

Running head: FIELD LIMB AMPUTATIONS

Field limb amputations used as an extrication option in complicated
entrapments or disaster events.

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

Abstract

A field limb amputation is a rare life-saving measure that can be employed as a last resort method of disentangling a victim from a complex entrapment. The relative infrequency in which this procedure is used often leads agencies to overlook the need to have a protocol in place in the event this extraordinary procedure is ever required. The Seminole County Fire Department (SCFD) acknowledges that we must address this gap and identify factors needed to develop a plan for such an event. The problem is that SCFD does not have a procedure to address field limb amputations as an option during complicated technical rescues and in times of disasters.

The purpose of this research focused on identifying existing policies and factors for consideration of a field limb amputation policy by SCFD. To obtain this information this author focused on four research questions: What type of procedures do other EMS agencies have in place addressing field amputations? When is it appropriate to consider a field limb amputation as an option for disentanglement of a trapped victim? What is the current position of the SCFD medical director, emergency physicians and the state medical director regarding the use of field limb amputations as a disentanglement option? And, can specially trained paramedics be permitted to perform field amputations during specific entrapments or disaster events?

Utilizing descriptive research and a combination of a literature review, survey and interviews helped identify the current trends and existing policies regarding field amputations. It also provided important factors to consider when developing a policy including identifying potential obstacles that must be addressed such as liability and paramedic scope of practice before establishing a procedure where paramedics would be allowed to perform field amputations.

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Field limb amputations used as an extrication option in complicated entrapments or disaster events.

Introduction

The fire service agencies in the United States have been traditionally tasked with providing fire prevention and suppression services to the communities they serve. Over the years, as the complexity and needs of communities evolved, fire agencies were also asked to expand their services to include a number of other emergency response type activities. These include emergency medical services, hazardous materials incident mitigation, high angle rescue, swift water rescue, urban search and rescue, and confined space or collapse rescue among others. Fire service leaders have expanded their agencies from a monochromatic function to a diverse mission that provides comprehensive services encompassing an all hazards approach to the delivery of emergency services and disaster response activities.

Within the many services provided agencies have an important function to rescue victims from the most perilous locations and confines under unstable and quite hazardous conditions. These incidents can occur at any time and can range from a simple automobile crash to a disaster event such as the one recently seen in our neighboring country of Haiti which suffered a 7.0 Richter scale earthquake 16 miles west of the capital of Port-au-Prince on January 12, 2010. (“2010 Haiti Earthquake”, 2010). This massive earthquake literally destroyed the capital city causing an estimated 230,000 deaths and 300,000 injuries. Many of the victims were trapped under tons of debris and concrete. Limited equipment and resources, a collapsed infrastructure, and the sheer number of victims brought in a worldwide response of units and personnel to assist in the rescue efforts. Removal of trapped victims often involved the amputations of extremities as the only viable method of disentanglement in order to save the victim’s life. Disentanglement

is defined as the act of releasing from an entangled or snarled condition. This term is used interchangeably with extrication which means to also to remove a victim from an entrapped situation (“Disentanglement”, 2010).

This recent event highlighted the need for emergency services to plan for such extreme events or conditions where the only viable option that will result in survival is field limb amputation procedure when all other rescue methods have failed. Seminole County Fire Department (SCFD) provides an all hazards mitigation service to the citizens of Seminole County which includes a special hazards and operations team (SHOT) capable of performing difficult rescues, disentanglements, and victim removal in the most extreme type conditions. SHOT has executed a multitude of complex rescues and have been presented several times with challenging entrapments that would have benefited from a protocol or policy addressing the use of field limb amputations as a disentanglement option. The relative infrequency in which field limb amputation is needed cannot be used as justification to not have a policy, protocol or plan in place. Historically, natural and man-made disasters have driven the need for rescuers to employ field limb amputations as a last resort effort to save a life by sacrificing a limb. An important aspect to remember is the need for such policy is not limited to disasters.

Geographically, SCFD serves a complex industrial and agricultural area. SCFD cannot discount the possibility of responding to a significant entrapment that may require field limb amputation as part of our daily normal emergency responses. We cannot sit idly praying and hoping that such measures will not ever be needed. Trying to improvise a method during the excitement of an emergency is not the most prudent way to go about planning. SCFD must be prepared to tackle the most complex rescues in the most adverse of conditions using protocols and policies created through a methodical research and development process. We have

recognized the problem that Seminole County Fire Department and the special hazards and operations team does not have a procedure to address field limb amputations as an option during complicated technical rescues and in times of disasters.

Realizing that SCFD and particularly the SHOT team does not have a plan identifying what to do in the event such an extreme method of disentanglement is needed drives the purpose of this research. As such, the first step in future development of a policy or plan is to identify the current trends in existence specifically addressing field limb amputations. The purpose of this research focuses on identifying existing policies and factors for consideration of a field limb amputation policy by SCFD. In order to determine if current policies are in place and to identify the current opinions and position of the medical community addressing this subject this project will utilize descriptive type of research to collect and analyze all current pertinent information related to field limb amputations. Specifically, this research will focus on the following research questions: 1. What type of procedures do other Emergency Medical Services (EMS) agencies have in place addressing amputations as a disentanglement option? 2. When is it appropriate to consider field limb amputation as an option for extrication/disentanglement of a trapped victim? 3. What is the current position of the SCFD medical director, emergency physicians, and the state medical director regarding the use of field limb amputations as a disentanglement option? And 4. Can specially trained paramedics within SCFD be permitted to perform field limb amputations during specific entrapments or disaster events?

It is my intent, through this research, to establish a baseline on the current methods, trends, opinions, and possible hindrances that will drive or guide SCFD's future consideration for a policy or protocol addressing field limb amputations.

Background and Significance

The Seminole County Fire Department (SCFD) is a full-time career department employing 406 personnel that staff 18 stations in a three platoon system. SCFD provides an all encompassing approach to emergency responses including fire prevention and suppression, technical rescue, all-hazards mitigation, emergency medical and advanced life support services servicing all unincorporated areas of Seminole County (Seminole County Government, 2009). SCFD also operates a Special Hazards and Operations Team responsible for the mitigation of hazardous materials emergencies, confined space rescue, dive rescue, and technical rescues of victims from a variety of situations. SHOT personnel are certified in a variety of rescue operations and have the best tools currently available to handle the most complex rescues. SCFD is also the host agency for the Urban Search and Rescue Florida Task Force 4 (USAR-FL TF4), an elite team of highly trained personnel equipped for deployment anywhere in the country following a disaster event solely for the purpose of victim search and rescue from a variety of hazardous disaster areas.

Located north of Orlando, Florida and covering an area of 344 square miles, Seminole County is composed of a mix between residential, commercial, light industrial properties, and farming/agricultural areas with a current population of 415,786 (Seminole County Government, 2008). Due to the nature and mix of the community, SCFD has been called upon to render complex rescues from a number of incidents that presented a challenge in the disentanglement and removal of trapped victims. Some of these events had the potential to require a last resort approach for victim removal through the performance of a field limb amputation. Although none of the previous incidents required such drastic measures, this option was at least considered, but the department lacked a process or procedure that would have provided direction if indeed a field

amputation became necessary.

Field limb amputation is a rare heroic but essential life saving procedure. In the majority of entrapments, rescue crews will perform whatever procedures are necessary to remove the victim from the confining area. In some instances, a deteriorating victim's condition, safety concerns such as further collapse, or when disentanglement procedures are deemed futile, dictates the need to consider or perform a field limb amputation (Sharp, Mangram, Lorenzo, & Dunn, 2009). This procedure is certainly considered a "last resort" option in an effort to remove a victim from an entrapment before they perish.

Throughout history, limb field amputations have been used as a treatment option in a variety of settings as far back as colonial times. During trips to the new world and during revolutionary times, doctors used amputations as a treatment option to cure infections or to save lives following traumatic injuries such as gunshot wounds during battle. This practice continued even during the Civil War when medicine was primitive at best and doctors did not understand the concept of infection, the need for antiseptics or sterile surgical conditions ("Civil War Amputations", 2008). Wounded soldiers would have extremities amputated routinely as a life saving measure. In fact, it was the most common life-saving procedure performed during the war (Mackersie, 2006). With the advent of modern medicine and the development of antibiotics this practice diminished a great deal. Today, amputations are still performed to a lesser degree as a last resort procedure, executed only after all forms of treatment such as powerful antibiotics, surgical debridement, and reconstruction have been exhausted.

In the last 40 years, the use of field limb amputations resurfaced as a last ditch effort for disentanglement during disasters. Major disasters where field limb amputations were employed include the skywalk bridge collapse at the Hyatt-Regency hotel in Kansas City, Missouri in

1981; the Loma Prieta earthquake in San Francisco in 1989; the earthquake in Gujarat, India in 2001; the earthquake in North Pakistan in 2005, and most recently the earthquake that struck west of the capital of Port-au-Prince on January 12, 2010. All of these disasters have one commonality: the victims were trapped by a sudden and massive event that caused the collapse of many structures, the disruption of the area's infrastructure, and the rapid depletion of emergency responders.

The recent disaster in Haiti has highlighted the need for emergency responders to develop plans that address field limb amputations. Even before the earthquake, the emergency services and medical infrastructure in that country was precarious at best. Following the earthquake it became non-existent. Early responders for the relief efforts following the disaster acknowledged that amputations had to be performed because of scarce specialized equipment availability and the sheer number of victims trapped under tons of concrete and debris (Lorich, Jeffcoat, MacIntyre, Chan & Helfet, 2010). The few physicians lucky enough to arrive early to the country were overwhelmed by the number of injuries and certainly could have used alternative trained personnel like paramedics to assist in the treatment and disentanglement process.

Disasters are not the only type of event where field limb amputation may be indicated. Motor vehicle crashes, industrial accidents, and entrapment involving heavy machinery whether in an urban or agricultural environment may call for a field limb amputation when all other disentanglement procedures have failed. For example, as recently as Friday, September 10, 2010 a collision of a locomotive train against a slow moving freight train in Fontana, California trapped the conductor in the locomotive. The slow moving freight train, carrying I-beams was struck by the locomotive the conductor was driving trapping him by the upper extremity. After all attempts to disentangle the conductor from the wreckage failed, a surgical team was

transported to the incident to evaluate the patient and after three and a half hours of extrication to perform a field amputation. The conductor was flown to the trauma center in critical but stable condition and is expected to survive (Statter 911, Sept. 10, 2010). Another incident occurred on July 8, 2010. A motor vehicle crash in Miami, Florida trapped a woman in such fashion that rescue teams summoned a trauma surgeon team from Ryder Trauma Center to perform a field limb amputation, unfortunately however, the victim died before the team could reach the crash site (News4Jax.com, 2010).

Field limb amputations occur more frequently than is generally expected. In the winter of 2005 in Green Bay, Wisconsin the on scene paramedic performed a field amputation in an effort to save the patient's life. I had the opportunity to interview the firefighter paramedic from this incident. It involved a public works employee during the process of cleaning a sander attached to a dump truck when his arm became entangled in the auger and the victim was sucked into the device with such force the motor to the truck actually stalled. He was pinned in such a fashion that his respiratory effort was compromised. The responding crew assessing the gravity of the situation proceeded to amputate the arm to remove the victim from the entrapment. Despite these efforts, the victim died from asphyxia (C. Bereza, personal communication, September 3, 2010).

Another example took place in Chesterfield County, VA in 1997. A severe crash between two large trucks trapped the driver in such fashion that all disentanglement efforts failed. The crash occurred in a rural area of the county where the closest trauma center with an available surgeon was over 45 minutes away. Through consensus via radio it was decided that the flight paramedic already on the scene would perform the field amputation. Using limited equipment and eventually resorting to the use of a reciprocating saw, the leg was amputated and the patient removed (Kelly, Thompson, & Gervin, 1999).

These examples illustrate the need to be prepared in the event that our agency is faced with a complex entrapment requiring the use of field limb amputation to disentangle the victim. As unfortunate as it may seem, resorting to an amputation to remove a victim from an entrapment seems to happen more frequently than we tend to acknowledge. Because of the apparent significance of this problem, it is imperative for SCFD to determine the need to further explore this subject.

The need to resort to such an extreme measure is dictated primarily by the patient's condition. Sometimes even the most advanced equipment, tools, and technology may not be effective enough, or timely enough to remove a critical victim from an entrapment. The mix between commercial and industrial businesses makes Seminole County prone to face incidents requiring the use of this heroic type measure. SCFD can opt to ignore this need hoping it will never happen, or face the reality that we may be called upon to make such decisions in order to save a life. The worst policy is one made in the heat of battle. It is imperative that this agency takes a critical look at current efforts or procedures already in place. SCFD needs to determine the most appropriate course of action to take regarding field limb amputations being used as an option in disentanglement.

This research of this problem supports the concepts specifically addressed in the Executive Analysis of Fire Service Operations in Emergency Management course (EAFSOEM) that encourages emergency response agencies to plan and develop policies that may be ultimately needed when responding to complex emergencies and in times of natural or man-made disasters. SCFD engages in an all hazards approach to emergency responses consistent with the goals set forth by the United States Fire Administration (USFA). This project supports the USFA operational objectives goal number two, which stresses the need to "Improve local

planning and preparedness” (USFA Strategic Plan 2010-2014, 2009, p. 19) specifically by enhancing SCFD’s performance in response to all hazards. In addition, it also supports goal number three to “Improve the fire service’s capability for response to and recovery from all hazards” (USFA Strategic Plan 2010-2014, 2009, p. 20) specifically the emergency preparedness to rescue victims and improve survival during complex entrapments or disaster events.

