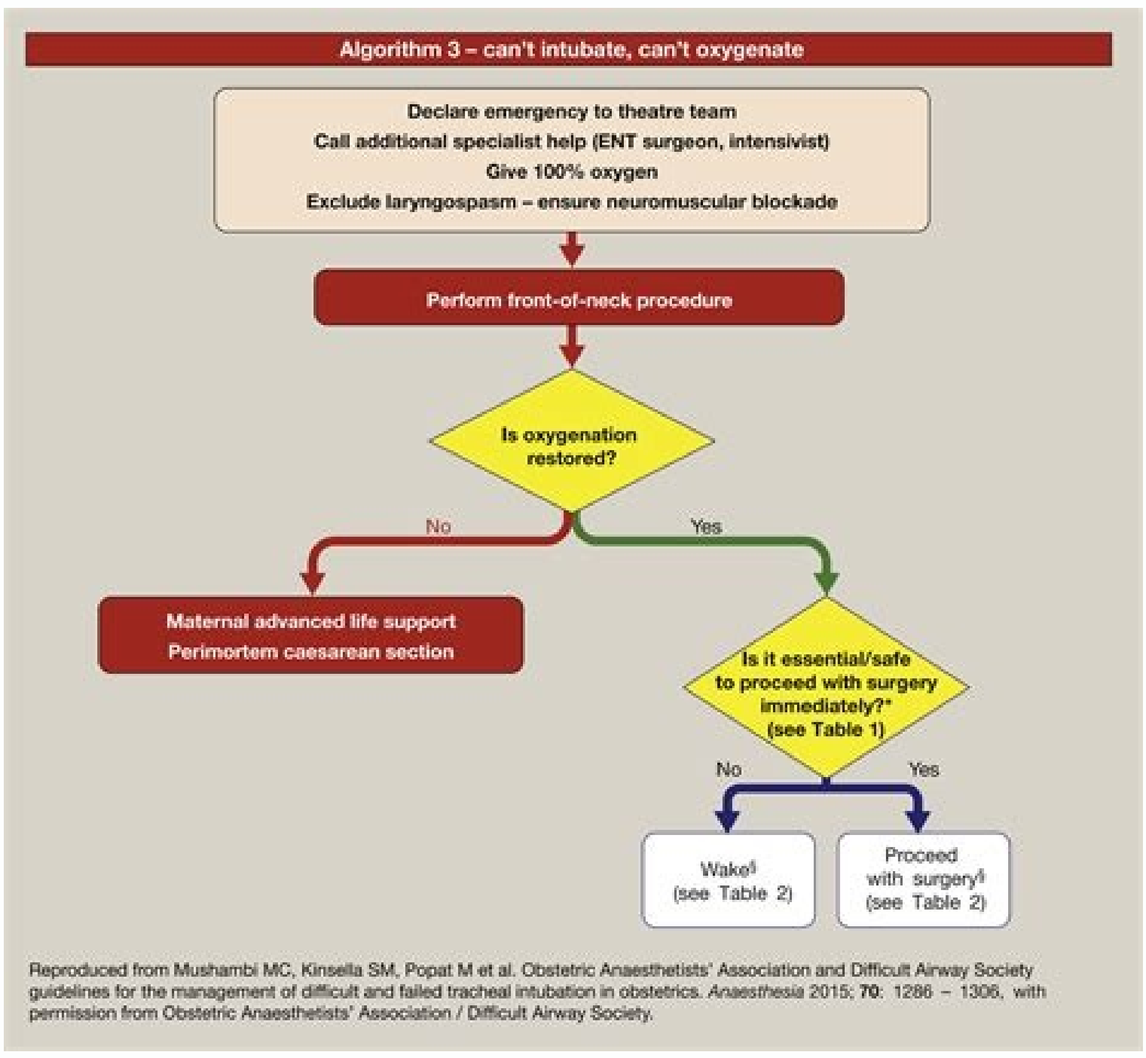
Das difficult intubation guidelines

Table 1. MACOCHA Score Calculation Worksheet

	Points
- Factors related to patient	
Mallampati Score III or IV	5
Obstructive Sleep **A**pnoea Syndrome	2
Reduced Mobility of **C**ervical Spine	1
Limited Mouth **O**pening <3cm	1
- Factors related to pathology	
Coma	1
Severe **H**ypoxaemia (<80%)	1
- Factor related to operator	
Non **A**naesthesiologist	1
Total	**12**

