The 2022 ASA Practice Guidelines for Management Of the Difficult Airway:

A Closer Look

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Introduction

The 2022 American Society of Anesthesiologists (ASA) Practice Guidelines for Management of the Difficult Airway, approved by the ASA House of Delegates, were published in February in *Anesthesiology*.[1] This is the third revision of the guidelines since their debut in 1992. Each new version has included changes in recommendations as new evidence has honed our knowledge of airway management.

The task force producing the new update consisted of 15 members, including methodologists; intensivists; physicians in private practice; pediatric anesthesiologists; physicians in practice-administration roles; content experts; and leaders of societies focused on airway management. Several international ASA members were included. The task force was led by Jeffrey Apfelbaum, MD; Carin Hagberg, MD, FASA; and Rick Connis, PhD.

Roots of the Latest Guidelines

The guidelines on airway management are a direct outgrowth of the Closed Claims Project spearheaded by Ellison Pierce Jr., MD, the ASA's president in 1984. The first task force was assembled in 1989, and the first difficult airway management practice guidelines were approved three years later. The guidelines provide recommendations that are intended to improve decision making, but importantly, they depend on the judgment of the responsible anesthesiologist and the practice in the local community. They are not meant to be rigid, one-path-fits-all difficult airway patients.

All ASA guidelines are developed based on a very rigorous process that includes the examination of the scientific evidence and the consensus of experts. Interpretation and implementation of the guidelines take

place within the context of the local institution, and departures from the recommendations are permitted.

The current task force met for the first time in August 2019, to develop an evidence-based model that was used to guide a search of the relevant literature. Over the next year, the two task force methodologists, led by Connis, examined more than 10,000 abstracts, whittling down this body of literature to 367 papers that were acceptable as evidence. The full task force reconvened in August 2020 (of course, by video conference), and over a period of five days and 35 hours of meetings, recommendations were developed under the leadership of Apfelbaum. In addition to the 15 members of the task force, a large list of consultants was also assembled. This group was consulted by email if the task force did not reach a clear consensus on any issue.

The first reading of the guidelines can be confusing, even frustrating. A strict strategy following the evidence model assembled at the August 2019 meeting in Schaumberg, Ill., was adhered to, as the literature was analyzed by the task force's methodologist. The rigor with which this process was followed was, at times, aggravating to non-methodologist task force members!

However, some factors that were considered vital to the success of the guidelines and assumed to be within the bounds of the evidence model had to be excluded from the recommendations because they had not been explicitly outlined at that first meeting. Fortunately, sections of the guidelines, outside the recommendations, allow for expert opinion, and proscribed issues could be discussed there.

Likewise, the reporting structure of the document has been met with some criticism. In 2003, with the first update, the ASA adopted a "level of evidence" structure wherein the relevant literature was discussed, followed by recommendations. This structure was expanded in the following iterations (including the current one), with more detailed discussions of qualifying literature and the addition of a "summary of recommendations." This structure, although well organized in terms of presentation, introduces some redundancy for the reader.

The structure also includes discussion of some evidence-based literature that might not apply to 2022 practice but nonetheless are well studied (e.g., the light wand) or discussion about technologies that are now outdated (the fiber-optic scope). This strict, evidence-based model is unique to the ASA in a world where many organizations have produced primarily opinion-based recommendations.

A Look at the Guidelines

The 2022 recommendations place an emphasis on the measurement of exhaled carbon dioxide (CO_2) to verify gas exchange with airway management. This was previously included in the 2013 guidelines, but its prominence was elevated in 2022. Although oxyhemoglobin saturation has long been a standard ASA monitor, it is not suitable for monitoring airway patency because oxygen transported from the lung to tissues and bound to hemoglobin is a measure of the support of physiologic or clinical homeostasis. Oxygen supply from the reservoir of a preoxygenated lung may support this long after an airway has become non-patent.

Some changes in the 2022 guidelines don't directly affect patient care but are associated with the scope and application of the new recommendations. The inclusion of problems with supraglottic airway ventilation, extubation and invasive airway performance expand the definition of the difficult airway, which historically had been limited to difficulty with face mask ventilation and intubation.

The purpose of the guidelines previously was an emphasis on safe airway management. The purpose now has been expanded to optimize the success of the first attempt at airway management and recognize that the appropriate choice of management devices and techniques is dependent on the experience, training and preferences of the airway operator. Furthermore, these choices will be influenced by medical issues and the context in which airway management takes place. In addition, the focus of the guidelines has been expanded to include pediatric patients, patients undergoing non–operating room procedures (including in the ICU), and sedation, regional anesthesia and obstetrics cases.