Literature Review

Field limb amputations are considered a heroic last ditch effort to remove a victim from an entrapment before they die. SCFD understands the extreme nature of using such a procedure. Before exploring the use of field limb amputations as an option for disentanglement, it is important to first establish a historical baseline that would help determine how we should proceed. A comprehensive literature search and review was conducted using the USFA Learning Resource Center located at the National Emergency Training Center and the Florida Hospital medical library in conjunction with a number of database searches. This expansive search yielded a very limited amount of literature specifically addressing field limb amputations used by emergency response services. Surprisingly, most of the information found through research is anecdotal information. Although limited, the material obtained does provide some important points and commonalities to consider if a field limb amputation is ever considered as an option for disentanglement.

Of the few articles discovered through the literature review, the work of Kampen, Kromher, Jones, Dougherty and Bonness (1996) reveals that field limb amputations have been a matter of discussion and concern for quite some time. The authors sought to identify the prevalence of in-field extremity amputations and the existence of protocols for Emergency Medical Services (EMS). Although this is considered an older article it does specifically address

the current concerns regarding field limb amputations and illustrates the point that this subject has legitimate justification for policy development and most agencies have not followed up on this matter. In their research, they identified a significant lack of policies or procedures that address field limb amputations as an option for disentanglement. They also discovered that training of pre-hospital personnel in this procedure is virtually non-existent.

Their results in 1996 had already suggested the need for developing protocols and policies establishing a method to facilitate the use of field limb amputations easily accessible when needed. This was of particular importance in large metropolitan or urban EMS systems. These protocols need to specifically address the timely notification and deployment of the surgical teams, method of transport, and a plan as to where the patient will be transported to once the amputation is performed. In their study, the consensus from the respondents revealed that the most qualified surgeon available be assigned to lead the team during the response. They also stressed that formal training must be developed to educate physicians and surgeons responding to these events that consist of familiarization of how EMS systems operate in an incident command structure; utilization of the equipment and capabilities of EMS responders to support their procedures and education of programs such as medical disaster response which are provided to the responding physicians. For field personnel, they also suggested training in indications as to when is appropriate to consider field limb amputation, when to mobilize the amputation response team, and how to assist the response team when the procedure is being performed (Kampen, Jones, Dougherty, & Bonness, 1996).

There are only a couple of emergency systems identified through the literature review that have an actual policy in place for field limb amputations. What is interesting from this particular article, is the fact that the Dallas, Texas emergency medical services in conjunction

with Methodist Dallas Medical Center and the hospital based helicopter service CareFlite have had a program in place to assist field units with limb amputations since 1984 (Sharp, Mangram, Lorenzo, & Dunn, 2009). Their policy calls for the request of an amputation team consisting of an attending trauma surgeon and a resident trauma surgeon to be flown to the scene of the entrapment. Because of limitations of space and weight restrictions associated with the personnel transfer via helicopter, the two surgeons are the only hospital personnel that respond. Additional personnel used to assist in the procedure are selected from the on scene paramedics. The surgeon team brings with them the necessary equipment for the procedure as well as two units of uncross-matched O negative blood. These surgeons are briefed on the victim's condition; they are given an update on the disentanglement efforts already attempted and those in progress and briefed in any specific obstacles impeding the removal of the victim. The team is able to provide additional expertise related to the patient care efforts and when all disentanglement efforts are exhausted or deemed futile, an amputation is performed. In order to proceed with an amputation consent or medical consensus must be obtained. The team will attempt to obtain informed consent from conscious victims whenever possible. In the event the victim is unconscious or unable to provide informed consent, the team must have a two-doctor consensus in order to proceed.

Methodist Dallas Surgical Team has responded to several incidents since 1984. In February and March of 2008 the team responded to three incidents where field amputations were performed. Each of the cases revolved around industrial type accidents. The first case involved a victim who was performing tree trimming when he lost footing and fell into the tree shredder trapping his right lower leg to the level just above the knee and severely injuring his left foot and ankle. The patient was removed by partial disassembly of the machine and the completion of the amputation by cutting the remaining soft tissues from the mangled leg. After multiple surgeries

he recovered and has since been fitted with a prosthesis. The second case that occurred two weeks later involved a victim trapped at an industrial recycling plant. The victim was inside a large chevron auger cleaning the unit when the unit was started. The auger dragged the victim towards the bottom of the device and entangling his right lower extremity in the draining conduit of the bin. After all disentanglement attempts failed, a below the knee amputation was performed. He also recovered and is able to ambulate with the use of a prosthetic leg. The final case involved an entrapment at a lumberyard. The victim's foot had become entrapped in the mechanical devices of a forklift when he was riding in the forks of the unit. When the device was raised, it caught the victim's steel-toed boot and crushed the frontal portion of his foot. Just as in the previous cases, after all rescue attempts failed, an amputation was performed. He also survived.

Sharp, Mangram, Lorenzo and Dunn (2009) strongly suggest that a field amputation team can be an integral part of any EMS system. Although the instances where a field amputation procedure is needed are infrequent, they argue that having a plan in place with an established set of parameters which includes a trauma surgeon team, air medical transport, and an aggressive EMS system can make the difference in these situations.

The scope of using trauma surgeons to complete field amputations is not limited to industrial accidents or isolated incidents. Field limb amputations are more commonly used during disasters. The World Health Organization's defines a disaster as:

1. A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources (ISDR).
2. Situation or event, which overwhelms local capacity, necessitating a request to national or

international level for external assistance (CRED). 3. A term describing an event that can be defined spatially and geographically, but that demands observation to produce evidence. It implies the interaction of an external stressor with a human community and it carries the implicit concept of non-manageability. The term is used in the entire range of risk-reduction activities, but it is possibly the least appropriate for response. (World Health Organization [WHO], 2010, p. 2).

In the medical context, a disaster exists when the need for services far exceed the available resources. It doesn't take a large-scale natural or manmade event to create a disaster. Any incident can escalate to the point where the need for resources far exceeds those available in a given area meeting the definition of a disaster. The majority of the literature regarding field limb amputations obtained through this search dealt specifically with the use of the procedure during disaster type events.

The most recent disaster in the neighboring country of Haiti and the eventual response of medical teams to provide medical care illustrate the importance and need of having an established plan for field limb amputations. Haiti, the poorest country in the western hemisphere, suffered a devastating earthquake that resulted in 230,000 deaths and an estimated 300,000 injured victims. A large number of victims were trapped under tons of concrete or construction materials. Early medical response teams assembled large caches of equipment and responded, on their own accord, to the capital of Port-au-Prince. One of such teams came from the orthopaedic trauma service unit at the Hospital for Special Surgery and Weill Cornell Medical College in New York. Their actions and lessons learned were recently published in the *Techniques in Hand and Upper Extremity Surgery Journal* (Lorich, Jeffcoat, MacIntyre, Chan, & Helfet, 2010). In

their report, they relate their experiences in less than austere conditions, facing significant challenges and limited resources.

The healthcare system in Haiti, which was precarious at best prior to the earthquake, had completely collapsed. These surgeons found themselves fending for themselves in an attempt to provide the maximum possible care in what could be considered total devastation. Although these surgeons made every attempt to salvage limbs whenever possible, amputations became a life saving alternative for the victims. By the time news of the earthquake flooded news outlets and the time it took to assemble, prepare, and transport medical teams to the country, most of the victims being evaluated had been suffering with their injuries anywhere from three to five days. The delay of care, contaminated nature of the wounds, early onset of infection and gangrene mandated the need for the surgeons to perform these amputations. From the lessons learned during this disaster, Lorich et al. admit their lack of knowledge in disaster response working in concert with additional emergency response agencies hampered their medical support efforts.

Teams from other countries reported similar conditions when responding to Haiti with the most experienced international disaster medical response team coming from Israel. The Israel Defense Forces Medical Corps Field Hospital was quickly deployed to Haiti and served as one of the strongest medical support units in the weeks following the disaster. They also reported performing multiple amputations as a mainstay of treatment for mangled or infected extremities. This team of physicians prioritized their treatments based on the needs of the patients within the scope of available resources. Due to the inherent limitation of equipment, supplies, and aftercare services, they resorted to amputations in an effort to save lives that otherwise would have been compromised (Kreiss et al., 2010).

Similar reports from previous disaster events such as the earthquakes in Gujarat, India, and Turkey all show the need of having established protocols or procedures to perform field amputations. Jain, Nopponen & Smith (2003) and Yasin, Malik, Nasreen, & Safdar (2009) reported similar situations and the need to have medical teams prepared to perform amputations. Their observations call for either trauma physicians or orthopaedic teams should be used to perform the procedures only. They did not address whether other types of emergency services providers would be a suitable alternative to perform field limb amputations.

Although there are only a few articles directly addressing the subject of field limb amputations as an alternative in disentanglement of victims, the need to address this subject is clearly evident. The prevalence and frequency of events requiring the use of field limb amputation is perhaps severely under-reported. The report from Sharp, Mangram, Lorenzo, & Dunn (2009) provide a strong foundation that justifies the need to have a policy or plan developed for field limb amputations. This procedure may be a once in a career type event, but as this literature review demonstrates, it is necessary to have a plan in place, should the need ever arise.

Procedures

The use of field limb amputations as an option in disentanglement and to determine where SCFD needs to go in regards with policy development and preparedness, this research utilized a descriptive method to answer the following research questions: First, what type of procedures do other EMS agencies have in place addressing amputations as a disentanglement option? Second, when is it appropriate to consider a field limb amputation as an option for extrication/disentanglement of a trapped victim? Next, what is the current position of the SCFD medical director, emergency physicians, and the state medical director regarding the use of field

limb amputations as a disentanglement option? Finally, can specially trained paramedics within SCFD be permitted to perform field limb amputations during specific entrapments or disaster events? To answer these questions, it was necessary to use a tiered approach when collecting the base information as there are a number of independent stakeholders that must agree that performing a field limb amputation is indeed an option to be considered when all other disentanglement attempts have failed.

The first tier of our research was to identify what are other agencies doing to address field amputation policies or protocols. To understand the current state of policies within the nation, a baseline assessment of emergency response agencies was explored using a nationwide survey distributed via emergency services newsletters and distribution lists. This survey was developed by this author, reviewed by the medical director, and distributed using a commercial survey software website. This survey was accessible for completion for a period of 30 days from August 10 through September 10, 2010. Voluntary respondents represented a convenience sample with 72 surveys returned (see Appendix A for the complete survey instrument). As a result of the voluntary nature of this survey, the results are limited by the sample size obtained for this project.

The survey was broken down into three sections. The first collected demographic data including agency type; personnel strength; service area description; resident population size; level of care provided; and specialty rescue capabilities. This data was used for comparison as related to the current demographics of Seminole County.

The second section of the survey sought to identify if a field limb amputation had been performed within their service area in the recent past; whether their agencies has had a complex rescue where a field amputation could have been an option but these services or policies were not

available; identify which agencies have policies specifically addressing field limb amputations; if so, who is responsible for performing the actual amputation when needed and whether a special kit with the necessary tools is carried by the agency. The survey also sought to identify what parameters are used to determine when to perform field limb amputations. This section helped identify and provide background to answer the first two research questions.

The third section of the survey sought to identify the current thoughts of the respondents as to whether they believe a policy addressing field limb amputations needs to be addressed or established within their jurisdictions. It also asked whether their respective agencies would support the development of such a policy or procedure. This question specifically asked for comments to explain their positive or negative answers. Finally, the respondents were given the option to provide contact information. In this final section, the information was used to establish whether SCFD concerns are in alignment with the thoughts of similar agencies across the country.

The second tier of this research sought to answer the third and fourth research questions by specifically addressing the position and opinions of the physician stakeholders that would have direct influence and final authority to determine whether a policy would be put in place regarding field amputations. This was accomplished through personal interviews with Dr. Todd Husty, Seminole County Medical Director conducted in his office on August 24, 2010 (see Appendix B for the complete interview). This author also interviewed the State of Florida EMS Medical Director, Dr. Joe Nelson via telephone on September 8, 2010 (see Appendix C for the complete interview). Additionally, Dr. Richard Slevinski, emergency physician and former State of Florida EMS Medical Director participated in an interview at Winter Park Fire Department Headquarters on August 26, 2010 (see Appendix D for the complete interview). Aside from his

experience in emergency medicine, Dr. Slevinski also had the added experience having participated in a field limb amputation in the past. Finally, this author had the opportunity to conduct a phone interview with Firefighter/Paramedic (FF/PM) and registered nurse Corey Bereza from the Green Bay (WI) Fire Department on September 3, 2010 (see Appendix E for the complete interview). FF/PM Bereza actually performed a field limb amputation approximately five years ago. His experience would be valuable in answering some of the questions posed by this research.

