

**BATTLEFIELD LESSONS:
THE FORWARD AIR SURGICAL
TEAM (FAST) RESPONSE**

BY

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USAWC STRATEGY RESEARCH PROJECT

**BATTLEFIELD LESSONS:
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by

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ABSTRACT

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Research with trauma models and battle zone experience have identified critical time frames in which the most seriously injured must reach and receive comprehensive trauma care. Patients getting care in these time frames have reduced morbidity and mortality. The one battlefield model that has not transitioned to domestic mass casualty and disaster response is the military triage model. First responders are forced to forfeit immediate life-saving services and interventions to some of the most critically injured due to the complexity of resources required at the scene or extended transport times to tertiary care facilities. The military medical response to injuries in contemporary war zones provides a template that can be used by domestic civilian first responders responding to mass casualty events in geographically isolated areas. This paper presents a hybrid civilian-military partnership response that could to reduce morbidity and mortality rates in domestic disaster response.

BATTLEFIELD LESSONS: THE FORWARD AIR SURGICAL TEAM (FAST) RESPONSE

Domestic Mass Casualty Incident (MCI) response has evolved and now provides improved community preparedness, high-tech communication methods, command structures, and complimentary services and equipment based on the type of event. A blended hierarchy of response levels includes local first responders, mutual aid agreements from surrounding communities, state, regional, and national resources including military resources. Research and battlefield experience with trauma models have identified critical time frames for the most seriously injured to reach definitive care and receive comprehensive trauma care in order to reduce morbidity and mortality. The one model that has not transitioned to domestic mass casualty and disaster response is the military triage model. Despite the evolution in Domestic MCI first responders are still forced to forfeit immediate life-saving services and interventions to some of the most critically injured due to the complexity of resources required at the scene or extended transport times to tertiary care facilities. The initial military medical response to injuries in contemporary war zones provides a template to augment response by domestic civilian first responders addressing Mass Casualty Incidents (MCIs) in geographically isolated areas. The military medical response is a demonstrated best practice; consequently combining the current domestic response with the military medical response would yield a hybrid response that could morbidity and mortality rates in MCIs in the United States. The battlefield tested best practice is particularly valuable if considered for application in natural and man-made MCIs, such as tornadoes, plane

crashes, and explosions. For the purpose of the paper this hybrid response is called the Forward Air Surgical Team (FAST) Response.

Background

FAST Response, the focus of this paper, is founded on a translation of certain military injury response practices and concepts as well as on modified standards of care and regimens in the civilian medical and disaster response arenas. Prior to presentation of the proposal, it is vital to understand the fundamental building blocks of FAST Response. This section chronicles development of the building blocks which include the history of the military aircraft used in patient transport, forward resuscitative and surgical interventions used by the U.S. Army and U.S. Marine Corps on the battlefield, and programs envisioned by the U.S. Air Force that are based on modifications to Army and Marine practices. This history is followed by an examination of the characteristics of the domestic Emergency Medical System (EMS), that make the system more responsive in urban areas than in rural and isolated communities or nations with third world economies, lack of infrastructure, extensive country, and challenging terrain. This section also investigates the commonalities and differences among Metropolitan Medical Response Systems (MMRS) that area primary mass casualty responder resource for many states. The paper next examines the role of the hospital in disaster response and patient treatment and concludes the review of building blocks by examining medical triage methodologies.

Military Transport of Patients

As with many innovations in Emergency Medical Services (EMS), the concept of transporting the injured by aircraft has its origins in the military and the concept of using aircraft as ambulances is almost as old as flight itself. Medical evacuation of patients on

the battlefield traces its roots as far back as before the First World War to the use of the balloon.¹ As technology in wars and weapons progressed, so did the use of aircraft for patient movement. World War I and II saw the use of small fixed wing aircraft and the Korean War introduced use of rotary wing aircraft.² Although this technique did not provide in flight care of the patient, it greatly increased the timeliness of critical care. The use of onsite extraction or pick-up by helicopters decreased the mortality rate from nearly 60 percent to less than 10 percent.³

Not only did the use of aircraft minimize mortality, it greatly decreased the time in which wounded patients were taken to the appropriate level of care based on injuries. This capability brought with it the almost certain preservation of life, limb and eye sight of those injured on the battlefield. This capability also proved invaluable as the helicopter was capable of landing in small areas and in various terrain.

By the height of the Vietnam War, Bell Helicopters UH-1 “Huey” was the work-horse of the medical evacuation (MEDEVAC) world.⁴ Due in large part to the dedicated unhesitating service to our fighting force, the call sign “Dustoff” was given to the US Army Air Ambulance force during Vietnam, and that call sign continues to be the designation of the US Army Air Ambulance today.⁵ The use of the UH-1 also provided in flight care by trained medical personnel thus increasing once again the likelihood of survival.

