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Developing a Rapid Sequence Intubation Course for an Advanced Life Support Ambulance Service

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Table of Contents

List of Tables

Abstract

People can not survive without an intact and functional airway. Thus, the concept of airway is vital to survival. Paramedics of advanced life support ambulance services use airway management tools such as bag valve mask, oral and nasal pharyngeal airways, combitubes, nasal and oral tracheal intubation. While these tools are beneficial for airway breathing management, in some cases they are ineffective due to the severity of the illness or injury. Neuromuscular blocking drugs and intravenous (IV) anesthetics are routinely used for intubation for difficult airway management in hospital emergency rooms, intensive care units, and operating rooms. This technique is referred to as rapid sequence intubation (RSI). RSI enhances the ability of the care provider to effectively control the necessary airway and breathing needed for the patient to survive.

A majority of paramedics of advanced life support ambulance services are currently not trained in RSI and have no alternative options when faced with a difficult airway that can not effectively be controlled with the current airway skills and tools available to them. This project has brought RSI beyond the hospital doors to the prehospital arena for paramedics of an advanced life support ambulance service. A protocol for the use of RSI and the training necessary to implement RSI has been developed for paramedics of an advanced life support ambulance service.

Eighteen paramedics attended the airway course. The evaluation and feedback from the participants was positive indicating that the project was successful. RSI has now become another option for this advanced life support ambulance service to manage patients with difficult airways in the prehospital environment.

Chapter I

Introduction

The advanced life support ambulance service this project targeted is located in the upper Midwest, is owned by a large multi-health system and provides service to the citizens of two counties and multiple cites both urban and rural. A combined population of 200,000 citizens receive emergency medical service (EMS) from the advanced life support ambulance service. The annual average service call volume within this population is 13,000 requests per year (personal communication, J. Doe, Operations Manager, March 15, 2005). The paramedics at the advanced life support ambulance service have had an average of 142 intubations per year for the past three years. In order to ensure skills validation, this advanced life support ambulance service requires each paramedic insert an oral or nasal airway, mask ventilate, and intubate at least four times per year (personal communication, J. Doe, Clinical Supervisor, March 15, 2005). Medical direction for the advanced life support ambulance service is under the direction of an emergency medicine physician from a local hospital.

There is no medical entity that faces more difficult airway challenges than the prehospital emergency medical service arena (Margolis, 2004). For the paramedics at this advanced life support ambulance service establishing and maintaining an adequate airway is one of the most important initial therapies provided to patients who are critically ill or injured. Patients with conditions such as severe head or brain injury, facial trauma, acute alcohol or drug intoxication, and severe cardio-respiratory compromise or failure frequently require invasive airway-breathing management. The problem faced by paramedics is that some cases requiring invasive airway management are not manageable

with the current tools available to them such as, bag valve mask, combitube, and intubation. Some patients require neuromuscular blocking drugs and intravenous (IV) sedatives or anesthetics to facilitate and maintain an adequate airway. This is what made this project vital to the advanced life support ambulance service and the citizens they serve.

Clinical Problem

In order for a paramedic to sustain the life of a patient they must know and understand the importance of the ABCs—airway, breathing, and circulation. It is no coincidence that the A for airway in the ABCs is first in treating every patient. Of all the skills a paramedic learns in their training and subsequently use on patients in the clinical setting, airway management is the most important (American Heart Association, 2003). Simply stated, patients without an adequate airway have increased morbidity and mortality because they cannot take in oxygen.

The importance of implementing RSI is due to the fact that no matter how good the care a paramedic may render, if they cannot adequately clear and maintain the patients airway, everything else such as IV fluids and medications will be of no benefit. The patient can not survive in the absence of an open pathway for oxygen to enter the lungs (Bledsoe, Porter & Cherry, 2003). Having the ability to use RSI is an important tool and step for securing the airway and providing oxygen for those patients that cannot be effectively managed with the current tools available to the paramedics at this advanced life support ambulance service.

This advanced life support ambulance service has an aggressive quality assurance program with an active physician medical director and clinical supervisor that require all

paramedics to intubate in the clinical setting a minimum of four times per year, as well as quarterly skills training for intubation and combitube insertion using a manikin. These requirements along with the high service call volume of 13,000 per year have made the paramedics at the advanced life support ambulance service proficient at airway management and intubation. However, as stated earlier, there remains a class of patients that are difficult to manage and require aggressive airway management.

Patients with head injuries, status asthmatics, status seizures, or acute drug and alcohol intoxication frequently have severe muscle tension resulting in a clinched jaw and truncal rigidity. These are difficult and sometimes impossible patients to ventilate with a bag-valve-mask. Due to increased muscle tension the mouth cannot be opened for tracheal intubation. In addition, these patients are at high risk for aspiration due to depressed airway breathing reflexes. Without oxygen the brain begins to die and multi-organ system failure develops due to the poor hemodynamics (Morgan, Mikhail & Murray, 2002).

The benefit of RSI is that administration of an IV sedative or anesthetic will render the patient unconscious. Administration of a neuromuscular blocking drug will paralyze all muscles in the body. Once the patient is unconscious, muscle tension and truncal rigidity are relieved, allowing for easier access and control of the airway. The patient will not be combative and the mouth can be opened which will facilitate suctioning and tracheal intubation. If tracheal intubation is unsuccessful a combitube can be inserted to maintain a patent airway and allow the patient to be adequately ventilated, which is the ultimate goal of prehospital care management (Bochicchio & Scalea, 2003).