Each physician interview had a core set of questions used to identify their thoughts and position on the subject of field limb amputations. It is important to note that some of the questions were slightly modified for each physician based on their position as related to this subject and to explore further into the specifics of field limb amputations, such as to who should be perform the actual procedure and whether specially trained paramedics should be trained and authorized to perform field limb amputations during complex rescues or during disaster events. Below are the core questions the physicians were asked:

1. Historically, field limb amputations have been used during disasters. What other instances do you see the need for response agencies to have a protocol addressing field limb amputations?
2. Field limb amputation is a heroic last ditch effort to remove a person from an entrapment before they die. What parameters would you suggest must be addressed in this protocol? What other criteria must be met before such an extreme procedure is considered as an option?

3. There has been much debate recently regarding this topic. Can you summarize the concerns the trauma surgeons voiced if you had an opportunity to attend these meetings?
4. If trauma surgeons are not willing to respond outside of the hospital to perform limb amputations, what do you believe is our next best option?
5. Amputations are an ultra-low frequency, ultra-high risk procedure, should any agency be concerned with developing a protocol addressing this procedure?
6. In this procedure, who should be performing the actual amputation?
7. Should specially trained paramedics (members of specialty teams such as USAR, confined space rescue, etc.) also be trained in performing field limb amputations?
8. What kind and length of training and refresher programs must be developed for these paramedics?
9. What obstacles do you suspect must be tackled to establish such a protocol?
10. Finally, the physicians were asked to offer a summary statement of their position in regards to field limb amputations as an option for disentanglement.

The interview with FF/PM Bereza focused on his experience performing an actual field amputation. It included some background information about the EMS system in Green Bay (WI) and their protocols, specifically asking whether their system actually has a protocol in place for field limb amputations. During the interview this author also asked FF/PM Bereza about the decision-making process; what was the most difficult aspect of this event; and whether there were any questions raised by the medical director or state EMS agency following the event. Further, he was asked to share his views on this subject such as what are some important pointers

to consider should SCFD proceed with a protocol; and whether he believes that specially trained paramedics are needed in the event a field amputation is needed in the field.

The collected survey data was reviewed and analyzed using basic statistical software to obtain percentages from the appropriate questions as compared to the sample size. Questions that required short answers were evaluated individually and these comments incorporated when appropriate in the results of this research. The individual interviews were compared in order to identify commonalities within them, formulate a consensus as to their opinions and position on this subject and to identify a set of recommendations and priorities that would guide any possible future development of a policy, if that is the final route chosen to address field limb amputations.

Results

This research project sought to identify the answers to four specific questions using a nationwide survey and personal interviews. In the survey, before proceeding with the core data questions, this author collected demographic composition of the respondents. A total of 72 completed surveys were returned. The first demographic question dealt with the agency type. 75% of the respondents came from career, full-time paid departments; 25% were from combination paid and volunteer departments. Of these agencies 37% employed between 50-150 personnel, 21% 150-400 personnel, 33% less than 50 and 8% with more than 400 employees. By far, the majority of these agencies (50%) serviced a suburban area and the smallest percentage (6%) served a large metropolitan area. Population from the respondents' service areas revealed that 68% had less than 100,000 people, 19% ranged from 100,000 to 250,000 and the remaining 14% served areas with greater than 250,000 residents.

As far as the service level provided, the majority of the agencies (82%) provided advanced life support (ALS) and of those 42% also provided transportation services to the

hospital. Each agency had a number of technical rescue teams all capable of performing technical and complex rescues. This information helped this author understand how the agencies submitting the survey compare with SCFD.

Next, we addressed each research question individually. First question: What type of procedures do other Emergency Medical Services (EMS) agencies have in place addressing amputations as a disentanglement option?

Of the survey responses from EMS agencies only one of them had a field limb amputation protocol in place. The remaining responses reported that there are no protocols in place. In the literature review we were also able to identify two other systems that have a surgical team predetermined in the event a field limb amputation is needed. These teams are hospital based, using hospital protocols in conjunction with an air ambulance program which is also hospital based. The field units are aware these teams exist and can call upon them to assist in a complex rescue however; the field agencies being serviced by these hospitals do not have a specific protocol addressing field limb amputations.

The only positive response where a field limb amputation protocol is in place comes from Miami-Dade Fire Rescue (MDFR) (see Appendix F for the complete protocol). MDFR acknowledges the fact this is a rare but life-saving procedure and has taken definitive steps to have a protocol in the event this procedure is needed. The protocol has clear parameters as to when field units would request the response of the surgical team. In the event that all extrication efforts have failed, or a situation in which the patient's life is in immediate danger and prolonged extrication procedures could contribute to the death of a patient, a field amputation team is requested.

This protocol calls for the medical director or the deputy medical director of the agency (who, until recently happened to be part of the trauma surgeon team based out of Ryder Trauma Center in Miami) or their authorized representative to be transported to the scene in the most expeditious manner (usually aircraft) for evaluation of the situation. MDFR carries a field amputation kit in a number of units and their helicopters (a total of four aircraft available). The on-scene physician in coordination with the incident commander would evaluate the situation and has the final authority as to when field limb amputation will be used.

This protocol has the only explicit process generated by a fire or EMS system on how to identify when a field limb amputation needs to be considered, how to summon the appropriate team, a contingency to have the necessary equipment available on site and specifically addressed who has the final authority to perform the procedure.

The two other known systems that have a protocol are in Texas and Ohio. These protocols provide teams that are hospital-based composed of a trauma attending surgeon and a resident trauma surgeon available for response. Each system has a prepackaged field amputation kit with the necessary tools and one even carries uncross-matched type O negative blood so a blood transfusion can be initiated while the procedure is performed to counteract the shock associated with blood loss. Because of space and weight constraints when using a helicopter as means of the most expeditious form of transport to the scene, no additional surgical team members are transported to the scene. The attending and resident surgeon would travel to the scene; obtain a briefing on the patient's condition and rescue efforts done. In conjunction with the incident commander a decision to amputate is made. In these systems both surgeons must agree to the procedure. Fire/Rescue and EMS personnel on the scene are tasked to provide surgical support for the surgeons to complete the amputation.

In the survey, a subset of questions provided additional feedback which included the following: the respondents' previous experiences in situations where a field limb amputation could have been used as a disentanglement option but was not available. This question sought to identify a level of need for the procedure. From this subset, nine agencies or roughly 13% of the respondents do recall incidents in recent years where a field limb amputation could have been used to free the patient from an entrapment before perishing.

Another subset of the first question sought to identify who should be the most appropriate individual to carry out the actual amputation procedure. In Miami's protocol a trauma surgeon was specifically listed however, these surgeons were also part of the medical direction team for MDRF. The two additional identified teams with an established policy all use trauma surgeons to carry out the procedure. In the literature review, there was one documented case where a paramedic actually performed the procedure under the guidance of a trauma physician in direct radio contact. In the Wisconsin case, FF/PM Bereza did not have a protocol to give him direction and, due to the unstable and critical condition in which the patient was trapped, impeding his ability to breathe, a consensus decision by all paramedics on the scene was made to perform the amputation. In his interview, he revealed that there was no time to waste trying to make radio contact with the trauma surgeon. This would have further delayed the victim removal with even more deleterious effects (C. Bereza, personal communication, September 3, 2010). In the survey, the majority of respondents agreed that when available, a trauma surgeon is the best and most qualified person to perform the actual procedure.

The second research question was designed to identify when is it appropriate to consider a field limb amputation as an option for extrication/disentanglement of a trapped victim?

The single respondent with a protocol clearly identified that the patient's condition and stability dictated whether continued attempts at extrication would be suspended and a field amputation performed. In terms of the patient's condition, stability or how stable the patient's condition is, refers to his/her ability to maintain adequate oxygenation and blood perfusion to vital organs in order to sustain his/her life. An inability to provide adequate respiratory function and blood flow to vital organs can quickly deteriorate into death. In situations when the patient is unable to meet the physiologic demands of adequate oxygenation and perfusion of blood into vital organs, time becomes the parameter that crews must overcome.

Dr. Husty specifically answered this question echoing the parameters set forth by MDFR's protocol as the primary reason as to when a field amputation should be performed. He relates that as long as the patient is stable, tolerating the extended period of time that it may take to disassemble, tear apart, cut or remove the entrapping agent away from the limb is an acceptable option. He mentioned that it is the responders' responsibility to do everything within their power to affect such rescue and not to resort immediately to an amputation. Whether it takes hours to get the appropriate resource on scene so the patient can be freed without an amputation, the emergency responders must do so as long as the patient is stable. He mentioned that an amputation is a life-altering procedure and should only be used as a last resort, heroic measure to save a life. He was very specific that if the patient's life is at risk, which includes the patient being unstable, at risk of further injury or death from a building collapse or in an unstable trapped situation that can quickly deteriorate, sacrificing the limb to save a life then becomes the logical solution to the problem (T. Husty, personal communication, August 24, 2010).

Dr. Nelson also acknowledged that there has to be an immediate risk for the patient of death or near immediate death. He stressed the procedure should not be considered unless it is a

situation that is truly life-threatening. Each incident is different and within each incident there will be varied degrees of entrapment with the possibility of limb salvage. Perhaps situations where the limb is mostly detached already with no chance to save the limb, it makes sense to complete the amputation and preserve the patient's life. His message intended to explain that each case will be different, with varying degrees of complexity which will require a close review of those responders on scene with physician oversight before a limb amputation is considered (J. Nelson, personal communication, September 8, 2010).

In the case of Dr. Slevinski, he echoes the comments of the two previous physicians. In his experience of performing a field limb amputation himself, the decision making process and coming up with a plan took a little too long. In his experience, this entrapment was beyond the routine limb crushed or trapped. This victim was trapped up to his pelvis and required the removal of the entire leg and part of his pelvis. The patient's stability had already begun to plummet. By the time he was removed, significant uncontrolled bleeding had caused the patient to become unstable and the patient eventually died. He explained that the way the patient was trapped, there was no way to control the bleeding unless he was removed from the entrapment (R. Slevinski, personal communication, August 26, 2010).

Finally, FF/PM Bereza in his experience substantiated the need to use the patient's stability as the determining factor as to when to perform a field amputation. The patient in this case was essentially asphyxiating and there was no time to waste. Immediate efforts to create an airway and provide oxygenation to the patient while the bolts were cut in an attempt to disassemble the sander were abandoned and a rapid consensus decision made to amputate his arm in order to save him. Not having a protocol in place and lacking the necessary equipment

became obstacles that delayed the actual disentanglement. This patient went into cardiac arrest and did not survive (C. Bereza, personal communication, September 3, 2010).

The third research question sought to identify the current position of the SCFD medical director, emergency physicians and the state medical director regarding the use of field limb amputations as a disentanglement option?

When questioned, all three physicians agree that SCFD and in general, all other response agencies should have a plan in place that specifically addresses what to do if a field limb amputation is necessary. Each had varying opinions as to how approach this process. They all agreed that, under ideal conditions a trauma surgeon should be the one tasked with making the final decision and performing the procedure. They also agreed that the majority of events requiring such a procedure do not occur under ideal conditions. To add to the complexity of the process, when they were questioned about what to do in a disaster type event, they all agreed that there is a need to explore other options.

In the national survey, this writer posed a similar question to the respondents if they saw the need to establish a protocol addressing field limb amputations for their respective agencies. The responses here were varied. 31% of the respondents expressed that developing such a protocol was not needed; 55% mentioned it would be optional and only 14% expressed it was essential for them to develop such a protocol.

The pursuit of alternative options was used to address the fourth research question: Can specially trained paramedics within SCFD be permitted to perform field limb amputations during specific entrapments or disaster events?

Dr. Husty, when posed with this question expressed that in times of a true disaster, like the recent experience in Haiti, there may not even be enough emergency responders to treat the

sometimes hundreds of thousands of victims. He not only agrees that we should have specially trained paramedics capable of performing field limb amputations when surgeons are unable to respond to an incident, but we should also have contingency plans should a horrible disaster like the one in Haiti occurs, for community response teams under physician radio direction, to be able to perform advanced medical procedures in order to save lives.

In his response, Dr. Husty also stressed the fact that this is not a procedure that each and every paramedic needs to be trained for. The relative infrequency, the need for ongoing training and review does not justify the need to teach all personnel. He stated that a select few senior paramedics with extensive experience, perhaps those already assigned to technical rescue teams, urban search and rescue or confined spaced teams are the intended target audience for this training. Dr. Nelson agrees. He stated that pre-designated personnel, preferably those with a set number of years of experience and documented specific training in field amputations. He does not believe that performing the actual procedure is that difficult; what is difficult is to have personnel with enough knowledge and experience and the decision-making abilities to carry out the procedure when it is needed (J. Nelson, personal communication, September 8, 2010).

In contrast, when asked whether a select group of paramedics should be trained in field limb amputations both Dr. Slevinski and FF/PM Bereza had differing thoughts.

Dr. Slevinski felt that EMS agencies cannot train and maintain, even a small group of pre-hospital providers to do amputations on a routine basis outside of the scope of a disaster. He acknowledges that, during disasters, this is a different issue. He stresses that training a small group of paramedics, those who are senior and have extensive experience would be the ones tasked with this duty.

FF/PM Bereza's response revolved around the fact that training anybody to do anything is easy, but the difficult part is whether the individual is able to maintain proficiency in performing that skill when the time comes. He believes, even in the best of training environments and due to the infrequency of this procedure, maintaining proficiency within the designated group of paramedics would be very difficult. His concern is that sometimes it is better not to have a procedure in place that addresses paramedics performing the procedure because of concerns and questions that may be raised after the event is done. He is worried that if the paramedic performing the procedure was trained in advance, his competency, ability to perform the procedure and all other associated training may be questioned in a litigious fashion. He does agree that departments should have a policy or procedure in place that may summon a surgical team to the scene but he recommended not having paramedics included in that policy (C. Bereza, personal communication, September 3, 2010).