Today, service members of the United States of America enjoy the latest aviation technology available. Sikorsky’s UH-60 “Blackhawk” is the most current version of our air ambulances in the demanding terrain of Afghanistan. It comes with a complete package of live saving capabilities and is equipped with the instrumentation that allows

flight in almost any category of weather. The UH-60 additionally provides for increased weight capacity and speed from its predecessor the UH-1.

The Forward Surgical Team of the U.S. Army

The Forward Surgical Team (FST) was conceived by Dr. Charles Rob, who started it with the British 1st Airborne Division in World War II. Although prototypes were initiated by the U.S. Army in the early 1990s, it officially fielded the first team in March 1997. Since then, Army FSTs (currently 14 active and 23 reserve) have deployed on numerous combat, peacekeeping, and disaster relief missions throughout the world.⁶

The FST purpose is to save the lives of those who could not survive traditional transport or who require immediate medical interventions. Historically, 10 to 15 percent of soldiers wounded in action require surgery to control hemorrhage and to provide stabilization sufficient for evacuation to a medical treatment facility where definitive care can be provided.⁷

The first wartime evaluation of the FST was conducted in 2009. The evaluation assessed “one split FST during a 14-month period in a remote area of Afghanistan” with 761 patients, 327 of whom had immediate surgery. The evaluators – consisting of surgeons and nurses -- concluded the FST’s offered acceptable “Died of Wounds” rates (2.36 percent) when “compared with other larger surgical units operating in the Global War on Terror.”⁸

Operational at an assigned site within 48 hours, the FST is currently in use in Afghanistan and was employed in Iraq. The personnel comprising the team are:

- Chief (1)
- General Surgeons (2)

- Orthopedic Surgeon (1)
- Medical-Surgical Nurses (2, but at two different grades)
- Operating Room Nurse (1)
- Clinical Nurse, Anesthesia (2)
- Field Medical Assistant (1)
- Detachment Sergeant (1)
- Operating Room Noncommissioned Officer (1)
- Operating Room Sergeant
- Practical Nurses (3, but at two different grades)
- Emergency Care Sergeant
- Operating Room Specialist
- Emergency Care Specialist (2)⁹

In addition to their medical training, all of the positions are trained as parachutists, although an actual airborne employment has not been attempted yet.

There are also specific, advanced courses required of some personnel, including Advanced Burn Life Support, Advanced Trauma Life Support, Advanced Pre-Hospital Trauma Life Support, and Trauma Nursing Care Course.

Key to the FST is its mobile hospital and equipment. The FST needs “less than 1,000 square feet of space (equivalent to one GP [General Purpose] tent) to set up and operate in.”¹⁰ However, additional shelters and tents may be added depending on the situation. The hospital houses a Pre-Operation, Operation, and Post-Operation Room. The FST mobile hospital, pallets of other equipment and supplies, trucks, trailers, and personnel are transported to location on a fixed wing vehicle.¹¹

The FST can be split into two Forward Surgical Elements, one of which can "jump" from the other and move to another location and set up independently. This leapfrogging capacity enables the injured requiring surgical stabilization to be treated close to their injury sites.¹²

The Forward Resuscitative Surgical System of the U.S. Marine Corps

The U.S. Marine Corps' Forward Resuscitative Surgical System (FRSS) is very similar to the FST, including its training elements. It was initiated during Operation Iraqi Freedom. Smaller than its counterpart in the U.S. Army, the team consists of 8 positions:

- Surgeons (2)
- Anesthesiologist (1)
- Critical Care Nurse (1)
- Surgical Technicians (2)
- An Independent Duty Corpsman or Physician's Assistant (1)
- Basic Corpsman (1)¹³

The FRSS has other unique features. It:

. . . can be set up within 1 hour by an experienced team and is equipped to perform up to 18 major surgical procedures over 48 hours without relief or resupply. Four preoperative and/or postoperative patients and 1 intraoperative patient can be cared for simultaneously. When relocation is necessary, the system can be taken down and repackaged within 1 hour for transport with a CH-53 "Sea Stallion" helicopter on 2 U.S. Air Force 463-L pallets or in 1 high-back, high-mobility multipurpose vehicle and 1 high-mobility, multipurpose vehicle ambulance with trailers. . . The team normally uses 2 BASE-X (Bea Maurer Inc, Fairfield, VA) shelter tents that can be joined and are part of the equipment block, or it can work out of a shelter of opportunity. When set up, the system provides 2 preoperative and 2 postoperative stations in 1 tent and 1 operating theater in the other tent.¹⁴

