# Updates on Airway Management


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**Introduction**

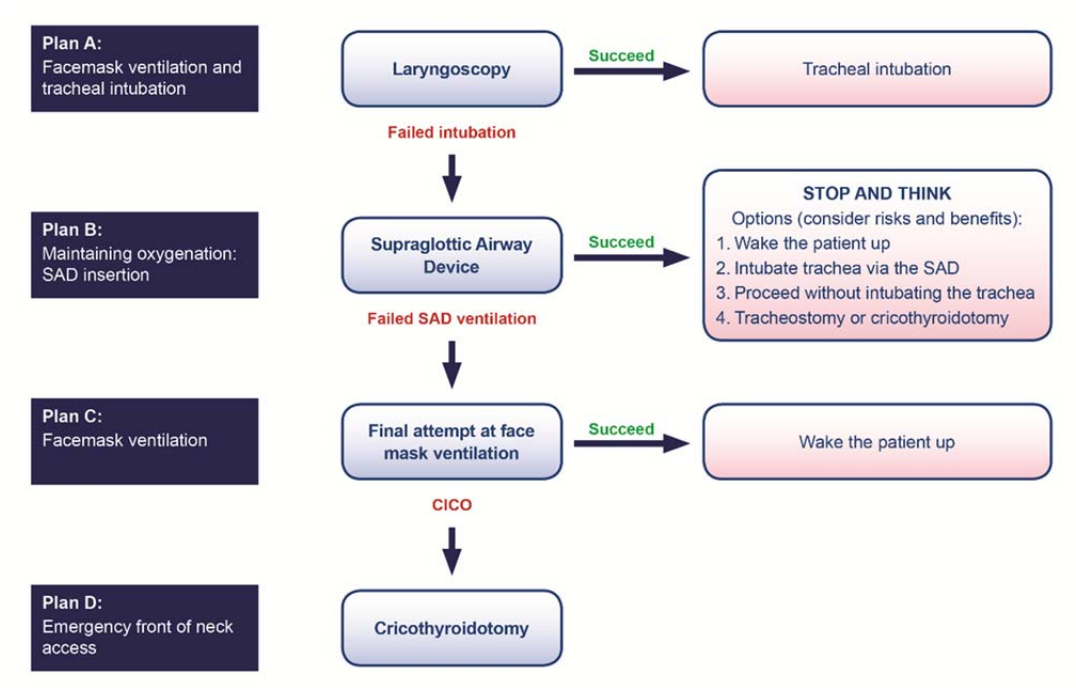
Despite events only occurring infrequently, complications in airway management remain an important contributor to morbidity and mortality during anaesthesia. Complications related to airway management have been well described and been subject to numerous reviews. The accurate data we have suggests that face-mask ventilation fails in 1 in 700 cases, difficulties inserting or ventilating via a supraglottic airway fails in 1 in 50 cases, and tracheal intubation fails in 1 in 1000 to 1 in 2000 cases. These difficulties result in an incidence of CICO of around 1 in 5,000 to 1 in 10,000 cases, with CICO having been reported as responsible for 25% of all anaesthesia- related deaths (1).

Complications related to airway management occur throughout the peri-operative journey. Closed claims databases (2) and the NAP4 (3) reported a similar distribution of airway events with 75% of all events occurring during induction of anaesthesia, and approximately 25% of events occurring during maintenance, extubation and post-anaesthesia recovery.

This presentation aims to cover recent updates in management, covering current airway guidelines as well as recent recommendations regarding airway management techniques

**Guidelines**

There are now many airway management guidelines in publication regarding the management of the difficult airway. The latest update of the DAS guidelines was published in 2015. These guidelines depict a plan A, B, C, D approach suggesting fluid movement through Facemask ventilation and tracheal intubation, maintaining oxygenation through SAD insertion, returning to Facemask ventilation, ultimately resulting in emergency front of neck access if all methods fail to achieve alveolar oxygen delivery. Branching off the flow chart are suggestions for management if any of the techniques result in successful oxygenation.

