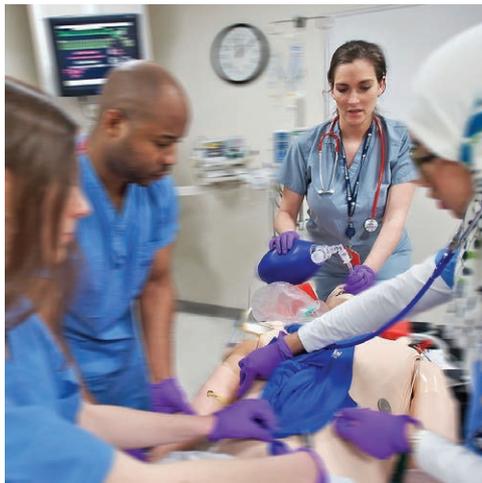


Current Difficult Airway Management—Not Good Enough!

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In safety-critical pursuits, such as aviation and anesthesiology, analysis of critical incidents involving threatened or actual harm is vital in identifying deficiencies and eliminating them. Analyses of anesthesiology-related closed claims offer a distillation of this necessary self-examination as they are concerned with events where harm has occurred. Reflecting on the particularly compelling cases they often involve offers anesthesia care providers insights that are far better gained vicariously than by their own direct experience.

In this issue of *ANESTHESIOLOGY*, Joffe *et al.*¹ examine recent closed claims related to difficult tracheal intubation and compare them to older claims, in part to determine whether updated practice guidelines and improved airway management devices and techniques have influenced patient outcomes. Difficulty in tracheal intubation is a time-honored concern in anesthesia practice. A closed claim analysis of adverse respiratory events in 1990 highlighted that adverse outcomes involving the respiratory system were the single largest class of injury, and that the incidence of death or permanent brain damage associated with respiratory-related claims was much higher (85% of claims) than that associated with nonrespiratory claims (30% of claims).² Since then, major efforts have been made to address difficult airway management issues with the first comprehensive practice guidelines formulated by an American Society of Anesthesiologists task force in 1993.³ These have been followed by updates⁴ and development of guidelines by other organizations.⁵ Monitoring has improved, with the wide availability and uptake of oximetry and capnography, and better airway management devices and techniques have been developed. Despite these advances, complications associated with airway management are still the largest cause of



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the operating or recovery rooms. Claims related to difficult intubation that did occur in perioperative locations were similarly distributed across phases of anesthesia for the two time periods examined, but the odds of brain damage or death at induction of anesthesia was five and a half times greater from 2000 to 2012 than from 1993 to 1999. The nature of the 2000 to 2012 claims indicated ongoing problems relating to inadequate practitioner skills, judgement and system response. The typical cases summarized at the end of the article illustrated these well.

It is unclear whether risk of adverse events has changed over the years, as the analysis lacks denominators and so the absolute risk cannot be estimated. Nevertheless, there were 93 claims made in the 7 yr from 1993 to 1999⁷ and 102 claims in the more recent 13-yr period of 2000 to 2012,¹ which, along with other reports,^{2,7,8} suggests that the incidence of serious adverse outcomes related to difficult intubation may have decreased.

anesthesia-related death or permanent brain damage.⁶ Hence the analysis of Joffe *et al.*¹ is timely as it provides a contemporary view of the characteristics of airway management problems that are now responsible for serious adverse outcomes and provides impetus for renewed efforts to prevent them.

Joffe *et al.*¹ examined claims that had difficult tracheal intubation as the primary damaging event in the Anesthesia Closed Claim project database. This database contains closed anesthesia malpractice claims made in the United States. The authors compared claims occurring in 2000 to 2012, with those in 1993 to 1999.⁷ They found that, compared with cases in 1993 to 1999, cases in 2000 to 2012 were generally of poorer physical status and more frequently occurred in nonperioperative locations, away from

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However, regardless of the absolute incidence, the study findings make it clear that there are ongoing problems related to this challenging area of anesthesiology practice which require attention. Concerningly, Joffe *et al.*¹ point out that almost three-fourths of claims exhibited judgment failures, suggesting that these death or permanent brain damage outcomes could have been prevented. Previous reports support this finding.⁹ The judgement failures reported included failure to plan for difficult intubation on induction, failure to use a supraglottic airway as a bridge for oxygenation in the case of difficulty, overly persistent attempts to secure the airway with a particular tool or technique without deviation or change, and delay in establishment of a surgical airway in the case of a “cannot intubate, cannot oxygenate” emergency. They also reported instances of failure to plan for airway difficulties on extubation.