Purpose of the Project

The purpose of this project was to develop education necessary to implement RSI for the paramedics, and to provide an educational workshop to strengthen all airway management skills of this Midwest advanced life support ambulance service.

Conceptual/Theoretical Framework

Merle Mishel developed the model of perceived uncertainty in illness and injury in order to assess the degree of uncertainty and identify coping strategies the patient and family can use to adapt to situations involving illness or injury. The model recognizes that an event or symptom such as injury and illness can serve as a stimuli that creates uncertainty because the patient and family do not know the outcome and are in fear of a negative outcome. Identifying and implementing coping and buffering strategies is key to the adaptation of the uncertainty (Tomey & Alligood, 2002).

Michel's research into uncertainty drew upon existing concepts such as stress, appraisal, coping, and adaptation from Lazarus and Folkman. Mishel also incorporated parts of the Chaos Theory because it focuses on open systems and is more applicable to how acute illness and injury causes disequilibrium. The goal of Merle Mishel's research was to return knowledge to practice. Bringing the model of perceived uncertainty into practice allows nurses responsible for patients to incorporate uncertainty assessment and intervention into the plan of care (Tomey & Alligood, 2002).

Merle Mishel's theory of uncertainty can be applied to acute onset of illness or injury. Uncertainty in anyone's life can have a negative psychological impact on the patient and the entire family. If a person is ill or injured to the point that they need airway management, there is an immediate amount of uncertainty thrust upon the patient and

their family. RSI is an important tool that can be used to address one of the most important parts of uncertainty that has been created from an inadequate ineffective airway. If paramedics do not have RSI tools available to them, rendering them unable to manage the patient's difficult airway, the uncertainty of the airway problem then becomes a certainty that increased morbidity and mortality will result.

While an airway problem alone is devastating, an airway problem impacts, family, employment, income, financial status, and spirituality. The psychological distress of uncertainty that results from airway problems can lead to stress, anxiety, depression, and hopelessness for the patient and their family. This can have a profound effect on the healing process and cause a patient's condition to worsen (Tomey & Alligood, 2002).

The paramedics are the first practitioners who will address the uncertainty. By establishing and adequately maintaining the airway and breathing the paramedics are addressing the most immediate critical part of the uncertainty. Without an effective airway there is certainty that the patient will suffer increased morbidity and mortality.

When the patient enters the hospital system it is the primary responsibility of the nurse caring for the patient to recognize uncertainty from an airway problem. Helping the patient and family through this difficult time with the uncertainty that has been created can have an impact on the outcome of the patient as well as the entire family.

There are three primary things the nurse can do to reduce the uncertainty related to airway. First and foremost, providing information about what has happened and why airway management was needed is vital to reducing uncertainty. Patients and families who are informed and understand the reasons behind what has transpired tend to have less anxiety (Tomey & Alligood, 2002).

Secondly, if possible, it should be explained as to what to expect in the near future and beyond. It is generally known approximately how long someone will need airway management. If the patient is on a ventilator, the patient and family must be informed if it is expected to be short or long term. Patients who are severely traumatized, especially head or chest injuries, generally require long term ventilator assistance versus acute alcohol or drug intoxication, which may require short-term ventilator assistance. Informing on expectations gives the patient and family information and direction so they can begin decision making on how to manage their daily lives (Noone, (2002).

Thirdly, resources should be gathered to help reduce uncertainty for the patient and their family. This may include scheduling a care conference between the physician, patient, and family. A care conference via telephone or face to face will provide specific medical information related to airway and all other body systems. Making arrangements for a conference with clergy, finance department, or the hospital social worker can be helpful to provide more information and assistance with difficulties in these areas. These resources can provide insight and information to the patient and family, reducing the amount of uncertainty created from an airway problem while creating certainty which will reduce the negative impact and enhance the coping ability for both patient and family (Tomey & Alligood, 2002).

Definitions

Combitube: A double lumen airway with two cuffs, the two lumens are separated and color-coded. The tube is blindly inserted, both cuffs are inflated, and if placed in the esophagus, ventilation through the blue tube will force air out the side perforations and into the larynx. If placed in the trachea, ventilation through the white tube will direct air

into the trachea. Ninety percent of combitubes are inserted into the esophagus; therefore ventilation is most often performed through the blue tube. (Barash, Cullen & Stoelting, 2001).

Conventional airway tools: Airway breathing management tools currently used by advanced life support ambulance such as oral and nasal airways, bag valve mask, combitube, oral and nasal intubation.

Rapid sequence intubation: Administration of an IV sedative or anesthetic followed by a rapidly acting neuromuscular blocking drug. Sellick's maneuver is applied prior to administration of the drugs to reduce the risk of aspiration. Direct laryngoscopy and intubation is performed as soon as muscle relaxation is detected (Barash, Cullen & Stoelting 2001).

Sellick's maneuver: Application of firm pressure over the cricoid cartilage prior to initiation of RSI. The cricoid cartilage is an incompressible ring; pressure over it is transmitted to underlying tissue. The esophagus is collapsed, and gastric regurgitated fluid cannot reach the hypopharynx reducing the risk of aspiration (Morgan, Mikhail, Murray, 2002).