Sources: De Jong et al. 2014a; 2013b
M. **M**allampati score III or IV
A. **A**pnoea Syndrome (obstructive)
C. **C**ervical spine limitation
O. **O**pening mouth <3cm
C. **C**oma
H. **H**ypoxia
A. **A**naesthesiologist Non trained

Coded from 0 to 12
0 = easy
12 = very difficult



Reproduced from Mushambi MC, Kinsella SM, Popat M et al. Obstetric Anaesthetists' Association and Difficult Airway Society guidelines for the management of difficult and failed tracheal intubation in obstetrics. *Anaesthesia* 2015; **70**: 1286 – 1306, with permission from Obstetric Anaesthetists' Association / Difficult Airway Society.

Complications of Intubation

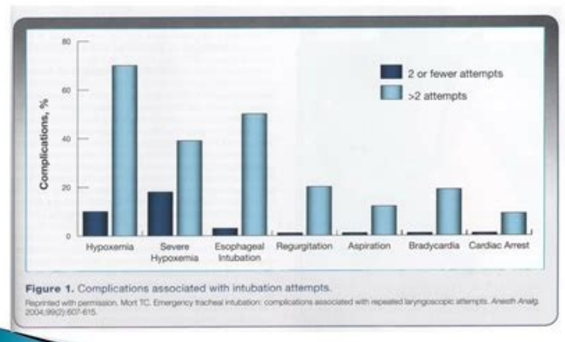


Figure 1. Complications associated with intubation attempts.
Reprinted with permission. Mort TC. Emergency tracheal intubation: complications associated with repeated laryngoscopic attempts. Anesth Analg. 2004;99(2):607-613.

Das guidelines for difficult airway. Das guidelines for management of unanticipated difficult intubation in adults 2015. Das icu intubation guidelines. Das awake intubation guidelines.