In the national survey, this author posed the question whether their respective agencies would support the development of a program within the technical rescue teams for paramedics to be trained and authorized to perform field limb amputations specifically during disaster events. From the responses 66% stated their department would support the procedure and the training of these paramedics, while 34% would not. This question also asked for a short explanation of their answers.

For those who answered yes, their comments were very similar. These included; in the event of a disaster, the lack of surgeons would cause people to die if paramedics are not trained; special rescue teams can fill the gap of trained personnel to perform limb amputations in order to save lives; and sometimes there is just not enough time to get a surgeon to the scene therefore, having a trained person on the scene could make the difference between life and death. In their

comments, they also all agreed that very tight control along with a strong policy combined with strict oversight from a physician must dictate when paramedics are allowed to perform the procedure. One even commented that this procedure should not become just another merit badge that is given to field personnel.

The group who responded that paramedics should not be doing field amputations expressed liability concerns as one of the primary reasons; difficulties in developing an agreement within multiple agencies and the trauma hospital; some mentioned that with plenty of available trauma services within their urban response area the need to have trained paramedics would not be necessary; and finally some expressed that it would not be needed in their area without further explanation.

To expand upon the possibility of having trained paramedics being allowed to perform field amputations a subset question inquired as to the type, quantity of training and frequency of retraining that would need to be provided in order to allow them to perform the procedure.

In response to this question, Dr. Husty expressed that the procedure itself is not that difficult. An amputation procedure consists of the selection of the appropriate site, slice through skin, tissue, vessels and finally bone. What is important, he mentioned, is to have the right tools. If the entrapment has cut through the majority of tissue and what remains is only a small portion of tissue and bone, it is even easier. He states that a three-hour course with biennial retraining would be adequate to accomplish the procedural task of the amputation (T. Husty, personal communication, August 24, 2010).

Dr. Nelson kindly deferred the training development and delivery of this training to his colleagues in the trauma surgery field. He insists that if we were to train paramedics, the trauma surgeons would have to also have a voice in this process. So it only tends to reason that they

perform the training, establish the time, length and frequency of any training sessions to maintain competency (J. Nelson, personal communication, September 8, 2010).

In the counterpoint, Dr. Slevinski is not completely convinced that we must train all paramedics. He agrees with establishing a plan to address field limb amputations but, due to the relative infrequency of these events, he is not sure we should be permitting paramedics perform the procedure at this point during routine operations. He does admit however, that in times of disaster it would be beneficial to have a select core group of senior paramedics trained to perform the procedure (R. Slevinski, personal communication, August 26, 2010).

After determining their position on this subject, each of the physicians interviewed were asked what obstacles would SCFD have to overcome in order to develop a policy or protocol specifically addressing field limb amputations by paramedics. All of them agreed there were three areas that could potentially become obstacles to the development of a policy. First and foremost would be the medico-legal aspect. Within this area specifically, the agency must first identify if performing a field limb amputation falls within the scope of practice of a paramedic. This is a question that would have to be answered by the State Bureau of EMS in consultation with their legal counsel. The second medico-legal aspect is the general liability assumed by the agency if a paramedic actually performs the procedure. FF/PM Bereza even brought up concerns that an incident of this magnitude would no doubt bring further investigation after the fact, lawsuits would be filed and he was concerned that the paramedic performing the procedure would be left “holding the bag” when it was all over (C. Bereza, personal communication, September 3, 2010).

The second obstacle to overcome is that such a program must have the direct buy in from the trauma surgeons and the area’s trauma center that would be receiving these patients. Dr.

Slevinski commented that this point is of particular importance during disasters. Emergency personnel trained to perform field limb amputations can do an excellent job of proper removal but if the system does not have the infrastructure to care for these patients, then perhaps we are just prolonging their death. After an amputation the patient is left with an exposed, potentially mangled, and bleeding extremity that would require definitive care by surgeons to perform debridement, close, and complete the amputation along with antibiotics to prevent infection. If this care is not available, the patient would most likely die from blood loss or infection (R. Slevinski, personal communication, August 26, 2010).

The third obstacle is to have adequately trained personnel that remain competent in the performance of the skill. Training was unanimously mentioned as a factor to consider if the adopted policy included the use of specially trained paramedics to perform amputations. Due to the infrequency, complexity, generally deemed as an ultra-high risk, and low frequency procedure, maintaining competency would be very difficult. Dr. Slevinski stated that to maintain competency and proficiency, the select group of paramedics trained on the procedure would have to have quarterly sessions where they would go to the operating room, pair up with an orthopaedic surgeon to observe and review the actual amputation process. If this refresher method was not deemed possible, he mentioned that using an animal model as an option, but it would be difficult to justify (R. Slevinski, personal communication, August 26, 2010). Perhaps a cadaver lab could be another option. The consensus from everyone is that to maintain proficiency would be extremely difficult.

One unexpected topic that continued to surface during this project was the need for specialized equipment and who should carry it. When the original project and research questions were developed, this author set to find out what is currently being done by other agencies and

whether SCFD should pursue this topic and consider future development of a policy. In an almost unanimous fashion, respondents of the survey, the physicians interviewed, and the paramedic who had the opportunity to actually perform a field limb amputation reported that having the proper equipment is essential to a successful procedure. In fact, this observation was also clearly evident in the literature research. Everyone agrees that, if a policy or protocol is developed, it must include a clear plan as to what equipment would be assembled in an amputation kit, where should it be staged, and a clear process to deploy the kit with the trauma surgeon team to the incident scene.

Finally it is important to point out this research was limited by the relatively low number of respondents to the survey. These respondents represented a convenience sample of volunteers that was not randomized in any fashion. This project was also limited in scope to address a problem affecting our agency specifically. During the course of this project, it was identified that the concept of allowing a paramedic to perform a field limb amputation had far greater implications and ramifications reaching all the way to state government, national standards of care, and the paramedic scope of practice. Exploring specifically how these ramifications would have to be clarified in order to allow paramedics to perform the procedure are quite complex and outside the scope of this study. This topic would require a separate applied research project by itself.

Another limitation that hampered this project is the relative lack of data on this subject. Most of the reports of field limb amputations performed came from the limited amount of information available through a literature review, so if a field limb amputation was not discussed in a publication it went unreported. The remainder of the known field limb amputations were discovered via anecdotal reports and networking through colleagues. In order to have a better

grasp at the actual magnitude of this problem and the relative lack of procedures, better data collection points need to be established and mandated through a national data collection instrument such as the National EMS Information Systems (NEMSIS).

Discussion

Field limb amputations used as a last resort, heroic procedure to save someone's life indeed has a place in the arsenal of tools that can be employed by rescue teams during complicated rescues and in times of disaster. The majority of the respondents to the survey agree it is a subject that deems further exploration. After review of the survey responses and interviews conducted for this project four major concerns were identified.

The primary concern that hovers over the entire concept of performing field amputations deals with medico-legal concerns. Surgeons are hesitant to respond because they feel that they would not be protected legally and their individual insurance riders only cover them within the context of providing care in a hospital environment. In Florida, there has been a recent debate as to who will provide medical liability coverage for surgeons coming out to the field to perform these procedures. The trauma surgeons fear that performing this procedure outside of the confines of a hospital in less than optimal conditions opens them up for a lawsuit. Until this is clarified, surgeons may refuse to respond to the field to perform an amputation. Both Dr. Slevinski and Dr. Nelson agreed that if the surgeons' primary reason for not responding to the scene is liability, this can be corrected through legislation which would include an extension of sovereign immunity or state statute changes that would afford them the necessary protection from lawsuits (R. Slevinski, personal communications, August 26, 2010). If liability is resolved and surgeons are protected when they respond, the need for agencies to develop an alternative

plan using paramedics would not be necessary (J. Nelson, personal communication, September 8, 2010).

Another medico-legal concern that must be addressed before proceeding with a policy that allows paramedics to perform field amputations is whether this is actually within the legal scope of practice for a paramedic. Dr. Nelson would like to bring in the state trauma committee members and discuss if paramedics performing field limb amputations is within their scope of practice. Right now it is unclear whether an agency can generate a policy that allows paramedics to perform the procedure. Under Florida law, paramedics are allowed to perform life-saving procedures that are within their scope of practice which is based on the national standard curriculum. Also within Florida law, paramedics are allowed to perform other emergency procedures as long as they have been trained to perform them and they are authorized by their respective medical director (Emergency Medical Services, 2010). This statement in the law opens the paramedic scope of practice to a great deal of interpretation. This question will require extensive discussion from a number of state committees, the committee on trauma, the Bureau of EMS, the state Surgeon General, and their respective legal counsel before a final determination is achieved. If indeed paramedics are allowed to perform field limb amputations, this would perhaps need to be addressed in either state statute and/or the Florida Administrative Code that governs emergency medical services.

The second concern is defining who is actually going to perform the procedure. The problem must be divided into two categories to determine who is best suited for the actual task. First is the isolated entrapment during normal operations and the second deals with entrapments during a disaster event. Everyone agrees that a trauma surgeon is the most qualified to perform an amputation in an isolated incident outside of a disaster event. However, within this subset of

instances, the patient's stability could be deteriorating so quickly that a surgeon cannot be transported to the scene rapidly enough. This remains a very grey area as to what would be the next best option.

A different situation would be during a disaster. In an event where resources are scarce or non-existent, surgeons are not going to be available. In these instances, having a backup plan utilizing specially trained paramedics capable of performing the procedure would be an option if allowed under state law.

The third and largest concern voiced by the respondents and physicians is the need for a comprehensive integrated emergency system that would be able to care for these patients providing definitive care after they are removed from the entrapment. In the absence of this system, these heroic efforts would be futile. In order for emergency services to consider field limb amputations as an option for disentanglement, agencies must come together along with the trauma surgeons and trauma hospitals in the area to insure that the care would progress seamlessly from the field into the hospital environment. Dr. Nelson expressed concerns that if this is not done ahead of time, it would result in a breakdown of care and even the possibility of a trauma surgeon filing a formal complaint to the Bureau of EMS against a paramedic who performed an amputation under the direction of their respective medical director (J. Nelson, personal communication, September 8, 2010).

The fourth concern voiced if paramedics are allowed to perform amputations under certain conditions relates directly to training and competency. All have agreed that performing a field amputation is an infrequent and perhaps a once in a career event. They also agree that a trauma surgeon should be the one responding to and performing the procedure. If paramedics are used as an alternative option they would have to receive additional training to prepare them

intellectually, physically, and mentally to carry out this function. Dr. Slevinski commented that it is not hard to do an amputation; what was hard was the mental challenge it posed. The paramedic is performing a life-altering procedure that is gruesome, always in less than optimal circumstances. The paramedic must be mentally prepared to carry out this action. He related it to being shot at or shooting a person in combat. You can train a person to do it, but until you have actually done it, it is difficult to comprehend how difficult it is (R. Slevinski, personal communications, August 26, 2010).

Each of the physicians and FF/PM Bereza expressly voiced that it would be difficult to maintain competency. Even if an agency only has a core group of paramedics trained to do this, they are provided with ongoing training opportunities, it would be challenging to remain proficient and perform optimally when the need arises. If an eventual policy is developed to include paramedics as an alternative professional group to perform amputations, the policy would have to very specifically outline competencies, prescribed retraining intervals, and even operating room time to maintain their proficiency level.

After exploring current literature, review of the systems utilizing the procedure, discussing the subject with physician stakeholders, and exploring respondents concerns of the up to this point, the question remains: Are field limb amputations used as an alternative disentanglement option during complicated entrapments or disaster events feasible for SCFD? The answer seems to be yes. Most agree this would perhaps be a once in a career event. Just because of the infrequency in which it may happen is not the reason to turn a blind eye to the potential problem. As Dr. Nelson and Dr. Husty pointed out, the worst policy is one that is made on the fly or worse yet, not having a policy at all and needing to perform an amputation. Now, I say this with a cautionary tone. The subject of field limb amputations as an option for

disentanglement sits in a penumbra of uncertainty. There are too many what ifs and too many questions as to which is the most appropriate way to go.

It is necessary for SCFD to further explore options and consider developing a protocol in conjunction with the trauma hospital and surgical team that would be transported to the scene to evaluate the patient and if necessary, perform the amputation. To accomplish this would require the collaborative efforts of the department, medical director, trauma surgeon team, and the local level one trauma center as well as participation of the local air transport service. This protocol could be much like the one already in place in Miami but I would recommend taking it a step further. It should also list secondary receiving facilities in the event the primary trauma center is unable to take the patient due to an unforeseen problem. This would also require the inclusion and participation of the regional level two trauma centers and their respective surgeons to make this protocol truly comprehensive.

The second portion of this research sought to identify if training a select group of paramedics to perform the procedure would be a suitable alternative in the event trauma surgeons are unavailable or unwilling to respond to an incident scene to assist. This question actually generated more questions than answers. As a very grey area of EMS practice, multiple uncertainties including medico-legal; liability; whether performing this procedure is within a paramedic's scope of practice; training, and maintaining proficiency must be answered before we could ever consider including paramedics as part of a field amputation protocol. To answer these questions will require a statewide effort that begins at the State Bureau of EMS and flows through the Committee on Trauma right down to the Medical Director Constituency group of the State of Florida EMS Advisory Council. Depending on how these groups approach these questions, making parameters that allow paramedics to perform amputations would most likely

require statutory amendment and include administrative code language to make this option a reality.