Significance of the Project

Few situations more rapidly cause increased morbidity and mortality than airway problems and compromised breathing. Maintaining an airway and ensuring breathing are the first considerations when treating emergency patients. The primary goal of airway management is to establish continuous unobstructed movement of oxygen into and out of the lungs (Margolis, 2004). All body systems are dependent on oxygen, if the flow of

oxygen is obstructed, rapid decompensation develops causing the equilibrium and homeostasis of the body to be quickly moved to the left on the health continuum.

It can not be over emphasized that no matter what you do for a patient, if you have not first established an open airway to allow the flow of oxygen, everything else you have done will be of no help to the patient. This is what makes the A in the ABCs of airway management so vital to all patients who need emergency medical care.

The advanced life support ambulance service is frequently faced with difficult airway management for both medical and traumatic patients. Current airway management by paramedics is with nasal and oral pharyngeal airways, bag valve masks, oral and nasal tracheal intubation, and the combitube, which can be used as an initial airway or serve as a back up airway for failed intubation attempts.

There are a number of potential situations paramedics face that pose greater difficulty with airway management. An example is impending respiratory failure due to pulmonary diseases such as chronic obstructive pulmonary disease, congestive heart failure, asthma, severe pneumonia, facial burns, laryngeal or upper airway trauma. Patients with a Glasgow Coma Sore less than eight, head injury, acute drug or alcohol intoxication, and status epilepticus all have altered mental status and have increased risk of vomiting and aspiration. In some of these patients RSI may be the only effective option to gain control of the airway (Bledsoe, Porter & Cherry, 2003).

The advanced life support ambulance service for this project has a high service call volume with 13,000 requests per year. These requests come from both the urban and rural settings throughout the cities and counties they serve. Given this large service area, they frequently have transport times of over 15 minutes and it is not uncommon to have

transport times of 20-25 minutes. They also provide long distance transport of critically ill or injured patients outside their designated service area. The ambulance service brings patients from rural hospitals to hospitals in their service area, as well as transfer patients to larger facilities such as Hennepin County Medical Center in Minneapolis, MN, or the Mayo Clinic in Rochester, MN. Traveling these long distances create situations where the patient's airway and breathing must be effectively controlled in the prehospital setting for and extended period of time.

In the local service area a transport time of 15 minutes to the nearest emergency department is common, but is still too long for a patient to be without adequate airway and breathing. RSI is an important tool for difficult cases that cannot be effectively managed with the current conventional tools available. Application of RSI using an IV anesthetic agent and neuromuscular blocking drug provides the paramedic with the ability to intervene before or during patient decompensation. RSI is often the only way a paramedic can aggressively manage the airway of some patients who are too far from an emergency department and will suffer increased morbidity and mortality due to no effective airway and breathing (Margolis, 2004).

Assumptions/Limitations

The primary assumption with RSI is that paramedics are able to secure the airway and restore breathing in order to reduce morbidity and mortality while creating a positive effect on the outcome of the patient. It is well known and documented that patients who have extended periods of time beyond four to six minutes without adequate airway and breathing will suffer increased morbidity and potential mortality. RSI is an invasive method of controlling airway and breathing that remains compromised with the

conventional airway tools due to the severity of the illness or injury. The paramedics at the targeted advanced life support ambulance service desire to have more education and another available option with RSI for difficult airway management.

The major limitation with the use of RSI is that just because an IV anesthetic and neuromuscular blocking drug is given it does not guarantee that the patient can be intubated. These drugs will eliminate any airway-breathing reflex the patient may have. The ability to maintain an airway and breathe is then totally dependent on the paramedic. The conventional airway tools and combitube becomes an important part of RSI as a backup or rescue airway for failed intubation attempts.

Chapter II

Introduction

In order to introduce new and improved ideas or new equipment to existing procedures, these must be research based and supported scientifically. Current EMS practice must be justified with clinical data derived from objective and valid research. EMS providers at all levels share the responsibility for identifying the research that supports advancements in EMS (Bledsoe, Porter & Cherry, 2003). "The future enhancement of EMS is strongly, dependent on the availability of quality research" (Bledsoe, Porter, & Cherry, 2003, p.23). This RSI project showed determination and leadership by the advanced life support ambulance service to enhance their abilities to deal with difficult airway management for the citizens they serve.

Scope of Practice

The scope of practice for paramedics at the advanced life support ambulance service is determined by the National Registry of Emergency Medical Technicians, as well as the North Dakota and Minnesota state statute governing the scope of practice of paramedics (personal communication, J. Doe, Education Manager, March 24, 2005). The scope includes a fundamental skill set focused on the acute management and transport of critically ill and injured patients. Skills may be required at an emergency scene until transportation resources arrive, from an emergency scene to a health-care facility, between health-care facilities, or in other health-care settings. The paramedic's scope of practice includes invasive and pharmacological interventions to reduce the morbidity and mortality associated with acute out-of-hospital medical and traumatic emergencies. Rapid

Sequence Intubation (RSI) falls within this category, and under physician medical direction can be legally performed by paramedics.

Emergency care is based on an advanced assessment and the formulation of a field impression. The paramedic provides care designated to minimize secondary injury and provide the necessary treatments needed in order to maintain the viability of the patient and safely deliver them to an acute care facility (Bledsoe, Porter & Cherry, 2003). The highest priority in prehospital emergency medicine is to ensure every patient has a patent airway and to prevent aspiration. Whatever method is used must be effective as a problem airway does not allow the luxury of waiting until the patient can be taken to an emergency room or until the problem solves itself.