In case of the “cannot intubate, cannot oxygenate” scenario, all the major guidelines on difficult airway management recommend to place a supraglottic airway, and if that is ineffective, to establish a surgical airway,^{4,5} but a supraglottic airway was not attempted in 26% of cases.¹ In the remaining cases, placement of a supraglottic airway was attempted, but adequate oxygenation could not be achieved. Decision to provide a surgical airway was frequently delayed by repeated attempts at tracheal intubation, anesthesia care providers being hesitant to initiate surgical procedures, or surgeons being reluctant to perform tracheostomy or simply not available.

Other problems identified included lack of ready availability of difficult airway carts when required by the anesthesia care provider. In cases where risk factors for a difficult airway were identified and awake intubation planned causes for failure included no or inadequate topical anesthesia, precipitation of obstruction with topical anesthesia and over sedation with apnea, obstruction, and inability to ventilate.

It is apparent from these cases that inadequate planning is a core issue. The airway must be assessed preoperatively, not only to predict difficult intubation, but also the risk of difficulty in ventilation through a facemask or supraglottic airway, difficulty in securing a surgical airway and risk of aspiration. If difficult airway management is predicted, general anesthesia should not be induced before securing the airway. There should also be a clear backup plan for each case in case the initial or subsequent methods fail. If awake fiberoptic intubation fails, and time allows, equipment must be ready and qualified personnel nearby for possible provision of a surgical airway before induction of anesthesia. Persistent unsuccessful attempts at tracheal intubation using the same tool or technique without deviation or change should be avoided.¹⁰ Placement of a supraglottic airway should be considered early in the face of persistent difficulty while preparing, at the same time, for establishment of a surgical airway if the supraglottic airway cannot be satisfactorily placed. The number of attempts to ventilate through a supraglottic airway should be limited to three episodes, in

order to prevent undue persistence with a nonfunctional supraglottic airway.

This systematic approach to difficult airway management, including prompt establishment of a surgical airway when it is needed, is not a new idea,^{9,11} and is incorporated in current guidelines.^{4,5} Nevertheless, the study of Joffe *et al.*¹ has indicated deficiencies in application of these systematic approaches and practical solutions are needed to address them. For example, it appears that cricothyrotomy kits are not available in many operating rooms. Outside the operating rooms, necessary equipment (such as capnographs) is frequently not available, and in some settings clinicians may not have competence in difficult airway management.¹² We should therefore make sure that not only the anesthesia care providers, but all relevant medical staff, are trained in this area and that difficult airway management equipment is readily available in all areas where airway management is undertaken. A remaining challenge is where the surgeon may be reluctant to provide a surgical airway in an emergent situation and an anesthesia care provider is present. Addressing this requires a joint effort with our surgeon colleagues to ensure that this responsibility is readily accepted under such circumstances.

Knowledge of guidelines alone is insufficient to address these problems: skill and judgment are essential ingredients. For example, the fiberoptic laryngoscope is regarded as the most reliable tool for tracheal intubation, but considerable skill and knowledge are required to achieve a smooth intubation. However, skills in *awake* fiberoptic intubation in patients with very difficult airways may have decreased, because of a wide availability of videolaryngoscopes that obviate the need for awake intubation in less challenging cases and thereby the practice in the technique that this entails. In addition, there are not many clinicians who have sufficient experience in carrying out emergency cricothyrotomy. Regular simulation training to improve technical and nontechnical skills would help address these deficiencies.

We also need to regularly review the guidelines and encourage further research in relationship to these problems, as the current strategies are still not ideal.¹¹ For example, for awake intubation, sedation, and topical anesthesia of the airway are generally carried out according to each anesthesia care provider's preference, and evidence is required to define best practice in these strategies.

In conclusion, while anesthesia and the aviation industry have common interests in crisis management, systems are more firmly established in aviation, with crews undergoing regular, systematic simulation training and emergency equipment constantly to hand and regularly checked. The findings of Joffe *et al.*¹ suggest that medical practice falls short of these standards. The majority of death or permanent brain damage related to difficult tracheal intubation occurred through insufficient knowledge (not recognizing risk factors for difficult airway management, and not knowing the guidelines),

system failures (rescue equipment or people not being available), and delay in decision-making (such as progression to cricothyrotomy), and thus, these adverse outcomes could have been avoided. It is time for us to lift standards in crisis management for airway difficulties (through a more rigorous approach to training, certification, and equipment availability at various points of care), much as has been done for cardiopulmonary resuscitation in recent years.

Competing Interests

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