Field limb amputations is a complex topic that although rare, does require further exploration by SCFD to identify the most appropriate course of action to develop a protocol where field limb amputations are an option in disentanglement from complex rescue and in times of disaster.

Recommendations

In this project, this author has identified what is currently in place and general thoughts regarding the need for field limb amputations. Although an infrequent procedure, respondents and physicians alike agree for the most part that a protocol is needed to outline a course of action should this life-saving procedure ever be needed.

In order for SCFD to consider the development of a protocol that addresses the necessary procedures in the event a field limb amputation is required, the following recommendations are suggested:

1. Initiate dialogue between SCFD, Seminole County Medical Director, Dr. Todd Husty, the local air transport service (AirCare), and the trauma surgery team at Orlando Regional Medical Center. This dialogue would pose the question of field limb amputations to determine each of the stakeholders' contributions to the development of a protocol. This group would first work to define the composition of a surgical team and the need for 24 hours per day, seven days per week coverage. Second, would be to identify who is going to hold the liability if surgeons respond outside of the hospital to assist the responding agency. Third, would be to establish criteria as to when the team would respond and what equipment would be needed by the team.

- Fourth, determine the most expeditious way to get the surgical team on scene. And fifth, formalize a plan of care for the patient so appropriate in-hospital care continues seamlessly from the field to the hospital.
2. Request from the State Advisory Council and the Bureau of EMS in conjunction with legal counsel to offer an opinion as to whether the performance of a field limb amputation by a paramedic falls within their scope of practice as specifically authorized by each individual medical director.
 3. Through the office of the State Medical Director, survey the trauma surgeons in the state to identify their current position in regards to responses outside of the hospital to perform field limb amputations. The survey must also identify their concerns including any medico-legal pitfalls or fears of lawsuits while performing procedures outside of the hospital.
 4. Armed with the results of the surveys from the trauma surgeons, the State Medical Director in conjunction with the State Surgeon General and the State Attorney's office determine what must be done to extend limits of liability or sovereign immunity to surgeons who respond out in the field for the purpose of performing a field limb amputation as a life-saving procedure.
 5. The epidemiology data regarding field limb amputations is poor. In order to get more accurate information regarding the incidence of field limb amputations, encourage the NEMSIS program to include a data collection point addressing field limb amputations; who performed the procedure and whether a protocol was utilized. These points would help get a more accurate picture of the actual impact of this problem.

In conclusion, the use of field limb amputations as a last resort method to disentangle a victim to save their life has been used in the past with success. This procedure is still rare but can make the difference between life and death when used in the right circumstances. Exploring this subject has uncovered more questions particularly when it pertains to paramedics performing the actual procedure. The general consensus is that fire response agencies need to have a protocol in place to address this situation should it ever occur. The difference in opinions comes when asking the different stakeholders how to go about developing this procedure. It is the intent of SCFD to continue exploring this subject and using the recommendations identified in this project to eventually have a plan in place. This plan, as suggested, would use a surgical team, not paramedics. There are just too many variables and unanswered questions that must be addressed before SCFD would ever consider training paramedics to perform this procedure.

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Appendix A

EMS policies on field amputations nationwide survey questions

Section 1: Demographics

1. How would you best describe your agency type:
 - a. Career
 - b. Combination
 - c. Volunteer
2. How many personnel does your agency employ:
 - a. <50
 - b. 50-150
 - c. 150-400
 - d. >400
3. How would you best describe your agency's primary service area:
 - a. Large metropolitan
 - b. Urban
 - c. Suburban
 - d. Rural
4. What is the approximate population of your agency's service area:
 - a. <100k
 - b. 100k to 250k
 - c. 250k to 400k
 - d. >400k
5. Which of the following best describes the highest level of care provided by your agency:
 - a. BLS/First Response non-transport
 - b. BLS transport
 - c. ALS non-transport
 - d. ALS transport
6. Does your agency currently have or participate in a regional specialty team listed below (check all that apply):
 - a. None
 - b. Confined space rescue team
 - c. High angle rescue team
 - d. Technical rescue team
 - e. Urban search and rescue team
 - f. Other (Please specify)

Section 2: Field limb amputation experience

7. Do you have any knowledge of a field limb amputation ever being performed in your service area?
 - a. Yes (If yes, could you please provide some details if available).
 - b. No

8. Do you recall complex entrapments or situations in the last few years where a field amputation could have been used as an alternative disentanglement option in your service area but was not available?
 - a. Yes (If yes, could you please provide some details if available).
 - b. No

Section 3: Field limb amputation protocols

9. Does your agency have a written protocol or policy that addresses field limb amputations as a disentanglement option in complex rescues? (If so, would you be so kind to e-mail a copy of your protocol back to me?)
 - a. Yes
 - b. No
10. For agencies who have a written policy for field limb amputations, who is designated in the policy as the primary person responsible to carry out the procedure?
 - a. Trauma surgeon
 - b. General surgeon
 - c. Emergency physician
 - d. Medical Director
 - e. Other _____
11. For agencies having a field limb amputation protocol, does your agency carry a field amputation kit?
 - a. Yes
 - b. No
12. Please describe what parameters and/or requirements are used in your protocol to determine if a field limb amputation procedure is indicated.
 - a. Short answer
13. If your agency has a written protocol or policy addressing field amputations, do your personnel receive training directly related to this subject?
 - a. Yes (if yes, please provide a short description of the type of training offered).
 - b. No
14. What are your agency's thoughts regarding the need to establish a written policy addressing field limb amputations?
 - a. Not needed
 - b. Optional
 - c. Essential
15. Would your agency support the development of a program for specially trained paramedics within technical rescue units be allowed to perform field limb amputations during disaster events? (Please provide a short explanation for your answer)

Appendix B

**Interview with Dr. Todd Husty, FACEP
Medical Director Seminole County EMS System**

August 24, 2010 at 0930 hrs

Subject: In reference to field limb amputations as a last resort disentanglement procedure during extrication or in times of disaster.

Myself *First question is historically there have been instances where the need for field limb amputations has been necessary. Instances such as earthquakes and building collapses come to mind. What other instances do you see the need for response agencies to have a protocol addressing field limb amputations?*

Dr. Husty I think you can start off with industrial accidents. Industrial has all kinds of things, you never know what you're going to get into with industrial, and that could be that the one [incident] in Lake County [FL] where the big auger...you never know, you could have a collapse of not just steel but steel frames and have people trapped and it goes on and on and on, concrete plants, anyplace that they've got big heavy things and...

Myself *What about farming applications?*

Dr. Husty Farming applications are definitely there, people getting wrapped up in [equipment/implements] – it's probably more with the turnover of equipment - tractors turn over that's always the problem – see, the thing is that you can't right the thing [tractor] like turning over and falling into a ravine or for something like that heck, I remember one in Missouri when I worked there and then there's other kinds of equipment. The trick though Ivan, I think is that some of these things can be dismantled. It's only things you can't dismantle or you can't lift it up, or you can't separate it so it's usually something really large or really heavy or really complicated like if you dismantle one thing something else will fall in and that could happen in industry as well as building collapse.

Myself *Second question is field limb amputation is perhaps a last ditch heroic last effort to remove a person from an entrapment before they die. What parameters such as patient status would you suggest must be addressed in this protocol? What other criteria must also be met before such an extreme measure is considered as an option?*

Dr. Husty I think it's probably important to start with the fact that this is not just because they've been entrapped a long time and if the patient is stable or unstable. If they're stable and there's a chance that we may still be able to do something to free the person if they're perfectly stable there's no reason to do an amputation just because they've been there an hour, or two or three. There may be other resources you can bring in if we can extend the time. So it really comes down to hydration. That is are they able to eat and drink which becomes important if they're going to go to surgery you want them eating and drinking but at some point if there's a possibility if we can get some other equipment or process in there and they're still stable then you can feed them, give them fluids you can at least

give them IV fluids and keep them hydrated and this could go on for a day. It's not the time, it's the status of the patient, the instability. So I think that other criteria is all about – see you have to do this because they are not going to survive if we don't amputate the limb.

Myself *So, not just the entrapment time itself but rather how are they tolerating the entrapment whether they're whole stability is going downhill then we need to move a little quicker that's when you would consider the amputation.*

Dr. Husty Exactly, and especially if they have other injuries I think the other status part is the other injuries. If they just have an entrapped limb you have to worry about lactic acidosis and rhabdomyolysis yeah you have to worry about these things but you know if it's just an isolated limb and you're worried about it. Maybe you're sure that this limb is dying and it's crushed and you can always put a tourniquet on it, which means they're probably going to lose the limb anyway. At some point you have to monitor the patient and see do you really need to get rid of this limb or do we need to be trying other measures?

Myself *Currently there are only a few field limb amputation protocols in place throughout the United States. This calls for summoning a trauma surgeon to the scene to perform the procedure. In recent state meetings this procedure became the subject of much debate. Could you summarize what the surgeon's concerns were at the time of that meeting?*

Dr. Husty You know I have to tell you I didn't hear every single last piece of why the surgeons weren't happy about this but the primary one was medico-legal. They're performing a procedure outside of their normal, controlled circumstances. They're not trauma surgeons, they're general surgeons I mean even if you get a trauma surgeon to go they're going to tell you that they're still operating in an environment that's prone to infection you don't have the same things and indeed are you covered by even malpractice insurance? The surgeons get credentials to do certain procedures in hospitals and that's usually what their malpractice insurance covers them and for only certain procedures. I doubt very much that many of them have a little rider that says oh, if you fly out to a scene and we'll cover you there too for an amputation so it's probably a huge concern medico-legally.

Myself *Do you know if there were any concerns beside the obvious concern about complications from infection and non-sterile procedure and all those things what is your comment on that?*

Dr. Husty Yeah, I mean I think that has to be it. There's a medical-legal concern but there's also the fact that there's high risk for the patient, which means there's high risk for the doctor. You're worried about obviously the amputations someone's going to say you shouldn't have done that okay? So that's just pure medical-legal but the other side is the medical risk is the patient going to get an infection you are in a non-sterile environment doing a procedure which usually is done in a very sterile environment so their risk of getting infected or going septic not to mention that you've got a crush injury and there are other things that are going on with that patient like rhabdomyolysis or lactic acidosis and you

have to be, I think, it's just concerning that you could have a patient where anything could go [wrong]...

Myself *If the surgeons based on this information are not willing legally speaking to come out and perform the procedure what do you believe is our next option?*

Dr. Husty Well I think it would be somebody's going to have to perform the procedure I think you know you have two choices if you reach that point where the limb has to come off or the patient's going to die or most likely is going to have a high risk of dying yeah the choice is you either do it [amputate] or die. I feel that's as simple as it gets so somebody's going to have to perform this procedure. Obviously I think there should be a couple of heads involved in making this decision if at all possible. I mean with wilderness medicine you might be the only guy there with your buddy and he's trapped with logs rolled over his arm and he's not getting out. I mean people have done their own self-amputations. Given an EMS response to a patient you're stuck because the patient's stuck and you can't get somebody else to come out there I think you do have the resource of the Medical Director if available and if close by and if trained you know. A lot of Medical Directors are trained to do field limb amputations and wouldn't feel comfortable doing it and probably shouldn't and then so you go. Do we need to have somebody else trained who is actually trained to do this? Whether it's a paramedic or ARNP give me somebody who's been trained. In the military some of field medics got trained to do amputations all of the docs and nurses got trained to do the field amputations because if you get a mass casualty incident you might be doing a lot of amputations in order to save lives you lose limbs.

Myself *That leads into the next question. Although field limb amputations are an ultra low frequency, ultra high risk procedure should SCFD, under your direction, be concerned about developing a protocol or procedure addressing this type of event?*

Dr. Husty I think that because there is a chance this could come up and then we have to answer yes, we would do an amputation if nobody else would do it or we can't get a surgeon to do it, then somebody has to be trained, the answer is yes we should pursue it. Not with everybody, not with every single paramedic.

Myself *And one of the things that I've looked at that hopefully answers our question is that we have a special operations team, we have a USAR team, the confined space folks, those are the individuals that probably would be our target audience, rather than just Joe Medic out there. If we see one in an entire career may be too many, but we need to have a select group that can be prepared for that.*

Dr. Husty Yeah, I think finding a select group, spending time with them; I think the law of diminishing returns comes to play. I think if you train everybody [we would lose skill], why do we need to train everybody? You really don't need to train everyone.

Myself *This moves us to the next question: Under ideal conditions, who should be performing the field limb amputation? Under austere conditions, such as in a disasters, we talked*

about the surgeons, then the paramedics being an alternative option specially during a disaster, do you see any other options?

