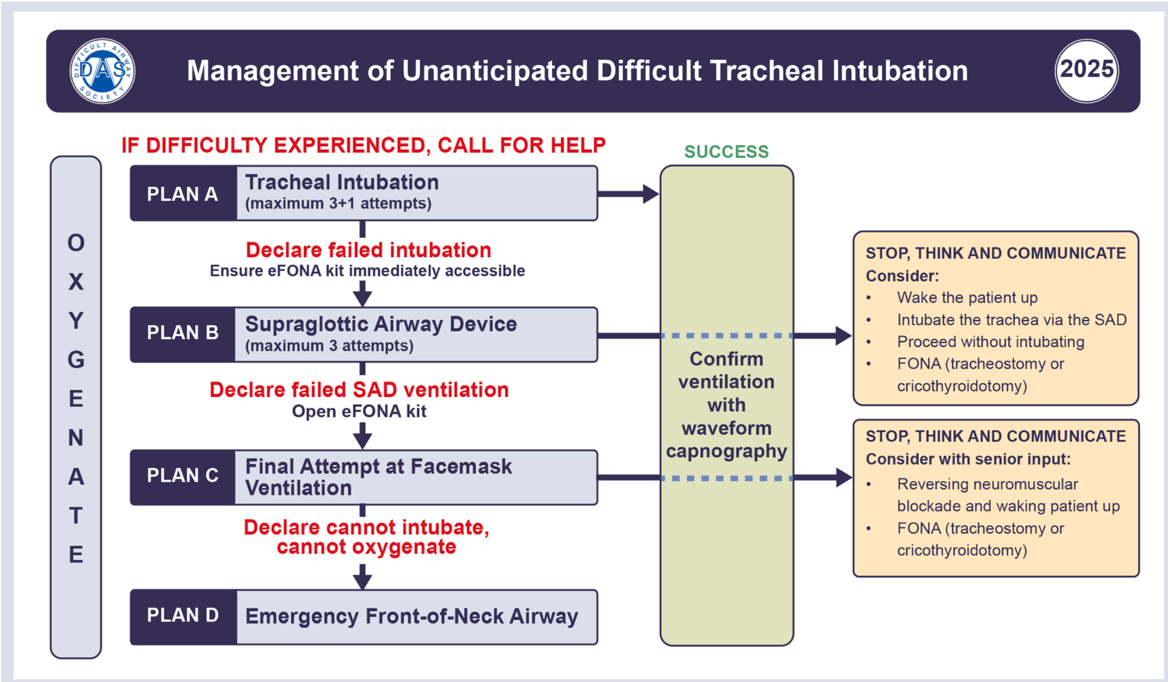

Fig 1. Management of unanticipated difficult tracheal intubation. eFONA, emergency front-of-neck airway; FONA, front-of-neck airway; SAD, supraglottic airway device.

- **If any difficulty is anticipated in Plans A, B, C, or D, awake tracheal intubation should be considered.**
- **The airway management strategy should be clearly communicated with the anaesthetic assistant.**
- **Airway management should be discussed as part of the theatre team briefing.**
- **Patient position should be optimised before pre-oxygenation and for tracheal intubation.**
- **Equipment for delivering Plans A–D must be immediately available in all areas where airway management is performed.**
- **Out-of-hours airway management is associated with increased risks; teams should plan accordingly.**
- **Optimal location for airway management should be considered.**
- **Consider a checklist when performing emergency tracheal intubation.**

Monitoring

Patient monitoring is essential in the provision of safe anaesthesia. The Association of Anaesthetists has published recommended standards for monitoring during anaesthesia and recovery.[78] In addition to minimum monitoring (pulse oximetry, noninvasive blood pressure, electrocardiography, and temperature), patients undergoing general anaesthesia require inspired and expired oxygen monitoring, and waveform capnography.

Pre-oxygenation is important to maximise the safety of airway management. During this process, clinicians can achieve two objectives: assess the efficacy of pre-oxygenation by targeting an end-tidal oxygen fraction (ETO_2);[35] and check that waveform capnography is working and correctly interpretable. Efficacy of pre-oxygenation is generally tested by targeting an ETO_2 of $\geq$0.9 when using a facemask,[79] but with use of HFNO techniques, this monitoring method can be less reliable.[25] Waveform capnography is the gold standard airway monitor,[9] however cases of both misinterpretation of the monitor and monitoring failure have been reported,[80,81] which were associated with devastating consequences.

After induction of anaesthesia, uninterrupted waveform capnography is essential to demonstrate effectiveness of facemask ventilation, and is the most sensitive and specific monitor to exclude oesophageal intubation.[22] When used in isolation, clinical tests (e.g. tube misting, chest rise, or auscultation) are unreliable.[82,83] Repeated evidence of serious consequences of unrecognised oesophageal intubation underscores the importance of functioning and continuous monitoring of waveform capnography.[14,84] Confirmation of tracheal intubation requires more than one variable to be assessed: 1) waveform capnography; and 2) visualisation of the tracheal tube entering or in the trachea, where possible. Although there are data to support the accuracy of ultrasound for confirming tracheal intubation,[85,86] it is potentially time-consuming and impractical, requires training, and could distract from immediate clinical care.

Task fixation and loss of situational awareness are recognised risks in airway emergencies.[87] Starting a timer when administering neuromuscular block can help clinicians appropriately time tracheal intubation and prompt transition through the algorithm in the event of unsuccessful attempts.[17] Audible triggers or alarms, particularly for oxygen saturation (Spo_2), might further reduce the risk of task fixation.[17]

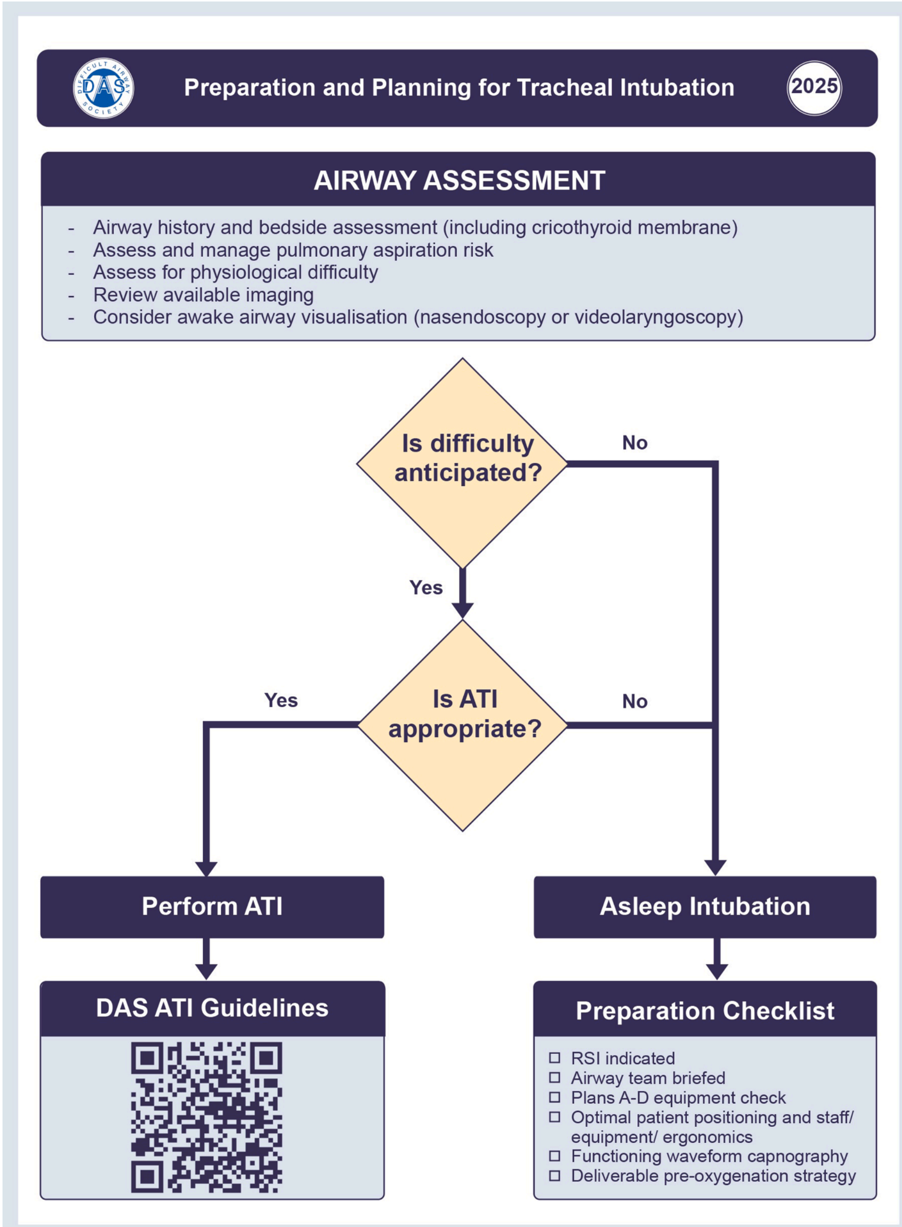

Fig 2. Preparation and planning for tracheal intubation. ATI, awake tracheal intubation; RSI, rapid sequence induction and intubation.