Airway compromise is the most common cause of severe morbidity and mortality in the acutely ill or injured patient (Bledsoe, Porter, & Cherry, 2003). The gold standard for airway care is endotracheal intubation (Bledsoe, Porter, & Cherry, 2003). Intubation of the larynx and trachea is taught in paramedic clinical training, advanced cardiac life support (ACLS) courses, and is required for every paramedic. These courses stress the skill and proficiency needed for inserting endotracheal tubes (Bledsoe, Porter, & Cherry, 2003). It is imperative to adequately manage these difficult airways because the brain will begin to die in four to six minutes without an open effective airway and adequate breathing to supply oxygen to the brain (American Heart Association, 2003). RSI is defined as the rapid administration of both a neuromuscular blocking drug and an IV sedative or anesthetic to facilitate intubation while decreasing the risk of aspiration, combativeness, and other potential damage to the patient (Barash, Cullen, & Stoelting, 2001).

History of RSI

RSI first emerged in the 1970s and drew a great deal of controversy from the medical community. In the beginning, it was difficult to understand why a highly trained medical person would give drugs such as neuromuscular blockers and potent IV anesthetics that induce unconsciousness and muscle paralysis in a patient with a difficult airway, rendering them unable to breath. It was soon realized that the use of these drugs enhanced the practioners ability to manage difficult airways and facilitated intubation with less problems and delays; resulting in quicker restoration of airway and breathing reducing morbidity and mortality of the patient with the difficult airway (Knopp, 1998).

By the late 1980s and early 1990s anesthesiologists and emergency physicians were routinely using RSI for patients that needed emergency airway management, but were difficult to deal with using the conventional tools available to them. The primary reason physicians were increasingly using RSI was that it resulted in higher success rates with fewer complications than the conventional tools used for difficult airway management (Knopp, 1998). "In 1995 a survey of emergency medicine residence reported that 95% of residencies routinely used neuromuscular blocking drugs" (Knopp, 1998, p.398).

As RSI moved into the 20th century, the technique became routine in emergency rooms across the country, in operating rooms for patients with difficult airways, and in patients at risk of aspiration during the intubation process. Prehospital RSI first began with flight services and is now being adopted by prehospital ground ambulance services.

There is extensive research supporting the use of RSI for difficult airway management. The research shows RSI is used extensively in the operating room,

emergency department, and with air medical teams. There are a small limited number of studies that have been conducted in the prehospital setting for RSI. Ten studies were evaluated for this project, and from the ten studies, six themes emerged that provided valuable information for this RSI project.

Efficacy of RSI

One of the most consistent themes throughout RSI research studies is that the use of RSI creates favorable conditions for intubation. The need to implement RSI for advanced life support ambulance is supported in a study by Li, Lavoie, Bugas, Martinez, and Preston (1999). Li et al., compared 233 intubations, RSI with IV anesthetics and neuromuscular blocking drugs was used on166 intubations. Sixty-seven intubations were performed without IV anesthetics or neuromuscular blocking drugs. The study found complications of aspiration, airway trauma, and death in the patients without RSI and none of these complications in the patients who received RSI.

Another study by Marvez, Weiss, Houry, and Ernst (2003) was done to predict adverse outcomes from RSI. It had 1320 patients in the study and found no cases of aspiration, airway trauma or death related to the application of RSI. In both of these studies patients receiving RSI were successfully intubated, thus reducing the morbidity and mortality associated with difficult airway management. These studies support the efficacy of RSI and show how implementation of RSI to the advanced life support ambulance could be beneficial for difficult airway management.

The previously discussed studies were hospital based, and the intubations were performed by physicians. Studies by Ochs, Davis, Hoyt, Baily, Marshall, and Posen (2002), and Pace and Fuller (2000) were in the prehospital setting where paramedics

managed airways. Ochs et al. enrolled 114 patients that received RSI. Of those, 96 were successfully intubated with an endotracheal tube. Seventeen failed intubation attempts were successfully secured and maintained with the combitube. There was one failure where the patient could not be managed with RSI.

The Pace and Fuller (2000) study enrolled 150 patients, with 132 successful intubations using RSI. The remaining 12 patients that could not be intubated were managed with bag valve mask. An important part of this study was that 54 patients had failed intubation attempts prior to RSI. Of these 54 patients, 49 were successfully intubated after the application of RSI. The five failures were successfully mask ventilated.

There are many other credible authorities that have written on the efficacy of RSI for prehospital EMS. Levitan (2003), director of emergency medicine at the University of Pennsylvania, stated, "rapid sequence intubation is the fastest and most effective means of controlling the emergency airway" (p.82). He also discusses that prior to RSI, an immediate cricothyroidotomy was the best option. A cricothyroidotomy is a surgical airway where an incision is made through the skin and crycoid membrane in the neck. A breathing tube can then be inserted into the trachea to establish and airway and ventilation. This procedure is technically too difficult for most physicians and only done when all other option have been exhausted. RSI has become the most effective way of dealing with the difficult airway. Another factor that supports the use of RSI is that the combitube is a safe and effective airway for failed intubation attempts. Combitubes are effective because they can be inserted it 20 seconds and can be easily taught to medical personnel in a short amount of time (Levitan, 2003).