Dr. Husty There is one more. People will tell you if we get hit by a Cat-5 hurricane that hits the coast and comes barreling through here, we may not have enough available personnel to take care of the needs medically, which is the definition of a disaster. True disasters not just, “boy that was uncomfortable”, but we are talking about people are going to die because get to medical care because the roads are impassable, the hospitals may be shut down, all kinds of things going on. So much need, that, we may not be able to get there. The question is, if we were in radio contact with somebody who has never been trained to do this and they have somebody who has a building collapsed on their leg and they can’t get them loose, what are you going to tell them? Can you teach them to do an amputation right there, on the radio? The answer is yes, you may. So this goes outside of EMS, this goes also, in big disasters, there may be lay people performing field limb amputations with the help or direction of medical personnel. Should we train our CERT [Community Emergency Response Teams] teams? Years ago, I started training CERT teams to put tourniquets on, when tourniquets were a “no, no”. If you think about it, you say, OK we are not going to save a limb but we are going to save a life. I said [to the CERT team], if you are going to learn first aid, you might as well learn disaster first aid and that is to use tourniquets. The next step from there in disaster first aid is to use tourniquets then cut the limb off if there are trapped in that limb. I think it may be in the extent of CERT teams.

Myself *Along those lines, after doing a recent literature review, literature is already coming out from the recent earthquake in Haiti, and there were many instances of field amputations, again a lot of times being done by surgeons, that is the perfect example that we have seen in recent history, in reference to hundreds of thousands of people being trapped, not enough care and obviously not enough equipment. They had a system that was totally poor. So I would certainly see that and see how that could be an option at that time.*

The next question: Do you foresee the protocols being established in the future, we kind of went through this, especially using trained paramedics like USAR collapse rescue personnel trained [in field limb amputations], but this would under the direction and supervision, via radio perhaps, of a physician. And what would be the criteria, how many physicians have to agree with the decision. It’s going to be a collaborative decision whether we are going to perform this or not.

Dr. Husty Well, if you have too many physicians that have to agree, you are going to get somebody who may disagree, or for medico-legal reasons. I think we all have to be trained to when would you make this decision. I think the parameters are fairly simple: If the patient is unstable or highly potentially unstable, their life is at risk, they are trapped. You know, once you get to that point and you have tried everything possible and there is not other resources that can get there fast enough to get his person out, you may, to help save their life, perform an amputation. You want people trained to that concept. Even physicians because if you just call my family doctor and say, hey, “do you agree we should cut this guy leg off?”, they are going to go... “I, I don’t know. I never thought about it”. So even

the people making the decision should be trained. Another part of this is what if there are no radio communications? In a true disaster we may not even have radio communications, so we have to be prepared to do this on our own. The first choice is to have radio communication with the medical director. And at least, I know what I am going to do; I am going to call Mark (Mark Wechsler) and Stan (Dr. Stan Haimes) and I am going to call you, I am going to talk with everyone that I know and trust. Are we making a good decision here? I am going to talk to the medics since they are the eyes and the ears. We may not be able to be there personally, or get there fast enough.

Myself *What kind of length of training should be required if paramedics are allowed to perform this procedure, and would you suggest be the minimum hours of training, what would you suggest that process should be?*

Dr. Husty Well, interestingly, the actual performance of a field amputation isn't that hard. In the military we trained on goats. I am not saying, or see that we need to train on goats or cut real limbs. We could possibly get a leg of lamb, to see what is like to cut through the meat and the bone. It's really not that complex of a procedure to tell you the truth. They've been doing them for, doing successful amputations long before modern medicine.

Myself *Yes, you look at the civil war. That was a standard medical procedure for somebody who had a leg wound that could not be treated.*

Dr. Husty And a whole lot of those people survived. And they would not have survived without it. So, I don't know, it probably would be a three-hour course or something like that. Would they need to retrain? Yes. Do we need to retrain every year? I doubt it very much. Is not like is something tricky. Is not like cricoidthyroidotomies where you have to know exactly where that spot is, using a one hand technique or all of those things that you need to keep in mind what pieces, part you need to put where; you slice you turn, etc. This is basically you slice, you go around and you cut the bone. The question is what tools are we going to use? As far as retraining we should do it every two to three years.

Myself *What obstacles, do you suspect that must be tackled, when you look at all the stuff we talked about to establish such a protocol?*

Dr. Husty Other than the fact there are people that are going to disagree, that we shouldn't be doing this, that's probably the biggest obstacle. I would say, other than that it is not a real difficult procedure to learn. I think the reasons for its use are not that hard to figure out. So, for medico-legal pitfalls are an absolute, I mean, I have no idea. Because this is new ground; the only thing I can say about medico-legal is that we usually get into a lot more trouble for not doing something that we could have done; than for doing something when other people say it would be questioned whether it was right or wrong, but we did it for good reason, we were trying to save a life. If you are trying to save a life, do something and people question it, they still need to have to get over the motive, which was to save a life by doing something heroic. Like taking people against their will to get treated, we don't get sued for that, we get sued for not taking them when we should have. I think it

would be awful to say, “you know what, we can’t do a field amputation, so we are just going to have to let you die”. In that case, then they should sue us for that.

Myself *An excellent point, we also need to consider, especially since some of those patients may be awake and they may be given the information at hand of what’s going on and you let them an informed decision within the limits of their distress. I know they are in distress, in an emergency situation and so on. But is like, “if we don’t take you out, we don’t cut your leg, you will die”.*

Dr. Husty Well that brings up a great concept, is what if they say no? You know, are they in distress? Are they experiencing an emergency medical condition? Are they incapacitated? And Are they unreasonable? Yeah, [the patient says] “I rather die here than lose my leg, I cannot imagine life without my leg”. You know, they are under such huge, huge stress, they are injured, they are probably incapacitated and they are definitely unreasonable. And, if you gave them pain medicine they are certainly incapacitated. And is unreasonable to die over your leg. So, would you do it anyways? That would be a very hairy predicament. My vote would be to do it anyways, because I think that, could you claim the person was in shock. Let’s say you don’t do it and their spouse’s attorney asks you, “You let him refuse?” His arm is stuck in an auger, he is bleeding, in severe pain and you let him refuse? Was he in shock? [Absolutely]. I mean it is difficult.

Myself *It is going to be an interesting minefield when that happens. In closing, give me a little summary of your position regarding we seem pretty obvious were we stand regarding the development of a field limb amputation for us. Again, when everything else has been exhausted.*

Dr. Husty We need a protocol and my feeling, if you don’t prepare for it, it will happen. If you do prepare, it may not. So maybe by preparing for it we may never have to do it.

Appendix C

**Phone Interview with Dr. Joe Nelson, FACEP
Emergency Physician
State of Florida EMS Medical Director**

September 8, 2010 at 1000 hrs

Subject: Interview in reference to field limb amputations as a last resort disentanglement procedure during extrication or in times of disaster.

Myself *Dr. Nelson, thank you for having this interview today. Today is September the 8th, 2010 at 1000 hrs. This is an interview in regards to field limb amputations and part of my research is whether this is something we need to address as a protocol in the field, specifically who should perform and what should that protocol, if we decide to create one, should include within it.*

My first question is field limb amputations have been a subject of debate in the last few months particularly in the recent state EMS meetings. Did you have an opportunity to be present in these meetings and if so, could you summarize the concerns voiced in these meetings.

Dr. Nelson Yes, I was in the, I believe, in the Medical Director's meeting, this subject came up as a way of disclosure I would tell you that I don't know if I was present for, I certainly was not present for the entire medical director association meeting, and there could have been some discussion that took place while I was out of the room. I was trying to attend other meetings and I had a very important meeting, I had to step out and actually run. So I don't know if I was privy to all of the conversation. But I do remember some of it.

Myself *Great. If you could give us a brief summary of what was the biggest concern that would be great.*

Dr. Nelson Well, the subject of limb amputations it was brought out that Miami-Dade Fire Rescue in the past has done, has facilitated in the field limb amputations a number of times in the past few years. However that was being done by the trauma surgeons out of Ryder Trauma Center. Miami-Dade Fire Rescue, to my knowledge would take the trauma surgeon to the scene, or the trauma surgeon would respond to the scene and they would either do the amputation themselves, or they would oversee the amputation as it was done by fire-rescue personnel. In the last couple of years, the trauma surgeon who was spearheading that effort, in fact I believe did the responses, who is also is the former chair of the State EMS Advisory Council, who was the chair, left and moved his practice to California. Since he has left, I do not believe they had done any in field amputations and they don't really have a procedure for accomplishing this now. So, there was some discussion by the medical directors as to whether this was an issue that we needed to address and if so, did we address it formally or do we address it with a position paper, or how are we going to handle it. I don't believe we came to any conclusions. There was a lot of controversy or shall I say disparity in the points of view in this subject and my distinct impression is that the perception was this is a very

infrequent event. That's what I recall from the meeting.

Myself *Like you mentioned before is definitely not very frequent and that kind of leads us into my second question; field limb amputations is perhaps a heroic, last ditch effort to remove a person from an entrapment before they die. If protocols were developed for this purpose, what parameters such as patient's status, would do you suggest must be addressed within that protocol or what other criteria must also be met before such an extreme measure is considered as an option.*

Dr. Nelson Well, first of all I think that, and I am speaking as an emergency physician not a trauma surgeon, I want to make sure that is clear. First of all I think that parameters would have to be met, that if the patient did not have the procedure done they would be at risk for immediate or nearly immediate death. I do not think that a procedure like that should be undertaken unless there is an immediate risk for the patient. In cases of entrapment, you know, the situation may vary all over the place, and it may be is simply a matter of time until the rescuers get the right extrication equipment on the scene, or figure out a way to say, remove the vehicle or to move the object in which the patient's limb is trapped. So, I don't think, the procedure should not be considered unless it is truly life threatening. Secondly, I think that there would need to be some type of, if you will, staging of the procedure, in terms of, if you have a person trapped underneath a vehicle and that arm is 99% amputated already; nothing is holding other than a small flap of tissue, that's one circumstance. On the other hand, if in doing the procedure whether is done by EMS or done by someone else, that would require physically incising all the layers of tissue that would normally would be found, including cutting through arteries, and nerves, etc, and bone. I think that is a much more complex procedure, you know. It may be that such a thing as setting some parameters so that if it was simply a matter of clipping a small area of tissue and completing the amputation that may be able to be done by field personnel with permission by their medical control, as opposed to say an amputating an arm or a leg that is crushed and underneath something, requiring, you know, access through all the layers of tissue. I think that is a much more complicated procedure, to do it right.

Myself *Ok. Along that, you mentioned the protocol that Miami had, and going through the research there's a few and I would say, less than five, protocols in the U.S. that I am aware of, that call for a trauma surgeon to be sent to the scene to perform a field amputation. We also mentioned in the meeting there is a concern about the surgeons not wanting to go out to perform the procedure, so legally speaking; what do you think is our next best option with this situation?*

Dr. Nelson Well, I wonder if we shouldn't look at, or really take a formal look at the legality and the protections afforded to a trauma surgeon. It may be that they do have significant protection and they just don't realize it. There may be ways to assure them that the protection exists. That would be one tactic I would take. We look in more detail what the real liability is. Should we still not be able to accomplish that level of comfort that the trauma surgeons would have when responding to the scene, then I think we would, there would need to be a formal protocol written. But I am not sure, meaning we, the

EMS community, couldn't fulfill the needs of the trauma surgeons, to assure that they would have that protection. That would be done best through vehicles such as formal protocols, memorandum of understanding, which would extend the governmental immunity of the responding agency to the trauma surgeons and maybe even statutory language inserted. I don't know, but I would think that would be one option. That being said, I don't think that would work statewide, because the trauma surgeons are few and far in between. They are usually not going to want to respond to the scene, they can't respond to the scene and leave the trauma hospital uncovered. That may be feasible in Miami where there are multiple trauma surgeons and is a big operation. If you take Bayfront Medical Center, for example which is a level two trauma center, or Lakeland Regional, the same thing, a level two trauma center, they usually only have one or maybe a backup or two trauma surgeons on call at any given time. They may or may not be present in the hospital; at Bayfront sometimes the trauma surgeon responds from someplace else in the community and they have a time period to get there. It may not be feasible to get trauma surgeons to respond in every instance throughout the state. That is something else we need to look at.

Myself *My next question: Although amputations are ultra-low frequency and ultra-high risk procedure, should any agency, fire department or EMS, be concerned with developing a protocol addressing the procedure. Again based on need more than anything, you mentioned some of the differences of Miami vs. like a rural area, what kind you share with us about that?*

Dr. Nelson Well, I think it is an issue that agencies need to have some premade guidance on. In saying that I understand that an agency might go 25 years or maybe never be required to use such a policy, but I think that is always better to, my recommendation is they have some type of written guideline on how they are going to handle such an instance. Just because, I think the worst kind of policy is one that is made on the fly.

Myself *Ok. Very good. So to do this policy or procedure; under ideal conditions we mentioned that the trauma surgeon would be the best person suited to do this. If the conditions are austere or there is a disaster event, then what do you think are our options; should we consider having perhaps, other surgeons, paramedics, whom else should be or have a knowledge of this? For example with the recent Haiti earthquake and the USAR response. There were not enough doctors to go around, so in a disaster type event what do you think is our next best option?*

Dr. Nelson I think the next best option, is to have some pre-designated personnel. Preferably if you are going to use field paramedics, then someone with a minimum set of years of experience and maybe some documented specific training, to help. I don't think doing the procedure is as hard as making the decision to do the procedure. So, I think it would have to be individuals pre-designated and authorized to do such advanced procedures with the additional training on how to do the procedure.