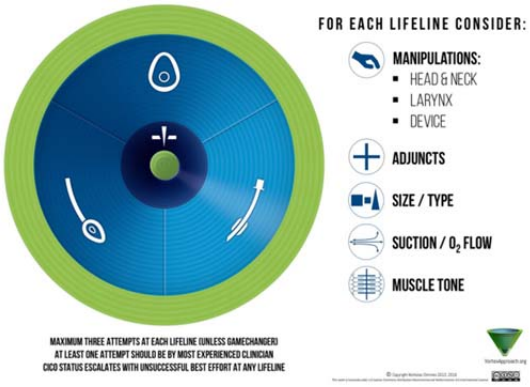



*The Difficult Airway Society Intubation guidelines. This flowchart forms part of the DAS guidelines for unanticipated difficult intubation in adults and should be used in conjunction with text.(4)*

The Vortex approach was designed and developed by Nick Chrimes in Melbourne as a cognitive aid to the management of encountered airway difficulties.

The vortex implementation tool is based on the premise that there are only 3 upper airway 'lifelines' (non-surgical techniques) by which alveolar oxygen delivery can be established and confirmed; facemask, supraglottic airway and an endotracheal tube. If a 'best effort' at each of these three lifelines is unsuccessful, then a can't intubate, can't oxygenate situation (CICO) situation exists and 'CICO rescue' or 'emergency front-of-neck-access' must be initiated.

The design of the vortex is such that with every unsuccessful technique, or 'loss of lifeline' CICO escalates and you move further down into the vortex. If, however, a technique results in successful alveolar oxygen delivery, you move out to the 'green zone' giving the opportunity to reassess the situation and consider the available options (such as wake-up, advanced techniques, more experienced help, FONA)(5).

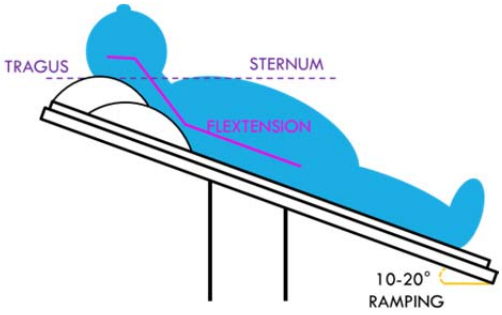



In addition to these guidelines, new guidelines for the management of tracheal intubation in critically ill adults have recently been published in the BJA. These guidelines describe a comprehensive strategy to optimise oxygenation, airway management and tracheal intubation in critically ill adults, in all hospital locations. They stress the role of the airway team, a shared mental model, planning, and communication throughout airway management.

There is currently an international, multidisciplinary group of airway specialist working together to produce a guideline that reflects, as much as possible, the consensus of existing published airway guidelines and can be applied to all episodes of airway care, across boundaries of geography, clinical discipline or context. They aim to present the final universal guidelines at the World Airway Management Meeting (WAMM) in Amsterdam in November 2019.

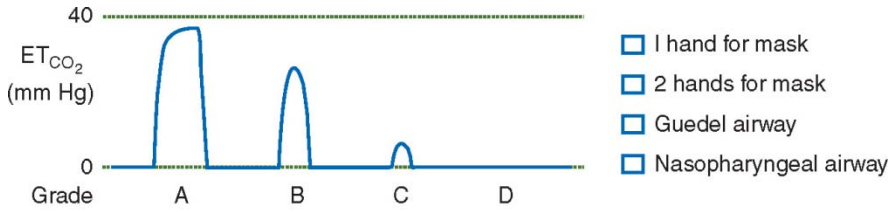
**Positioning**

Recently Tim Cook and colleagues have described a new term that describes anatomically the position required to improve the success of tracheal intubation. They have coined the term 'flextension' (6). This describes the position of the spine that aligns the oral, pharyngeal and laryngeal axis to create as 'straight' a line between the mouth and the glottic opening. This positioning describes flexion at the thoraco-cervical junction and extension at the atlanto-occipital junction. Ramping is useful for both physiological reasons (such as improving FRC, reducing aspiration risk) as well as improving upper airway patency and access in obese patients.




