

Department of Veterans Affairs Emergency Airway Management Initiative

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Abstract

Over the last 2 years, the U.S. Department of Veterans Affairs (VA) undertook a radical transformation of out-of-operating-room emergency airway management. As a result of root cause analyses on issues encountered in airway management responses, the VA gathered baseline data on who was providing airway management, use of devices to ensure correct placement of the endotracheal tubes, and difficulties encountered in intubations. The results mirrored rates of complications recorded in the literature (i.e., difficulties in over 10 percent of cases and esophageal intubations in 6 percent). During off-tours, anesthesia service was not available in many places. As a result, residents and others were sometimes performing airway management without significant experience or expertise. Furthermore, in one-third of the cases, no confirmatory adjunctive devices were being used to ensure the correct placement of endotracheal tubes. This paper describes the national efforts that resulted in mandated competencies and a demonstrated knowledge base beyond Advanced Cardiac Life Support for those performing emergency airway management, the required use of confirmatory adjunctive devices, and a national effort to support and nurture these changes.

Introduction

Over 11,000 times a year within the U.S. Department of Veterans Affairs (VA), an emergency airway management event occurs outside of the operating room. Prior to the efforts described here, well-trained, competent individuals handled the majority of these emergencies. They had the requisite skills in airway management and the appropriate tools available. However, the VA's National Center for Patient Safety identified some cases in which clinicians attempted to perform airway management without sufficient proficiency, expertise, support, or use of adjunctive devices that allowed confirmation of the placement of the endotracheal tube. This manuscript describes how the VA assessed the problem and the steps taken to remedy it.

Root cause analyses submitted by facilities in the years prior to this project provided examples of some system vulnerabilities that needed to be addressed. In some facilities, assessment of exhaled carbon dioxide was not used to verify tracheal placement of an endotracheal (ET) tube because such devices were not readily available outside of the operating room (OR). This resulted in an undetected esophageal intubation. In another example, a resident was uncertain of the ET tube's location and inserted an additional tube because there was no way to verify if either tube was in the trachea, thereby resulting in a delay in establishing the patient's airway. In another case, surgical and medical residents both believed they were in charge of a patient and

the leader of the code team; this resulted in a delay in establishing the patient's airway. Due to the unavailability of a Certified Registered Nurse Anesthetist (CRNA), a resident was called to reintubate a patient and was unable to establish an airway. The patient's condition deteriorated until the CRNA arrived and successfully intubated the patient.^a

This paper describes the rationale for the VA Airway Management Initiative, the specifics of the VA national policy, how it was implemented, support from national societies' position papers, and issues encountered with implementation.

Methods

The VA confirmed the need for this effort by reviewing the available literature and by capturing internal baseline data on complications associated with intubations, including who was performing emergency airway management. Reported rates of complications and esophageal intubations approximated rates found in other studies and reinforced the need for systemic fixes to address these issues.

We sent surveys to all VA inpatient facilities to gather data on how emergency airway management was being conducted (i.e., who covered for such incidents), the hours during which coverage was available, and whether adjunctive devices were used to confirm successful tracheal intubation.

We also conducted a review of the VA's own tort claims settlement, which provided additional support for this initiative, helping to make the business case for such an activity. There were 65 settlements in the VA tort claims database over 12 years (1988 – 2000) for improper intubations or inductions, totaling \$5,129,852. This equated to an average settlement of \$78,921. These claims included some cases that occurred within the operating room. Our database was unable to differentiate those that occurred due only to emergency airway management.^b

Although patient safety was the paramount consideration in planning for emergency airway management, the Veterans Health Administration (VHA) also had to consider the scope of practice, along with legal and licensing issues. This led us to also perform a literature and regulatory review regarding emergency airway management. After reviewing survey data, tort claim data, and the medical literature and regulatory documents, we instituted the management plan described below.

Results

Survey of Facilities

To gather national rates of difficult and unanticipated esophageal intubations in the VA, the National Center for Patient Safety (NCPS) developed a survey in conjunction with VHA's

^a Internal review of root cause analysis cases related to intubation.

^b Internal communication with William Weeks, MD, MBA, and Tina Foster, MD, MHSA, VHA Patient Safety Field Office, White River Junction, VT, 2001.

Director of Anesthesia. The survey was sent by e-mail to patient safety managers at all 163 VA hospitals in September 2002. A total of 135 surveys were returned to NCPS, representing an 83 percent response rate. Only three of the returned surveys lacked complete information; nine of the facilities that responded did not perform non-OR emergency intubations. In total, the survey respondents estimated that there were 11,007 non-OR emergency intubations per year in VA hospitals. Given that we had some nonrespondents, this represents a low estimate.

