An Instrument Approach to Airway Management

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Abstract

Aviation terminology and thought processes are commonly applied to medicine. We further propose the adaptation of instrument flight terminology to emergency airway management including the aviation approach plate visual aid and replacement of the term "failed airway" with "missed airway,"

Introduction

Since the publication of *To Err Is Human*,[1] medical providers have been aware of the use of aviation concepts for patient safety. In his 2003 article, Richard Levitan[2] looked at the safety of rapid sequence intubation (RSI) using the analogy of skydiving. More recently, Atul Gawande[3] has publicized the importance of using checklists, a basic aviation technology, to improve safety in medicine, particularly during surgery. In this article, we propose to use another aviation concept—the instrument landing approach—as a process to improve the safety and reliability of emergency airway management.

Discussion

Travelers today expect that the airlines will take off and land in all but the absolute worst weather. Most of these travelers are familiar with the large travel cases in which commercial airline pilots carry their navigational charts. Among these charts are instrument approach plates (Figure1)—specialized navigational charts used to land safely in adverse weather. These approach plates not only provide the pilot a detailed map of how to get to the runway but they also provide guidance for the pilot should he or she miss the approach and have to abort the landing attempt.

Unlike the pilot who "goes missed" when he or she does not visualize the runway, the emergency airway provider (EAP) who does not visualize critical airway landmarks often describes this experience negatively as a "failed airway." This description has been enshrined in the literature by several authors.[4-7] The term "failed airway" is a negative phrase in a neurolinguistic sense. Emergency providers, just like pilots, would like to believe they have "the right stuff."[8] Those same providers also believe, in the words of mission controller Gene Kranz, "Failure is not an option."[9] Although perseverance in the face of adversity is usually considered a positive attribute, when carried too far it can have tragic consequences.[10] The terminology of "failed airway" is familiar to all EAPs who use pharmacologically assisted intubation in their practice. There are various definitions of a failed airway, but several suggest that this occurs when critical oxygenation cannot be maintained or an experienced operator cannot perform endotracheal intubation within a variable number of attempts.[11-13] Walls and Murphy[4] define a failed airway as occurring when the chosen "method is not going to succeed, requiring the immediate initiation of a rescue sequence." Franklin and Murphy[14] state that "EMS [emergency medical services] providers . . . should also have at least one alternative airway device at their immediate disposal." Most of these situations can be successfully managed, at least temporarily, with an extraglottic airway (EGA). However, there are common barriers to placing an EGA that include but are not limited to perceived value of intubation over an EGA, pressure from colleagues/other providers, and the notion that an unsuccessful intubation is a failure. This is despite a growing body of literature that indicates that persisting in intubation can be detrimental to patient outcome because of time delays,[15] hypoxemia,[16] cardiopulmonary resuscitation disruption,[17] and other problems.[18] The literature also points to the high complication rate associated with repeated intubation attempts.[19,20] There is also a substantial body of literature showing the effectiveness of EGAs in the emergency setting and in providing airway protection.[21-23]

Cricothyrotomy is another alternative airway but one that may be used reluctantly by the EAP even though hesitation in the face of a patient with life-threatening obstruction can have dramatic consequences. It has been argued that the unwillingness of his physicians to perform a surgical airway

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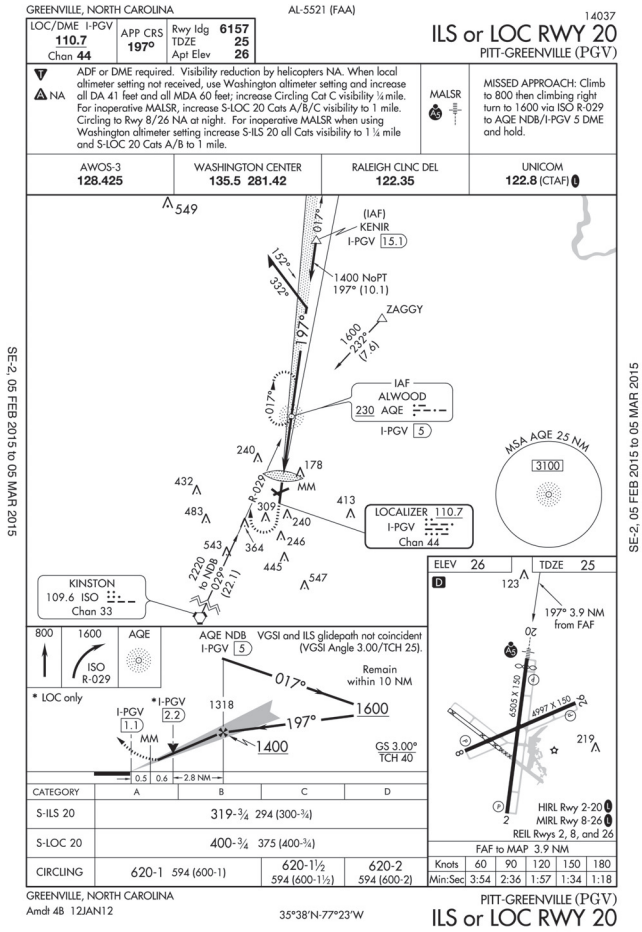
Figure 1. Typical pilot's instrument approach plate.