Proper and Adequate training

Proper and adequate training are key components to successful implementation and application of RSI. Dr. Leland Mizelle, director of emergency medicine from the Orlando Regional Medical Center in Orlando, Florida, and a panel of emergency physicians conducted case studies to determine how to prevent morbidity and mortality from prehospital paralytic assisted intubation. The panel found that, "failed RSI resulted from lack of adequate training, poor clinical judgment, and failure to promptly use alternative rescue airways" (Mizelle, Rothrock, Silvestri & Pagane, 2002, p.475). They believed the failure was due to limited RSI training, inadequate number of intubations, lack of experience by paramedics, and a less rigorous program than those using RSI in a hospital based setting. Only those EMS agencies with the training and experience equivalent to that for hospital based RSI can expect to have outcomes that are comparable to the outcomes for hospital based RSI (Mizelle et al., 2002).

Whatcom Medic One is an EMS system in Bellingham, Washington with similar demographics to advanced life support ambulance service for this project. Whatcom Medic One implemented a successful RSI program with a 97 % RSI success rate. The remaining patients with failed intubation were successfully controlled by combitube and bag valve mask. Whatcom Medic One believes that the success of their RSI program is built upon proper and adequate training with involved medical direction to perform physician level airway management (Wang, Davis, Wayne, & Delbridge, 2004). They stated that their, "RSI program is based on not only existing scientific data, but also the vast clinical experience they have" (Wang et al., 2004, p.371). Whatcom has developed the following standards for training paramedics for RSI (Wang et al., 2004).

1. Excellent patient assessment and basic airway skills.
2. Knowing and recognizing when to progress from basic to advance airway management techniques.
3. Once committed to providing an advanced airway, recognizing when it is appropriate to add sedation and neuromuscular blocking drugs.
4. Pharmacological knowledge base of all RSI medications, including indications, contraindications, actions, side effects, and associated complications.
5. The use of monitoring devices, including pulse oximetry, end-tidal capnography, as well as stethoscope to ensure the placement and continued retention of the endotracheal tube within the trachea.
6. When endotracheal tube intubation cannot be achieved, the use of the combitube as a rescue airway will be used without delay by frequent repeated intubation attempts (p.372).

Continuous quality assurance program

Highly organized and structured physician-based quality assurance program is behind every successful EMS system that utilizes RSI in their airway management protocols. If RSI is to be adopted by an EMS system, a considerable amount of cooperation is necessary from various parties in that particular system. Dr. Kory Kaye, Dr.Ralph Frascone, and paramedic Timothy Held developed an RSI training program for paramedic training at Regions Hospital in Minneapolis, Minnesota. Their training program emphasizes continuous quality improvement and quality assurance in order to implement the program and have continued success. Close physician medical direction

and supervision is mandatory during the training process and beyond. Long term quality improvement and quality assurance includes monthly ambulance run reviews and evaluation of each RSI case by the medical director, as well as cases that did not receive RSI, but were considered potential cases for RSI (Kaye, Frascone, & Held, 2003).

Rescue airway

Consistent throughout the literature is that the use of RSI does not guarantee that the airway will be successfully managed. In fact, the literature is clear that there will be failed intubations. A rescue airway must be available, and paramedics must be proficient with the chosen rescue airway. Practicing and being prepared for the failed RSI is an important aspect of a successful RSI program (Carley, Gwinnutt, Butler, Sammy, & Driscoll, 2002). In the hospital based setting for both the operating room and the emergency room the laryngeal mask airway (LMA) is the airway of choice for failed intubation attempts. However, this airway has not proven to be beneficial for prehospital EMS. The combitube is a dual-lumen airway with a ventilation port in each lumen, and has the following advantages as a rescue airway of choice for prehospital EMS:

1. It provides alternate airway control when conventional intubation techniques are unsuccessful or unavailable.
2. Insertion is done blindly making it rapid and easy.
3. It can be used for trauma or medical patients.
4. The patient can be ventilated regardless of the tube placement in the esophagus or trachea (Bledsoe, Porter, & Cherry, 2003).

Increased scene time

Time is an important consideration in the survival of seriously injured trauma patients. Research has shown that patient survival rates increase dramatically as time from the traumatic incident to the beginning of surgery decreases. The goal for incident-to-surgery time is one hour or less and is referred to as the golden hour (Bledsoe, Porter, & Cherry, 2003).

Longer scene times due to prehospital RSI is one of the concerns found in the literature. The Ochs et al., (2002) study tracked scene times and found that the average scene time was lengthened by 13 minutes. Another study by John, Atchley, Hatley, Green, Young, and Brady (1998) found that air medical units also had longer scene time when RSI was used for airway management. The golden hour is vital to the survival of critically injured trauma patients; however it remains a fact that patients without adequate airway and breathing will not survive. The condition of the patient in relation the amount of time and distance to the emergency room must be weighed against each other. Patients who need emergency surgery for trauma need it as soon as possible, but these patients will not make it to surgery without effective airway breathing management. "The debate about scoop and run versus stay and play has not been resolved" (Bochicchio & Scalea, p.525, 2003).

Patient Outcomes

RSI has been extensively studied and shown to have a strong efficacy in hospital-based settings for difficult airway management. Although limited research has been done, studies are showing that RSI is beneficial for difficult airway management in the prehospital setting as well. The literature is clear that patients suffer increased morbidity

and mortality without adequate airway and breathing, making aggressive airway management a priority. What the studies point out is that there needs to be research on what effect prehospital RSI has on the eventual outcome of the patient. "Certainly, a large randomized prospective trial will be needed to answer this question" (Bochicchio & Scalea, 2003, p.528).