Initial results were explored on the work of six FRSS teams approximately one month between March and April in 2003. A total of 149 procedures were conducted by the teams addressing 90 combat casualties presenting. The treating FRSS surgeons agreed that “8 of these patients . . . would have died had the FRSS not been in theater and thus the time to surgical care prolonged.”¹⁵ Not one Marine treated by the FRSS died, although 2 Iraqi children and one Iraqi soldier died “of multisystem organ dysfunction after a damage-control vascular procedure.” One of the lessons learned from the experience was that pediatric equipment is needed to supplement adult equipment.¹⁶

The Mobile Field (or Forward) Surgical Team Concept of the U.S. Air Force

The Mobile Field (or Forward) Surgical Team (MFST) was conceived by the U.S. Air Force and resembles aspects of the U.S. Army’s FST and U.S. Marine Corps’ FRSS. However, the MFST was envisioned as smaller, more mobile, and quicker operationally (15 minutes to establish, compared to the 48 hours the FST requires). The MFST was designed to introduce “advanced trauma resuscitation, damage control surgery, and emergency medical care” in dynamic locations for up to 36 hours.”¹⁷

Originally – as a Mobile Field Forward Surgical Team – the concept was a stand-alone team. However, in its newer iteration – as a Mobile Forward Surgical Team – the concept merged the MFST with the Small Portable Expeditionary Aeromedical Rapid Response (SPEARR) team as a critical element of an Expeditionary Medical Support System (EMEDS). The Mobile Forward Surgical Team more closely resembles the FST or the FRSS because of its integration of a mobile hospital. It is the MFST capability on its own, however, that offers the greatest magnitude of flexibility and application for the civilian-military hybrid targeted by the FAST Response.

The MFST concept was inaugurated in 1983 by the U.S. Air Force. Initiated as a result of the Beirut Marine barracks bombing:

[The MFST] was operationally utilized within the USAFE AOR. Lessons learned during operations in Grenada, Panama, Iraq, Ecuador, Somalia, and the Balkans have also driven changes in the capability of forward surgical resources. The ability to provide forward trauma care in a rapid manner was the impetus for change. Additional requirements for the MFST were established when the Air Force Chief of Staff directed a transition to an Expeditionary Aerospace Force (EAF) in 1998.¹⁸

The MFST is identified as having been implemented in the summary document noted above; however, other than the initial reference in relation to USAFE AOR, there has been no evidence of activation in the U.S. Air Force or U.S. Air National Guard. The fact the MFST hasn't been mobilized was confirmed by Colonel Bret Wyrick, Surgeon General of the U.S. Air National Guard in 2010.¹⁹

The streamlined personnel required of the MFST are:

- General Surgeon
- Orthopedic Surgeon
- Emergency Physician
- Anesthesiologist
- Operating Room Nurse.²⁰

The MFST training is identical to the FST, but personnel are encouraged to also attend the Combat Casualty Care Course, biological warfare courses, Aerospace Medicine Primary (physicians only), and Critical Care Aeromedical Transport courses. Examples of types of injuries and conditions referenced as those the MRST can address are:

. . . blunt and penetrating trauma to the thoraco-abdominal cavity, extremities, genitourinary system and to the head and neck region. Multi-

system trauma, shock/hemorrhage, respiratory failure, airway emergencies, limb revascularization, stabilization of fractures, thermal injuries, major wound debridement and other emergency care can be performed by the MFST. The MFST also maintains limited emergency whole blood collection and transfusion capability. An MFST can provide care for ten damage control surgeries or twenty non-operative resuscitations as a stand-alone medical resource without re-supply. Initial disaster response and triage are also within the capabilities of the MFST.²¹

Clinicians convened by the Naval Health Research Center on behalf of the U.S. Air Force “reconciled the probability of performing [MFST] specific surgical procedures against those actually experienced at the FRSS” for purposes of establishing an audit capacity for “linking clinical requirements to supply items.”²² The results denoted treatment regimes most likely to be performed by the MFST, based on the FRSS experience, as Laparotomy, Vascular Shunt/Ligate, Amputation, Decompression Craniotomy, Thoracotomy, and Surgical Airway.²³

The MFST personnel and equipment may be transported by fixed wing aircraft or helicopter. The aircraft selected is dependent on the incident and can accommodate John Deere “gators” or other small, all-terrain vehicles or vans. Including the EMEDS and SPEARR, “ground transport requires 3 HMMWVs or 1 Military 2 ½ ton truck or 2 Civilian Pick Up trucks or 2 Civilian Vans. Air Transport requires 1/3 of a C-130 or 1 Sherpa 23 or 1 CASA 212 or 1 OV-22 Osprey or 2 UH-60 Blackhawks.”²⁴ There was no documentation listing the required equipment or personnel for MFST only transport requirements.