The Association of Anaesthetists recommend quantitative neuromuscular monitoring before tracheal intubation.[78] This can guide appropriate timing of tracheal intubation attempts, and also reduce the risk of complications during maintenance and after extubation.

Recommendations

- **Waveform capnography should be checked before induction of anaesthesia.**
- **Audible Spo_2 tones should be enabled before induction of anaesthesia.**
- **Continuous, uninterrupted waveform capnography should be used throughout all phases of airway management.**
- **Quantitative neuromuscular monitoring should be used to confirm adequate neuromuscular block before tracheal intubation attempts, when feasible.**
- **Institutions should provide equipment that enables patient monitoring in accordance with current Association of Anaesthetists recommendations.**

Drugs

Successful airway management can be affected by the choice of anaesthetic induction agent, dosing, administration method, and anticipated adverse effects. Propofol is the most widely used induction agent, providing favourable conditions for airway management. However, it can be associated with haemodynamic instability and aggravating physiologically difficult airway management.[14,19,88] Other drugs or combinations of agents can have a more favourable cardiovascular profile for induction of anaesthesia,[89–91] but it is useful for clinicians to prepare for haemodynamic instability regardless of induction agent.

A single bolus dose of propofol might be insufficient to maintain general anaesthesia during difficult airway management, posing a potential risk of accidental awareness under general anaesthesia in these settings.[92]

Historically, inhalation induction of anaesthesia in adults was thought to be a viable option when difficult airway management was anticipated. However, this technique is associated with substantial risks, and data suggest that it is not reliable in adults.[93]

Neuromuscular block is known to improve the effectiveness of facemask ventilation,[94,95] and is superior to alternative strategies for successful tracheal intubation without complications.[96,97] Each neuromuscular blocking agent has its own characteristics that must be considered. Although there is high-quality evidence that suxamethonium can provide better intubating conditions than rocuronium,[98] this should be balanced against the side-effect profile of suxamethonium. Moreover, data suggest that suxamethonium can be associated with an increased risk of postoperative pulmonary complications.[99] Rocuronium is used increasingly, possibly owing to the greater availability of sugammadex for reversal. Although there are cases in which sugammadex was used to antagonise neuromuscular block during 'cannot intubate, cannot oxygenate' (CICO) scenarios,[100] this is not a reliable strategy in failed tracheal intubation.[101] This is because it can be associated with significant risks (e.g. laryngospasm or pulmonary aspiration), does not guarantee a patent and manageable upper airway, and potentially might distract clinicians from immediate airway management (e.g. time taken to obtain and draw up enough sugammadex for full reversal of neuromuscular block). Regardless, the importance of effective neuromuscular block during tracheal intubation and throughout airway management cannot be understated. Neuromuscular block improves the likelihood of successful tracheal intubation, SAD ventilation, facemask ventilation, and eFONA.[102–104]

Recommendations

- **Neuromuscular blocking agents should be routinely used to facilitate tracheal intubation.**

Peroxygenation

Peroxygenation is the process of continuous oxygen delivery from before induction of anaesthesia (pre-oxygenation), during apnoea (apnoeic oxygenation), and throughout attempts at airway management (e.g. laryngoscopy) until the airway is secured.[35]

Pre-oxygenation is essential to prolong the safe apnoea time after induction of anaesthesia.[105] It increases the oxygen reserve, delays the onset of hypoxaemia, and allows more time for laryngoscopy, tracheal intubation, and airway rescue should intubation fail.[105] Pre-oxygenation requires consideration of: (1) devices (e.g. facemask, HFNO, noninvasive ventilation); (2) patient positioning (e.g. supine, head up); (3) breathing technique (e.g. tidal volume, vital capacity breathing); (4) oxygen flow rates; and (5) pressures applied (e.g. pressure support, PEEP).

The head-up position and positive pressure during pre-oxygenation increases functional residual capacity and, thus, the total volume of oxygen available during apnoea and laryngoscopy.[105] Therefore, the most effective strategy for pre-oxygenation involves using a positive pressure technique in the head-up position, either with HFNO, noninvasive ventilation, or facemask with continuous positive airway pressure.[25,106–108]

After induction of anaesthesia, oxygen delivery should continue through facemask ventilation. During attempts at laryngoscopy, facemask ventilation is not possible, but continuous oxygen delivery can still be achieved with nasal cannulae (low or high flow). This can further prolong safe apnoea time; however, a patent airway is essential. When using some high-flow cannulae, further attempts at facemask ventilation might require removal of the cannulae to allow for an effective seal.[35,109] HFNO involves an oxygen flow rate that exceeds peak inspiratory flow rate (typically >30 L min^{-1}). HFNO has a growing evidence base and has been used for prolonged safe apnoea in numerous settings.[110] Apnoeic oxygenation, ideally with HFNO, is particularly important in patients at risk of having a physiologically or anatomically difficult airway, as they can have rapid desaturation or prolonged tracheal intubation attempts.[110] If difficult airway management is encountered whilst HFNO is being used, it should be continued and requires maintenance of a patent airway. However, clinicians should beware that HFNO has limitations, might not prevent hypoxaemia (though might delay it),[111] and should not be started as a rescue technique when facemask ventilation has failed.

Recommendations

- **All patients should be pre-oxygenated before induction of general anaesthesia.**
- **Pre-oxygenation should be performed in the head-up position and with a technique allowing positive pressure, where feasible.**
- **In patients with a risk of difficult airway management, peroxygenation should be used, ideally with high-flow nasal oxygen.**

Plan A: Tracheal intubation

The essence of Plan A remains to ensure successful (confirmed with waveform capnography) tracheal intubation at the first attempt without complications, limiting the number and duration of attempts at tracheal intubation whilst maintaining oxygenation (Fig. 3).

Laryngoscopy

Videolaryngoscopy improves the safety and efficacy of tracheal intubation compared with direct laryngoscopy across a range of patients, settings, and operators.[20,23,31,112] Therefore, a videolaryngoscope should be used first line to facilitate

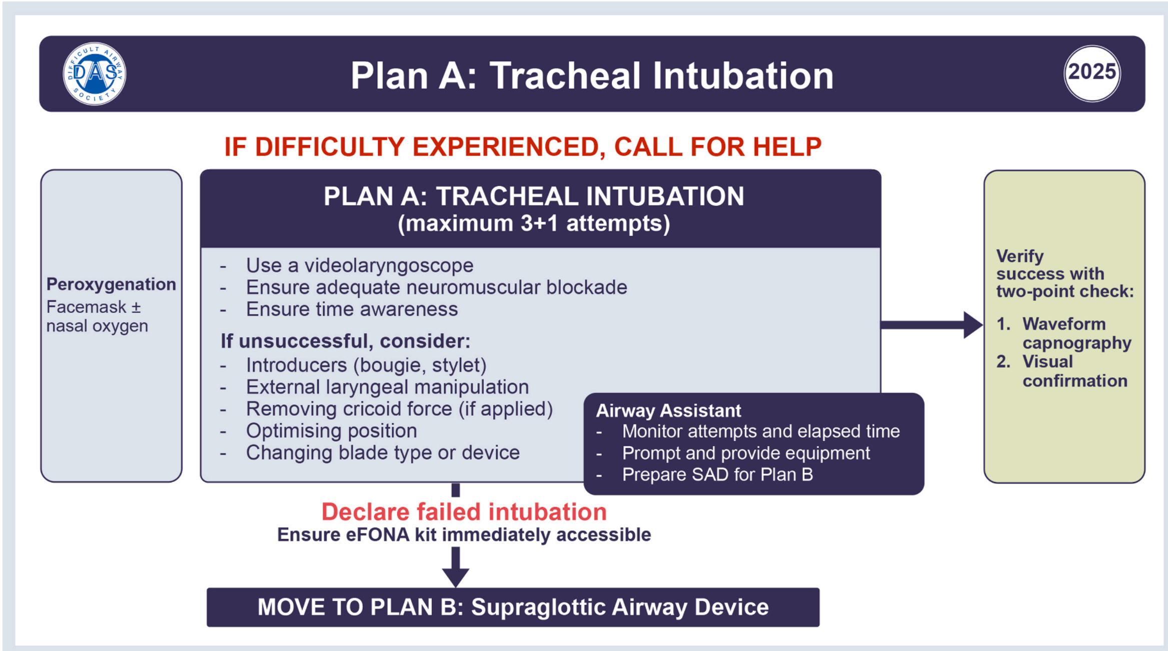

Fig 3. Plan A: Tracheal intubation. eFONA, emergency front-of-neck airway; SAD, supraglottic airway device.

