

### **3.2 Simulation Based Training Improves Airway Management for Helicopter EMS Teams**

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**Abstract:** The use of paralytic medications in the performance of RSI intubation is a high risk intervention used by many HEMS crews. There is no margin for error in RSI intubation as the results can be fatal. Operating room access for airway management training has become more difficult, and is not representative of the environment in which HEMS crews typically function. LifeEvac of Virginia designed and implemented an SBT airway management program to provide a realistic, consistent training platform. The dynamic program incorporates standardized scenarios, and real life challenging cases that this and other programs have encountered. SBT is done in a variety of settings including the helicopter, back of ambulances, staged car crashes and simulation centers. The result has been the indoctrination of a well defined, consistent approach to every airway management intervention. The SBT program facilitates enhancement of technical skills, as well as team dynamics and communication.

#### **Nomenclature (symbols/definitions):**

CAMTS-Commission on Accreditation for Transport Services

ETI, Endotracheal Intubation

HEMS, Helicopter EMS

NMBA, Neuromuscular blocking agent

RSI, Rapid Sequence Induction,

SBT, Simulation Based Training

#### **INTRODUCTION:**

In the United States, many HEMS flight crews are trained in the procedure of RSI intubation to help manage airways. One of the risks of emergency intubation is aspiration of stomach contents which can lead to a significant increase in morbidity and mortality. RSI intubation was developed for the purpose of providing a means by which an endotracheal tube could be placed while minimizing the chance of aspiration in patients considered having "full" stomachs. It is a high risk procedure that uses a sedative and NMBA (paralytic) to induce pharmacologic relaxation and

paralysis in order to facilitate airway management and endotracheal tube placement. If performed correctly, a patient can have their airway secured rapidly and with minimal chance of aspiration or oxygen desaturation in order to be effectively oxygenated and ventilated. If performed incorrectly or if a provider is ill prepared to deal with potential complications the procedure can have disastrous consequences resulting in permanent disability or death.

## BODY:

Historically the use of paralytic agents has been reserved for use by anesthesiologists and emergency physicians with years of specialized training in a hospital environment. However, the last decade has seen a proliferation of use of such agents in the out of hospital setting to facilitate airway management and endotracheal intubation by paramedics, nurses and respiratory therapists. The high acuity and severity of illness of patients typically transported by HEMS often places flight teams in the position of having to utilize advanced airway management skills such as RSI. HEMS teams are often called upon by emergency medical services providers for their expertise in airway management. Frequently they are required to utilize these skills on patients that require interfacility transport as well.

It is important to master the technical aspects of the RSI procedure as well as the associated risk assessment and decision making involved in the decision about whether or not to deploy the procedure. This level of risk assessment is essential in order to minimize any potential patient harm secondary to RSI intubation. SBT has become an increasingly popular tool for training in healthcare settings and has been specifically recommended for emergency medicine training [1-3].

LifeEvac of Virginia is a CAMTS accredited three base rotor wing program based in central Virginia that flies with a critical care paramedic and critical care RN. Although CAMTS accreditation is voluntary, it is rapidly evolving into an industry standard that symbolizes a commitment to quality and safety by transport agencies. CAMTS

requires that flight crews participate in airway management training on patients that fall within the scope of care for the transport service (e.g., infants, children and adults) on a quarterly basis in order to ensure ongoing skill competency. The training standard states [4] "...no less than one successful live, cadaver, or mannequin intubation per quarter is required..." There is significant latitude left to the individual programs as to how they develop their educational programs to meet the standard. LifeEvac of Virginia developed and implemented a program utilizing SBT several years ago in order improve preparation for and success of RSI intubation and to minimize potential complications.

With any high risk procedure such as RSI it is essential that a consistent approach is utilized each time in order to maximize success and minimize complications. LifeEvac of Virginia developed a structured and guided SBT program for airway management built on the principals and algorithms endorsed in Emergency Airway Management [5]. Although there are many different ways to approach and perform RSI, this approach was chosen due to its reproducibility, ease of use, and due to the fact it is one of the most evidenced based approaches to airway management that currently exists.

The airway management training program is led by its Medical Director and a dedicated team of individually chosen crew members that have all taken The Difficult Airway Course: Emergency™, a physician level nationally offered emergency airway management course, directed by Ron Walls [6]. LifeEvac's airway instructor team is active year round in planning and designing training sessions. The airway instructors typically run three

age based scenarios each quarter. Flight crew members rotate through each station in teams of two. (Figs 1, 2)



Fig 1



Fig. 2

They are provided an initial briefing of the scenario by the instructor and then given approximately thirty minutes to complete the scenario. The station is then debriefed with the crew and questions answered during the second thirty minutes. This same sequence is then repeated for the remaining two stations. These trainings take place over the course of two full days in order to cycle all of the crews through. At the end of the two days, the instructors debrief amongst themselves in order to identify any common trends or problems noted and to identify opportunities to improve the scenarios or overall training for the following quarter.