Respondents estimated that 12.3 percent (N = 1,354) of non-OR emergency intubations in VA hospitals were unusually difficult to accomplish. Furthermore, 6.5 percent (N = 715) of the total intubations resulted in at least one episode of inadvertent esophageal intubation. This equates to nearly four cases per day that are difficult to accomplish and two per day that result in inadvertent esophageal intubation. Again, these are consistent with other studies and literature on this subject.¹

At most VA medical centers (VAMCs), multiple disciplines provide coverage for emergency airway management. However, the proportion shifts dramatically from regular tour to off-tour hours. During regular tour hours, an anesthesia provider is available in 86 percent of the facilities. During off-tours, only 45 percent of facilities have anesthesia providers available. Because the survey did not ask who performed the intubations, we do not have good data on what proportion of the intubations are actually performed by each type of provider.

Based on survey results, in 2002, over half of VA facilities used colorimetric analyzers (CO₂ analyzers) to confirm tracheal placement, in addition to clinical assessment of breath sounds. Less than 1 percent used only syringes or only self-inflating bulbs; 30 percent of all reported cases involved no adjunctive devices, which equates to nine cases per day, or 3,370 per year, in which no adjunctive devices were used within the VA to confirm tube placement.

The regulatory and legal literature provide relatively little guidance as to who can manage an airway, and there really are few legal precedents. A search of a database^c of appellate decisions bearing on this question found no directly relevant cases. However, it is clear that nonphysician personnel undertaking what traditionally has been a physician provided service are held to the same standards of task performance as physicians who would usually perform the same task.^d Thus, it was incumbent upon the VHA to ensure that whoever performed emergency airway management be trained at a level consistent with the skill level that is expected for a physician.

Many articles document the success of nonphysician providers in airway management once training is provided; their success rate is generally much higher than it is for physicians not specifically trained in airway management. Paramedic success rates in field intubations generally hover in the 90 to 98 percent range under conditions that often are quite trying.²

One respiratory care department published their experience as back-up providers of endotracheal intubation following failed attempts by nonanesthesiologist physicians.³ Their success rate was 90 percent, remarkable in light of the fact that these were patients for whom a physician had

^c Westlaw[®], West Publishing Co, Eagan, MN.

^d Belmon vs. St. Frances Cabrini Hospital, 427 So 2d 541 (1983).

already failed. Noteworthy is the fact that the providers in this study all performed 12 or more successful OR intubations yearly and had ongoing training requirements.

Discussion

After reviewing the results of our multipronged investigation (root cause analyses, tort claims, and literature review), the VA elected to embark on a national plan to ensure the quality of around-the-clock airway management.

The Department of Veterans Affairs addressed these issues by rolling out a national initiative requiring demonstrated competency for those performing emergency airway management on live patients and the use of adjunctive devices to confirm placement of the endotracheal tube. Specifically, the new VA national policy:

- Stipulates that those performing intubations must have privileges or scope of practice to perform intubations.
- Establishes the criteria for privileging clinicians.
- Ensures that there is a training program for those seeking to be privileged in intubations at each VA facility.
- Directs that an adjunctive device be used to confirm tube placement. On the use of adjunctive devices, the VA national policy supports the recommendations of the American Heart Association (AHA) guidelines, which state that “a CO₂ colorimetric device is appropriate when there is a perfusing rhythm; otherwise, use a syringe or bulb designed to confirm endotracheal tube placement.”⁴

One of the major challenges was to change the mindset that only physicians can effectively perform airway management, and that physicians should be the first choice for airway management and intubation, irrespective of their experience or proficiency. Encouragement has been given to evaluate the available staff during off-tours and consider respiratory therapists, advanced practice nurses, and others to be trained to perform emergency airway management.

We felt that we needed, at a minimum, to meet the community “standard of care.” In a legal case, the standard of care is not a written code but is defined on an ad hoc basis by a judge or jury.⁵ From the perspective of the VHA group considering this issue, we felt we needed to provide the same standard as comparable facilities in the community. Thus, a nursing home facility without acute care issues might meet that standard by having personnel trained in supporting the airway until paramedics arrive, whereas an acute care hospital needs to have immediate access to an individual trained in tracheal intubation.