tracheal intubation whenever possible. There are a variety of videolaryngoscopes available and evidence suggests they are effective at increasing first-attempt success, reducing hypoxaemia, and reducing the risk of oesophageal intubation compared with direct laryngoscopes.[20,31] There is currently no strong evidence to recommend one blade design over another.[20] Specific blade types (e.g. hyperangulated, Macintosh type) require different techniques to facilitate successful tracheal intubation.[113,114] Local provision will be influenced by various factors (e.g. widespread availability)[115] and should be supported by training and regular use.[116] Tracheal intubation can also be achieved with a range of other devices, such as optical stylets,[117] although their effective use requires training.[118]

Tracheal tube introducers

Bougies (static or dynamic) and stylets are tracheal tube introducers that can facilitate more effective tracheal tube delivery. They can be used routinely in a range of settings, such as with a reinforced tracheal tube or during rapid sequence induction and intubation. They can also facilitate tracheal intubation when unexpected difficulty is encountered. The evidence for efficacy and safety of one introducer over the other is unclear.[29,30,119–124] In particular, when using a videolaryngoscope with a hyperangulated blade, a stylet, bougie, or flexible bronchoscope should be used. Introducers should be shaped appropriately before use.[120,125] There is a potential risk of airway trauma from the use of either a bougie or stylet,[30] but this must be balanced against the benefit of increased likelihood of successful tracheal intubation.[120]

Blind (Cormack–Lehane grade 3 or 4 view of the glottis) bougie insertion can be associated with trauma or device misplacement and should be avoided.[30,126,127] The 'hold-up' sign can indicate passage of the bougie into the bronchial tree,[128] but can be associated with risk of airway perforation and trauma and should be avoided.[127]

External laryngeal manipulation

External laryngeal manipulation can be performed by a trained assistant to improve the glottic view. Manual displacement of the larynx with backward, upward, rightward pressure (BURP) on the thyroid cartilage manoeuvre can improve the glottic view.[129,130] It is possible that the shared visibility of the glottis with videolaryngoscopy might make the effectiveness of external laryngeal manipulation greater, although there are currently no studies to support this.

Attempts

Tracheal intubation requires successful laryngoscopy and successful insertion of a tracheal tube. A successful attempt is defined as a tube placed in the trachea after instrumentation with a device, introducer, or both, confirmed with waveform capnography and visualisation[131] when possible.

Each successive attempt at tracheal intubation increases the risk of complications, including airway trauma, and reduces the likelihood of successful intubation.[72] This underscores the importance of making the first attempt the best attempt. A suboptimal attempt is a wasted attempt. These guidelines maintain the principle of 3+1 attempts: a maximum of three attempts at intubation, with a fourth and final attempt only being undertaken by a more experienced colleague. Each subsequent attempt should involve a change to increase the likelihood of success. Any change should be informed by previous attempts, such as adjusting positioning; change of laryngoscope or blade; use or change of an introducer; change of operator; external laryngeal manipulation or airway suction; removal of cricoid force if applied; or optimising neuromuscular block.[132] If hypoxaemia occurs at any time during intubation, the attempt should be abandoned and oxygenation prioritised with facemask ventilation. Oxygenation with facemask ventilation should continue between tracheal intubation attempts, and anaesthesia maintained.

Failure of Plan A can be declared at any time, even after the first attempt at tracheal intubation. This decision can be made when clinicians cannot identify any changes to improve the likelihood of success (e.g. impossible laryngoscopy despite optimal conditions) or if further attempts may lead to complications (e.g. airway obstruction or failure of facemask ventilation). At this stage, a decision can be made to discontinue anaesthesia, but this requires either insertion of a SAD or effective facemask ventilation until full reversal of neuromuscular block and emergence from anaesthesia.

In the event of unsuccessful tracheal intubation after the maximum 3+1 attempts, the operator should declare 'failed intubation', move onto Plan B, and ensure the eFONA kit is immediately accessible (priming). Appropriate assistance must be summoned.

Confirmation of tracheal intubation

A two-point check has been advocated to confirm tracheal tube placement, where the tube is seen to pass through the vocal cords and confirmed by the presence of sustained exhaled carbon dioxide on waveform capnography.[22,24] Although sustained exhaled carbon dioxide can exclude oesophageal intubation, it does not confirm correct placement of the tube in the trachea when used in isolation, as the tube can be in the bronchus or in the pharynx.[133–135] Thus, visualisation of the tracheal tube passing through the cords or within the trachea is important. A two-person check has also been suggested, but warrants further research.[24]

Recommendations

- **A videolaryngoscope should be used for tracheal intubation whenever possible.**
- **Airway managers should be aware of the differences in videolaryngoscope blade types and techniques.**
- **Airway managers should attain and maintain competence in the use of videolaryngoscopes available in their department.**
- **The number of intubation attempts should be limited to a maximum of three, plus one final attempt by a more experienced colleague (3+1).**
- **A stylet, bougie, or flexible bronchoscope should be used with a hyperangulated videolaryngoscope blade.**
- **Successful tracheal intubation ideally should be confirmed with a two-point check: sustained exhaled carbon dioxide and visualisation of the tracheal tube through the vocal cords.**
- **In the event of a poor glottic view during laryngoscopy, consider use of external laryngeal manipulation.**
- **When difficulty with laryngoscopy or tracheal intubation occurs:**
  a. **Continue oxygenation throughout**
  b. **Maintain anaesthesia**
  c. **Optimise head and neck position; optimise blade size and type; consider adjuncts; optimise tube size and type; external laryngeal manipulation; remove cricoid force; optimise neuromuscular block; change operator; suction; and optimise ergonomics**

Facemask ventilation

Facemask ventilation is a core airway skill that is required in all stages of the algorithm. Effective performance requires training and experience to maximise the likelihood of success, particularly in difficult airway management scenarios. When facemask ventilation is difficult, the risk of failed tracheal intubation increases more than 10-fold.[2,136]

Prediction of difficult facemask ventilation is generally poor;[48] however, an assessment should still be made. Features associated with difficult facemask ventilation include a previous history of difficulty; obstructive sleep apnoea; radiotherapy; high BMI; increased neck circumference; Mallampati 3/4; and male sex. Scoring systems can also predict difficult facemask ventilation.[137,138]

Neuromuscular block improves ease of facemask ventilation.[103,139–141] After pre-oxygenation, induction of anaesthesia, and administration of neuromuscular block, facemask ventilation with 100% oxygen should be commenced. Clinicians should not delay administration of neuromuscular block to confirm facemask ventilation. If HFNO is used, effective facemask ventilation should still be confirmed.

Effectiveness of facemask ventilation should be confirmed with waveform capnography, and ease can be classified using the Lim and Nielsen scoring system (Supplementary File 4).[142] Facemask ventilation can be improved by techniques and adjuncts. Techniques include ensuring a correctly sized mask with an airtight seal, increasing fresh gas flow, chin lift and jaw thrust, two-person technique, and correct hand positioning. Although data are limited, there is evidence that the VE two-handed grip is more effective than the CE two-handed technique.[143] Adjuncts such as oropharyngeal and nasopharyngeal airways can also improve the effectiveness of facemask ventilation, but must be sized appropriately.

Ease or effectiveness of facemask ventilation may change throughout the process of airway management. Subtle changes (e.g. increased airway pressure, reduced tidal volume, loss of facemask seal, deteriorating capnography trace, or increasing operator effort) may be early indicators of progressive airway difficulty or pending failure of Plans A–C. These changes should be verbalised to the team, help should be sought immediately, and the airway strategy adjusted appropriately.

Recommendations

- **Do not delay administration of neuromuscular block to check facemask ventilation.**
- **Facemask ventilation should be used to maintain oxygenation between attempts at airway instrumentation.**
- **Airway manoeuvres, adjuncts, or both can be used to improve ease of facemask ventilation where required.**
- **When facemask ventilation is difficult, this should be verbalised to the team, help should be sought immediately, and the airway strategy adjusted appropriately.**

Plan B: Supraglottic airway device

The principle of Plan B is that ongoing oxygenation should be maintained using a SAD as the initial plan for tracheal intubation has failed (Fig. 4). Effective oxygenation through a SAD gives the opportunity to stop, think and communicate the next steps with the team. The default decision should be to discontinue anaesthesia. Other options are high-risk and should only be considered with senior input (e.g. a more experienced anaesthetist or surgeon). These options include: continue with SAD *in situ* (without intubating the trachea), intubate the trachea via SAD, or perform a FONA (tracheostomy or cricothyroidotomy).