The Civilian Application of the Emergency Medical System

Similar to civilian patient transport aircraft, the civilian Emergency Medical Services (EMS) is adapted from lessons learned in providing care to soldiers injured in military conflict.²⁵ The civilian EMS can be defined as “a service providing out-of-

hospital acute care and transport to definitive care, to patients with illnesses and injuries which the patient believes constitute a medical emergency.”²⁶ Each year, EMS services are provided to almost 20 million people in the pre-hospital setting. Many of the patients served, “have complicated medical or traumatic conditions that require considerable knowledge, skill, and judgment to be treated effectively in the out-of-hospital setting.”²⁷

In the United States and in many developed countries around the globe, the assumptions and in many cases the expectations of the EMS are:

- A person can dial 9-1-1 or some other activation number to receive EMS for injury or illness and that the response time will be minimal
- Responders will be able to provide advanced life-saving interventions
- Transportation to definitive care will occur quickly

In reality, the paradigm exists only in metropolitan areas of highly-developed countries. This is partially due to the fact pre-hospital EMS and types of response teams vary widely across the United States, including the agency or type of agency providing the service. As a result, there may be:

- Marked increases in response times and in times for transport to definitive care facilities
- Decreased initial on-scene care due to limited numbers of initial responders or the provision of only basic response interventions
- Increased morbidity and mortality

A principal factor impacting the extent of EMS provision of care is the capability of the initial responder. Across the EMS community the capability of this position varies

dramatically. Specifically, the capability is contingent on scope of practice, training, licensure, and certification.

There are several levels of initial responders that are standard across the United States. However, all are variations of a group called Emergency Medical Technicians (EMT). The National EMS Scope of Practice Model (2007)²⁸ and the National Registry of Emergency Medical Technicians (2008)²⁹ each identifies the levels of EMT:

- First Responder (a.k.a. Emergency Medical Responder) possesses the most fundamental set of skills for immediate life-saving intervention, for example they may only be trained in basic cardio-pulmonary resuscitation. Most frequently this level operates with minimal equipment and a First Responder will often maintain these basic interventions until a higher level of EMT arrives, then care will be handed off.
- Emergency Medical Technician – Basic (EMT-B) is skilled in providing emergency medical care and transport of patients with critical or emergent needs. The EMT-B level is able to use most of the basic equipment available on an ambulance and serves as the initial direct link with other levels of the health care system.
- Emergency Medical Technician – Advanced (a.k.a. Emergency Medical Technician – Intermediate, EMT-I) provides not only basic emergency medical care and transport but can also perform certain advanced medical interventions and treatment. For example an EMT-A may be able to initiate peripheral intravenous lines.

- Emergency Medical Technician – Paramedic (a.k.a. EMT-P, Paramedic) has is able to provide advanced life-saving interventions. In addition to the Basic and Intermediate EMT skills, the EMT-P can provide advanced airway management and administer a number of emergency medications.

Individual States and Territories have determined the scope of practice and ultimate licensure for EMTs in their respective locales through legislation, regulation, or policy. The National Highway Transportation and Safety Administration (NHTSA) conducted a survey of all States and Territories in 2005 and discovered from the 30 responses that 39 different levels of licensure existed between EMTs and Paramedics.³⁰ The diversity and inconsistency with regard to scope and licensure can be problematic, confusing the public, challenging reciprocity, and causing duplication of effort.³¹

There are also standardization inconsistencies in EMT education, certification, credentialing and licensure. Some of these are noted in the definitions provided by the National Highway Traffic and Safety Administration (NHTSA):

Education includes all of the cognitive, psychomotor, and affective learning that individuals have undergone throughout their lives. This includes entry-level and continuing professional education, as well as other formal and informal learning. Clearly, many individuals have extensive education that, in some cases, exceeds their EMS skills or roles.

Certification is an external verification of the competencies that an individual has achieved and typically involves an examination process. While certification exams can be set to any level of proficiency, in health care they are typically designed to verify that an individual has achieved minimum competency to assure safe and effective patient care.

Licensure represents permission granted to an individual by the State to perform certain restricted activities. Scope of practice represents the legal limits of the licensed individual's performance. States have a variety of mechanisms to define the margins of what an individual is legally permitted to perform.