In evaluating a patient for airway management, the task force recognizes that the common means of bedside evaluation for airway management have limitations in both sensitivity and specificity. Consideration of advanced tools such as rapid bedside endoscopy or, when available at a facility, virtual endoscopy through advance processing of imaging data can be considered. Ultrasound may be used for pre-management airway evaluation and confirmation of tracheal intubation. Importantly, the task force recommends that the anesthesiologist charged with airway management must be the person evaluating the airway and should not rely on evaluation by another clinician.

Management Pathways

Since the first publication, the guidelines have included an algorithm with two distinct management pathways: awake intubation and intubation after the induction of anesthesia. This author has always construed this clear divide as the most important decision in the process of contemplating airway management. The act of inducing anesthesia and controlling a patient's airway should be humbling regardless of the degree of the challenge—taking a patient from a self-sufficient state to one in which they depend on the clinician's actions is an awesome responsibility.

If, based on preassessment, there is a perceived risk for airway failure, not inducing this dependence must be the course of action! Unfortunately, studies such as the National Audit Project in the United Kingdom and the ASA's Closed Claims Project have revealed faults in this decision process, often due to poor risk evaluation or lack of clinical confidence.[2,3]

A new decision tree has been prepended to the ASA algorithm to help the anesthesiologist choose between

the two pathways. The decision tree guides the anesthesiologist through basic assessments in a rational order. After first independently considering risk for intubation difficulty (with direct or video laryngoscopy), risk for ventilation difficulty (face mask or supraglottic device), risk for aspiration and oxyhemoglobin desaturation, and the difficulty of performing a rescue invasive airway, the anesthesiologist is then directed into one of the two pathways discussed above.

Awake Intubation

Briefly, the task force feels that awake intubation should be considered when the patient is suspected to be difficult to intubate *and* one or more of the following is true:

- suspected difficult ventilation;
- increased risk for aspiration;
- the patient may not tolerate a brief episode of apnea; or
- the patient may be a difficult emergency invasive airway rescue.

The decision tree tool not only guides the anesthesiologist, but also serves as a tool for premanagement as well as post hoc explanation of the chosen pathway. Oxygenation throughout the course of airway management (i.e., preoxygenation and optimization of oxygenation during airway procedures) is encouraged.