Myself *We have, like I said through previous interviews, we have discussed the folks from our special operations guys, urban search and rescue, your confined space technicians who*

are usually your senior personnel with a lot of experience, those would be our target audience to go at that point. Do you agree that would be a good approach for that?

Dr. Nelson I agree that is the approach that should be looked at.

Myself *When you mentioned training, what kind and length of training do you recommend we should do for paramedics, if we allow them to perform this procedure? And obviously, retrain is an important piece of that; what are your thoughts on that?*

Dr. Nelson Well, I would actually defer the specifics of the training to the subject matter experts. I would contact my colleagues in the trauma community, the trauma surgeons that actually they have done some [field amputations] or even if they have not done in the field, but certainly they do them at the hospital and talk to them about that. Get a sense of what their thoughts are in terms of training. I would not be, at this point, prepared to state that there need to be “X” number of hours or include “X” number of things. I think that we need to get the subject matter experts to help us with those things.

Myself *Great, thank you. Next question: What obstacles do you suspect must be tackled to establish a protocol. Obviously there is a mindset out there, we don’t do this; we don’t need it. There is also a concern you mentioned earlier about the medico-legal aspect of it. What do you foresee in your position as the State Medical Director that is going to be obstacles or hurdles that must be addressed or overcome to address this protocol?*

Dr. Nelson Well, first and foremost is the training, making sure that we are using whatever prescribed training is approved by the committee on trauma and the state office of trauma and that’s number one. Is making sure that we have training that everyone agrees upon. The second thing, there is a couple of legal issues, one is making sure that is clear that doing this type of procedure is within the scope of practice of a paramedic and if so, under whose authority? Now, I think that will fall out to the medical director’s authority for that agency, but since is a trauma procedure; the medical director would have to have some sort buy in by the trauma center that services the area. The last thing we would want to have such a procedure be done then have the trauma service at that hospital file a formal complaint against that medic for doing that procedure. So, we would, we probably need to get clarification to make sure that such an emergency procedure is actually within the legal scope of practice of a paramedic in the State of Florida.

Myself *Excellent, thank you very much. The last question I have just in kind of closing, can you give us a summary of your position in regards to field limb amputations today as an option for disentanglement when everything else is exhausted and the patient, if this is not performed, the patient will die.*

Dr. Nelson Before I do that, let me say there is a third issue, is actually a legal issue and is the concerns about liability. So I see as two separate legal issues, one being the professional scope of practice issue, the second one being the medico-legal liability issues. So I just want to make sure we had that answer in the mix.

So in summary, my position on in field amputations, I think that there is on occasion, a place for such a procedure; I think that the procedure certainly should be reserved as “the” [said with emphasis] last ditch effort and it must be done only under circumstances when the patient’s life is in jeopardy if the procedure is not done. I, in terms as to who would do the procedure, I would want my trauma colleagues have in put and an opinion on what they think. Is clear to me that a trauma surgeon or general surgeon, I mean, general surgeons do amputations all the time, they just do them in the O.R. under different conditions. I certainly think is within the privy of the surgeon to do such a procedure. I am not so convinced that this is something that a field paramedic should do; certainly if they have additional training and we have answered the liability and the legal questions I think it is something they could do. It would have to be very clear, I think the most important thing in summary is that whatever we choose should be chosen ahead of time, should be in writing and in a formal protocol so that the paramedic is protected as much as possible, from liability. I think we need to talk more with the EMS communities, I think we need to talk more with our trauma colleagues and try to figure this out.

The other issue is, I would like to know is, and have a better handle on the frequency of this event, say on a nationwide basis. Because I really have no knowledge of how often is currently being done across the country.

Myself *That’s like I said was an interesting finding from the survey that I sent out, certainly will include that. I had like 72 responses and it was like a 6% incidence that they have done them or seen them or participated in. One particular jurisdiction they had two of them. So it is pretty interesting that there is more than I ever thought [field amputations] that there was going to be out there.*

Dr. Nelson Well I know in Miami-Dade they, I think they had two in the last four or five years, since the trauma surgeon... And the trauma surgeon who did this and I am sure you know him, actually was one of their associate medical directors for Miami-Dade Fire Rescue. That may be an important point in answering the liability issue. Is maybe that trauma surgeon or local surgeon needs to have a formal appointment within the EMS agency to extend that protection.

Myself *Very good. So Dr. Nelson I really appreciate your time this morning, I hope I didn’t take too much of it.*

Dr. Nelson I think this is a very important topic and I am glad that you preparing something. I look forward to see what you find out.

Myself *Absolutely and thank you very much.*

Appendix D

**Interview with Dr. Richard Slevinski, FACEP
Emergency Physician
Former State of Florida EMS Medical Director**

August 26, 2010 at 1230 hrs

Subject: Interview in reference to field limb amputations as a last resort disentanglement procedure during extrication or in times of disaster.

Myself *Dr. Slevinski, thank you for having me conduct this interview today. Today is August 26th, 2010 at 1230 hrs. This is an interview in regards to field limb amputations and part of my research is whether this is something we need to address as a protocol in the field, specifically who should perform and what should that protocol, if we decide to create one, should include within it.*

The first question I have, field limb amputations have been a subject of debate in the last few months particularly in the last EMS state meetings. Did you have an opportunity to be present in the meeting and if not, would you summarize concerns that you would have of performing field limb amputations as a last ditch effort to disentangle a person, life vs. limb kind of approach?

Dr. Slevinski I was not at the meeting. I did not know the debate had occurred, but I would think in normal that is such a rare procedure that can only be performed by someone who has done these procedures and can be taken out to these sites to perform the procedure as best they can. I don't think you can train even a small corps of pre-hospital providers to do this in a routine basis now for that problem. If you want to talk about mass disasters and mass casualty that's a different issue and we can talk about that.

Myself *Going into that area, aside from the isolated cases, let's say field limb amputations, as I said a second ago is a last ditch effort to remove a person from an entrapment before they die, so we are looking at life vs. limb; if protocols were developed for this purpose, what parameters such as patient status do you suggest must be addressed within that protocol or plan and what criteria must also be met before such an extreme measure is ever considered as an option?*

Dr. Slevinski I think with today's modern methods of communication you would need to have two paramedics concur that this is necessary and contact medical control to confirm this is necessary. If a surgeon cannot be brought to the scene it needs to be documented. And if are going to have a team of people do this they have to have some pre-training. Before they do the procedure, maybe take just five minutes, but they need to figure out a way to do a "just in time" review either on a small computer, i-phone type of device that they carry to do a "just in time" review so they can see it again right before they do it.

Myself *Basically, a two-minute refresher before they actually do the procedure.*

Dr. Slevinski That's right. That would be pretty easy to do, and pretty easy to build. Because in that gross environment, what you are going to do is not nice, is not pleasant, and is not that hard.

Myself *The few current protocols that I have been able to find in my research call for a trauma surgeon to be sent to the scene to perform the field amputation. Some of the thoughts is that the surgeons are no longer willing to come out, legally speaking, to perform the procedure. What do you believe is the next best option for EMS?*

Dr. Slevinski The answer was imbedded in my last question. Some exposure by senior people with a lot of experience and then a select group of people who are exposed [to the procedure] on a routine basis and just in time review, a just in time training before you do the procedure.

You would not want to train every paramedic. You would want to train your senior paramedics and to save money and save time, they would be the ones that twice a year would have to look at the film again. Or perhaps go and just like now, the OB [obstetrical] standards. You have to go every so many months and participate in so many OB cases. Maybe they would have to participate in some scheduled hospital based amputations.

Myself *So you would recommend perhaps associating with an orthopaedic surgeon that does these procedures to again, learn anatomy, be present in the operating room and observe...*

Dr. Slevinski Yeah, but you would have to have a core of people because you cannot have one person be on call 24 hours per day. Say you would have to realistically make it your shift supervisors or individuals in separate transport vehicles and decide you want to invest the money and time if these people have the mental [preparedness] to do an amputation. Cutting a person is not so easy. We can all talk about it but unless you have done it, is not... the skin is a lot more difficult to cut through that people know. The layering of skin bone and tissue is a very hard thing to do. You'll probably end up doing this with some form of a saw and unless you have done it, you may not be able to carry out the procedure unless you know how to do it. May require if you cannot get human experience, go to an animal model and I don't know if you would be able to pull that off. The acting of cutting through tissue and bone is not that...simple.

Myself *Is not that simple, as you say.*

Dr. Slevinski The smells, the feelings...I had to do it and it's not easy.

Myself *Although amputations like you made reference to earlier is an ultra-low frequency, ultra-high risk procedure, should an agency, either fire department or*

EMS, responsible for emergency responses, be concerned in developing a procedure or protocol addressing how to deal with this should it become a necessity?

- Dr. Slevinski** Protocol, yes. Whether is going to work when the time it is called upon, I don't know. We have a lot of protocols that get buried and become dinosaurs and become old programs in some computer because you don't do them with enough frequency to make them work on a daily basis. So maybe the ultimate solution is having a protocol and to review that protocol in a timely basis, a review of the training with the understanding that this is a once in a lifetime event.
- Myself** *Under ideal conditions we all seem to agree that a surgeon should perform the amputation, but, if like you mentioned before in a disaster type event, if the conditions are austere, there is not enough resources, no surgeons are available, could other people be called upon perhaps a general surgeon, an emergency room physician or even a medical director to do this?*
- Dr. Slevinski** Yes but, if you are in that sort of disaster condition, even after you take the leg off, who is going to care for this patient? You may just be prolonging their death and disability. So unless you plan your system as to what you are going to do once this arm or leg is cut off, you just have a patient with a tourniquet or a big bleeding mess that you are going to cauterize the heck out of it, probably... what good have you done for them? You don't have a plan to keep them alive; so if you run out of surgeons, you run out of people because you are in austere conditions or in mass disaster, this may be changing the person's triage code and decide not to do it...
- Myself** *As an expectant patient perhaps?*
- Dr. Slevinski** As an expectant because the system resources don't exist to care for them afterwards. You have to plan those two things.
- Myself** *Very good. Do you foresee protocols being established in the future and you made some mention of this previously where specially trained paramedics, you mentioned senior paramedics, like those involved in urban search and rescue, collapse rescue, be allowed to perform the procedure in a disaster event, not on a, you know "this is a single patient trapped" kind of thing.*
- Dr. Slevinski** There is almost too many what ifs [chuckles]... If we were to plan a worst case scenario, if this is in place then you have let the person carry out their skills that they were trained for. But the decision to make that training and make that skill set available is an awful big decision that should not be made with a couple of round-table discussions. The implications of what you are doing, especially in a mass casualty situations which would probably be the only place in which they would be done because otherwise you can get some hot dog collar that would just go out and do this [an amputation]. I mean, it would be easier to pass a clause in the legislature to say if they [the trauma

surgeons] would have to go out to do a field amputation, that they would have sovereign immunity or something. It would be much easier than carrying out training for a core of EMS people to have the necessary skill set to do this.

- Myself** *So, what I am hearing from what you just said, is perhaps this is such an infrequent event that, maybe to do a law change rather than to find an alternative formal procedure for EMS or whatever; like you said a sovereign immunity for a trauma surgeon so that liability is eliminated henceforth their concerns to go out in the field...*
- Dr. Slevinski** If the problem is truly of liability. That is easily solved by other methods other than training a core group of individuals to carry out a once in a lifetime procedure that they are not going to be familiar with and not probably do as well as it could be done.
- Myself** *And you mentioned the training earlier, but just in a little more specifics, if we decide that the option is to train those senior paramedics; what kind and length of training would be required to perform this; how many hours and you mentioned something about retraining, can you expand on that?*
- Dr. Slevinski** I can't tell you about the type of training and the hours until we actually set out details, but in any procedure if you don't perform it at least, or are familiar with it "X" number of times per year, when the time comes to perform it, you are not going to be able to. And what that is depends on the difficulty of the procedure. This is going to take three or four exposures per year, to be able to carry it out competently. Once again, I go back to the issue... to really do this is not a normal human being pleasant thing to do. So you have to be prepared mentally as well as physically as well as intellectually for the procedure.
- Myself** *In closing, can you give us a little summary of what your thoughts are after all this discussion we have had this morning; what do you think is our best option to pursue, you mentioned the legal side, you mentioned the special training, but what do you think is going to be our path of least resistance of sorts, to try to... have something in place should we need this?*
- Dr. Slevinski** Let's talk about not a path of least resistance, but a path of competence. If some them [the trauma surgeons] don't want to go out there because "I can get sued", we change the law. If your trauma surgeons are unwilling to do this because they think it can't be done appropriately in the field, then you have a bigger problem because no matter whom you are trying to get it to do it, you cannot do it appropriately. If we get into a time of total social collapse and you want people trained that are going to do this so they can save lives, then only stabilize you have to have a system in place that after you do the amputation can save that life. So is not such a simple answer to the question

and that's why we don't do too many of these. That's why, even in a hospital based environment, an amputation is a life threatening event. You have to do more than just cutting the limb and stopping the bleeding; it has to do with changing blood volume, changing intravascular pressures. Is not a simple thing. At the same time the Civil War proved that you can take a hot saw and some cauterizing, you can cut a limb off in less than two minutes. If you have the need to do that; it has been done in history, the question is do we want to go back that far.