Credentialing is a local process by which an individual is permitted by a specific entity (medical director) to practice in a specific setting (EMS agency). Credentialing processes vary in sophistication and formality.³²

The relationship and overlap between the domains described above is illustrated in the Figure below.³³ It shows overlap among the domains.

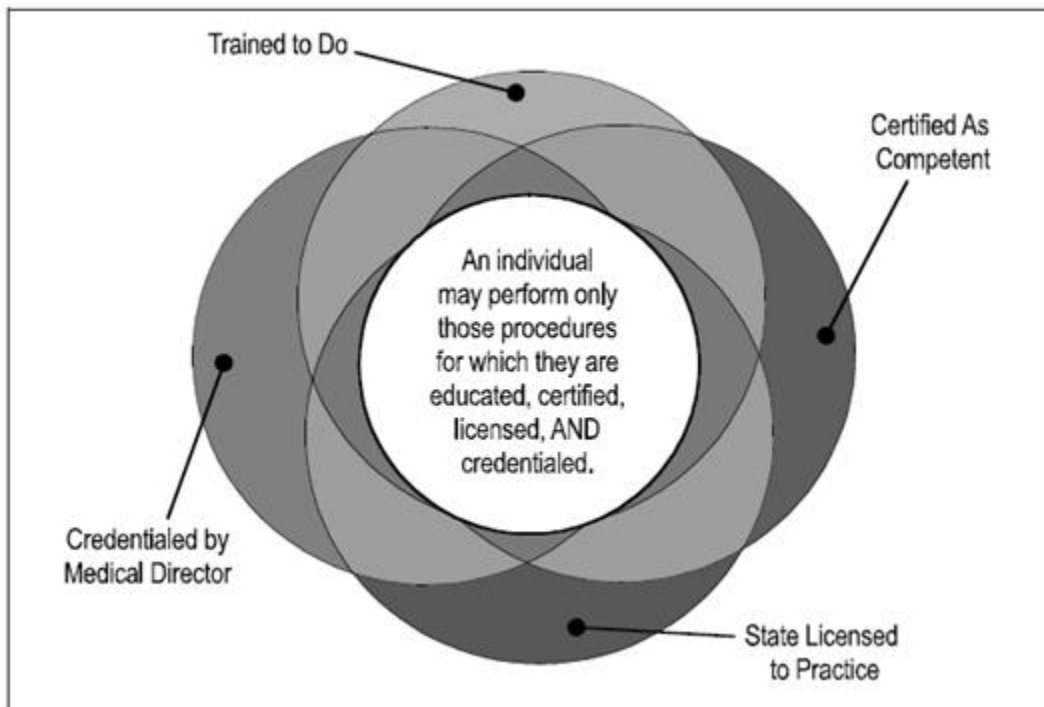


Figure 1: The Relationship among Education, Certification, Licensing, and Credentialing

While NHTSA developed the model for scope of practice in 2007, the certification process and education was developed several decades earlier by the National Registry of Emergency Medical Technicians (NREMT), a non-profit national certifying agency for all levels of EMT. The impetus for the development of this organization and subsequent standards and certification process came as a result of a recommendation by the Committee on Highway Traffic Safety in 1969 under President Lyndon B. Johnson. A Task Force was developed under the auspices of the American Medical Association's Committee on EMS. The Task Force was lead by a pioneering trauma surgeon noted

for work with the American College of Surgeons' Committee on Trauma, Oscar P. Hampton Jr., M.D.³⁴ Leaders from all facets of emergency response and service from around the nation participated in the development meetings. Within 6 months, the Task Force was retired and the NREMT began functioning as a national certifying agency. This agency administered the first certification exam, NREMT- Ambulance, simultaneously to 1,520 ambulance personnel at 51 sites across the United States in 1971.³⁵

The certification for each of the EMT levels requires the EMT to actively work in the field, successfully complete a course approved by NREMT, and demonstrate competency in psychomotor skills and knowledge. All levels require medical oversight and review by a medical physician for care rendered.

In 1974, the NREMT developed a standardized education curriculum for the EMT levels.

The Metropolitan Medical Response System/Municipal and State Response

The Metropolitan Medical Response System (MMRS) is relatively new in the disaster response arena. While the February, 1993 bombing of the World Trade Center in New York and the March, 1995 Sarin gas attack in the Tokyo subway provoked public concern, it was the April, 1995 explosion of the Alfred P. Murrah Federal Building in Oklahoma City by Timothy McVeigh that focused the nation's attention and made the need for a well prepared EMS a national priority.