Personnel

The most important consideration as we established this program was to ensure that patients receive the best care appropriate to their situation. The literature review suggested that automatically having physicians responsible for airway management did not necessarily result in the best possible care. We felt there were three key issues to consider in terms of who should be trained:

1. Availability of personnel in the hospital 24 hours a day, 7 days a week.
2. Educational background.
3. Skills.

Anesthesia personnel (anesthesiologists or certified registered nurse anesthetists) are in-hospital around the clock in fewer than 30 percent of VHA hospitals. Although no data were available regarding other physicians traditionally trained in intubation (such as emergency room physicians, intensivists, and some surgical specialties), we felt that 24-hour coverage by such specially trained clinicians was not common.

All VHA hospitals have personnel trained in Advance Cardiac Life Support (ACLS). However, as pointed out in the ACLS Provider Manual,⁶ the goal of that course is to ensure that “all members of a resuscitation team...understand the concept of tracheal intubation and the steps involved in successful intubation...and be able to recognize when intubation is being done incorrectly.” There is no expectation that the course provides sufficient training to assure competency, and in fact, the manual recommends that it be done only by those who perform intubation frequently or take renewal courses frequently.

In some hospitals, emergency airway management had been provided by residents, often in specialties where intubation training is not routine, such as internal medicine or surgery. This was identified in our review of adverse events as a factor in some cases of failed management.

Given that emergency airway management and endotracheal intubation are within the scope of practice for respiratory therapists, they have tended to be the alternate provider of choice in many VHA hospitals. However, other hospitals have sought different solutions. In one hospital, two internal medicine chief residents live on the hospital grounds for a year and provide coverage after initial training in the OR.

Another solution described by one VHA facility is a two-tiered system, whereby respiratory therapists are the initial responders for patients in cardiac arrest. However, for patients requiring tracheal intubation but able to wait up to 30 minutes, they call in an anesthesiologist.¹

Adjunctive Devices

Even in the best of hands, emergency airway management can be difficult. At Hartford Hospital, 10 percent of 2,833 out-of-operating room intubations required three or more attempts with an initial esophageal intubation rate of 9.7 percent.¹ If not recognized, esophageal intubation guarantees the patient will not survive. In the review of adverse outcomes in the VHA, several cases had presumed successful intubations only to have esophageal intubation ultimately demonstrated.

During intubation, seeing the endotracheal tube pass through the cords is a useful indication of likely success. However, a review of closed malpractice claims performed by the American Society of Anesthesiologists Closed Claims Project documented numerous cases in which trained anesthesiologists felt the tube had gone through the cords when in fact it had not.⁷

Following intubation, observation of the patient provides an initial indication of tracheal intubation—mist in the tube and a rise and fall of the chest being key indicators. Again, these signs are fallible. Hence, after reviewing the literature, we wrote our Airway Management Directive to require adjunctive evidence of successful intubation.

In the operating room, the presence of end-tidal CO₂ provides a sensitive and specific indicator of successful tracheal intubation. Although generally reliable for out-of-OR use, during cardiac arrest, these indicators may fail. The lack of perfusion means that carbon dioxide may not be reaching the lungs and, thus, end-tidal CO₂ indicators may falsely suggest an unsuccessful intubation. In such situations, an “esophageal detector device” (EDD) may be useful. These devices generally include a bulb syringe that is deflated and then connected to the endotracheal tube. If the tube is in the esophagus, the EDD should not reinflate as rapidly as it would when in the trachea, as a significant volume of air is not normally present in the esophagus. However, a false result can occur if air has been insufflated into the trachea during bag-and-mask ventilation. Conversely, a false result may occur if the tube is in the trachea, but secretions are plugging the trachea or there is little air in the respiratory system due to obesity or obstructive airway disease.

Adjunctive devices greatly increase the likelihood of ensuring proper location of an endotracheal tube—especially when combined with observation of tube placement and chest motion—and should increase patient safety. Such adjunctive devices are also supported by numerous medical societies and organizations that have, after very careful deliberation, endorsed the use of adjunctive devices. Endorsing organizations include the AHA,⁴ the American College of Emergency Physicians,⁸ the American Society of Anesthesiologists,⁹ and the National Association of EMS Physicians.¹⁰

Gaining Buy-in and Seeking Feedback

The process of implementing the VA emergency airway management policy was designed to allow for input and the development of support from different stakeholders throughout the VA. To this end, representatives from the field were included from the earliest stages. They were involved in developing the specific language for the national policy, testing the policy within their local facilities, and acting as ombudsmen with their respective peer groups. Chiefs of staff, patient safety officers, respiratory therapists, anesthesiologists, and field advisory committees for anesthesia, medicine, surgery, and critical care were all involved in the review and critique of the final guidance.

