Victim Rescue Drill: Lessons Learned

Tactical medics face the fire at the International Tactical EMS Association's fifth annual Medic Up competition

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"To every man, there comes in his lifetime that special moment when he is tapped on the shoulder and offered the chance to do a very special thing, unique and fitted to his talents. What a tragedy if that moment finds him unprepared and unqualified for the work that would be his finest hour."*-Sir Winston Churchill*

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Under the supervision of an ITEMS evaluator, tactical operators and medics approach a downed officer during the Medic Up victim-rescue scenario.

Rescue of downed law enforcement officers is a critical function of tactical teams. Specific algorithms have been developed on the subject.2 As many as 90% of combat fatalities succumb to their wounds before ever reaching a site of definitive medical care.3,4 Twenty percent of early combat deaths (occurring less than one hour after injury) occur from readily treatable causes, particularly exsanguination and untreated tension pneumothorax.3-6 Early identification of and interventions for these injuries by trained medical personnel is therefore critical to patient outcome.

Last year, the fifth annual Medic Up competition, sponsored by the International Tactical EMS (ITEMS) Association, was held at Strategic Operations, a state-of-the-art training facility in San Diego, CA. Ten two-person tactical medical teams competed in four events: dynamic entry, victim rescue, extraordinary deployment and the "gauntlet." This article describes elements of the victim-rescue scenario and lessons learned from it.

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Under the supervision of a tactical medic, members of the Hamilton County (OH) Police Association perform a wounded-officer extraction drill.

The Victim-Rescue Scenario

The scenario: A radio patrol car responded to a report of shots fired in a residential neighborhood. Upon stepping out of the vehicle, the officer either stepped upon an

improvised explosive device (IED) or an IED was detonated in close proximity. The officer sustained grievous blast injuries, including amputation of the right lower leg at mid-calf, resulting in significant blood loss.

A first-response tactical element, consisting of three tactical operators and two tactical medics, was tasked with officer rescue. After performing a remote assessment and noting the severity of his injuries, they deemed self-extrication impractical, and the medics advanced under cover provided by the tactical operators. No ballistic shield was available for deployment, nor was a rescue vehicle available for extraction.

During the medics' return to cover, an armed suspect emerged from a nearby building, firing two rounds at the tactical element. The closest officer was struck by a single round through the right upper arm, causing him to drop his weapon. The remaining tactical element engaged the suspect and neutralized the threat. Once in a location of cover and concealment, the tactical medics suddenly found themselves with two patients requiring emergent medical management.

Lessons Learned: Patient One

The first victim sustained multiple traumatic injuries as a consequence of the IED blast, including traumatic amputation of the right lower leg and profuse arterial bleeding. Without prompt intervention, he would die. Although the presence of an IED would be more expected in a combat zone than in a civilian setting, secondary devices have been deployed in the United States. For example, data from the U.S. Drug Enforcement Administration's El Paso Intelligence Center (EPIC) reveals that between 0.4-0.8% of all clandestine drug labs contain IEDs or other booby traps.7

The U.S. Special Operations Command Committee on Tactical Combat Casualty Care (COTCCC) has identified three distinct echelons of care in combat casualty management: care under fire, tactical field care and combat casualty evacuation care (CASEVAC).8 Analysis of early combat deaths demonstrates that 22%-38% of

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Figure 1: Medical operations in the hot zone. After achieving the cover of the radio patrol car, a tactical medic attempts to find medical equipment in his backpack.

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Figure 2: Sample second-line medical equipment package. In the management of patients under fire, all medical supplies needed for lifesaving interventions should be immediately available without the need to access a large medical bag. An ad hoc kit is shown, including a CAT tourniquet (1), an emergency bandage (2), an Asherman chest seal (3), a nasopharyngeal airway (4) and two 14-gauge 1¼" angiocath needles for tension pneumothorax decompression (5). Total weight of all items, including the pouch, is only 0.33 kg (0.73 lbs).

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Figure 3: Extraction of first patient. While tactical officers remain in position, the tactical medics begin extrication of the first wounded officer. At this point the potential exists for the tactical package to separate, resulting in the medics and their charge being left unprotected by the tactical operators. Note the now-closed medical pack left

behind on the ground in the hot zone.

exsanguinating hemorrhage deaths occur in anatomic locations amenable to at least temporary lifesaving hemorrhage control by simple first aid measures.3,4,6 Recent experience in Iraq demonstrates that 77% of casualties surviving to presentation at a Forward Resuscitative Surgical System (FRSS) sustained extremity injuries.9 As a result of these findings, COTCCC has recommended that the medical management of casualties while under effective fire be limited to control of life-threatening external hemorrhage.6,9,10 In these circumstances, the tourniquet (TQ) is recommended for definitive control of exsanguinating extremity trauma.6,8,10,11 To this end, every U.S. Army and Marine Corps soldier is now being equipped with a TQ as a component of their Improved First Aid Kit.

In any civilian tactical event, inner and outer perimeters may be defined. While working within the inner perimeter, it has been recommended that the traditional civilian Advanced Trauma Life Support primary survey (ABCDE) be modified to a tactical primary survey (XABCDE), which again stresses exsanguinating hemorrhage control (X) before airway management.12 In the civilian tactical EMS arena, care under effective fire translates into medical operations in the inner-perimeter "hot zone." Due to the high threat level to both patient and rescuer, medical operations in the hot zone are typically limited to rapid control of exsanguinating hemorrhage.

