

Improving Emergency Airway Management within the VA

By Erik Stalhandske, MPP, MHSA, program manager

OVER 11,000 TIMES A YEAR within the VA, there is an emergency airway management event that occurs outside of the operating room. Well-trained, competent individuals handle the majority of these emergencies. They have the requisite skills in airway management and the appropriate tools available. However, in a number of cases, clinicians attempt to perform airway management without sufficient proficiency, expertise, support, or adjunctive devices that allow confirmation of the placement of the tracheal tube.

To address this issue, NCPS has been working on an initiative with the VHA Director of Anesthesia, Dr. Michael J. Bishop. This initiative, which will culminate in official guidance, will require that each facility establish an emergency airway management program that:

- ❖ Delineates that those performing intubations must have privileges or scope of practice to perform intubations
- ❖ Establishes the criteria for privileging clinicians
- ❖ Ensures there is a training program for those seeking to be privileged in intubations
- ❖ Directs that an adjunctive device be used to confirm tube placement

Inadvertent esophageal intubation is one possible adverse outcome from an emergency airway management event. If not identified in a timely manner, esophageal intubations can result in serious injury or death to the patient. Root Cause Analyses (RCAs) submitted to the NCPS SPOT database confirm that adverse events during non-OR emergency intubations occur in the VA.

Root Causes and Emergent Airway Management

Examples are provided below from root causes from RCAs:

- ✓ Assessment of exhaled carbon dioxide was not used to verify tracheal placement of ET tube because such devices are not readily available outside of the OR; this resulted in an undetected esophageal intubation.
- ✓ The 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 lung, thereby resulting in a delay in establishing the patient's airway.
- ✓ The surgical and medical residents both believed they were in charge of the patient and the leader of the code team; this resulted in a delay in establishing the patient's airway.
- ✓ Due to the unavailability of the CRNA, a resident was called to re-intubate a patient and was unable to establish an airway; the patient's condition deteriorated until the CRNA arrived and successfully intubated the patient.

Sampling of Proposed Actions and Outcomes

Many VA facilities have implemented actions to improve emergency airway management. Below are some examples.

Action	Outcome Measure
Restructure respiratory therapist assignments to optimize coverage. Update policy so that the first respiratory therapist responding to a code will attempt intubation.	Proportion of codes with respiratory techs in attendance, and proportion where respiratory tech performs intubation.
Drills and mock codes on the unit will be instituted to emphasize the importance of caregiver roles and communication. Consider using a pin/hat (bright color) to identify leader of code.	Mock codes occur and are documented every month with documented leader. Rates of unanticipated esophageal intubation.
For all intubations including tube exchanges, the clinician will enter a progress note indicating the results of exhaled carbon dioxide assessment. Database will be adapted to include a field for results of exhaled CO2 assessment.	Clinician entries will be reviewed by the appropriate committee on a quarterly basis. If no undetected esophageal intubations are cited, then medical record and emergency effectiveness sheets will be reviewed.
Assemble specialized airway management equipment and supplies to be brought to each cardiac arrest by the resident or caregiver on-call. Anesthesia and Respiratory Services will develop a procedure to ensure its availability, including the replenishment of supplies.	Tracking data will confirm that kits are brought to 100% of codes.
Anesthesia standby will be required for all intubations (elective and emergent).	Proportion of total intubations with anesthesia present. (Goal is 100%)
CO2 analyzers will be purchased and stocked on all code carts. Anesthesia and respiratory techs will be trained in the use of the CO2 analyzers.	Committee will verify that CO2 analyzers are on the code carts. Monthly, compare the number of analyzers being used to the number of codes requiring intubations.
Since the current ACLS training program relies on self-reporting of training, develop a systematic program that identifies and verifies training requirements for privileging in intubation.	100% of those performing intubations are privileged and trained for intubation.

Survey of Facilities

To gather national rates of difficult and unanticipated esophageal intubations in the VA, NCPS developed a survey in conjunction with VHA's Chief of Anesthesia.

The survey was e-mailed to Patient Safety Managers at all 163 VA hospitals in September 2002 and returned to NCPS by December 2002. 135 surveys were returned to NCPS, representing an 83% response rate. Only three lacked complete informa-

continued on back page

Lessons learned from the big blackout of August 2003

Contributions from VISN 3: Rosario-May Mayor, RN, MA, patient safety officer; from VAMC Detroit: Michael V. Olson, chief, facilities management; from VAMC Bronx, Robert M. Walton, chief, facilities management, John Rocco, information technology specialist, Phil A. Zablocki, information technology specialist.