Another major change in the ASA Difficult Airway Algorithm is the elimination of the option to "wake the patient" from the emergency, cannot-intubate,
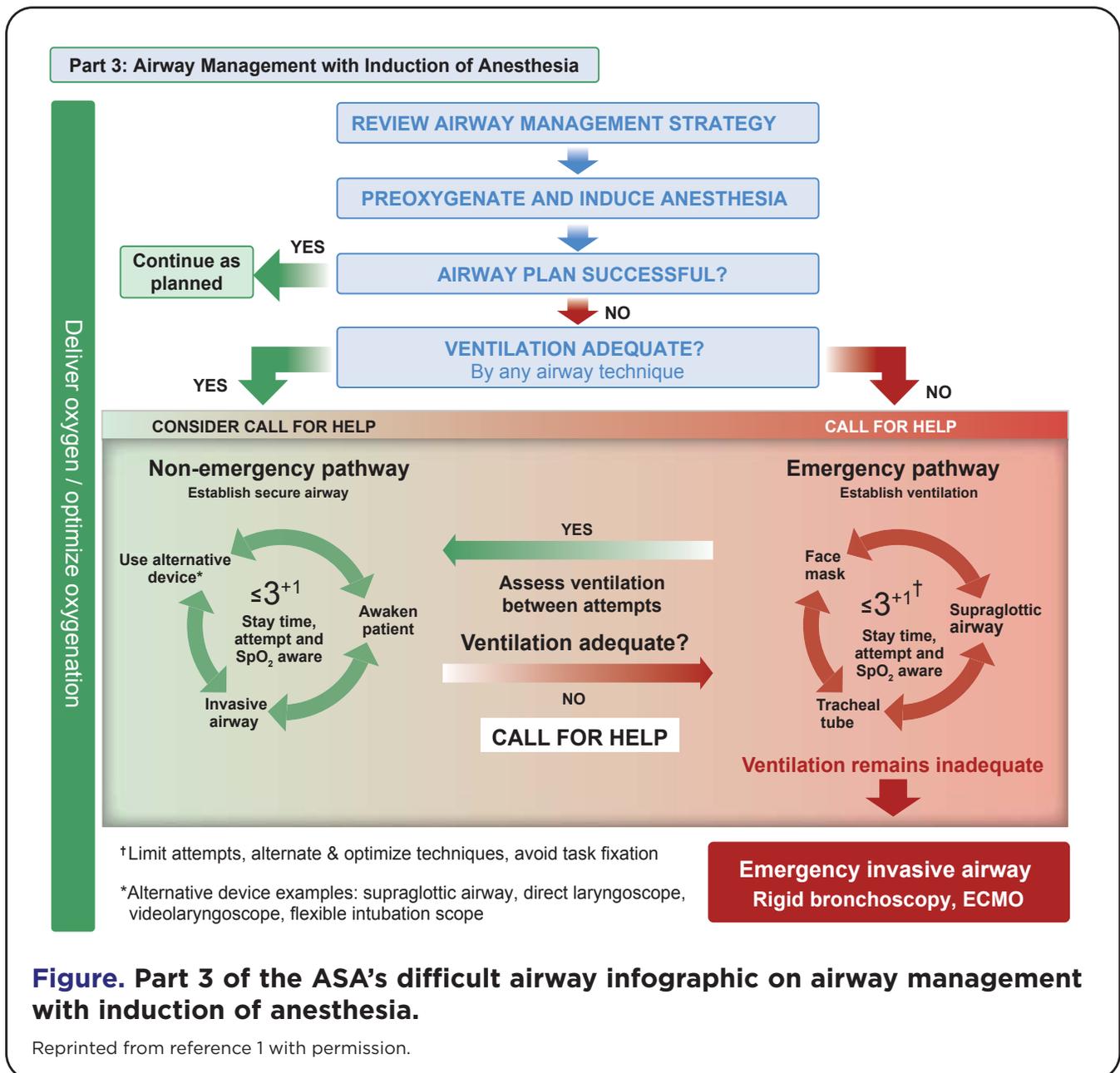

Figure. Part 3 of the ASA's difficult airway infographic on airway management with induction of anesthesia.

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cannot-ventilate arms of the algorithm. At first this may appear unwise, but the logic is as follows: In a situation where there is a patent airway and gas exchange is possible, but the airway plan has failed (e.g., the situation in which they can ventilate but cannot intubate), maintaining the patient until they wake may be practical. In contrast, in a situation where no gas exchange is taking place, a cessation of activities with the strategy of allowing the patient to wake carries the risk for severe oxyhemoglobin desaturation. Allowing a patient to emerge from anesthesia and apnea may be allowed, but it cannot be a strategy.

Other new changes to the ever-evolving ASA Difficult Airway Algorithm include an emphasis on the individual making decisions both before and during management in consideration of their own experience, available resources and the context in which airway management will take place; emphasis on limiting attempts at laryngoscopy and encouraging an early call for help; and confirming gas exchange by the detection of CO_2 independent of the device used.

An innovative addition to the 2022 guidelines is the inclusion of infographics for both pediatric and adult airway management. These infographics are the result of intensive work by the current task force, and meld the evidence-based recommendations and expert opinion that emphasize flexibility and the variation in strategies that occur in managing airways. As with the ASA

Difficult Airway Algorithm, the decision tree tool is used to choose between pathways.

The awake intubation pathway is suggested with the criteria outlined above. Expanded options for the management of failed awake intubation include elective invasive airway, alternative awake intubation techniques, regional anesthetic techniques (as appropriate to the clinician's skill and situation), and an option for general anesthetic induction with preparations for emergency invasive airway by a skilled clinician (equivalent to entry into the anesthetic induction pathway).

Infographic: Intubation After Induction

The third panel of the adult infographic may be viewed as an updated version of the intubation after induction of anesthesia pathway of the ASA Difficult Airway Algorithm, reflecting many of the concepts discussed above (Figure). Not only does the panel begin with preoxygenation for all patients, but it includes an airway "time-out"—this to encourage the anesthesiologist to discuss the airway plan and any concerns during the World Health Organization surgical safety checklist sign-in procedure. Following the airway time-out, anesthesia is induced. Importantly, anesthetic induction is not limited to general anesthesia, and induction of regional, sedative or monitoring-only plans are included. Airway management within the planned anesthetic may include tracheal intubation, supraglottic airway or face mask ventilation, nasal

