Towards a universal, holistic, evidence-based consensus on difficult airway management: the new American Society of Anesthesiologists guidelines

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Comment on: Apfelbaum JL, Hagberg CA, Connis RT, *et al.* 2022 American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway. Anesthesiology 2022;136:31-81.

Introduction

Difficulty in airway management is a major cause of anesthesia-related adverse events occurring in the different healthcare settings. The 4th UK National Audit Project (NAP4) estimates an incidence of major airway management complications during anesthesia to be 1:22,000 with a mortality rate of 1:180,000 (1). One in four major adverse events are likely to occur in intensive care units (ICUs) or emergency departments (EDs) and more often leads to persistent neurological damage or death (2). Therefore, airway management is an essential skill for medical specialists. During perioperative intubation, difficult airways show a relatively low incidence (4.4%) (3), slightly increased (4.7%) for critically ill patients (4). The development of new airway devices (5), the publication of national and international airway management guidelines and the possibility of improving technical and non-technical skills based on simulation scenarios contribute to the reduction of severe airway management complications. Nevertheless, closed claims analysis shows a decrease of adverse events occurring during general anesthesia induction, while no decreases are observed during the maintenance or extubation phase (6). At the same time, records of the incidence of intubation failure by direct laryngoscopy show contrasting trends: some studies report an overall reduction over the analyzed period (7), while others report no improvement (8). In this confusing scenario, guidelines

and recommendations represent a reference point for the clinicians facing critical airway challenges. The variety of airway management guidelines and algorithms reflects the difficult goal for different practitioners to manage potentially different patients (9), as strongly recommended by the 2010 Helsinki Declaration of Patient Safety in Anesthesiology (10). However, such a plethora of guidelines could be overwhelming for the clinician dealing with both anticipated and unexpected difficult airways in heterogeneous healthcare settings. Moreover, continuing medical advances and the development of increasingly sophisticated airway devices requires the guidelines to be updated every 5 years at latest.

The aim of this editorial is to compare the different approaches described in the recent airway management guidelines by focusing on the American, British, and French guidelines, as they were reviewed no later than 5 years ago.

American Society of Anesthesiologists (ASA) guidelines 2022

The recently published guidelines replace the 2013 ASA guidelines and differ from previous ones because they were drafted by an international task force of anesthesiologist representing several medical organizations (11). Recommendations are developed through a review process that includes evidence-based literature, expert consensus, opinion polls and random samples from ASA members.

The recommendations included in the updated guidelines are not only applicable to a protected environment such as the operating room, but focus on the management of the difficult airway that may be encountered both inside and outside the hospital. They are addressed to adult, pediatric, obstetric, intensive care, and critically ill patients. The broad applicability is one of the main strengths of these guidelines; the aim is to standardize the approach to the difficult airways regardless of the different past experience of the professionals involved, the work environment, the routine or emergency context. Preliminary airway assessment and adequate preparation, including adopting a strategy before approaching the airway, availability of airway devices, patient positioning and monitoring, are the starting point for difficult airway management. Furthermore, the guidelines emphasize the importance of preoxygenation and oxygen administration throughout the entire airway management procedures, including extubation (12). The 2022 ASA's Difficult Airway Algorithm is based on a "parallel" approach, implementing both anticipated and unanticipated difficult airway management highlighting the importance of risk assessment for early warning of airway management failure in at-risk patients (13). A preformulated strategy, when facing an anticipated difficult airway, is mandatory. The airway strategy should be based not only on the clinician's experience, but also on the accessibility of the equipment, the context in which airway management is performed and the availability of help by an experienced clinician. Guidelines strongly recommend to perform awake tracheal intubation (ATI) in case of suspected difficulty with laryngoscopy and one or more of the following: suspected difficulty with facemask or supraglottic ventilation, increased risk of aspiration, decreased apneic tolerance or suspected difficulty with emergency invasive airway rescue. When approaching an anticipated difficult airway, performing a risk/benefit assessment between a noninvasive and an invasive approach is a first choice at a decision-making crossroad. If the strategy adopted is to proceed with intubation after induction of general anesthesia, the guidelines recommend identifying a preferred sequence of airway devices, being aware of elapsed time and oxygen saturation and limit the number of attempts to prevent potential complications. Recognizing failures help progressing through further steps of the algorithm, including invasive approaches to the airway.

Unexpected difficult airway management represents a frightening event that can occur to specialists while handling with airways. The recommendations emphasize the importance of asking for help, aiming to optimize patient's oxygenation and considering the possibility of waking the patient before a non-invasive or invasive approach to the airway is performed. Particular attention throughout the document is devoted to confirming tracheal intubation, which must be guided by capnography. Finally, these guidelines provide updated recommendations for difficult airway extubation.