VA facilities affected by this summer's blackout rose to the challenge of carrying out basic services in support of patient safety. Below is a synopsis of how two facilities, VAMC Detroit and VAMC Bronx, dealt with several emergent problems and learned how to better position their facilities to enhance response to potential future occurrences.

VAMC Detroit

Problem: Pressure in the city's main water system wasn't sufficient for all facility requirements.

Response: The booster fire pumps were disconnected from automatic operation because they would be ineffective due to lack of water pressure. A fire watch was initiated and the Detroit Fire Department notified. A "bucket brigade" was developed to carry water from an atrium fountain to the fifth and sixth floors to flush toilets. The boilers had to be shut down. In particular, this meant no steam for cooking or sterilization in the Supply Processing and Distribution Department. To keep patients fed, cold meals were served, consisting of such things as lunch meats, breads, chips, etc. Sufficient instruments had been previously sterilized in readiness for emergency surgeries; elective cases were cancelled. Drinking water had been stored for use; additional water was purchased. Hemodialysis operated effectively, as enough city water was available to maintain the dialysis water treatment system.

Lessons learned: Store as much drinking water as possible. As this is a "dated" item, there needs to be a balance/strategy on what constitutes a reasonable amount.

Problem: Reduced electrical power

Response: All eight generators started immediately and the automatic transfer switches operated as designed. Stored flashlights and batteries were available; additional batteries were purchased. The emergency power maintained air conditioning units in the Surgical Suite and Animal Research facility only. Critical care patients were moved from the Medical and Surgical Intensive Care Units to the Recovery Room. To ensure other patients weren't overheating due to the lack of A/C, temperature readings were taken throughout the facility.

Lessons learned: (1) Ensure all generators operate well and that sufficient fuel is available. (2) Check the emergency electrical distribution system to ensure that all

items listed as being attached to the system actually are attached. (3) Keep flashlights and batteries available and in secure locations. It is amazing how often these are not where they are supposed to be.

Problem: Potential loss of oxygen supply for home care patients

Response: As contractors generally provide equipment for patients who require oxygen through the prosthetics program, provisions had been developed in the contract for backup situations. The contractor performed as required, contacting all appropriate patients to ensure their oxygen supply had not been disrupted.

Lessons learned: (1) Have an accurate, up-to-date list of patients receiving home care available, emergency numbers for the appropriate contractor(s), and back-up provisions should an emergency occur. (2) Ensure the facility has recent, confirmed agreements with suppliers and vendors for replenishment of supplies; the midst of an emergency is a difficult time to forge new business relationships.

VAMC Bronx

Problem: The main backup generators started up, but failed because the generator control logic did not allow transfer switches to close. Two existing under-voltage relays had never been tested in the "cold load pick-up" mode. They may have been out of calibration, though they had been calibrated within the last three years as recommended. In this case, the generators were configured to start simultaneously during a power failure. The "cold load pick-up" created by the generators coming on-line at once, however, caused them to shut down due to the control logic. The problem was not experienced during monthly generator tests. The normal control test sequence is to synchronize the 4,160 volt generators with the utility company feeder and then transfer the load to the generators so that no outage occurs during the test. When a triennial electrical outage test was performed, the generators were started up prior to the last feeder outage to minimize the outage time.

Response: Individual generators for Life Support and Nursing Home Care Unit started up and operated successfully. Intensive Care Unit, Operating Room, and SCI ventilator patients had power, resulting in no harm to critically ill patients.

Lessons learned: (1) Test the main backup generators under all potential scenarios; test several times annually under full blackout conditions. (2) Calibrate all critical control relays every 1-2 years as per control vendor recommendations to ensure proper operation. This is especially important regarding the older, induction-disk type relays. The medical center now plans to conduct generator tests with a "cold load pick-up" several times annually to determine if logic is working correctly.

Problem: The medical center's main emergency generators started up, but did not transfer power. Because the power for the generator cooling systems was on the secondary side of the transfer switch, the cooling systems did not get power and the generators overheated without ever transferring load. This resulted in damage to



Photo courtesy of John Paglione, health systems specialist

Facility management staff closely monitor VAMC Detroit's electrical load.

engine cooling system hoses on one of the generators.

Response: The emergency generator had to be repaired prior to use. The medical center is investigating the installation of a distribution panel and a 4,160-volt to 480-volt transformer on the primary side of the transfer switches — specifically to power all generator accessories, such as the cooling systems.

Lessons learned: Ensure that all emergency generator accessories are powered directly by the generator and do not rely on the transfer switch closing in order to operate.