Second-generation SADs offer important benefits over first-generation devices. Second-generation SADs are designed to reduce risk of aspiration. They generally have a higher pharyngeal seal, they can have a drainage port, and many are better suited as a conduit for intubation than first-generation devices.[144,145] Among second-generation SADs, current cuffed devices have higher oropharyngeal leak pressure and allow adjusting cuff pressures.[146] Insertion success rates do not appear significantly affected by design.[145] There is insufficient high-quality evidence in clinically relevant insertion time differences between cuffed and uncuffed second-generation SADs. It is clear that second-generation SADs should be used ahead of first-generation devices. There is currently insufficient evidence to recommend any particular second-generation device or design, but cuffed devices can have potential benefits.[146] Airway managers should attain and maintain competence in the use of the second-generation SADs available in their department.

Most evidence for the use of SADs involves their use as a primary airway device in elective settings, and extrapolation of these data warrants cautious interpretation. The limited evidence suggests that SADs can rescue difficult or failed tracheal intubation in 60–65% of cases, but are underutilised as a rescue technique.[113,147] There is little evidence on a safe maximum number of insertion attempts for effective oxygenation with SADs in Plan B. Extrapolation of evidence suggests that as the number of attempts increases, the likelihood of successful oxygenation with a SAD decreases.[72] Repeated attempts can lead to more airway trauma, making ventilation more challenging, and could delay timely transition to Plan C. Therefore, limiting the number of attempts to a maximum of three is recommended. Each subsequent attempt should involve a change to increase the likelihood of success, such as changing the size or using an alternative SAD, and ensuring full neuromuscular block. Oxygenation with facemask ventilation should continue between SAD insertion attempts.

Stop, think, and communicate

Successful ventilation and oxygenation through a SAD should be confirmed with waveform capnography and pulse oximetry. The next steps should be guided with senior input. Many factors will influence the decision on which option is most appropriate such as operator skill, urgency of surgery, location, equipment availability, and patient condition, but maintaining oxygenation and ventilation should take precedence.

Discontinue anaesthesia

After effective oxygenation through a SAD, the default decision should be to discontinue anaesthesia and wake the patient up, unless proceeding is essential. Compared with the other three options, emergence from anaesthesia is likely the safest way to maintain airway control and allow return of spontaneous ventilation. There is limited evidence, but data suggest that it is usually a viable option.[15,72] However, this is not without risk. Vigilance is required for the potential risk of airway complications on emergence, such as laryngospasm. Considerations include quantitative neuromuscular monitoring to guide full reversal and controlled emergence from anaesthesia.

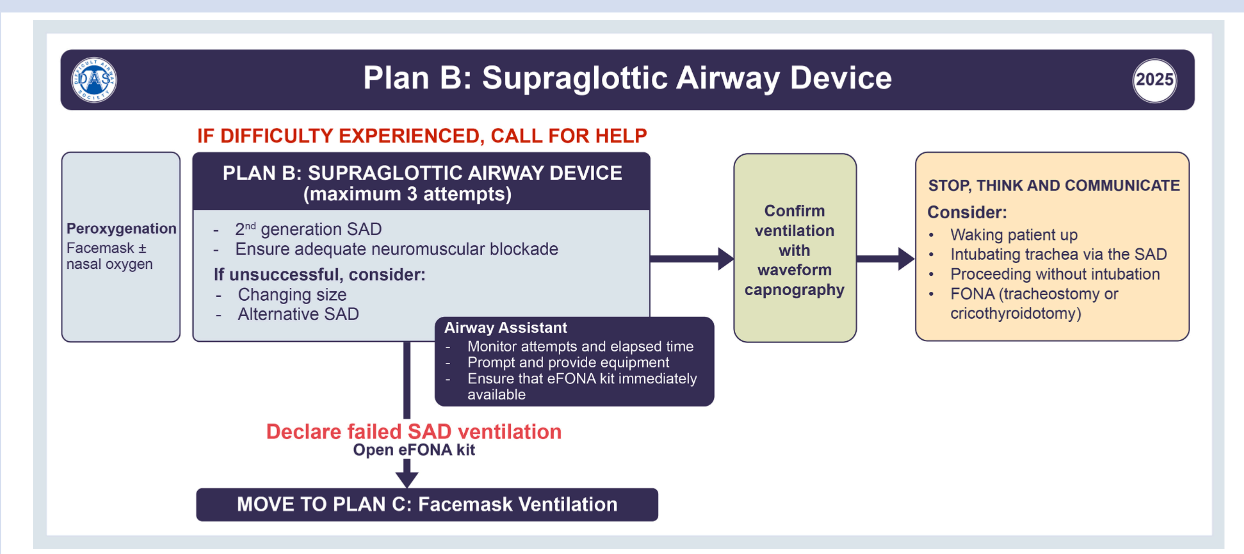

Fig 4. Plan B: Supraglottic airway device. eFONA, emergency front-of-neck airway; FONA, front-of-neck airway; SAD, supraglottic airway device

Proceed with surgery using a supraglottic airway device

This should be considered as a high-risk option reserved for specific or immediately life-threatening situations and should involve input from senior clinicians. The airway might already be traumatised from several unsuccessful attempts at intubation and might deteriorate during the course of surgery because of device dislodgement, regurgitation, airway swelling, or surgical factors. Rescue options are limited given that tracheal intubation has already failed. Despite the good evidence supporting use of SADs in a range of surgical procedures,[28,117,148] there is little evidence in the rescue scenario.

If proceeding with surgery is agreed by the team, effective oxygenation and ventilation must be continually confirmed. Before proceeding with a SAD, all techniques to maximise the likelihood of success should be considered, including optimising cuff pressure where relevant, passing a nasogastric tube to decompress the stomach, and optimising head and neck position and neuromuscular block.[149] Consideration should also be made regarding expediting safe surgery and plans for device failure.

Intubation through a supraglottic airway device

This should be considered an advanced technique and a high-risk option that can fail. If tracheal intubation is essential, consider one attempt at intubation through a well-functioning SAD if the patient is stable, oxygenation is adequate, and the airway manager and assistant are trained in the technique.[150] Tracheal intubation through a SAD that allows this technique can be performed with or without an Aintree Intubation Catheter™, but it must always be performed under visualisation (e.g. with flexible bronchoscopy). Blind techniques should not be performed.

Front-of-neck airway

In rare circumstances, even when it is possible to ventilate through a SAD, it might be appropriate to secure the airway with a tracheostomy or cricothyroidotomy (FONA). This is a more controlled scenario than an eFONA, but is complex and requires senior surgical and anaesthetic presence.

In the event of unsuccessful oxygenation and ventilation after three attempts or at any point during Plan B, the operator should declare failed SAD ventilation, move on to Plan C, and open the eFONA kit. Appropriate assistance must be summoned immediately. Clinicians should recognise that the need for eFONA is increasingly likely at this point.

Recommendations

- **If tracheal intubation fails (Plan A), a second-generation supraglottic airway device should be used to attempt rescue.**
- **Airway managers should attain and maintain competence in the use of the second-generation supraglottic airway devices available in their department.**
- **The number of supraglottic airway device insertion attempts should be limited to a maximum of three.**
- **Once effective oxygenation is established with a supraglottic airway device, stop, think and communicate.**
- **If proceeding is not essential, wake the patient up.**
- **If proceeding is essential and ventilation through the supraglottic airway device is satisfactory, consider continuing with the supraglottic airway device.**
- **If tracheal intubation is essential, consider one attempt at intubation through the supraglottic airway device using a flexible bronchoscope or perform a front-of-neck airway (tracheostomy or cricothyroidotomy).**
- **Blind tracheal intubation through a supraglottic airway device is not recommended.**
- **If supraglottic airway device ventilation is difficult, start priming for emergency front-of-neck airway.**

Plan C: Final attempt at facemask ventilation

Plan C is the final attempt at facemask ventilation after failed tracheal intubation and SAD ventilation (Fig. 5). Up until this point, facemask ventilation might have been possible, but airway trauma and oedema from repeated instrumentation can contribute to increased difficulty. Therefore, every effort must be made to maximise the likelihood of successful oxygenation. This includes ensuring full neuromuscular block; adequate depth of anaesthesia; optimising patient positioning; using an oropharyngeal airway, nasopharyngeal airway, or both; and using a two-person mask ventilation technique. Clinicians should be aware that rapid progression to Plan D might be necessary at this point.