William E. Clark, Deputy Director of the U.S. Department of Health and Human Services' Office of Emergency Preparedness took a number of steps to address mounting congressional scrutiny and public alarm. In October of 1996, he outlined the HHS OEP's actions to congress:

- Developed a framework for a rapid-deployment team

- Hosted a meeting of regional and local responders for the purpose of developing a metropolitan strike team
- Hosted a two-day conference titled, “Responding to the Consequences of Chemical and Biological Terrorism.”³⁶

As a result, Congress authorized the creation of metropolitan emergency medical response teams in the Defense Against Weapons of Mass Destruction Act of 1996. Referenced as Metropolitan Medical Strike Force Teams, they were to “provide medical services that are necessary or potentially necessary by reason of a use or threatened use of a weapon of mass destruction.”³⁷

In 1997, the Nunn-Lugar-Domenici Amendment to the National Defense Authorization Act funded the first Metropolitan Medical Strike Teams (MMST). The initiative was designed to “train and equip State and local emergency personnel to respond to domestic terrorist WMD incidents” in 20 cities identified by the FBI as high risk (Amendment No. 4349, p. 1). Through the U.S. Department of Health and Human Services, funding was allocated through grants to cities to prioritize biological incidents and:

. . . render assistance for upwards of 1,000 casualties. Mass casualty supplies, pharmaceutical, detection, decontamination and personal protective equipment, including hazardous materials (HazMat) gear, are all components of this system. The operational plan calls for a quick emergency decontamination of victims with simultaneous triage and medical treatment. Treatment protocols include the administration of antidotes for victims and first responders.³⁸

The MMST model evolved into the MMRS, broadening the original concept to include more response professions and targeted collaborative planning and capacities. By 2002, the MMRS had grown to 124 cities.³⁹ Each with unique scopes, organizational

charts, capabilities, composition, and equipment reflective of state plans, legislation, and resources already in place.

Today, the MMRS across the nation remain (still vary widely in capabilities; however, they share a number of common capabilities that include:

- Response to a chemical, biological, radiological, nuclear, or explosive WMD event
- Forward movement of patients
- Metropolitan Medical Strike Team (optional)
- Local hospital and healthcare system preparedness
- Pharmaceutical and equipment plans
- Training Plans⁴⁰

There is continuity among the MMRS community, they all have pharmaceutical caches, decontamination tents, protective gear, and an “All Hazards” approach to disasters. While tailored to state and regional needs, each MMRS also has strategies for enhancing existing local and regional emergency preparedness systems to respond effectively during the first 72 hours to a public health crisis, until state or federal resources may be mobilized.

MMRS is a locally developed, owned, and operated mass casualty response system. In Arizona – the location of the proposed pilot project for the FAST Response -- there are four cities designated as MMRS cities: Phoenix, Mesa, Glendale, and Tucson. However, these cities are responsible collectively for addressing all mass casualty scenes state-wide.

The scope of the MMRS is defined by the Arizona State Emergency Response Plan. It states:

In the event of a major catastrophe, immediate supplemental assistance will be provided to impacted local governments to:

- Support the situational assessment;
- Support operation of the local Incident Management System;
- Identify product/agent;
- Stabilize and mitigate circumstances utilizing HazMat, TRT, Heavy Rescue, SWAT and Bomb squad assets;
- Rescue victims;
- Perform decontamination including establishing secondary decontamination locations as needed;
- Treat patients and deliver pharmaceutical support;
- Liaison with appropriate county, state and federal support agencies.⁴¹

The MMRS cities have Mutual Aid Agreements in place with neighboring communities to support and strengthen capacities and store mass casualty equipment caches. A Mutual Aid Agreement request is one process which can be used to activate the MMRS by a jurisdiction; the other process is contacting the Arizona Department of Public Safety.⁴²

Among the equipment for Arizona's MMRS are the following for each city:

- Limited pharmaceutical cache,
- Tractor trailers,
- Multi-patient modules,

- Decontamination equipment,
- Base Ex sheltering system,
- Mass casualty transportation vehicles, and
- Transportation equipment.⁴³

The MMRS team consists of public safety officers who work regular shifts in the Fire Departments.⁴⁴ The MMRS may be supplemented with additional resources and teams such as Rapid Response Teams and Urban Search and Rescue.

The MMRS collectively in Arizona are guided by a steering committee comprised of leadership from each of the four MMRS cities. The committee meets monthly. However, each of the MMRS are governed by and report through their own municipal Fire Departments.⁴⁵

Proposal

Multiple models and concepts exist within the military for immediate and advanced life-saving intervention that could be applied to improvements of the domestic MCI scene. It is hypothesized that a hybrid Forward Air Surgical Team (FAST) Response could augment the current triage model by adding life-saving resources at or near scene that are traditionally not provided until a patient reaches a trauma center. The FAST Response would ultimately decrease morbidity and mortality associated with MCIs in the United States. The team would be staged in relative proximity to the disaster event. The team would be equipped with sufficient supplies to begin on-scene advanced care that includes limited surgical treatment and interventions on the injured unlikely to survive transfer to a definitive care facility without these.