The rationale for difficult airway algorithmsThe DAS GuidelinesThe Vortex approachEmergency Intubation ChecklistsThe Difficult Airway Society (DAS) publishes evidence-based, peer-reviewed guidelines for unanticipated failed intubation.1 These guidelines outline relatively simple airway skills, several of which are listed as core competencies for trainees by CICM, ACEM and ANZCA, and all of which are covered in the CCAM course.The Vortex approach is a cognitive aid which moves the intubator between three broad airway management strategies: oxygenation via a face mask, supraglottic airway device (SAD) or tracheal tube. It recommends that when an optimal attempt has failed using each technique sequentially, an emergency surgical airway is performed.Both of these algorithms are designed to enhance situational awareness (where are we now?) and facilitate decision making (what shall we do next?), in an attempt to prevent the intubator from making multiple attempts, potentially making a difficult situation worse. This 'fixation' on one method, leading to a failure to progress to the next one, and eventually to a surgical airway, has long been recognised to be a problem in difficult airway management.2 An analysis of 2833 tracheal intubations in the ICU and ED showed that, when there were more than two attempts at laryngoscopy, the incidence of several harmful complications rose markedly: hypoxemia (70% vs 11.8%); regurgitation of gastric contents (22% vs 1.9%); aspiration of gastric contents (13% vs 0.8%); bradycardia (21 % vs 1.6%); and cardiac arrest (11% vs 0.7%).3The UK Royal College of Anaesthetists Fourth National Audit Project (NAP 4) suggested that this phenomenon is still causing morbidity and mortality, despite the widespread use of algorithms. In the audit, there were several incidents where multiple attempts at laryngoscopy resulted in a 'can't intubate, can't oxygenate' scenario in patients in whom ventilation was initially possible, and several others where an emergency surgical airway was not performed when indicated.4-6The DAS and Vortex algorithms are relatively simple and straightforward, which makes them easy to remember. However, it is clear that clinicians still find it difficult to progress through these algorithms in stressful situations. This is due to a multitude of factors, such as the high stakes involved, but is also due to the fact that failed intubation is a relatively infrequent event. As a result, the skills and behaviours required to follow an airway algorithm to its successful conclusion need to be practised and rehearsed.Some of the practical skills involved (such as cricothyroidotomy) are rarely used in everyday practice and consequently, various authorities have recommended that they be taught in a simulator setting. Furthermore, the acquisition of simple airway skills does not require a full high-fidelity simulator: for example, there is good evidence that practice on a simple model bronchial tree helps trainees gain the manual dexterity required for fibre optic bronchoscopy in real patients.7However, technical skills are only part of the story. As a team of clinicians, we also need to be trained in the attitudes and behaviours needed to manage a crisis. These traits are variously known as 'non-technical skills' or 'human factors' and training in this area often termed 'Crisis Resource Management'.The tragic case of Elaine Bromiley gives us compelling evidence for the importance of human factors and in health care. This 37 year-old mother died during anaesthesia for routine surgery in 2005 when the Difficult Airway Society guidelines were not followed when it proved difficult to intubate her trachea or ventilate her lungs. The independent review which followed Elaine's death concluded that the technical skills of the anaesthetists concerned, facilities and staffing levels were all more than adequate and that human factors such as poor situational awareness, decision making and communication skills, and a lack of adherence to a difficult airway algorithm were responsible for her death.8 Elaine Bromiley's husband, Martin, an airline pilot and a 'human factors' trainer for the airline industry, has responded to this tragedy by founding the Clinical Human Factors Group, an independent organisation that promotes awareness of and training in non-technical skills (www.chfg.org).Please watch Martin's video below for an account of Elaine's case, and how Martin suggests we respond.The DAS guidelines place a heavy emphasis on planning: Plans B, C and D should be decided in advance so that they can be implemented quickly if Plan A (the primary technique) should fail. The guidelines stress that oxygenation takes precedence over everything else during the execution of each plan, and that the best available help should be sought early in cases of difficulty.The DAS guidelines were originally published in 2004, but were updated in 2015. The most significant changes were:-There is one algorithm covering routine induction and RSI (as opposed to separate ones), with maintenance face mask ventilation being supported for all inductions-Video-laryngoscopy is explicitly included-Cricoid pressure should be removed if laryngoscopy or intubation is difficult, and remain off for insertion of a supraglottic airway device (SAD) in Plan B-Plan B focuses on oxygenation using a SAD, with less emphasis on intubation through a SAD, though this remains an option-2nd generation SADs are preferred (e.g. the Proseal LMA™, igel™, Supreme™, Aura Gain™)-The degree of neuromuscular blockade should be actively reviewed when intubation fails-There is emphasis on standardisation and training for Plan D, with surgical cricothyroidotomy ('scalpel, bougie, tube') as the default technique. DAS recommends that cannula techniques should only be used by practitioners who are trained and skilled in the particular technique (i.e. experts only)-There is emphasis on the declaration of difficulty during airway mananagement-There is emphasis on crisis resource management, teamwork and regular rehearsal of the algorithm as a team.These algorithms are designed for peri-operative use rather than the critical care environment. As such they are not applicable to