Successful facemask ventilation is demonstrated by a waveform capnography trace and either maintenance or improvement in arterial oxygen saturations. If facemask ventilation is successful, stop, think and communicate with senior clinicians to determine the most appropriate option. This is a complex clinical scenario. If the airway team decides to discontinue anaesthesia, full reversal of neuromuscular block and careful emergence of anaesthesia should be performed. Emergence in this scenario can be associated with risks of further deterioration or complications.[150] Reversal of neuromuscular block could worsen airway obstruction or make facemask ventilation more difficult.[101,151–153] Even if facemask ventilation is successful, proceeding to FONA might be considered.

If facemask ventilation is unsuccessful, declare a CICO scenario, allocate roles to team members, and immediately proceed to Plan D to perform an eFONA.

Recommendations

- **When tracheal intubation and ventilation through a supraglottic airway device have failed, a final attempt at oxygenation by facemask ventilation should be made.**
- **For this final rescue attempt at facemask ventilation:**
  a. **Ensure adequate neuromuscular block**
  b. **Ensure patient positioning is optimised**
  c. **Use airway adjuncts**
  d. **Use a four-handed (two-person) technique**
  e. **Ensure adequate depth of anaesthesia**

Plan D: Emergency front-of-neck airway

Plan D arises when the ability to oxygenate the patient has failed by all other means (Plans A–C), leading to a CICO scenario (Fig. 6). Unless immediate intervention to establish an

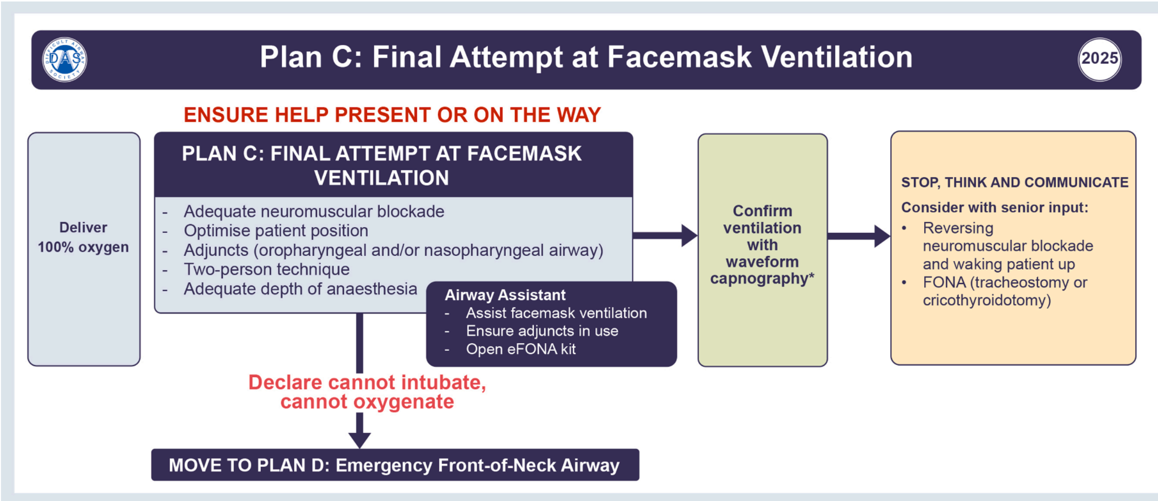

Fig 5. Plan C: Final attempt at facemask ventilation. *At this point, clinical signs might be the only available marker of effective oxygenation. eFONA, emergency front-of-neck airway; FONA, front-of-neck airway.

eFONA and deliver oxygen is achieved, hypoxic brain injury or death will ensue.

Despite the fundamental importance of eFONA, evidence in this area remains limited owing to its rarity and being subject to reporting bias. Data are limited to nonclinical[154–156] or retrospective studies.[157–160] Therefore, pragmatic recommendations are required to optimise decision-making and performance of eFONA. Of note, there is some evidence to support the first-line use of scalpel techniques.[161,162]

Decision-making

There is evidence that choice in an emergency hinders performance.[163,164] Decision-making in crises is almost solely based on previous experiences; in CICO situations this is usually from simulated scenarios. Clinicians should undertake repeated experience of skills training under stress and time pressure in a single technique that will be successful in most situations.[165] The choice of approach in the DAS 2015 guidelines was between a transverse stab incision for a palpable cricothyroid membrane or a vertical skin incision for an impalpable cricothyroid membrane.[9] However, locating the cricothyroid membrane by palpation is unreliable, even in elective settings.[166] A vertical skin incision is suitable for both palpable and impalpable cricothyroid membranes, but a transverse stab incision is only suitable for those in whom the cricothyroid membrane is correctly identifiable by palpation or has been previously marked after ultrasound.[167] Furthermore, a vertical skin incision should make it easier to identify the cricothyroid membrane. The decision regarding cricothyroid membrane palpability should have been made during airway assessment and verbalised by the end of Plan A. However, if this has not been explicitly assessed and determined, or if there is uncertainty regarding palpability of the cricothyroid membrane, we recommend that a vertical skin incision should be performed for eFONA as a default.

Performance

Once CICO has been declared and help has been summoned, the senior member of the team should rapidly allocate roles for the most appropriate person to perform the eFONA, the operator's assistant, and an individual attempting to deliver oxygen by the upper airway if possible. An eFONA should not be attempted without full neuromuscular block. If sugammadex has already been administered, a neuromuscular blocking agent other than rocuronium or vecuronium will likely be required.[168,169] Maximal neck extension is critical to successfully performing eFONA, usually by pushing a pillow beneath the shoulders or extending the head of the bed.

Oxygen should be applied to the upper airway throughout. This can be achieved using a SAD, a facemask, or nasal cannula. There can be advantages to using a SAD in this scenario, including optimal utilisation of staff and easier identification of the cricothyroid membrane.[170]

Equipment (scalpel–bougie–tube)

The required equipment for eFONA are: a scalpel with a number 10 blade, a bougie, and a size 6.0 tracheal tube. Suction is likely to be needed.

Technique

CICO scenarios are variable, but regular training improves the likelihood of success. However, anecdotally, technical variation is common. Surgical technique suggests that a right-to-right position (right-hand dominant operator standing on the right side of the patient) and a vertical incision starting at the thyroid cartilage, cephalad to caudad, can be advantageous. However, there is currently little evidence for this approach and many of the steps in the eFONA technique. Although we propose a specific technique, clinicians must be responsive to the clinical scenario, use approaches most likely to be successful in their hands, and train regularly in their preferred

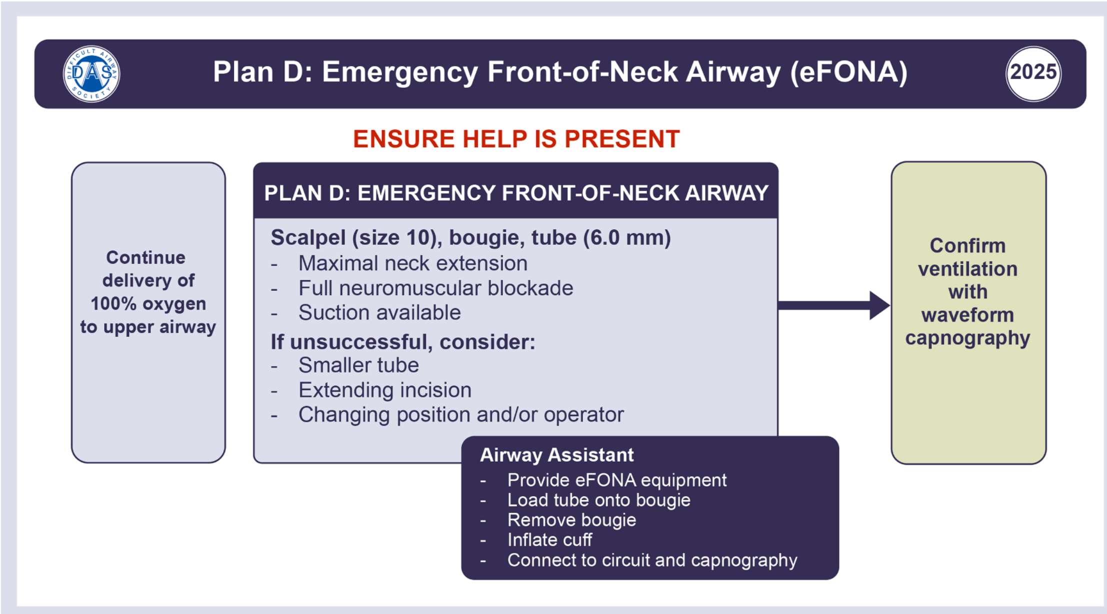

Fig 6. Plan D: Emergency front-of-neck airway (eFONA).

technique. Regardless of the technique, fundamental principles are that the scalpel should be held in the dominant hand and incisions made away from the operator's nondominant hand.