Specifics of the VA Policy

The VA national policy addresses emergent and urgent airway management that occurs outside the operating room, such as during a code, where respiratory distress is active or anticipated. We stipulated that this might involve bag-and-mask ventilation, oral or nasopharyngeal airway, tracheal intubation, or surgical airway.

Some of the specific language of the VA policy is as follows:

Purpose: This Veterans Health Administration (VHA) Directive addresses the appropriate competencies of those who perform urgent and emergent airway management outside of VHA facility operating rooms, and the confirmation of successful endotracheal tube placement through the use of devices, such as carbon dioxide (CO₂) monitors or esophageal detection devices, in conjunction with auscultation.

[There is] ... a requirement for using a device or devices to confirm tube placement in concert with auscultation. Auscultation alone is not sufficient evidence of correct tube placement. Devices that can confirm the tube placement (e.g., portable capnography, esophageal bulbs, syringes, or colorimetric devices) must be used in conjunction with auscultation of breath sounds in all cases of airway management. Use of devices to confirm endotracheal tube placement does not supersede or preclude other aspects of appropriate care, such as the use of x-ray imaging to verify the position of the endotracheal tube and to ensure that both lungs, rather than just the right lung, are ventilated.

End-tidal carbon dioxide (ETCO₂) detectors may provide a false indication of esophageal intubation in cardiac arrest patients because of poor systemic perfusion that delivers little CO₂ to the lungs for exchange or in cases of florid pulmonary edema. EDDs, on the other hand, may provide a false reading of esophageal intubation in obese patients or those with copious pulmonary secretions.

Local policy needs to allow for the appropriate use of both devices in a complementary fashion, depending upon the clinical situation, along with auscultation. For example, the American Heart Association's 2004 *Handbook of Emergency Cardiovascular Care*¹¹ recommends the use of a syringe or bulb as an initial check in cases of cardiac arrest, and the use of a colorimetric device if there is a perfusing rhythm.¹²

The policy requires a demonstrated competency in airway management, subject matter expertise, and a demonstrated proficiency in procedural skills. ACLS certification is not adequate in and of itself. Specific requirements include: (1) knowledge of the major anatomic structures of the airway; (2) ability to formulate and verbalize an appropriate alternative plan, if initial attempts at intubation are unsuccessful; and (3) knowledge of the indications and contraindications for pharmaceutical agents, especially muscle relaxants, for use in airway management.

Proficiency in procedural skills is defined as:

- Successful (i.e., without complications) endotracheal intubations with an actual patient, not a mannequin.
- Successful (i.e., without complications) cases of ventilating an unconscious patient using a bag and mask and either an oral or nasopharyngeal airway.
- Use of alternative methods of intubation that are in practice at each hospital with an actual patient, not a mannequin (e.g., use of the Laryngeal Mask Airway (LMA[®]), Combitube[®], or other means).¹²

Residents and Trainees and Extraordinary Circumstances

To address intubations by residents and trainees gaining these competencies, we included the following specific language:

“Resident staff or other clinical trainees are to be considered in compliance with this policy if they perform endotracheal intubation and airway management under the supervision of a licensed independent practitioner who is appropriately privileged for airway management or an Advance Practice Nurse or Certified Registered Nurse Anesthetist (CRNA) who has a scope of practice that includes airway management.”¹²

Of paramount concern is that the patient in an emergency receives the appropriate care. It is the expectation that there should be very few circumstances in which no individual with the requisite skills for airway management is available at a VA facility, as stipulated in the national guidance. However, to deal with this potentiality, the following language was included:

“In extraordinary circumstances, where an individual is not available with the demonstrated competency in airway management per the requirements of this directive, clinicians may exercise their judgment in the appropriate response with the overarching goal being the care and safety of the patient. If this situation should occur, facilities will conduct an analysis as to why this vulnerability existed and initiate appropriate systems fixes to minimize a repeat occurrence.”¹²

Implementation

Educational materials from existing programs were made available for others to use so that they would not need to develop them *de novo*. Sample policies, educational materials, links to online videos on intubations, FAQs, and information on contact people at other facilities were all provided and made available. (Note: For those interested, the corresponding author can be contacted to provide electronic copies of these materials.)