contributed to George Washington's death (although over 2 L of bloodletting certainly played a role).[24] Finucane et al[6] argue that psychological preparation is a key component in successful airway management, especially if unusual or unforeseen events occur. Levitan and Asken[25] note, ". . . how much the individual's mindset is critical to successful performance in a crisis."

Taking all this into consideration, we propose that the very negative terminology of "failed airway" may contribute to this resistance and therefore suggest a different terminology based on the aviation analogy of an instrument approach and landing (Figure 2).

The instrument approach begins with an assessment of the weather. This is analogous to assessment of the patient's airway for difficulty in intubation (LEMONS [Look externally, Evaluate 3-3-2 rule, Mallampati score, Obstruction, Neck mobility, Saturations[22]]), bag valve mask ventilation, EGA use, and surgical airway access. In the event of weather clearly below minimums, the instrument pilot proceeds directly to an alternate airport. This is the equivalent of an EAP delaying until additional help arrives and/or moving directly to an alternate airway management approach including continuous positive airway pressure/bilevel positive airway pressure, nasal intubation, awake intubation, rapid sequence airway, surgical airway, and so on. If the assessed "weather" is potentially favorable, the instrument pilot or EAP will make an attempt. This attempt should be performed extremely cautiously and carefully as if it is the only attempt you will get (ie, it should be an "optimal approach").

An optimal first intubation attempt has several potential components. First is preparation based on an appropriate checklist. This should include having all supplies ready, an appropriate tube/stylet shape, and proper patient positioning.[2] For a patient without cervical spine immobilization, this usually means a sniffing or ramped position with the goal of placing the ear canal at the same level as the sternal notch and the patient's facial plane parallel with the ceiling.[2] If cervical precautions must be maintained, then the front of the collar should be removed and in-line immobilization performed by an assistant.[26] Second is the appropriate management of neck pressure. In the event that airway landmarks cannot be visualized, cricoid pressure should be reduced and external laryngeal manipulation (also known as bimanual laryngoscopy) performed.[2] Any intubation attempt without the use of external laryngeal manipulation should not be considered an optimal attempt. The evidence would also suggest that video laryngoscopy will increase the chances of first pass success in the setting of a difficult airway or speed the time to intubation but whether this should be part of every first attempt remains controversial because this technology is not universally available.[26,27] Finally, a gum elastic bougie (also known as an endotracheal tube introducer) should be readily available during direct laryngoscopy and used if a Cormack-Lehane Class 3 airway (epiglottis only) is encountered. Alternatively, the EAP can forego a stylet entirely and make routine use of a bougie during direct laryngoscopy. Some EAPs and EMS agencies have adopted this approach based on the simple premise "if it's good for a difficult airway it's good for an easy airway." Although there are no empiric data yet that show this approach improves outcomes, it does guarantee that EAPs will be familiar with the device when they really need it. The same can be said for using video laryngoscopy, when available, on routine intubations as well as difficult ones. In the aviation world, this is similar to a pilot being familiar with his or her avionics and autopilot and using them even in optimal weather conditions.[28]

If the instrument pilot reaches the designated altitude without any sight of the runway, the approach is considered "missed." The terminology is notably not "failed." Some approaches are to a point on the chart; others are for a given number of minutes after a checkpoint. Similarly, in airway management, if an EAP reaches the designated cutoff in time or oxygen saturation without any sight of suitable landmarks, he or she should declare a "missed airway" rather than a failed airway. For the instrument pilot who feels that a missed approach is a failure, the result is often his or her own death.[29] For the EAP who feels that a missed airway is a failure, the result may be the patient's death.

Once a "missed approach" is declared, a pilot will proceed to a holding point and circle while options are considered.