The vertical eFONA technique below remains largely unchanged from the DAS 2015 guidelines (Fig. 7). However, alternative scalpel–bougie–tube techniques are also acceptable, such as those presented in Supplementary File 5. More than one attempt might be required.

(1) Stand on the patient's left-hand side if right handed (reverse if left handed).
(2) Attempt to identify laryngeal anatomy in maximum neck extension and locate the midline with the nondominant hand.
(3) Apply tension to the skin and stabilise the larynx with the nondominant hand.
(4) Make a midline vertical skin incision up to 8 cm in length, caudad to cephalad (bottom to top).
(5) Use blunt dissection with fingers of both hands to separate tissues and identify and stabilise larynx with the nondominant hand.
(6) Use the nondominant hand index finger to identify the cricothyroid membrane.
(7) Hold the scalpel in the dominant hand, make a transverse stab incision through the cricothyroid membrane with the cutting edge of the blade facing towards you.
(8) Keep the scalpel perpendicular to the skin and turn it through 90 degrees so that the sharp edge points caudally (towards the feet).
(9) Swap hands; hold the scalpel with your nondominant hand.
(10) Maintain gentle traction, pulling the scalpel towards you (laterally) with the nondominant hand, keeping the scalpel handle vertical to the skin (not slanted).
(11) Pick the bougie up with your dominant hand.
(12) Slide the coudé tip of the bougie down the side of the scalpel blade into the trachea.
(13) Rotate and align the bougie with the trachea and advance gently to 10–15 cm.
(14) Remove the scalpel.
(15) Stabilise the trachea, apply tension to the skin, and hold the bougie with the nondominant hand.
(16) Railroad a size 6.0 mm cuffed tracheal tube over the bougie with the dominant hand. Rotate the tube as it is advanced.
(17) Remove the bougie.
(18) Inflate the cuff, ventilate with 100% oxygenation, and confirm ventilation with waveform capnography.
(19) Secure the tube.

After emergency front-of-neck airway

After successful eFONA and stabilisation of the patient, complications such as bronchial intubation and pneumothorax should be excluded. Review by a suitable surgeon is required to determine the most appropriate next steps for airway management.[171,172]

Reflection after a significant airway event is important to determine what process and procedural elements can be improved. It is recognised there is a significant psychological impact on those involved in eFONA scenarios extending beyond the individual performing the procedure.[173] Debriefing and signposting those involved to support services is encouraged after events.[174]

In the event of an unsuccessful eFONA attempt, consider extending the incision, performing more blunt dissection down to the cricothyroid membrane, changing position of the patient or operator, changing operator, or changing to a smaller tube. However, we recognise that the situation at this stage is likely catastrophic.

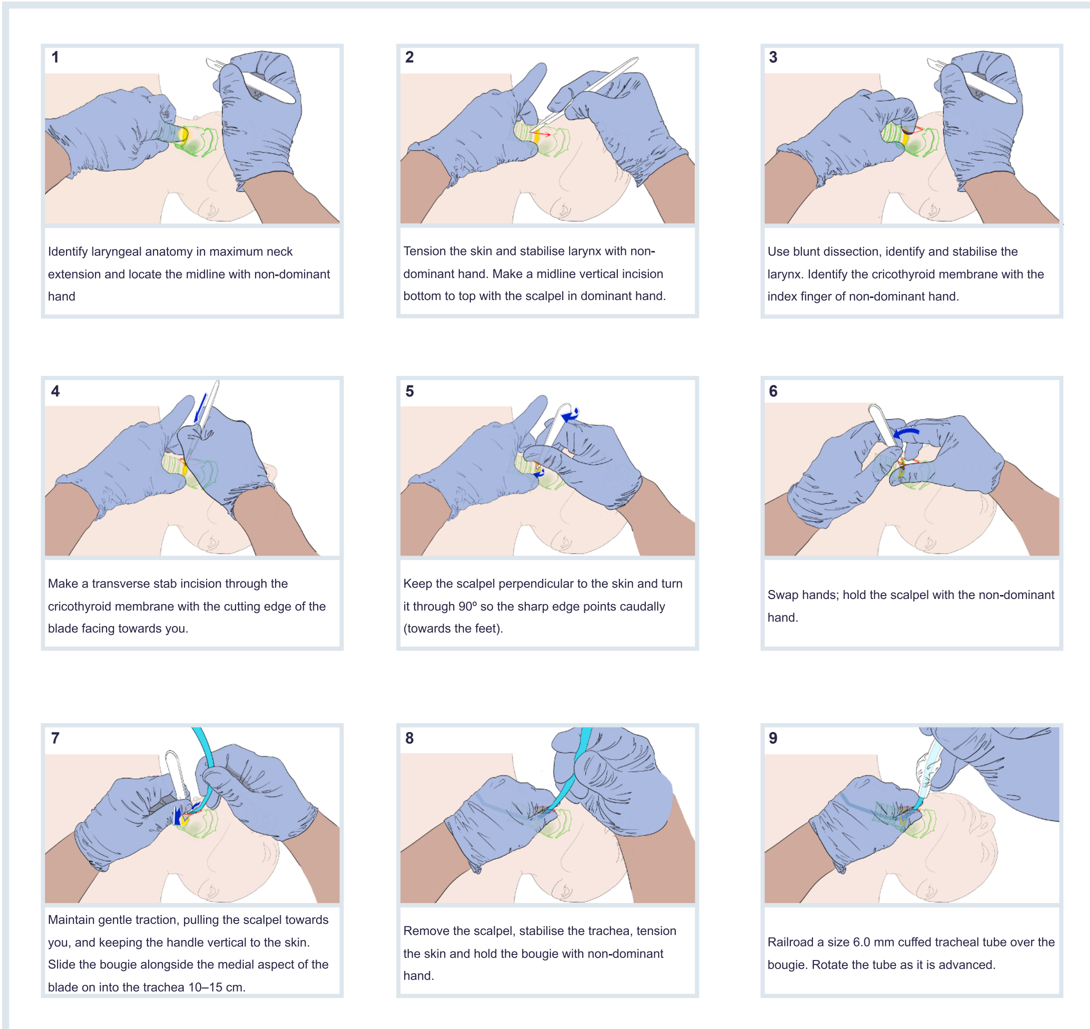

Fig 7. Emergency front-of-neck airway technique.

Recommendations

- **Where Plans A, B, and C have failed, and a 'cannot intubate, cannot oxygenate' scenario exists, an emergency front-of-neck airway (Plan D) must be performed.**
- **Ensure maximal neck extension before performing an emergency front-of-neck airway, where feasible.**
- **Give a full dose of neuromuscular blocking agent before performing an emergency front-of-neck airway.**
- **Psychological support should be available to those who have been involved in an emergency front-of-neck airway scenario.**

Rapid sequence induction and intubation

Rapid sequence induction and intubation (RSI) is used in patients who are identified as being at increased risk of pulmonary aspiration after induction of anaesthesia and before securing a cuffed tracheal tube. Although the same general principles of airway management apply in this setting, there are some specific considerations in patients requiring RSI (Table 1, Supplementary File 6).

Clinicians should consider that these patients might also have a physiologically difficult airway and manage this appropriately.

Cricoid force aims to reduce the risk of pulmonary aspiration before tracheal intubation. Classically defined, it involves the application of 10 N of force before induction followed by 30 N once consciousness is lost.[175] There is variation in the use of cricoid force across specialties and globally[176–179] because of uncertainty in both safety and efficacy.[180] In particular, there are concerns that cricoid force might worsen the view at laryngoscopy, reduce successful tracheal intubation,[181] reduce lower oesophageal sphincter tone,[182] and might not reduce the risk of pulmonary aspiration.

These concerns are not founded in robust contemporary evidence, with unreliable data on the safety and efficacy of cricoid force.[183] There is increasing evidence that localisation of the cricoid cartilage and nearby anatomical structures is likely

Table 1 Considerations for rapid sequence induction and intubation.