The FAST Response would consist of uniquely trained medical professionals including physicians, nurses, MMRS paramedics, pilot and crew, and a pre-designated type and equipped aircraft. This team would not require shelter/structure to operate. Both of these components merit further discussion.

Forward Air Surgical Team (FAST). The surgical team is similar to that observed in wartime zones. The team composition most closely resembles the U.S. Air Force Mobile Forward Surgical Team. The size and mix is dependent upon the nature and scope of the disaster. A comprehensive roster of diverse emergency and surgical specialties (emergency medicine, general surgery, orthopedic, oral-maxillofacial, ear-nose-throat, trauma, and thoracic), anesthesiologist/nurse anesthetist, nurses, and other supporting technicians would train and exercise routinely with selected MMRS to maintain skills and be ready to respond to diverse disaster scenarios.

MMRS paramedics would be authorized and trained to provide advanced interventions at or near the level practiced by wartime medics. The paramedic would be supervised by the on-scene team surgeon(s). The state licensing board would provide the authority to practice in this new scope.

Paramedics would join the team through a selection process and successful completion of an advanced training program. Recommendations for selection criteria of the paramedic team members include:

- Trauma experience
- Letters of Support from Supervisors and trauma surgeons
- Background in targeted areas, including rappelling/rock climbing, parachuting, water rescue, HAZMAT, and Urban Search and Rescue

- Physical endurance test scores (e.g., capacity to hike severe terrains)
- Preference to those paramedics who have military service may be an option as well

Planned paramedic advanced training curriculum includes, but is not limited to suturing, surgical assist, and procedure assist. This advance training is offered through a local hospital with an existing adult and pediatric trauma program, burn center, and with experience in training military professionals.

Medical professionals that join the team are from the community or National Guard. The design of the team members and surgical specialties is deliberate to afford response and intervention for the most likely causes of morbidity and mortality from delayed care – airway interruption, chest and abdominal injuries, hemorrhage, large bone fractures, and burn.

Army Aviation National Guard aircrews would need to be current and qualified in this mission profile. If the airframe is determined to be a CH-47, the likelihood is that crews will already be current in their 2000 series (or their basic and advanced mission tasks) tasks for the loading and movement of internal/external loads as well as passenger and patient movement. This task should not cause any additional training for crews as internal/external loads are a common task for CH-47 crews. The aircraft itself could be quickly reconfigured for the movement of the team and the back-haul of patients, resupply or “jumping” the FAST.

These military professionals will be accessible through Memorandums of Agreement (MOA's) or Letters of Agreement (LOA's) with the state National Guard leadership so that in the time of actual emergency, these missions are pre-designated

for the unit. The team may be activated by The Adjutant General (TAG) at the request of local, regional, and state officials through the governor's office.

Specially Equipped Aircraft. A rapid mobile aircraft capable of transporting the team and necessary equipment (including gators and MMRS equipment) to drop spots. The aircraft – such as a CH-47 or smaller, but similarly flexible aircraft – would also need to be capable of transporting back a volume of patients in excess of the current air ambulance standard due to the considerable number of injured. The aircraft could be an MMRS and National Guard asset held in collaborative partnership. However, the asset would be maintained/sustained by the National Guard at their local Army Aviation Support Facility. Within the proposal, the FAST funding would come from the civilian hospital system which would be documented in a Memorandum of Agreement between the hospital and the state National Guard.

Endnotes

¹ D. M. Lam, "To Pop a Balloon: Aeromedical Evacuation in the 1870 Siege of Paris," *Aviat Space Environ Med*, 59 (1988): 988-991.

² R. Mebane and J. H. Makovec, "Timeline Events in the History of Air Evac," http://www.icehouse.net/jmakovec/makovec/ae_tmline.htm (accessed June 15, 2010).

³ "Aeromedical Evacuation - Korean War 50th Anniversary," <http://wpafb.af.mil/museum/history/korea50/k50-8.htm> (accessed June 15, 2010),

⁴ The United States Army Medical Department, Office of Medical History, "Forward Surgical Team (FST) Logistical Planning Requirements (Medical) Fact Book," 6, <http://history.amedd.army.mil/booksdocs/MedicalEvacuation/MEDEVAC> (accessed January 2, 2011)

⁵ Ibid.