Conclusion

Adequately maintaining effective airway and breathing is the most important aspect of prehospital EMS. Oral intubation remains the benchmark of airway control. If airway management is difficult, poor oxygenation will develop causing the patient to rapidly decompensate and swing to the left on the health continuum. It is important to treat the problem promptly in order to reduce and prevent increased morbidity and mortality from lack of oxygen. Prehospital EMS providers cover large areas creating long distances between patient and hospital. Research studies show the efficacy of RSI and the need to bring this technology beyond the hospital doors to the advanced life support ambulance service (Wang, H., Sweeny, T., O'Conner, R. & Rubinstein, H., 2001).

Chapter III

Introduction

The primary task of the paramedic is to provide emergency medical care in an out-of-hospital setting, extending the care of the emergency physician to the patient in the field (Bledsoe, Porter, & Cherry, 2003). Paramedics must always strive toward maintaining high quality healthcare, and must always be an advocate for the patient and assure that the patient receives the best possible care. The paramedic must be a confident leader who can accept the challenge and responsibility of the position. They must have excellent judgment, critical thinking skills, and be able to prioritize decisions so as to act quickly in the best interest of the patient. Overall, the paramedic must be able to function independently at an optimal level in a non-structured environment (Bledsoe, Porter & Cherry, 2003).

These characteristics are important when considering the tremendous responsibility that comes with the implementation of RSI. It is imperative that the paramedic is able to maintain composure and self-control while critically thinking during the high-pressure situations of difficult airway management that requires the application of RSI.

Securing and maintaining a patent airway is the highest priority for paramedics of the advanced life support ambulance service when caring for critically ill or injured patients. When airway intervention is required it must be performed in an expedient and organized manor by experienced paramedics with the goal of providing a definitive airway safely, while minimizing any possible complications. Successfully implementing RSI takes experience through understanding of the indications, contraindications and

limitations, and a working knowledge of the physiology and pharmacology of the drugs used. This course reviewed how to recognize airway or breathing compromise and how to manage the problem. It emphasized the proper use of RSI with a focus on clinical skills and discussed the pharmacology and indications of the drugs used with RSI (See Appendix A).

Target Audience

The target audience for this RSI project was 30 paramedics employed by an upper Midwest advanced life support ambulance service. In accordance with administration company policy from this advanced life support ambulance service, candidates for this class had to meet already established criteria for participation that included:

- Demonstrated history of competency with all patient care skills. This is verified through skills validation requirements and direct observations in the clinical setting by field supervisors.
- Attendance and completion of all required training and in-services.
- Approved for the airway course by the physician medical director (personal communication, J Doe, Operations Manager, March 15, 2005).

Prerequisites of the Target Audience

Prior to attending the Advanced Airway Management Course, administrators and physician medical director of this advanced life support ambulance service require employees to watch two video segments on the Combitube and Airway Cam. These videos demonstrate the combitube and show footage of airway anatomy and intubation of actual patients being intubated (personal communication, J Doe, Operations Manager, March 15, 2005).

Instructors

There were three instructors for the airway course including myself. Two of these instructors are paramedics certified in EMS education by the United States Department of Transportation (USDOT). The USDOT was in charge of training and testing all prehospital EMS instructors. Instructor one was the education manager of the advanced life support ambulance service. He has been a paramedic for 10 years and is also a licensed mortician. His experience in both EMS and mortuary science has provided him extensive training and experience in EMS and anatomy. He taught the airway evaluation and anatomy portion of the course. The second instructor was the clinical supervisor for the advanced life support ambulance service. He has been a paramedic for 20 years and has been teaching classes for the past seven years. He provided the overview of airway management. This author served as the instructor for the RSI part of the course. The three of us together taught the practice sessions and breakout sessions for airway management. The entire course was observed by the physician medical director.

Ethical considerations

Prior to implementation of this RSI project, institutional review board (IRB) approval was gained from the University of North Dakota. There were no documents that could identify any person involved in this project. Paramedic participation was on a voluntary basis. The name and location of the advanced life support service was not identified. The administration and physician medical director of the advanced life support ambulance service granted verbal consent for this RSI project.

Summary

Airway problems in any setting pose a difficult challenge; however in the prehospital setting are an even greater challenge due to outside environment, and time and distance to the nearest hospital. "Critical thinking is a key to resolving airway problems. Paramedics who do not think critically become part of the problem" (Alfaro-Lefevre, 1999, p.18). Implementing the education and training necessary to perform RSI provides new knowledge and skills while up grading problem solving and critical thinking skills (Alfaro-Lefevre, 1999). This RSI education project has brought a new skill and another option for difficult airway management while elevating the critical thinking skills for paramedics of this advanced life support ambulance service.

Chapter IV

Introduction

The goal of airway management is to ensure that the patient has a patent airway through which effective ventilation can take place. An obstructed airway causes the patient to be deprived of oxygen. If ventilation is not established anoxic brain injury begins in four to six minutes with brain death developing in ten minutes (American Heart Association, 2003). When a patient is critically ill or injured and requires airway management it is the responsibility of healthcare professionals caring for the patient to ensure that the airway is secure and ventilation is established.

The healthcare professionals responsible for the initial airway management are prehospital EMS paramedics and nurses. It is expected that prehospital EMS providers are equipped and trained to manage critical airways. Prior to this project the target EMS group used the conventional tools available for airway breathing management. This project was developed to provide the education necessary for RSI to be added as a tool to be used when the conventional tools currently used for airway breathing management are unsuccessful. There were 18 participants in the seven-hour course, and in this chapter I will discuss the actual application of the project and course evaluation.