Risk assessment	History, examination, and investigations, including point-of-care gastric ultrasound
Prokinetics and antacids	Consider risks/benefits
Nasogastric tube management	Suction if present; consider insertion if not
Suction	On and at hand
Head-up position	≥30 degrees
Pre-oxygenation	ETO_2 ≥0.9 where possible; consider high-flow nasal oxygen
Rapid onset of anaesthesia	Dosing to consider physiology
Rapid onset of neuromuscular block	No latency between induction agent and neuromuscular blocking agent. Ensure sufficient dosing (e.g. 1.2 mg kg^{-1} rocuronium; 1.5 mg kg^{-1} suxamethonium)
Cricoid force	Correct localisation and correct force, performed by a trained assistant
Gentle mask ventilation or apnoeic oxygenation	Low-pressure mask ventilation if required
Videolaryngoscopy	Optimise ergonomics for a shared view
Tracheal tube introducers	Bougie or stylet prepared

inaccurate unless performed with ultrasound.[50,51,184–186] Furthermore, the correct application of force is variable unless the operator undergoes regular training.[187,188] First-attempt and overall intubation success with videolaryngoscopy is not hampered by the use of cricoid force,[189] though it could reduce the ease of tracheal tube advancement.[190] Finally, despite high-quality data, there is no evidence that cricoid force either increases the risk of failed tracheal intubation or reduces the risk of pulmonary aspiration.[189,191] Therefore, given the dearth of definitive evidence, pragmatic recommendations are required. In patients at particularly high risk of pulmonary aspiration, cricoid force should be used. If inserting a SAD in Plan B, or difficulty with laryngoscopy or tracheal intubation is encountered, or active vomiting occurs, cricoid force should be removed.

Recommendations

- **If cricoid force is used and the view at laryngoscopy is poor, it should be removed in an attempt to improve the view.**
- **Assistants providing cricoid force should receive regular training in correct application.**

Physiologically difficult airway

In addition to anatomical factors, airway managers must also consider risks of physiological (e.g. old age, pregnancy) and pathophysiological (e.g. sepsis, cardiac failure) alterations including hypoxaemia, haemodynamic instability and complications on transition to positive pressure ventilation.[19] These alterations could decrease the effectiveness of peroxygenation and precipitate or worsen cardiovascular instability, which can contribute to cognitive overload and impact patient outcomes. Although anatomically or physiologically difficult airways can occur independently, they are particularly hazardous in combination.[192]

Haemodynamic instability is the most common life-threatening complication of tracheal intubation in critically ill adults,[193] but is often predictable and preventable. Therefore, assessment and optimisation before induction of anaesthesia is vital.[194,195] This includes appropriate fluid resuscitation and management, use of vasopressors and choice of induction agent.[88,196,197] Designating a team member to monitor and independently manage haemodynamic status allows the airway manager to focus on tracheal intubation.

Physiological alterations can impair oxygen uptake and delivery, underscoring the importance of pre-oxygenation with a positive pressure technique,[25,26] and of continuing oxygen delivery throughout airway management (i.e. peroxygenation). Multiple attempts at tracheal intubation significantly increase the rate of adverse events in patients with physiologically difficult airways,[193] making first-attempt success particularly important.

Propofol can contribute to haemodynamic instability, highlighting the importance of careful dosing.[88,193] There can also be a role for alternative induction agents such as ketamine, etomidate, and remimazolam in these high-risk patients.[89,198,199]

Recommendations

- **Haemodynamic status should be optimised before induction of anaesthesia, and those at risk of ongoing haemodynamic instability should have a team member nominated to manage this.**

Obesity

Obesity is associated with an increased risk of airway complications, as highlighted in NAP4 and NAP7.[16,71,200] People living with obesity are more likely to be difficult to ventilate with a facemask or SAD. Excess adiposity can make tracheal intubation and FONA more difficult. These risks are compounded by higher basal metabolic rate and reduced functional residual capacity, increasing the risk of rapid haemoglobin oxygen desaturation after induction of anaesthesia. Therefore, ATI, HFNO for peroxygenation, and early use of a SAD should be considered. Recent guidelines from the Society for Obesity and Bariatric Anaesthesia (SOBA) describe how the risks of adverse events might be mitigated in this population; however, it is important to acknowledge that this involves a comprehensive package of measures to create a safe airway strategy.[201] It is vital to optimise patient positioning throughout. The head-up position (≥30 degrees) increases the effectiveness of pre-oxygenation, facemask ventilation, and tracheal intubation.[202,203]

Calling for help should be considered earlier for this group of patients.

Recommendations

- **Consider awake tracheal intubation in people living with obesity.**
- **Patients should be pre-oxygenated in a head-up position (≥30 degrees).**

- **Consider performing airway management in the operating theatre.**
- **Consider use of high-flow nasal oxygen for peroxygenation.**
- **Consider early use of a second-generation supraglottic airway device for ventilation if facemask ventilation is suboptimal.**

Human factors

The science of human factors and ergonomics is central to airway management.[87,204,205] Although technical and nontechnical skills are considered and taught independently, they are complementary and interdependent.[206] Education and training are reported as the least effective control to improve patient safety.[17] Mitigations, barriers, and design changes are more effective, and specific examples can be seen in Supplementary File 7.

Priming

In these guidelines, priming is the process of preparing for eFONA in parallel to Plans A to C. It aims to ensure immediate availability of necessary equipment, and that appropriately skilled staff are present and cognitively prepared. After declared failure at tracheal intubation, the operator and assistant should ensure the eFONA kit is immediately accessible, declaring clearly who is the most appropriately skilled individual to perform eFONA. After a maximum of three attempts at oxygenation through a SAD, the assistant should open the eFONA kit.

Transitioning

Transitioning is recognising that Plan A, B, or C has failed and immediately moving on to the next step of the algorithm. As part of airway crisis management, this is often poorly executed owing to task fixation or excessive efforts at failing techniques, potentially leading to airway trauma and progression to CICO.[136] Each transition should be declared clearly to the whole team and should trigger seeking appropriate help. The need to end attempts at a plan and move on can be prompted by the assistant or another member of the team.

Cardiac arrest algorithms effectively use time-based transitioning,[207] which is not always practical in airway management crises. However, triggers such as number of attempts at a technique, time taken, and physiological response are feasible alternatives to guide transitioning.[136]

Calling for help

Integral to these guidelines is the need to call for help whenever any difficulty is encountered. This should not be related to seniority or role (progression through the algorithm places increasing demand on the airway assistant), and should be determined by the clinical scenario. Who seeks this help, and how, will be dependent on institution, location, scenario, and time. If difficulty is anticipated, airway teams should discuss during the team brief who they will ask for help, and allocate a member of the team (not the airway assistant) to this task.

Airway assistant

The airway assistant plays an integral role in technical and nontechnical aspects of safe airway management. They should be appropriately trained and empowered to confirm sustained exhaled carbon dioxide on waveform capnography, have situational and time awareness, prompt transitioning after the maximum number of attempts, and know when to seek appropriate help.[208] Graded assertiveness tools can be used to facilitate communication with the airway manager.[209,210]

Point-of-care ultrasound

Point-of-care ultrasound has an increasing evidence base in airway management for airway assessment, preprocedural anatomical localisation, and pulmonary aspiration risk assessment. Airway assessment to predict a difficult airway is possible using a number of sonographic measurements and assessments.[59–65] Although this is now well-validated in research settings,[211] its current role and application in clinical practice is unclear and limited.

Airway ultrasound can be used for preprocedural localisation of the cricoid cartilage and the cricothyroid membrane. Manual palpation is often inaccurate for localisation of the cricoid cartilage, with pre-induction sonography proving significantly more accurate for both cricoid cartilage and cricothyroid membrane.[50] In patients in whom difficult airway management is anticipated, pre-induction sonographic identification and marking is beneficial for asleep and awake techniques.[166] This should ideally be done with the neck extended.

Pulmonary aspiration risk assessment with point-of-care gastric ultrasound can influence airway management decisions,[212,213] and is increasingly recognised as a skill anaesthetists should acquire.[214–216] It can be readily learned with supervision, and performed quickly by competent clinicians.[217,218] Despite the challenges in widespread training, this is likely to become as a more commonly used skill for clinicians in the future.

Ultrasound skills are important to advancing practice but they currently lack validated training programmes and rely heavily on enthusiasts to share knowledge and provide teaching.

Documentation

Clear, concise documentation is vital to provide a reference for current and future airway management and to inform case reviews. No minimum standards for documentation of airway management currently exist. However, airway assessment, techniques and equipment used, difficulties encountered, and outcomes should be documented and communicated with staff involved in the patient's immediate and ongoing care (e.g. PACU, ward, or critical care staff). A distinction should be made when a technique has been used purely for training (e.g. intubation through SAD) or when it has been used because of anticipated or actual difficulty.[219]

When airway management has been considered to be difficult, in addition to documentation in the patient's record, this should be communicated verbally and in writing to the patient, and also to their primary care provider using appropriate diagnostic coding (e.g. SNOMED CT 718446005).[220] These details can also be entered into a national registry (e.g. DAS Difficult Airway Registry or DAS eFONA Registry),[48] and recorded using theatre coding systems.