**Bag-Mask ventilation**

Lim et al have recently taken on the challenge of attempting to improve the communication around bag-mask ventilation. Through this they have proposed a new definition for difficult bag-mask ventilation. They propose that difficult mask ventilation is when 'the best attempt results in inadequate or absent exhaled CO2' (7). Using this definition, they propose a new grading scale for bag-mask ventilation




Grade A: plateau present
Grade B: no plateau, $ET_{CO_2} \geq 10$mm Hg
Grade C: no plateau, $ET_{CO_2} < 10$mm Hg
Grade D: no $ET_{CO_2}$

| Grade | Definition |
|---|---|
| A | Plateau present |
| B | No plateau, $ET_{CO_2} \geq 10$mmHg |
| C | No plateau, $ET_{CO_2} \leq 10$mmHg |
| D | No $ET_{CO_2}$ |

This new scale suggests grading the efficiency of bag-mask ventilation on the generation of the exhaled CO2 capnograph. Describing the capnograph allows for standardized and objective communication of mask ventilation outcomes.

The use of this scale does not preclude the subjective comments on mask ventilation such as 'easy' or 'difficult', but explains and justifies them with evidence from the monitor. The grades simply label the sequential phases of the capnograph. As ventilation improves, dead space, mixed and then pure alveolar gas produce the flat=line, upstroke, and plateau. The plateau phase (grade A) is already recognize as a marker of effective mask ventilation (7).

**Apnoeic Oxygenation**

There has been recent interest on the potential for high-flow nasal oxygen delivered by cannulae at up to 60l/min to prolong the safe apnoeic time. This has been shown to be effective during elective apnoeic oxygenation of patients with a normal BMI. However, its value in critically ill hypoxic patients or those undergoing RSI is less clear.

It is worth acknowledging that there are simple alternative methods to deliver oxygen during airway management. These include the use of nasal cannulae at a flow of ≥ 15 l/min once the patient is unconscious or buccal oxygen. The current evidence indicates that oxygenation techniques should be used for all patients in whom difficult airway management is anticipated, and arguably in all patients undergoing general anaesthesia. This is particularly relevant with high oxygen demand (the obese, critically ill, septic and pregnant), those who would be intolerant of hypoxaemia (pregnancy, neurological injury) and in those in whom airway management may be predicted to be prolonged.

**Video- Laryngoscopy**

Within the last 2 years several meta-analyses have been published comparing video-laryngoscopy to direct-laryngoscopy. Notably, Lewis et al. reviewed the literature of all published cases within the operating room (8), and Arulkumaran et al, outside the OR (9).

Lewis et al. concluded that Video-laryngoscopes may reduce the number of failed intubations, particularly among patients presenting with a difficult airway. However, following a sub-group analysis, the only device that did show an improved first-pass success rate was the CMAC video-laryngoscope with the Macintosh-type blade. Currently, no evidence indicates that the use of a video-laryngoscope reduces the number of intubation attempts, the incidence of hypoxia, or respiratory complications.

With a number of video-laryngoscopes currently available for use in clinical areas, communication and documentation of the devices used must be clear. Focus needs to be made on education on the use of each specific device as well as clear documentation when successful intubation is achieved.