Problem: The medical center's Life Support generator started up and operated normally, but shut off after approximately 10 hours because the day tank was empty. Although the medical center had adequate fuel in the exterior underground storage tank, the day tank fuel transfer pump did



Photo courtesy of John Paglione, health systems specialist
VAMC Detroit nursing staff reconnect monitoring systems for a patient moved to temporary ICU in Recovery area.

not receive power from the Life Support generator. This transfer pump was powered by normal power and when the main emergency generators failed, there was no power to the pump. This had not been determined during many years of testing because normal power was available for the other circuits during the generator testing.

Response: The facility obtained a small portable generator to power the fuel transfer pump in order to restart the Life Support generator. The circuit for the pump has now been transferred over to a

Life Support generator electrical panel. This will ensure it is powered automatically by the generator.

Lessons learned: Ensure that all emergency generator accessories are powered directly by that emergency generator and do not rely on other generators to supply power.

Problem: When the medical center's main 4,160 volt emergency generators failed, the 480-volt Life Support generator did not supply power to all critical loads in the medical center. The Medical and Surgical units, Mental Health unit, elevators, medical air, vacuum, fire pump, telephone system, radio systems, etc., received no power. The electrical distribution system had been designed in the mid-1970s and did not distinguish between Critical, Life Safety, and Equipment branches as required by the National Fire Protection Association (NFPA) codes. A complete blackout hadn't been experienced since the replacement hospital was opened in 1980; further, the emergency power was designed to power up the entire medical center using 4,160-volt generators. Many features of the emergency generators and distribution system can contribute to unreliable emergency power. This includes the control logic for the generators and the distribution of normal and emergency power using the same wiring, transformers, secondary switchgear, etc. There are no transfers for individual electrical risers except for those on the Life Support generator.

Response: A project is being developed to upgrade the electrical distribution system to comply with NFPA code. Four-hundred and eighty-volt generators and transfer

switches are scheduled to be installed in equipment such as Critical and Life Safety risers.

Lessons learned: Ensure that the medical center electrical distribution system is in accordance with NFPA codes and that critical loads are on reliable emergency generator sets.

Problem: The Uninterrupted Power Supply (UPS) on each BCMA backup PC was capable of generating enough power to view the Medical Administration Records (MARs), but not enough to print them. The amount of power needed to print the MARs would have drained the UPS and caused the backup PC to reboot.

Response: Since the ICU had a backup generator that functioned, the staff was able to print MARs for their area. They did not realize, however, that they could do so for the whole hospital. The computer room staff recognized that they had the capability to print MARs for the entire facility and did so.

Lessons learned: Ensure that staff members understand whether or not they have the capability of printing MARs at their workstations; develop a plan regarding who should be responsible for printing them during such an emergency.

NCPS Observation: Many of these situations confirm the value of end-to-end testing of contingency plans to confirm that they will work as intended. HFMEA™ provides a framework for this process.



Preventing Surgical Fires at the Birmingham, Alabama VAMC

By Jimmie G. Davis, BVAMC Patient Safety Manager

AT BIRMINGHAM VAMC, we take the issue of surgical fires and their prevention very seriously. There has been a collaborative effort underway to educate and train staff in our process for prevention of such fires. The training consists of three elements.

The first element has been conducted during monthly surgical resident meetings. Resident physicians have been trained at these meetings to control heat sources regardless of the type equipment

utilized. For example, they have been instructed that when draping patients they need to either allow adequate time for the wet area to dry, or to absorb any wet areas with a towel prior to the start of the procedure. They also learn to maintain ambient oxygen levels near 21% by not tenting over nasal oxygen equipment.

All OR staff have had in-service training in potential OR fire events. This training consisted of a lecture and video on surgical fires, and actual simulation of

a fire in the OR suite. Staff practiced extinguishing a live fire according to service guidelines and completed a post-test evaluation.

The BVAMC will report any surgical or near miss fires to the Patient Safety Manager who in turn will work with the Hospital Safety Officer and other appropriate staff to investigate the events and recommend corrective action to prevent future occurrences.



Improving Emergency Airway Management within the VA (continued from front page)

tion and nine of the facilities that responded do not perform non-OR emergency intubations. In total, the survey respondents estimated that there are 11,007 non-operating room, emergency intubations per year in the VA. Given that we had non-respondents, this is a low estimate.