all critically ill patients. When planning to intubate a critically ill patient, careful consideration must be given to whether the patient can be woken up if the airway cannot be secured. This option is often not available in very sick or badly injured patients, committing the team to progression to a surgical airway if all else fails.-Plan A: maximum 4 attempts at direct or video-laryngoscopy (as long as oxygenation can be maintained between attempts). Emphasis on external laryngeal manipulation-Plan B: no more than 4 attempts at SAD insertion. Decreased emphasis on intubating via SAD. Blind techniques discouraged using ILMA-Plan C: if the above fails, all efforts turn to oxygenation via bag mask ventilation. Manoeuvres are suggested to promote adequate oxygenation. Muscle relaxation should be administered if bag mask ventilation is impossible (with an agent other than rocuronium or vecuronium if sugammadex has been administered up to this point)-At this point, if oxygenation is successful, the patient is woken if possible. If oxygenation is failing, CICO is declared and the CICO algorithm is used-Plan D: the surgical technique is preferred, with emphasis on identification of anatomy ('laryngeal handshake'1 and vertical incision), then a 'scalpel, bougie, tube' technique9The Vortex approach is a cognitive aid designed to help with situational awareness and decision making during difficult airway management.10,11 The main justification for the approach is that in times of stress, clinicians need very simple decision rules which are goal focused, rather than technique focused. The Vortex facilitates decision making by encouraging progression through three broad categories of airway management; oxygenation via face mask, SAD or tracheal tube. An optimal attempt at each technique ('lifeline') should be made, with up to three attempts, before moving onto the next.Optimisation strategiesThe authors emphasise that optimisation strategies should be employed between attempts, as without changing something, the next attempt is as likely to fail as the last. It should also be noted that the approach does not require three attempts, suggesting instead that if a technique is clearly failing with an optimal attempt, a different technique should be used. The Vortex approach includes five optimisation strategies which can be applied to all the upper airway lifelines:Manipulations: of head and neck (e.g. head lift, jaw thrust); larynx (e.g. bimanual laryngoscopy); and device (e.g. two-person technique, bougie left turn)Adjuncts: (e.g. nasopharyngeal airway, laryngoscope for SAD, bougieSize and type: of face mask, SAD, tube or laryngoscopeSuctionPharyngeal Muscle Tone: consider increasing neuromuscular blockadeOnce optimal attempts at all three upper airway lifelines have failed, emergency cricothyroidotomy ('CICO rescue') should be performed.Importantly, in contrast to the DAS guidelines, the Vortex approach advocates CICO resuce even if oxygen saturations are being maintained. In contrast to the DAS guidelines, the Vortex approach does not stipulate the techniques that should be used, rather the goals that should be achieved (adequate face mask, SAD or tracheal tube oxygenation, or CICO rescue).Performing CICO rescue when the oxygen saturations are 100% might seem counter-intuitive. The authors of the Vortex approach justify it on the basis that, once optimal attempts have been made using the three techniques, further attempts are unlikely to be successful, and likely to make the situation worse. They also believe that the patient is less likely to suffer dangerous hypoxia, that the operator will have more time to perform the procedure, and will be calmer while doing so.The final concept in the Vortex approach is the 'Green Zone'. This is the horizontal 'safety zone' which lies outside the Vortex. You are in the 'Green Zone' if you are adequately oxygenating the patient, which is defined by the presence of an end-tidal CO2 waveform and/or rising O2 saturations.Importantly, no value for O2 saturation is ascribed to the Green Zone. This is due to the fact that the interpretation of oxygen saturations is very context dependent. For example, a well pre-oxygenated patient with normal lungs but with a critical airway obstruction may have an SpO2 reading of 90%. This would be of more concern than a patient with chronic lung disease with a good ETCO2 trace and an O2 saturation which had risen to 90% with an optimisation strategy. The authors of the Vortex suggest that rather than define adequate oxygenation numerically, the question should be asked:'Is this patient likely to suffer harm from hypoxia if this SpO2 level persists for the next 15 minutes?'If the answer is 'Yes', then plans need to be made to optimise or change technique.Planning in the Green ZoneWhen you are in the Green Zone there is time to think, make a plan, mobilise resources and consider what will be done if the next plan fails. See 'Considerations for Planning the Green Zone'.Not all Green Zones are the same. Clearly, if you have entered the Green Zone after a short period of difficult mask ventilation, which you then resolve with a simple change in head position, this is very different to having reached the green after three failed intubation attempts, three SAD insertion attempts and a second dose of muscle relaxant. You will be more stressed, with fewer options, and by definition, you are closer to performing a CICO rescue. Rather than a Green Zone at the top of the Vortex, you are in a Green Zone near the