Advanced Airway Management Course

The course consisted of three distinct parts:

Part 1. Lecture

Three lectures were given that encompassed the topic listed below. These lectures included power point presentations and visual aids of the topics (See Appendix D).

Lecture topics included:

- Proper ventilation techniques
- Combitube placement
- Airway anatomy review
- ETT confirmation techniques
- Esophageal detection devices
- RSI Protocol
- Medication usage during RSI
- Contraindications
- Flexible tube introducer device (Bougee)
- Pitfalls
- Sellick's maneuver
- Cricothyroidotomy

Part 2. Skill Stations

Three skill stations were developed with a computerized manikin set up to assist with practical application and practice at stations one and two. The computer simulator is an import part of effective training. "The simulator experience is an extremely powerful teaching aid for RSI and its potential complications" (Bush, Gray, McGowan, & Nichol, 2000, p.309).

Station 1: Basic Life Support

Station 1 involved using the manikin for instruction and practice with the conventional airway tools including proper ventilation technique and combitube placement.

Station 2: Drug / Medication

Station 2 gave the participants an opportunity to examine and discuss the medications used during RSI as well as practice administration of the drugs. Indications, contraindications, concentration, and dosages of each drug used were discussed at this station.

Station 3: Advanced Airway

Station 3 included Bougee tube introducer, intubation, and using endotracheal tube confirmation devices.

Part 3. Scenario Practice and Evaluation

Scenario practice gave the students hypothetical situations where advanced airway management techniques needed to be utilized. This section resembled an ACLS megacode, but focused on airway problems and complications of RSI. The students needed to integrate knowledge gain from lecture and were required to put in to practice the techniques and equipment studied in parts 1 and 2 of the course. Students were also required to pass a written test following the practical evaluation of their skills (See Appendix B). The written examination was administered on an individual basis and then a class discussion was held on each scenario. All 18 participants received a score of 100% on the written examination.

Course Evaluation

A course evaluation was given to the participants at the end of the RSI course (See Appendix C). Table 1 lists each question asked on the evaluation and shows a break down of the scores. The scores on the evaluation were positive. There were no below

average scores given. The scores on the evaluation indicate that the project was successful and the participants were able to learn, understand, and perform RSI.

Table 1:

Course Evaluation Questions and Responses

Questions	% Average	% Above Average	% Strongly Agree
Classroom was physically and visually adequate.	6.25%	37.50%	56.25%
The equipment used for training was appropriated for teaching purposes.	6.25%	37.50%	56.25%
The audio visual aids were up to date and accurate.	6.25%	37.50%	56.25%
The instructor was prepared for class.	6.25%	6.25%	87.50%
The instructor made good use of time.	12.50%	18.75%	68.75%
The instructor was effective in presenting the information.	6.25%	25.00%	68.75%
Students were given enough time to practice skills that were taught.	12.50%	18.75%	68.75%
The lectures were easily understood and relevant to the course.	6.25%	37.50%	56.25%
The course met my expectations.	6.25%	37.50%	56.25%
I feel prepared to perform RSI.	18.75%	50.00%	31.25%

Summary

Ensuring a secure airway is an essential component of providing patient care. The primary concern of all EMS care providers is to protect the patient's airway and ensure adequate ventilation and oxygenation. It is recognized that advanced airway management is sometimes necessary to achieve the goal of managing the patient's airway. It is also a fact that some critically ill and injured patients cannot be effectively managed by EMS

with the conventional airway tools available. In most cases patients without adequate airways suffer severe brain damage as well as multi-organ damage or death.

Course participants gained another option for difficult airways that require advanced airway management. This course was intended to teach RSI, but it also provided opportunity to strengthen the skills needed to use the conventional airway tools. Implementing RSI does not guarantee that the airway will be secured, that is why it was important to for this to be an educational course that encompassed the conventional airway tools. These tools continue to be the main part of airway breathing management. This project helped EMS providers remain proficient with the conventional airway and breathing tools as well as learn RSI for difficult airway management.

Chapter V

Introduction

When a person is injured or becomes ill, it rarely happens in a hospital with doctors and nurses nearby. When an incident takes place away from a healthcare facility there is always an amount of time that passes by between illness or injury and the patient's arrival to the hospital. This time lapse can increase morbidity and mortality of the patient (O'Keefe, Limmer, Grant, Murray, & Bergeron, 1998). The prehospital EMS system is design to work in a timely manor to respond, provide treatment, and safely deliver patients who are ill and injured to a hospital emergency room.

The purpose of this project was to develop and provide education necessary for prehospital EMS personnel to use RSI on patients with difficult airways in order to reduce the morbidity and mortality of critically ill and injured patients. The purpose of this chapter is to discuss the potential impact of this project on patients in the prehospital setting, and the importance of initial airway management on the implications of nursing.

Implications for Nursing

Like paramedics "emergency nurses are essential members of the trauma team. Morbidity and mortality of trauma patients can be significantly reduced by educating nurses to who provide care to trauma patients" (Emergency Nurses Association, 2000, p. 2). There are registered nurses employed with advanced life support ambulance services as well as registered nurse first responders who will be able to expand their skills through future training and implementation of RSI. This will allow a higher level of nursing care in the prehospital setting for difficult airway management, thus contributing to reduced morbidity and mortality of patients at risk for a compromised airway.