Table. Options and Optimizations in the Emergency and Nonemergency Pathways of the ASA Difficult Airway Infographic

Nonemergency pathway	Technique	Options	Optimizations
Use an alternative airway technique	Tracheal intubation	Direct laryngoscopy Video laryngoscopy Flexible scope Combined techniques	Blade type Blade angulation Blade size External manipulation Bougie/introducer Rigid stylet Tube size Suction Muscle relaxants
	Supraglottic airway		First- vs. second-generation Size change Design change
	Face mask ventilation		Size Hand grip Oral airway Nasal airway
Awaken the patient	Awake intubation Case deferment Regional anesthesia Elective invasive airway		
Elective invasive airway			Awake or asleep Skilled operator Controlled conditions

cannula or possibly no airway support. The infographic continues only if the anesthetic plan does not appear to be successful, and the clinician considers the adequacy of ventilation (end-tidal CO_2 measurement).

Removal of CO_2 is the primary measure of airway patency because without patency, CO_2 cannot be measured for any meaningful time. In traditional thinking, oxygen saturation has been considered the measure of the adequacy of airway management, and this is true. But oxygen saturation is a measure of homeostasis, not patency of the airway. A drop in the oxygen saturation indicates inadequate oxygenation and may be delayed. No end-tidal CO_2 is indicative of an obstructed airway, and is an immediate indicator.

The nonemergency pathway is entered if the airway plan has failed but ventilation appears adequate as clinically judged. The goal in this pathway is to provide a secure airway, and the techniques listed in the Table can be attempted. Some basic caveats pertain to each attempt at establishing a secure airway:

1. Each attempt at airway management should be optimized, and no technique should be repeated without optimization.
2. Attempts at intubation and supraglottic ventilation should be limited to three, with the possibility of one more attempt if a clinician with a higher level of skill should become available.
3. Ventilation should be rechecked after each attempt.

The Table lists the options and optimizations in the nonemergency pathway. The wide variety of options and optimizations may seem complicating—wouldn't a short and ordained list of options be more suitable? Two factors explain why a rigid step-by-step algorithm with a limited list of options is not practical to recommend. First, clinicians differ in their experience and the instruments available to them, and second, each attempt at airway management is informed by the previous attempt—that is, the clinician learns more about the airway as attempts are made. Attempts are limited because there is a subtle balance between the probability of success and what is learned with each attempt, and the trauma incurred that may degrade the ability to ventilate and remain in the nonemergency pathway.

The Emergency Pathway

The emergency pathway is entered when ventilation is found not to be adequate to sustain the patient. This may occur at the outset, after the induction of anesthesia or in the course of managing the nonemergency pathway. The goal of the emergency pathway is the establishment of airway patency, qualitatively measured by the detection of end-tidal CO_2.

A patent airway is achieved by cycling between the three core techniques of airway management:

1. tracheal intubation
2. face mask ventilation
3. supraglottic ventilation

Many of the procedures described in the Table will apply, as well as some vital caveats:

1. optimize and do not repeat attempts;
2. limit attempts to three, plus one; and
3. check ventilation between attempts.

Although the establishment of ventilation moves the resuscitation to the nonemergency pathway, three factors may result in entrance into the emergency invasive airway pathway:

1. a critical drop (absolute or rate of change) in the oxyhemoglobin saturation;
2. the exhaustion of attempts; and
3. passage of time, wherein a reasonable anesthesiologist, familiar with the situation, foresees the inevitable collapse of physiologic homeostasis.

The invasive emergency airway pathway includes surgical airway, rigid bronchoscopy and extracorporeal membrane oxygenation (ECMO). There has been criticism of the inclusion of ECMO in the emergency pathway, but the task force included this advanced modality for two reasons. The first is to introduce the anesthesiologist to the concept of ECMO as airway rescue, as has been demonstrated in the literature.[4] The clinician who considers ECMO early is more likely to have a favorable result if it is ever needed. The second reason is the criteria for adequate ventilation stated above: Ventilation, as qualitatively measured by end-tidal CO_2, may indicate that some airway patency exists. This airway patency may provide marginal oxygenation to a patient whereas eventual collapse of physiologic homeostasis is inevitable. This may describe a situation in which ECMO with placement of a large-bore cannula may be possible.

The 2022 airway management guidelines include major changes from previous iterations. This author believes that the changes described above, and especially the new infographics and decision tree, will improve patient care by focusing anesthesiologists' evaluations and our understanding that one size in airway management does not fit all.

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