For each scenario, there are "critical actions" that reflect the fundamentals

and essential technical aspects of RSI intubation as well as decision making and risk assessment for deciding whether or not to proceed with RSI intubation. All critical actions must be met in order to pass the scenario. If all criteria are not met, the team is remediated on the spot, and depending on the level of concern, may be brought back for additional remedial training at the discretion of the instructors and Medical Director. If a crew member's performance demonstrates numerous missed critical actions, their privilege to perform RSI intubation may be revoked until they demonstrate a satisfactory level of performance.

## DISCUSSION:

One of the major advantages of SBT is that it has provided the ability to more realistically train HEMS crews in airway management in ways that were previously impractical. Traditionally many HEMS crews have done rotations in the operating room in order to gain intubation and airway management experience. Although these experiences are valuable, they are not reflective of the environment and conditions in which HEMS crews typically function. Operating rooms have good lighting, climate control, and patients are typically placed on the operating table in a position that is a comfortable level to intubate. The patients have empty stomachs (and thus are at low risk for aspiration), and there are plenty of resources and backup available should a complication arise. HEMS crews on the other hand are often called to manage airways in adverse conditions such as the middle of the night, in the rain, on the side of the road, or with patients trapped in vehicles, with poor lighting and intubation conditions, etc. All of their patients are considered to

have “full stomachs” and are at high risk of aspiration. Should a complication arise, HEMS crews do not have the luxury of having backup resources available to assist. They have to be adequately prepared to manage the complications themselves. Another limitation of trying to send people to the operating room for training is that in recent years access to operating rooms has become more difficult due to concerns from anesthesiologists about liability exposure.

Various settings are utilized to train the crew in RSI intubation. These settings are intended to emulate environments that the flight crew may find themselves in, and include the back of an ambulance, a helicopter, the woods, vehicle entrapment, structure collapse, and in the hospital at the patient’s bedside. (Fig 3)



Fig 3

These various situations present different environmental, communication, and team work challenges. The flight crews have to manage the barriers to success these various environments may pose, while simultaneously implementing a consistent effective approach to airway management. There are no “critical actions” that are based on the environment in which airway management takes place. Rather these environments are selected in order to

provide an additional level of realism and distraction in which crew members must demonstrate proficient airway management. (Figs 4-6)

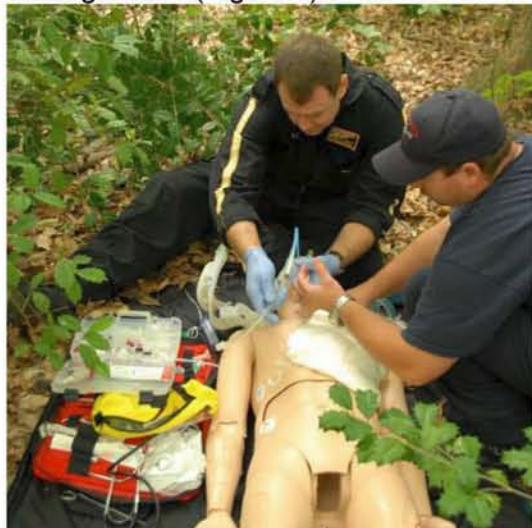


Fig 4



Fig 5



Fig 6

The scenarios are often based on actual calls that the program has experienced. Practicing in an environment with

equipment that replicates reality raises situational awareness and increases the probability that the trained teamwork skills will transfer to real life practice. The advancement in technology that has resulted in portable human patient simulators has been instrumental in allowing us to provide training in austere environments. (Figs 7-8)



Fig 7



Fig 8

The dynamic human patient simulators offer several advantages over static manikins. (Fig.9)



Fig 9

First, the instructors can set the difficulty of airway with regards to ability to visualize and access the vocal cords, by swelling the tongue or inducing jaw rigidity, and can create other physiologic complications. Physiologic responses to the flight crew's interventions as they work through the scenarios can be provided in real time. For example, if the crew does not adequately pre-oxygenate the patient, the instructor can cause the simulator to desaturate and become bradycardic in the middle of the procedure, forcing the crew to then have to manage this complication. Immediately after intubation, physiologic responses, such as lethal dysrhythmias that may occur can be reproduced with SBT and crew ability to respond to, diagnose and correct the problem measured.

#### CONCLUSION:

At LifeEvac of Virginia, the use of an SBT, using an active, dynamic human patient simulation training program for airway management and RSI intubation has led to high success rates of airway management with minimal complications. It has also improved medical team satisfaction with airway management training, in that we are able to more closely emulate real life situations.

The use of SBT as a training platform has allowed us to improve patient safety by being able to observe how team members anticipate, prepare for and manage potential complications associated with RSI intubation. Finally, use of the simulation based airway management program has reinforced the critical aspects of crew communication with respect to decision making and successful procedure implementation.

[http://www.theairwaysite.com/pages/page\\_content/Airway\\_Emergency\\_More.aspx](http://www.theairwaysite.com/pages/page_content/Airway_Emergency_More.aspx)

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