Recommendations

- **Individuals have a professional responsibility to document airway management as provided by their institution.**

Education, training, and institutional responsibility

Education and training in all aspects of airway management are fundamental for the effective delivery of Plans A–D. This must not be limited to device skill acquisition, but should also include other elements such as decision-making, communication, human factors, and guideline implementation. Recognising that airway managers do not work alone, training opportunities should include all members of the multidisciplinary airway team (Supplementary File 8).

Institutional and individual responsibilities

Institutions and individuals have a shared responsibility to ensure effective training. Institutions have a responsibility to provide access to and encourage regular use of any equipment required in Plans A–D. Individuals must ensure that they avail of such clinical training opportunities in an ethically appropriate way.[219] Demonstrable improvement in skill can be shown with relatively few uses of a device; however to achieve reliable first-attempt success without complications requires regular and ongoing training for all grades of airway managers.[114,188,221,222] Airway leads are ideally placed to determine local device choice and facilitate the necessary institutional airway training programmes.[223,224] Mandatory training might be introduced in the coming years,[225] and the responsibility for implementation of this should be shared. Confidential enquiries into airway complications, such as with the 'Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK' (MBRRACE-UK) reports,[226] might be a future aspiration.[227]

Team-based training

Effective delivery of multidisciplinary team training requires institutional direction and support to ensure staff can attend. Training as a team develops a shared approach and understanding. This enables teams to practise the roles of leadership and followership,[228,229] consider how they can optimise human factors, ergonomics,[17] and practise challenging hierarchies in emergency situations.[230,231] This will help promote a culture of psychological safety amongst the multidisciplinary team.[232] However, it is important to understand the need for clear leadership in emergency situations.[233]

Educational opportunities

We recognise that although certain aspects of clinical procedures can be rehearsed (e.g. cricothyroid membrane palpation), practising the complete eFONA technique is usually manikin-based. Manikin and simulation-based training has an important role in skill development,[234] which along with tea trolley training,[235] airway courses and workshops and conferences should be regarded as a foundation for clinical practice. The COVID-19 pandemic demonstrated the potential benefits of learning through webinars and virtual classrooms, and these continue to be an important source of airway education.[236]

Learning from adverse events

Adverse airway events and near misses should be reviewed at departmental morbidity and mortality meetings, ideally moderated by airway leads. This should focus on learning outcomes for individuals and the institution to ensure the prevention of future events and implementation of these guidelines. The airway leads network is an important resource for the sharing of such incidents and their learning nationally.[224]

Training in laryngoscopy

Despite the evidence and availability of videolaryngoscopy, routine use of videolaryngoscopy for tracheal intubation has yet to be achieved in many countries.[39] One barrier might be a fear of loss of skill in direct laryngoscopy. Evidence now supports the effective teaching of both direct and indirect (video) laryngoscopy with a videolaryngoscope.[237]

Capnography interpretation

All members of the multidisciplinary team should be trained in recognising and verbalising the presence of appropriate waveform capnography (sustained exhaled carbon dioxide).[24]

Recommendations

- **Institutions should support and facilitate individuals at all levels to train and maintain competencies in airway management with clinical and nonclinical multidisciplinary training.**
- **Institutions should support clinicians to train with new equipment or guidelines.**
- **Airway leads should reinforce familiarity with the Plan A–D approach amongst airway managers and assistants.**
- **Human factors and team performance under stress should be included in training.**
- **All individuals involved in airway management should have training in capnography interpretation.**
- **All airway managers should be regularly trained in performing an emergency front-of-neck airway.**
- **Every failed intubation and emergency front-of-neck airway should be reviewed and discussed at morbidity and mortality meetings.**
- **Evidence of airway training can be used to support annual performance assessments, such as appraisal.**

Discussion

These guidelines emphasise the importance of maximising the likelihood of successful tracheal intubation at the first attempt; continuous oxygen delivery throughout airway management; confirmation of ventilation with capnography; multidisciplinary team working; and ongoing education and training. We encourage clinicians to prioritise improving the likelihood of successful airway management rather than management of failure whilst being prepared for all eventualities. Importantly, we advocate for early recognition that an attempt at any technique is unsuccessful, learning from this failure for subsequent attempts, and promptly moving on to the next step of the algorithm (Fig. 1).

In keeping with previous iterations (Supplementary File 9),[9] these guidelines are designed to manage unanticipated difficulty when the primary airway plan is tracheal intubation. However, we recognise that elements of these plans will be relevant to any airway management strategy regardless of the starting point. Adherence to these guidelines should reduce the risk of unanticipated difficulty occurring and increase the likelihood of success if difficulty is encountered.

Where the primary airway management plan is a SAD,[14,16] failure requiring subsequent tracheal intubation necessitates entry into the algorithm at Plan A. However, progression through the algorithm should be informed by previous unsuccessful SAD ventilation attempts. If initial attempts at effective oxygenation with a SAD were unsuccessful, it would be futile to repeat these steps, and rapid progression to Plan C might be necessary.

The DAS 2015 guidelines generated debate around eFONA given the recommendations to primarily focus on a scalpel rather than cannula technique.[9] We had similar uncertainties regarding technical elements of the scalpel eFONA approach (e.g. operator positioning, palpable *vs* nonpalpable cricothyroid membrane, transverse stab *vs* vertical incision) owing to a paucity of evidence. We therefore used an expert consensus process to help inform the recommendations for this technique. Given the dearth of evidence, clinicians should choose which scalpel eFONA approach is most likely to be successful in their hands, and train in that technique. Another technical change was the removal of decision-making about a transverse stab *vs* vertical incision depending on cricothyroid membrane palpability in Plan D, but encouraging its consideration earlier in the algorithm. This change was guided by human factors theory, suggesting that decision-making in a crisis can hamper performance.[238] It remains to be seen whether this will improve outcomes in eFONA. Although the eFONA Registry might improve our understanding and lead to changes in technical recommendations,[239] data demonstrate that decision-making throughout airway management continues to be delivered poorly, leading to airway complications.[14,48,71] This highlights that the technical specifics of procedures might be less important than decision-making around eFONA.

There have been advancements in clinical practice since the previous iterations of these guidelines. In the coming years, artificial intelligence will likely play an increasing role in airway management, from education to airway assessment and tracheal intubation. Similarly, technology such as combined videolaryngoscope/endoscope devices or novel introducer designs might become more widely available. There have also been changes in the characteristics of patients requiring airway management. For example, obesity has become increasingly prevalent, surgery in the older patient is more common,[14,15,18] use of TIVA is widespread, and introduction of drugs such as glucagon-like peptide-1 (GLP-1) receptor agonists have all influenced clinical practice. These have affected decision-making and the role of techniques such as cricoid force application, rapid sequence induction and intubation, use of point-of-care gastric ultrasound, and management of physiologically difficult airways. Regardless of the technological and clinical practice changes, the fundamental principles of all airway management strategies are likely to remain, including having a strategy and preparation for failure.

Effective implementation of these guidelines relies on the provision and delivery of suitable education material to support educators and learners. As such, we have developed a multimodal educational package to be used in conjunction with these guidelines to allow multidisciplinary, standardised, and consistent training for the effective delivery of airway management (Supplementary File 8).

There are limitations to these guidelines including evolving techniques and their associated literature base; the lack of RCTs in some areas; and the limitations of trials and meta-analyses. We eagerly await evidence from a number of studies, including the eFONA Registry, and updated analyses of the Difficult Airway Registry, although we recognise the limitations of cohort studies. The recommendations are pragmatic but might not necessarily apply to all scenarios or all airway managers, because of the complexity and heterogeneity of clinical practice. Changes made from the previous guidelines were often based on expert opinion. Finally, some elements of these recommendations might not be applicable to low-resource environments.

In conclusion, these guidelines are designed to support clinicians in delivering airway management that prioritises efficacy and safety. Overall, we emphasise the importance of maximising the chances of success rather than the avoidance and management of failure, to improve outcomes for patients undergoing airway management.

Authors' contributions

Guidelines development: all authors
Manuscript drafting: IA, KE, HI, AFM
Revision and final approval: all authors
Chair: IA
Secretary: KE
Deputy secretary: HI

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bja.2025.10.006.

Supplementary File S1. Systematic review methodology and results.

Supplementary File S2. Recommendations and level of evidence.

Supplementary File S3. HEAVEN and MACOCHA criteria.

Supplementary File S4. Lim and Nielsen scoring system for facemask ventilation.

Supplementary File S5. Emergency front-of-neck airway techniques.

Supplementary File S6. Emergency tracheal intubation checklist.

Supplementary File S7. Example human factors considerations in Plans A—D.

Supplementary File S8. Educational resources for the 2025 DAS Guidelines.

Supplementary File S9. Overview of key changes to the DAS 2025 Guidelines from DAS 2015 Guidelines.

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