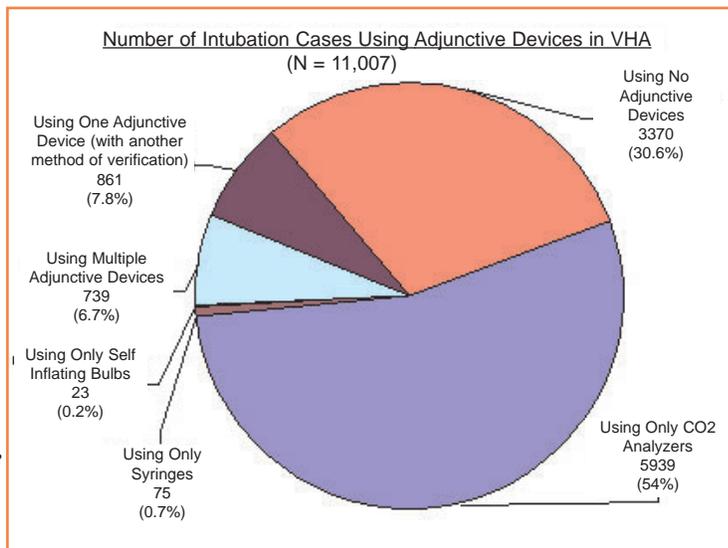
Difficult cases and unanticipated/unplanned esophageal intubations

Respondents estimated that 12.3% (n=1,354) of non-OR emergency intubations in the VA were unusually difficult to accomplish; further, that 6.5% (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.

Who is taking care of emergency airway management and use of adjunctive devices

At most VAMCs, multiple disciplines provide coverage for emergency airway management. However, the proportion shifts dramatically from regular tour to off-tour duties. During regular tour hours, an Anesthesia provider is available in 86% of the facilities. During off tours, only 45% of facilities have anesthesia providers available. (Note: We do not have good data on what proportion of the intubations are actually performed by each type of provider.)

Over half of VA facilities use colorimetric analyzers (CO2 analyzers) to confirm tracheal placement in addition to clinical



assessment of breath sounds. Less than 1% use only syringes or only self-inflating bulbs. Thirty percent of all reported cases use no adjunctive devices; this equates to nine cases a day or 3,370 per year within the VA with no adjunctive devices confirming tube placement.

What to do about this issue

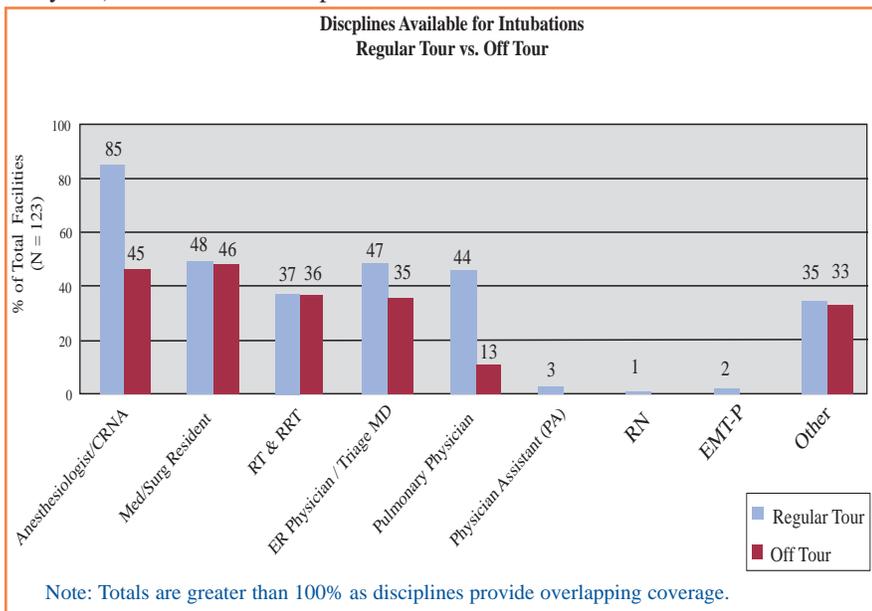
In addition to developing requirements for those who will

have privileges and scope of practice to perform intubations, it is also important to use an adjunctive device to confirm placement. As can be seen in the above pie chart, CO2 analyzers are the most popular adjunctive device by those that use them. However, facilities should also consider syringes and bulbs, as they are cheap, effective, and reliable in confirming tube placement. They also yield important complementary clinical information, especially during cardiac arrests and other low output states.

Summary

Patient Safety Managers may want to examine their policies on emergency airway management in anticipation of new national guidance. Special attention should be given to who performs intubations, what competency requirements now exist, and who will be responsible for competency assessments and proficiency programs.

The Chief of Anesthesia may be the most appropriate person to oversee this issue.



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VA National Center for Patient Safety
P.O. Box 486
Ann Arbor, MI 48106-0486

Phone:(734) 930-5890
Fax:(734) 930-5877
E-mail:ncpstips@med.va.gov

Websites:Internet - www.patientsafety.gov
Intranet - vawww.ncps.med.va.gov

NCPS Director James P. Bagian, MD, PE
Editor Joe Murphy, APR
Asst. Editor, Layout & Design . . . Jean Alzubaydi, MA

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