pointy end.On the CCAM Course we teach that the DAS algorithm and the Vortex approach can and should be used together. Using this approach, the DAS algorithm is used to plan the techniques to be employed during airway management, which should be voiced to the team before induction of anaesthesia in the Plan A,B,C,D format. The Vortex approach is then used as a cognitive aid to help the team to move from one plan to the next (once they have made their best effort at a particular lifeline).The combination of the DAS algorithm and the Vortex approach is especially relevant to the critically ill or injured patient, where the Vortex lifelines are used in the same order as Plans A,B,C and D of the DAS algorithm (endotracheal tube, supraglottic airway, face mask, CICO rescue). Waking critically ill patients up case of failed airway management is often not an option. Instead, following the combined DAS/Vortex approach will lead the team through Plans A, B, C and D in a familiar order.In association with the developers of the Vortex algorithm, we have created The Emergency Airway Cognitive Tool that we believe contains the essentials of the DAS algorithm and the Vortex approach. This simple visual aid is designed to help the team through the steps of difficult airway management in stressful situations:The following video was made by the creator of the Vortex, Dr Nicholas Chrimes. It portrays what might happen if the Vortex approach is used in cases similar to Elaine Bromiley's. However, as Dr Chrimes points out on his website, it is impossible to know what outcome would have resulted from this approach in Elaine Bromiley's case and the video is purely fictional.Airway management can be a complex task, especially in critically ill or injured patients. Many studies have shown that the incidence of complications and failed intubation is higher out of the operating theatre environment. One recent ED study showed a 24% incidence of difficult laryngoscopy and a 16% incidence of desaturation.12 A UK analysis of 164 out-of-theatre intubations revealed a 13% incidence of desaturation, a 21% incidence of significant hypotension and 4 deaths.13 In an Australian ICU, desaturation occurred in 18% of patients, hypotension in 22%.14In NAP 4, a disproportionately high number of major airway incidents occurred in the ED and ICU, and they were more likely to result in prolonged harm. Thirty six out of 184 major airway incidents occurred in the ICU, with 50% resulting in death, and another 10% brain damaged. This equated to a seventy-fold increased risk of death compared to patients in the anaesthesia cohort. The incidents more likely to occur out of hours and involve junior doctors, and failure to use capnography contributed to 74% of deaths. One of the strongest recommendations from the authors of NAP 4 was the introduction of pre-intubation checklists, so that things like capnography do not get forgotten.6The effect of intubation checklists has not been studied extensively. One study showed little impact on number of intubation attempts or vital signs, although there was little cause for concern in these parameters before the introduction of the checklist.15 A small simulation study has shown better task completion, with no effect on time to intubation.16 Perhaps the most compelling evidence for checklists is a study from a French ICU, where a the introduction of a protocol, with ten separate interventions, resulted in significant reductions in hypoxaemia and hypotension.17How to use an Intubation ChecklistIntubation checklists are designed to be used as a final check, before the induction drugs are given. As such they resemble the operating theatre 'Time out'. The checklist should be commenced when all members of the team think they are ready to proceed. Team members should all be quiet and listen, with the most appropriate person responding to each challenge-response question. For example, the airway assistant would answer the questions about the airway equipment; the drug administrator the questions about drugs. It is acceptable for more than one person to answer the 'Yes/No' questions for the sake of speed.When used in this way, the checklist should take less than a minute to complete. If you have a minute to spare (i.e. the patient is not in extremis), then it is time well spent.Checklists can also be used by individual team members as an aide-memoir, to help them prepare the patient, drugs and equipment. It's a good idea to have a few copies of the checklist available to allow for this.Two examples of intubation checklists are shown below. The first is from from Australia and the second from the UK (see www.saferintubation.com).See also the video from RPA ICU in Sydney, showing their intubation checklist in action.Frerk C, Mitchell VS, McNarry AF, et al. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. British journal of anaesthesia. 2015;115(6):827-848.Greenland KB, Acott C, Segal R, Goulding G, Riley RH, Merry AF. Emergency surgical airway in life-threatening acute airway emergencies–why are we so reluctant to do it? Anaesthesia and intensive care. 2011;39(4):578-584.Mort TC. Emergency tracheal intubation: complications associated with repeated laryngoscopic attempts. Anesthesia and analgesia. 2004;99(2):607-613, table of contents.Cook TM, MacDougall-Davis SR. Complications and failure of airway management. British journal of anaesthesia. 2012;109 Suppl 1:i68-i85.Cook TM, Woodall N, Frerk C, Fourth National Audit P. 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