The ASA Difficult Airway Algorithm is a simple tool that allows the clinician to take crucial decisions in managing difficult airway while ensuring clear and gradual approaches. It is important to consider that the decision-making depends on a rational approach, the experience and skills of the airway operator and the clinical context where airway management is performed (14).

Difficult Airway Society (DAS) guidelines 2012–2019

In the last decade the DAS has published several guidelines, accompanied by their respective algorithms, aimed at the airway management of pediatric and adult patients, obstetric patients and critically ill patients (15-19).

The DAS 2015 guidelines focus on managing unexpected difficult airway. The authors acknowledge the difficulties in decision-making during an emergency airway approach, emphasizing the importance of back-up strategies before approaching the airway. Human factors, such as lack of communication, training and teamwork, and cognitive overload are considered important predisposing factors to the occurrence of adverse events when managing an airway emergency. The use of cognitive aids, such as the Vortex approach, and the "stop and think" strategy are considered important steps to support decision-making through the process. The Vortex algorithm represents a simple and universally applicable vision-based cognitive aid intended to support the airway management team during emergency airway management (20). The 2015 DAS Algorithm provides a "serial" approach (Plan A–D) to manage difficult airway focusing on patient oxygenation prior to any effort to protect the airway. A limited number of attempts and reporting of failure is encouraged to progress through the airway strategy. Plan A aims to maximize the likelihood of successful intubation after ensuring proper patient oxygenation through mask ventilation. In case of failure Plan B consists of oxygenating the patient using a second generation supraglottic device. If a valid oxygenation is achieved, it is reasonable for the team to "stop and think"

and consider waking the patient or securing the airway with non-invasive or invasive approaches. Otherwise, a last trial with mask ventilation should be performed. Failure of Plan C defines a "can't intubate can't oxygenate" (CICO) situation and progression to Plan D, which is a front-of-neck emergency access (FONA).

The DAS 2019 guidelines focus on ATI for the management of anticipated difficult airway in adults. This approach is described and recommended in several national guidelines dealing with predicted difficult airway. ATI should be performed after adequate topicalization of the airway and with minimal sedation. Supplemental oxygen should be given during the procedure. Induction of general anesthesia should only be initiated after visual confirmation of the proper endotracheal tube positioning and the presence of an end-tidal capnographic waveform. The guidelines recommend limiting the number of attempts to 3+1. The use of video-laryngoscopy or fiberoptic bronchoscopy has shown a comparable success rate and safety profile; the choice between the different devices depends on the operator skills and equipment availability. Both the 2015 and the 2019 DAS guidelines shift the focus of difficult airway management from the sole airway physician to the anesthetic team, suggesting that teamwork and communication could prevent adverse events attributable to human factors.

The DAS algorithms are characterized by a "serial" approach primary based on the prediction of difficulty of airway management with the decision-making process depending on the oxygenation of the patient; if the primary endpoint is achieved the team should consider a time to "stop and think" before proceeding to the next step.

French National Society of Anesthesia and Intensive Care Medicine (SFAR) 2018

The SFAR recently published an update to the difficult airway management guideline, addressing the recommendations to adults and pediatric patients (21,22). The authors consider both scenarios of expected and unexpected difficult airway, reiterating the importance of an accurate airway assessment, peri-procedural oxygenation and the use of decision trees to decrease the risk of adverse events related to difficult airway management, including predicted difficult extubation. A strong and innovative message, coming from the ever-growing evidence, is the "new" role of the videolaryngoscope as a first-choice device in patients with at least two risk factors for difficult

intubation and, anyway, as the second attempt device, if the first attempt with a standard laryngoscope has failed. Another recommendation, different from the ASA and DAS guidelines, is the use of a supraglottic device as a first approach in case of ineffective mask ventilation. The decision tree focuses on both achieving an adequate ventilation and oxygenation.

Discussion

Practical guidelines are recommendations based on reviewed scientific evidence and expert opinions that aim to support the practitioner in decision-making and therefore contribute to "safe" airway management. Technological advances and recent scientific publications in this field require continued implementation of the guidelines. Difficult airway management guidelines must meet the following requirements: (I) simplicity and applicability in an emergency setting, and (II) universality, i.e., an approach that can be taught to the team involved in airway management regardless of heterogeneity of skills and context. Despite the differences among the various societies' recommendations, the recently published guidelines, compared in this editorial, show broad agreement on several recommendations, such as the importance of a preliminary airway assessment and preparation, the adoption of a preformulated strategy, the development of technical and non-technical skills, availability of airway devices and improved communication within the airway management team. An overview of the main recommendations is shown in *Table 1*.