These materials, vetted with field experts, included pre- and post-tests and steps for preparation and success in intubation, and drew upon an existing body of knowledge.^{6, 13, 14, 15, 16, 17} To assist facilities, the following is an example of a competency checklist and assessment tool that can be used during an observed intubation:¹⁸

- Assessed airway for signs of possible difficult intubation.
- Laryngoscope and suction checked.
- Mask ventilation established.
- Scope placed in left hand.
- Right hand used to open mouth.
- Blade placed to displace the tongue to the left.
- Blade pulled rather than levered on the teeth.
- Tube placed with tip coming in from the right side (and hand not in line of sight).
- Number of attempts needed for successful intubation.

The VHA faced a number of challenges in implementing this policy, including entrenched medical culture, training availability, and costs. However, the change in policy had the backing of national clinical VHA leadership in surgery, anesthesiology, and critical care, as well as senior administrative leadership, facilitating our ability to face those challenges.

Airway management and tracheal intubation are dramatic and frequently life-preserving or life-saving measures. Consequently, physicians have a natural desire to be able to provide that care. However, as the literature demonstrates, physicians without specific training in airway management tend to have a relatively low success rate. The concept that intubation is now a skill that requires privileges was a real culture change, even though many other skills need to be specifically mentioned in privilege.

Another cultural issue raised by facilities was, “How will our residents get experience with airway management, if they are not permitted to do it?” The culture change for resident education was that the skill needed to be learned just as any other skill is learned, with education and mentoring. Residents whose programs do not routinely include such training can be encouraged to seek out training in the operating room or, possibly, to participate in a mentored situation during out-of-OR intubations.

For some institutions and individuals, identifying a nonphysician as the responsible individual created cultural issues. Here is an example of how this might be an issue: Hospital policy identifies trained respiratory therapists as being responsible for intubation. An attending physician for the patient is present at a cardiac arrest and wishes to do the intubation but is not privileged and not trained, so the therapist needs to proceed. This is a real change from traditional medicine.

For many institutions, training availability is an issue. Our office created a Web site with text, graphic, and video training. Whereas use of mannequins for initial training was encouraged, the task force agreed that actual patient experience under observation—not just for tracheal intubation, but also for bag-and-mask ventilation—was mandatory. The latter skill is highly dependent on patient anatomy and is not well learned from a mannequin.

A recent study suggested that mannequin simulations may be as good as human subject training for paramedics.¹⁹ However, that study required 10 hours of mannequin training, at which point the success rate was still only 88 percent. It was our feeling that demonstrating skills in human subjects is critical, not only for high success rates for intubation, but also for developing and being able to appropriately implement an alternative plan for failed intubations.

Many VHA facilities are relatively small, and the opportunities for training are limited. Furthermore, new developments in anesthesia, such as laryngeal masks, mean fewer and fewer patients are being intubated. This has been an ongoing challenge for small facilities, which is why they have been encouraged to partner with larger facilities or nearby community hospitals.

For some nonacute care facilities (eg, long-term care facilities) that rarely have resuscitation situations, the concept that intubation should not be attempted was a culture shift. Intubation by

untrained individuals sometimes results in esophageal intubation. In communities with trained paramedics, such facilities were encouraged to seek a waiver permitting trained paramedics to be the responders, with initial airway support provided while awaiting the paramedics' arrival.

When instituting the new Directive, we were concerned that cost might be an issue. Potential solutions generally involved some cost. A solution that would have been the most costly was to add in-house anesthesia staff or emergency medicine physicians with airway training. We are not aware of any facilities that did this. Other less obvious costs included overtime for respiratory therapists to attend training sessions in operating rooms plus travel costs for some personnel to go to other facilities for training. Surprisingly, we received almost no negative feedback concerning costs, presumably because of the near-universal recognition of the need for trained individuals.

Conclusions

The U.S. Department of Veterans Affairs identified a significant issue through their patient safety program: in some circumstances, clinicians (oftentimes residents) were being placed in a position of performing airway management, despite their lack of competency and proficiency and without the availability and use of adjunctive devices to confirm tube placement. By proceeding deliberately in the development of a national policy and initiative, the VA successfully transitioned to a current position of mandated use of confirmatory adjunctive devices that are inexpensive but have high sensitivity and specificity. Furthermore, by drawing upon the existing professional communities for feedback and support, the VA eased this transition.

Support materials were developed, vetted, and shared across the system to further help in this endeavor. Next steps will involve gathering information from facilities regarding confirmatory adjunctive devices being used, types of professionals now providing airway management, and other requisite needs to assist in continuing improvement.

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