⁶ Harry Stinger and Robert Rush, "The Army Forward Surgical Team: Update and Lessons Learned, 1997-2004," *Military Medicine*, April, 2006, http://findarticles.com/p/articles/mi_qa3912/is_200604/ai_n16350293 (accessed October 5, 2010).

⁷ C. Howe, M. Sadler, and P. A. Patrician, "Military Nursing at the Forefront: The Army Forward Surgical Team," *Clinical Care Nursing North America*, June, 2003, in PubMed.Gov, <http://www.ncbi.nlm.nih.gov/pubmed/12755185> (accessed October 5, 2010).

⁸ Shawn C. Nessen, DO, FACS, et al., "US Army Two-Surgeon Teams Operating in Remote Afghanistan-An Evaluation of Split-Based Forward Surgical Team Operations," *Journal of Trauma, Injury Infection, and Critical Care*, Vol. 66, Issue 44, April, 2009, http://journals.lww.com/jtrauma/Abstract/2009/04001/US_Army_Two_Surgeon_Teams_Operating_in_Remote.4.aspx (accessed October 5, 2010).

⁹ U.S. Army Medical Department, "Forward Surgical Team (FST) Book."

¹⁰ Ibid.

¹¹ Col Jeff Bailey, USAF, MC, FS, and Director USAF Center for Sustainment of Trauma and Readiness Skills and Division of Trauma, St. Louis University, St. Louis, MO. Interview by author, May 27, 2010.

¹² Ibid.

¹³ Lowell W. Chambers, MD, et al., "Initial Experience of US Marine Corps Forward Resuscitative Surgical System During Operation Iraqi Freedom," *Arch Surg*, vol. 140. (January, 2005), 27.

¹⁴ Ibid.

¹⁵ Ibid., 27.

¹⁶ Ibid., 32

¹⁷ U.S. Department of the Air Force, *Air Force Medical Services (AFMS) Concept of Operations for the Mobile Field Surgical Team (MFST) (UTC FFMFS)*, (Washington, DC: U.S. Department of the Air Force, September 10, 1999), 5.

¹⁸ Ibid., 6.

¹⁹ Bailey.

²⁰ Bailey.

²¹ U.S. Department of the Air Force, *AFMS Concept of Operations*, 15

²² U.S. Department of the Navy, *The Air Force Mobile Forward Surgical Team (MFST): Using the Estimating Supplies Program to Validate Clinical Requirement, 04-34*, (Washington, DC: U.S. Department of the Navy, December 1, 2004), 9.

²³ Bailey.

²⁴ Bailey.

²⁵ National Highway Traffic and Safety Administration, National EMS Scope of Practice, February 2007, <http://www.nremt.org/nremt/about/scopeOfPractice.asp> (accessed November 11, 2010), 6.

²⁶ National Registry of Emergency Medical Technicians, What is EMS?, 2008, https://www.nremt.org/nremt/about/What_is_EMS.asp (accessed November 11, 2010)

²⁷ National Highway Traffic and Safety Administration, 4.

²⁸ Ibid.

²⁹ National Registry of Emergency Medical Technicians, *What is EMS?*

³⁰ National Highway Traffic and Safety Administration, EMS Scope of Practice, 4.

³¹ Ibid.

³² Ibid., 11.

³³ Ibid., 12.

³⁴ National Registry of Emergency Medical Technicians, *What is EMS?*

³⁵ Ibid.

³⁶ M. N. Moultrie, "A New Kind of Cavalry," *Fire Chief*, Overland Park, KS: Intertec Publishing, Inc. (September, 1996), 49.

³⁷ Defense Against Weapons of Mass Destruction Act of 1996, <http://www.fas.org/spp/starwars/congress/1996/pl104-201-xiv.htm> (accessed November 5, 2010), 6.

³⁸ National Defense Authorization Act for Fiscal Year 1997, [Fas.org/spp/starwars/congress/1996/s960627a.htm](http://www.fas.org/spp/starwars/congress/1996/s960627a.htm) (accessed October 5, 2010), 3.

³⁹ Debbie Gramlick, "Metropolitan Medical Response System (MMRS) Program: presentation to the 2007 Medical Reserve Corps National Leadership and Training Conference," April, 2007, 3.

⁴⁰ Ibid., 7.

⁴¹ Frank Navarette, "State of Arizona Emergency Response and Recovery Plan," Arizona Department of Emergency Management. (December, 2003), 8-5-2.

⁴² Ibid.

⁴³ Gil Damiani, "Metropolitan Medical Response System," presentation power point to Coyote Crisis Collaborative, Mesa, Arizona, March 31, 2010, 8 and 11-16.

⁴⁴ Ibid., 19.

⁴⁵ Ibid., 6.