The 2022 ASA guidelines are the strongest and most up-to-date document available to date. The structure takes the form of the previous version, integrating the results and recommendations obtained from the recent scientific literature on airway management. The result is a straightforward set of recommendations that are applicable in almost every clinical context and on both adults and pediatric patients. The document focuses on preliminary airway assessment as a fundamental step to early recognize a difficult airway to preemptively adopt a strategy before approaching the patient's airway. In this regards, as already pointed out by Crawley *et al.* (23), the limit of the single airway assessment tool as a predictor of difficulty in airway management is highlighted, recommending the application of multiple tests and the retrieval of previous documentation about encountered difficulties. Unlike the previous version, ATI plays a cardinal role in the anticipated

Table 1 Summary of DAM recommendations

Guideline	Patients	Setting	Unanticipated DAM	Anticipated DAM	Tracheal extubation
ASA 2022	Adult, pediatric, obstetric, ICU/ critically ill patients	Operating room, non-operating room, ED, critical care, ambulatory setting	Call for help, optimize oxygenation, limit the number of attempts	Preformulated strategy for ATI, difficult FMV, emergency airway access	Before extubation consider elective tracheostomy, airway exchange catheter, awake extubation *vs.* deep extubation
			Consider waking up the patient. If adequate ventilation/oxygenation consider noninvasive or invasive approach	Perform ATI when predicted difficult intubation + difficult FMV, ↑ risk of aspiration, ↓ apnea tolerance or predicted difficulty with emergency invasive airway rescue	Ensure oxygen supplementation through the process
DAS 2012–2019	Adult, pediatric, obstetric, ICU/ critically ill patients	Operating room, non-operating room, ED, critical care	Sequential approach. FMV + intubation (A); SAD positioning (B); final attempt at FMV (C); emergency FONA (D)	ATI as gold standard procedure in anticipated DAM	Risk assessment for prediction of difficult extubation/ reintubation
			Preoxygenation/apneic oxygenation, crucial role of video-laryngoscope, limit the number of attempts (3+1)	Continuous oxygen supplementation. Consider a reduced oxygen reserve in critically ill and pregnant patients	Preoxygenation before extubation
			Early declaration of failure to proceed through the decisional algorithm	Avoid or minimize sedation in critically ill patients, use dexmedetomidine or remifentanil in pregnant	Awake extubation safer than deep extubation
SFAR 2018	Adult, pediatric	Not specified	Preoxygenation/apneic oxygenation	Video-laryngoscope as first choice device if 2 criteria for difficult intubation	Preformulated strategy before performing extubation
			Video-laryngoscopes as a second attempt device in CL grade III or IV, if effective mask ventilation	ATI as gold standard in predicted difficult intubation + difficult FMV	Consider preventive measures (continuous oxygen support, airway exchange catether or tracheotomy) if extubation risk factors
				Induction of general anesthesia with rapidly reversible agents	

DAM, difficult airway management; ASA, American Society of Anesthesiologists; ICU, intensive care unit; ED, emergency department; ATI, awake tracheal intubation; FMV, face-mask ventilation; DAS, Difficult Airway Society; SAD, supraglottic airway device; FONA, front-of-neck access; SFAR, Société Française d'Anesthésie et de Réanimation; CL, Cormack-Lehane.

difficult airway management. Moreover, in the footsteps of the British recommendations, it emphasizes the role of human error in the occurrence of major airway management complications. It is, therefore, recommended to be aware of the time elapsed, limit the number of intubation attempts and promptly call for help. The guidelines include a short set of recommendations regarding confirmation of tracheal intubation through capnography and safe management of tracheal extubation. Finally, the new algorithms and infographics are very clear. They no longer focus on

intubation as primary aim, focusing on patient's ventilation and oxygenation, and representing a fundamental cognitive aid for the airway clinician.

The call for a universal approach to airway management has recently been gathered by the Project for Universal Management of Airways (PUMA, https://www.universalairway.org/), an initiative coordinated by an international board of airway management experts. PUMA is intended as a project that integrates the recommendations from different national and international guidelines.

The goal is to develop "universal" set of principles that can be validated for the management of difficult airways regardless of the geography, clinician specialty, patient characteristics, urgency of the procedure, healthcare context and complexity of the procedure (24). The hope for a broad consensus in airway management is probably no longer a utopia but a well-defined path to patient safety.

Acknowledgments

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Annals of Translational Medicine.* The article did not undergo external peer review.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://atm. amegroups.com/article/view/10.21037/atm-22-4271/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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