Most critically ill and injured patients arrive at the hospital from prehospital EMS. Registered nurses are receiving these critically ill and injured patients in the emergency room, intensive care unit, and operating room. The care provided to these critically ill and injured patients in the prehospital setting has an impact on the nursing care when the patient arrives. As advocates for the patient and prehospital EMS, paramedics and nurses have a duty to enhance patient care. Bringing RSI beyond the hospital doors will not only raise prehospital EMS to a new level, it will contribute to a decreased morbidity and mortality in this population. When critically ill and injured patients arrive at the hospital, nurses have a much higher likelihood of having a viable patient to work with if adequate airway and breathing has been established and maintained in the prehospital environment.

Education and Practice

This project was designed to educate a group of paramedics and nurses for RSI who are prehospital EMS providers. Having an adequate airway to breath is essential to all patients who are critically ill and injured. This concept is simple because those who do not have adequate oxygen will develop increased morbidity and mortality. Research has proven the harmful effects from lack of effective airway and breathing. Research has also proven the efficacy for RSI in hospital emergency rooms and operating rooms for difficult airway management. As discussed earlier one of the most consistent themes throughout RSI research studies is that the use of RSI creates favorable conditions for intubation. The theoretical basis for this project was that RSI be integrated into a targeted prehospital EMS system having similar results.

In order to be successful with RSI it takes the determination and leadership from the employees, training department, administration, and physician medical director of the

EMS agency. The advanced life support ambulance service this project was designed for has recognized the need to expand their abilities to manage difficult airways. They embraced this project which gave them another option to use for managing difficult airways. It is through this education project that RSI has been integrated into practice at this advanced life support ambulance service. Having RSI as another option for difficult airway management has given this EMS agency greater ability to address the most immediate uncertainty for patients who are critically ill or injured.

Research

The literature review for this project has found that there have not been studies performed to determine if there is any change in outcome of the patient when RSI is employed in the prehospital setting. Improving the outcome and moving the patient to the right on the health continuum are important aspects of nursing. Research indicates that patients cannot survive without adequate airway and breathing. "The optimal care of the trauma patient is best accomplished within the framework in which all members of the trauma team use a systematic, standardized approach to the care of the injured patient" (Emergency Nurses Association, 2000, p. 1). This statement shows why nurses must continue to advocate and respond to the call for further research into the use of RSI in the prehospital setting. It is through research that will allow nurses to further practice with the use of RSI. Future studies should include a large-scale study on outcomes of prehospital patients with and without the use of RSI for difficult airway management. These studies should include the impact increased scene times and shortening of the golden hour has on patient when RSI in implemented in the prehospital setting.

Policy

Having adequate and appropriate tools to effectively manage airway and breathing in the prehospital setting is a public safety issue everywhere, and will remain an ongoing issue. It is important to continue educating and training prehospital caregivers to provide the information to a wider audience and to keep those possessing the skill current. Opportunities for education and training in RSI should be taken to new providers outside the local system in an effort to expand the clinical skill level of providers in other EMS systems. The Emergency Nurses Association stated "its constituents have the responsibility to facilitate trauma related, continuing education opportunities for nurses who provide care to trauma patients" (Emergency Nurses Association, 2000, p. 2). This statement shows the tremendous importance this project has on prehospital EMS as well as nursing. Once the necessary research has been established providers must work toward establishing local, state, regional, and national policies that govern the use of RSI. RSI is not intended for all EMS services. Only those that have a substantial call for service volume and a committed administration with active physician medical direction and training personnel will be able to establish the education necessary to effectively implement RSI for difficult airway management.

Theoretical Framework

Merle Mishel's model of perceived uncertainty can be used to show how a compromised airway and breathing from critical illness or injury creates and immediate uncertainty for the patient and their family. Having integrated RSI into this advanced life support ambulance service has created another option that can be used to address this most immediate uncertainty. Being able to secure the airway and breathing with RSI not

only will help the body survive, it helps reduce some of the uncertainty and allows the patient and family to more effectively cope with the difficult situation.

The goal of Merle Mishel's research was to return knowledge to practice. Now that RSI has been integrated into practice at this advanced life support ambulance service, the knowledge gained from this educational project is in practice, and helps address the most immediate need for patients and families who are dealing with a critical illness or injury (Tomey & Alligood, 2002). Using RSI to effectively manage the airway and provide breathing in the prehospital environment increases the chance of having a viable patient entering the hospital emergency room. Nurses can now focus on other uncertainties and continue to help the patient and their families with the situation they have been thrust into.

Conclusion

One certainty in the field of medicine is that there will always be change. At any time, new research can push aside seemingly solid concepts. Research is why theory and practice related to emergency medicine has changed and will continue to change. This RSI project was developed from research and was designed to change the approach to difficult airway management in the prehospital setting. Having worked in EMS for twenty years. I can recall many difficult airway challenges where I needed to have another tool or option such as RSI for those patients that could not have their airways effectively controlled with the conventional tools available.

This project has been a tremendous and exciting challenge to research and develop the education necessary for prehospital paramedics and nurses to learn and perform RSI. This project has fueled my passion to further research and develop RSI opportunities and

technology for airway breathing management. When a person is critically ill or injured and needs airway breathing management I hope that in the future RSI will be a part of the standard of care ensuring the patient has a patent airway and adequate breathing which will reduce the morbidity and mortality of critically ill and injured patients.

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