**Awake intubation**

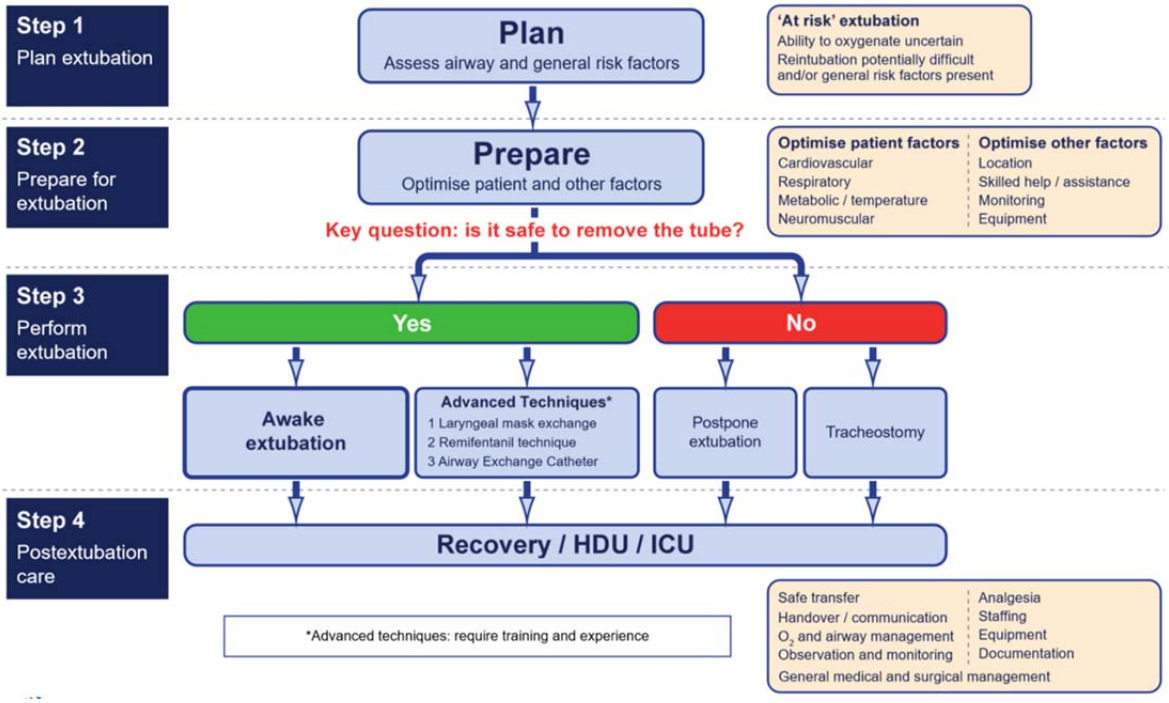
Alhomary et al. recently published a meta-analysis comparing the use of video-laryngoscopy to flexible bronchoscopy for awake intubations (10). There was significant heterogenicity between the studies, and significantly fewer studies published on the use of video-laryngoscopy, however, they did conclude that video-laryngoscopy appears to be safe for awake intubations, and can achieve overall and first-attempt success rates comparable to fiberoptic bronchoscopy.

It is important to be aware of the limitations of video-laryngoscopy for awake intubation.

- Video-laryngoscopes may not be the correct size or shape to match the patient's airway anatomy
- They aren't ideal in limited mouth opening
- They may be difficult or impossible to insert in patients with significant neck flexion deformities
- They have been associated with pharyngeal hyperreflexia

**Extubation**

The majority of complications that occur during extubation and emergence are minor, however, a small and significant number have resulted in serious morbidity or mortality. Up to 25% of all airway events have been related to the extubation and recovery period (3). The Difficult Airway Society developed guidelines for the safe management of tracheal extubation in adults in peri-operative practice. These guidelines discuss potential problems that may arising during extubation and recovery, and promote a strategic approach to extubation. Strategies to the extubation of the difficult airway are outline in a clear concise manner (11).




*The Difficult Airway Society Intubation guidelines. This flowchart forms part of the DAS guidelines for unanticipated difficult intubation in adults and should be used in conjunction with text(11)*

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