Myself *Right. You mentioned earlier previous to our discussion that you have had the opportunity to do one [a field amputation]. Can you expand on your experience and what you see, something that is so horrific, I guess.*

Dr. Slevinski Yes, I participated in one some years ago on a man that got bit and got sucked into an auger to the ground and our procedure actually ended up killing him. A trained trauma surgeon, myself and others and we knew what we were doing. It wasn't just a simple limb being crushed, it was kind of a hemi-pelvectomy [a procedure where the lower extremity is being removed with a portion of the pelvic bone] that we had to do in the field with minimal amount of [blood] stasis and held the person up. It's a horrible thing. I know it is a lot harder than people think, is just... like when you have to shoot at people, you can practice it but at the moment when you have to shoot at someone for the first time or when being shot at for the first time, it changes you forever; and until you do that, you don't know how hard it is.

Myself *Well, I really appreciate and thank you for your time today and I would certainly take all this information again and put it together, so thank you very much.*

Appendix E

**Phone interview with Corey Bereza, FF/PM, RN
City of Green Bay Fire Department**

September 3, 2010 at 2000 hrs

- Myself** *Corey could you give me a quick introduction to yourself, name, place of employment, certification, experience, etc.*
- Corey** My name is Corey Bereza; I am currently a firefighter/paramedic with the City of Green Bay [Wisconsin] Fire Department, I am also a registered nurse and a deputy medical examiner with the county. I have been employed with the City of Green Bay Fire for 14 years roughly. Prior to working with Green Bay I worked as a registered nurse in the hospital setting in the emergency department, flight nurse and ICU.
- Myself** *Alright Corey, my first question to you: You work for the City of Green Bay and according to my colleague Chief Rob Goplin, he told me that you had the opportunity to experience a field limb amputation. Does the City of Green Bay have a procedure in place should a field limb amputation would ever be required during a rescue?*
- Corey** The City of Green Bay operates under the Brown County Paramedic Protocols which are an agreed set of protocols for all the [EMS] services in Brown County and also agreed upon by the four hospitals that are primarily serving Brown County including St. Vincent hospital which is the primary trauma center guiding the protocols but all the hospitals and all the service providers have their input on these protocols. We all operate under one protocol not through the city itself. There is not protocol to my knowledge that actually addresses field amputations.
- Myself** *I understand from what Rob told me that you had an opportunity to perform a field limb amputation some years back. Could you share with us a little bit of the incident, what happened and what was your experience?*
- Corey** You are from Florida; I don't suppose you are familiar with the sanders used to spread sand on the highways in the winter time? The dump trucks up here have, some of them have a tailgate sander. What that device is a trough attached to the back of the dump truck and it has an auger inside the trough that allows when the dump box is lifted for the sand to dump into that trough and the auger moves the sand into a spinner in either the driver or passenger side of the truck that dumps the sand on the road.
- The individual that I was involved with was a gentleman that was just done and I believe was in the process of cleaning out that auger because he didn't want the sand to freeze in there and somehow in that process his upper extremity was drawn into the auger and he was lifted off the ground. This gentleman was a pretty good size fellow, you know 230 lbs plus, I guess from what I can recall. It picked him off

the ground and turned him supine and carried him across in the direction of the auger until it got him to a point and actually bound him so tightly that it actually stalled the engine, a diesel engine of the truck, it tightened that much. He was discovered a few minutes later to my recollection by a mechanic that was working in the proximity to the incident in the department of public works yard where he was at.

Myself *I take it you guys responded and I would assume that all other forms of extrication or disentanglement were not working, had failed and you guys resorted to the amputation.*

Corey Yeah, we were summoned there with all of our extrication equipment, I believe we had at least one if not two engine companies, ladder company and ambulance. I was actually on the ladder company that day and upon our arrival the mechanics were working with a cutting torch trying to release this individual from the auger attachment. When we got there his clothing was so taught that he basically asphyxiated; there was no significant blood loss from his injuries from the auger, so I crawled up into the equipment and intubated him or actually placed a non-visualized airway into him and still was difficult to ventilate. We kept asking the mechanics as to how close they were at getting this out, for what I can recall they said they had one more bolt to cut; even after they cut the bolt the device didn't release. I knew at that point he had been there for a period of time, so for this gentleman to have any chance of survival we needed to remove him immediately so it was at that point it was decide we would proceed with a field amputation.

Myself *How did you come up with the decision? Did you the trauma center, radio in for authorization?*

Corey No, I believe we went with – we had this gentleman in there, in this situation – we notified the trauma center of what we had and that we were attempting to extricate and there was a core group of very seasoned medics and myself there and I said – this is what we have to do right now. In the time it would have taken to get a physician on the radio, sometimes that takes, you know, five minutes or longer up here to get any direct physician on the radio or any type of direct medical control. So it was like, OK, at this point he is pulseless, non-breathing; does anybody have any concerns about what we are about to proceed with? Nobody did. At that point we are going to take his arm off, the tissue was ground into the auger, there was no chance at reattachment of this limb even if he did survive the event. I proceeded to start to cut away the extremity at the shoulder. The only thing we have in our arsenal at the time was a small scalpel in the OB [obstetrical] kit. I could not even cut his clothes with the scalpel; the scalpel broke almost immediately. Again, is cold and being wintertime his clothing was multi-layered clothing and it was so taught that it literally the scalpel could not cut through it. The next option was somebody - I said we need a knife and one of the firefighters handed me his multi-tool and I proceeded, as gingerly as I could, cut the extremity off and get him out of there so we could begin resuscitation. He was not in a

position that we could not even get to his other arm to do treatment, like IV's or anything. In the attempt of clearing his clothing to take his extremity off, even after cutting the extremity, we still had to cut through additional clothing because it was wound so tight around his torso that we weren't able to ventilate him, so he was really asphyxiated tightly with that stuff.

Myself *So I take it the outcome was that he died?*

Corey Yes, he died. I sat in his autopsy at a later date. We looked at it all, the area had cut away and stuff. There was virtually no blood loss there that was detectable in the autopsy. I believe the autopsy result was actually asphyxiation as the cause of death. Taking the arm off, for instance, had virtually nothing that contributed to his demise at that point.

Myself *If you would think back to the event, and not having a policy, what was the most difficult aspect of performing the procedure?*

Corey The most difficult aspect was just coming to the decision that this was just what it had to be. You look around and if you are the most senior medic, in this case there were a couple that had been around a little longer than I had been, somebody has got to make the decision. We were to a point where all of our current treatment has met a roadblock unable to proceed wholeheartedly [with resuscitation] or call it [as in terminating the resuscitation efforts]. We obviously met as far as we were going to go with him. I knew once we got him out of there we could proceed with more resuscitation efforts at that time. The decision itself was the most difficult. As far as the actual procedure having an instrument that can cut through bone and skin was the next most difficult challenge since we just don't carry that kind of equipment.

Myself *Along those lines, the challenge was the lack of equipment; if you were to point what was the number one factor to come in with this decision [amputation] you would say the acuity of the patient and the timing; he either had to come out or he died.*

Corey Right, exactly. For all practical purposes by the time the decision was made he was probably beyond resuscitation because, again, it took us probably less than 4-5 minutes for us to get on scene, but you figure he was probably in the device for at least 5-10 minutes upon discovery and by the time 9-1-1 was activated, we were already going past the hour of viability in an individual. With the changes in the body, so we were already pretty significantly behind the eight ball, so to speak, to get this gentleman back but if he were to have any chance at all, we had to do it [the amputation] now or there was going to be no chance at survival whatsoever.

Myself *Was there any questioning after the fact by the medical director of what you guys did? Was there a review along those lines?*

Corey Not that I am aware of. Again I have worked in the E.D. for many years prior so I

have built a good rapport and knowledge base of the physicians and the staff there and I have never been called into question for any procedure or event that I have done in the field. This is attributed to the close working relationship that I have with these individuals that are part of medical control direction. I don't know if somebody else with less experience or less rapport with the physicians, I feel probably would be questioned more. When you work with these individuals for eight years prior to this time and seeing them on a daily occurrence at your next job [nursing] they have an idea of what people's capabilities and judgment are. I was never called into question about it at all.

Myself

That's great. I have a couple more questions and don't want to hold you up. I am looking at field limb amputations, basically looking at a state of affairs regarding this subject. What is going on in regards to field amputations with all the recent stuff, particularly Florida Task Forces having to go to Haiti, where they did a lot of crazy stuff out there. I am looking at this because we may only need it once in a career, but when we need it, we need it. We need to figure out what is it that we are going to do. In Florida, Miami-Dade they actually have a field amputation protocol that calls for a surgeon to be flown out to the scene but sometimes that doesn't happen.

If you were to give me some pointers based on your experience, you were there, you've seen it, what are some important things that I need to consider if I develop a field limb amputation protocol?

Corey

I guess, you know, it really needs to be boiled down to determine if this is a life or limb situation. If the person's life is in danger, you may have to sacrifice that limb. It have to be a determination where the medical control and the people establishing the protocols are comfortable in saying "this person's life is in imminent danger" so the question lies is that when the person loses the heartbeat because of this event, which in that event it becomes a resuscitation and they have less chance of being revived or is this a point of where you determine there is no practical way that you would remove this limb and save this individual even though their vital signs are stable or viable. That's the million dollar question and I don't know if anybody will be able to answer that. It would probably fall into the independent decision-making in the protocols when it comes to that. In our situation we did everything that we could up that point, the only way we could proceed any further with resuscitation or hope for this individual was to remove him from that area immediately. But somebody that potentially would have been conscious in that situation and maybe have time to get a surgeon out there, get some resources out there, it would probably handled differently. If he was conscious and alert we may have more time for the cutting torch and different tools to be used and gain better access to this patient. I don't feel, you know, being in this profession for as long as I have, there is not going to be any black and white answers.

Myself

And I know that. We have toyed with this for quite some time. I am just trying to figure out where is it that we are going to do like who is going to do it [the

amputation]. This leads me to the last question:

Would you believe, agree or disagree that we can have specially trained paramedics, particularly our special hazards, confined space or USAR guys as a suitable alternative individual to perform field amputations? This would be the ultra-last resort kind of thing but, like in the recent Haiti event where there were civilians performing amputations because there was no medical help anywhere. Another problem in Florida, being such a litigious state as it is, surgeons do not want to go out there, and they are refusing. So now we need to look at what it is our next “best” option. Do you believe that we can train a special cadre of paramedics, like I said, your USAR guys, confined space techs, to be able to do that.

Corey

The question is can you train them. You can train anybody to do pretty much anything, the question is how proficient are you going to be when the time comes. This is not something that occurs in any kind of regular basis, and what kind of training can you offer and what kind of training is going to be acceptable in the arena of doing this. Because of the litigation and because not being a physician and things like that is really such a broad spectrum of concerns out there. There are times, when sometimes, I believe when are not written are probably better for everybody involved. If you start to have too much policy in place for things that do not happen on a regular basis that actually leads to more questions and finger pointing after the event takes place. Was this person qualified? Did they have training? Did they keep up with the training? How often are you reviewing these policies? Something that is truly a life and death event sometimes those are best left to the discretion where you need to sacrifice life vs. limb, this is the physician you contact or facility that you contact, based on whatever system you have. Because again, to keep up on a proficiency kind of level on something that doesn't truly exist at this point is going to be even more questions asked and I doubt it will proceed slower with any kind of E.D. process. Once the question is asked, it leads to more questions, litigation and concerns, things like that. The parties at the end that be truly affected are the USAR guys on the front line, they may never get to see it. Because when they ask to do it, then the physicians say no, or one says yes, one says no, because of politics, insurance or things like that.

Myself

*I am glad you brought that point up about the policy. Sometimes writing too much policy is a bad thing. This some of the stuff I am looking at, sometimes is better to “punt” at the last minute and do the right thing and say “we did what was right for the patient” getting into that whole arena of policy.
Thank you very much for your time.*

Appendix F

**Miami-Dade Fire Rescue
Protocol 31
Field Surgical Kit / Amputation**

A. Introduction

In the rare event of a patient entrapment in which all resources have failed to successfully extricate the patient, or in which the patient's life is in immediate danger with prolonged extrication, field amputation of the trapped extremity should be considered. The Field Surgical Kit also carries equipment necessary to perform surgical airways, insertion of a chest tube, and placement of central venous access.

B. Procedure for Requesting

General Care

1. Prior to instituting a request, ensure that a TRT unit has been dispatched and is en route.
2. Either the Rescue OIC or Incident Commander can request that the Fire Alarm Office notify the Medical Director or Deputy Medical Director of the need for a possible field amputation or other advanced procedure.
3. The Fire Alarm Office will make contact with a Medical Director as quickly as possible. Only the Medical Director, Deputy Medical Director, or their appointed representative, is authorized to conduct this procedure.

NOTE: In the event the Medical Director or Deputy Medical Director is not available for transport to the scene, either may request the assistance of the Ryder Trauma Center Attending Trauma Surgeon or their designee.

4. The identified physician will be transported to the scene in the most expeditious manner after consultation with the Incident Commander.
5. The Incident Commander or designated physician must confirm that at least one Field Surgical Kit is available at the scene. Sources for a Field Surgical Kit include:
 - a) One kit is located at each Air Rescue station.
 - b) One kit is located at the JMH/Ryder Trauma Center.
 - c) One kit is carried by the Technical Rescue Bureau OIC.
6. Once on scene, the physician will assess the situation at hand and make the decision regarding the requirement for amputation. The physician on scene will have the final say as to the appropriateness of a field amputation.