Within the inner perimeter, locations providing cover and concealment may exist. In these so-called "warm zones," more traditional advanced medical care, including airway management, may be appropriately performed, provided such care does not delay CASEVAC. Civilian medical operations in the warm zone, then, are roughly analogous to tactical field care.

It must be stressed that, in contrast to the static definitions of the inner and outer perimeters, the definition of hot and warm zones is dynamic and may change rapidly as a situation unfolds. A location that initially provides cover and concealment-i.e., a warm zone-might become a hot zone based simply on the movement of a barricaded suspect from one window to another. As a consequence, operations within the inner perimeter require continued tactical awareness and close coordination with the tactical element.

In the civilian EMS arena, considerable controversy exists concerning use of the TQ and the potential for limb-threatening ischemia. Several textbooks state that TQs are an option of last resort and that they "often cause[s] damage to muscles, nerves and blood vessels."13,14 Presumably due to these concerns, multiple medics participating in the Medic Up competition said they simply weren't able to apply TQs due to their protocols. However, medical care in the tactical environment may more closely parallel the military experience than the traditional civilian EMS experience. In contrast to the civilian EMS environment, direct pressure and elevation are difficult to accomplish and sustain while attempting extrication from a potentially hazardous environment. Although rare, civilian fatalities from isolated extremity trauma have been observed.15 Given the relatively small size of the tactical medical cadre, it should be feasible for the TEMS medical director to develop and maintain situation-specific TQ protocols.

The military experience indicates that early and judicious use of the TQ in the tactical setting is safe and potentially lifesaving.10,12,16-18 A four-year review by the Israeli Defense Forces (IDF) demonstrated a 16% incidence of TQ use.17 Interestingly, 53% of the time, the indication for TQ use was situational rather than medical in nature-most commonly due either to an "under fire" situation or a mass-casualty event. The most common medical indication for TQ use was amputation, followed by bleeding from multiple sites. TQ application

was successful in 94% of upper-extremity injuries and 71% of lower-extremity injuries.

During Operation Iraqi Freedom, TQs were used to control extremity hemorrhage while under effective fire.9 Only three of 90 combat casualties (0.8%) managed in the FRSS over a one-year period died of their wounds. Two had traumatic brain injuries and would have been classified as expectant; the third sustained a comminuted open femur fracture with lacerations of the superficial femoral artery and vein. On arrival, he was hypothermic, hypotensive and acidemic. The patient survived evacuation to a Navy fleet hospital, but later succumbed to multisystem organ dysfunction.

It has been suggested that TQ use leads to more ischemic complications, and possibly more amputations, than lives saved.16 However, previous data have suggested that a TQ can be left safely in place for up to two hours without risk of permanent nerve damage.16,19,20 After approximately six hours of sustained use, the concern for crush/compartment syndrome and subsequent arrhythmias becomes so high that amputation above the TQ site is recommended.16,21 In the IDF review, the mean time of TQ ischemia was 83 ± 52 minutes (range: 1-305 minutes).17 Of 91 patients receiving TQs, only five had subsequent neurological complications. In these patients, ischemia time ranged from 109-187 minutes, with all but one patient having a time greater than 150 minutes. No amputations due to TQ use were reported in this study, and no TQ-related complications were noted in the FRSS report.9

In orthopedic-surgery literature, concern occasionally exists over the development of potentially fatal deep venous thrombosis and pulmonary embolus.22,23 However, the orthopedic cases involve concomitant procedural limb exsanguination. In contrast to the orthopedic surgery literature, no occurrence of deep venous thrombosis or pulmonary embolism has been noted in the combat application of TQs.

As the IDF study demonstrated, the decision to apply the tourniquet is often less related to exigent medical circumstances than to operational constraints.17 Effective hemorrhage control through other means is impractical under effective fire.12 In many circumstances, the TQ can be converted to a less-constrictive method of hemostasis once initial bleeding control is achieved. In the IDF study, a total of 76% of conversions were successfully performed in the field. An algorithm for TQ removal and conversion has been developed by the U.S. military.12 The TQ should specifically not be removed when the patient is in shock, has suffered an amputation, demonstrates evidence of uncontrollable bleeding, has had a TQ in place for more than six hours or cannot be monitored for rebleeding.

Unlike the military setting, sustained firefights in civilian TEMS operations are rare and transportation times are often short, especially in aeromedical evacuations. Consequently, it would be anticipated that use of a TQ in the civilian sector would be a temporizing measure for patient management under immediate threat of fire, and would be converted within the two-hour time period generally recognized as safe.

Several modern TQ systems have been tested by the military.24-26 Three commercially available systems were found to be 100% effective in occluding distal arterial flow as assessed by Doppler in both the upper and lower extremities: the Combat Application Tourniquet System (from Phil Durango, LLC), the Emergency & Military Tourniquet (Delfi Medical) and the Special Operations Forces Tactical Tourniquet (Tactical Medical Solutions, LLC). At present, the TQ most commonly provided to U.S. military forces is the Combat Application Tourniquet System (C-A-T system).27,28

Lessons Learned: Patient Two

The second victim, a member of the tactical team, sustained less dramatic but nonetheless life-threatening injuries during the extraction of the downed officer. A single gunshot wound resulted in injury to the mid right humerus and an inability to move the right hand. Bleeding appeared well controlled, and the officer was able to extract from the hot zone with minimal assistance. Unbeknownst to the rest of the team, however, a bullet fragment continued proximally and medially and penetrated the thorax near the axilla, resulting in a hemopneumothorax.

As part of the scenario, the officer was initially unaware of his chest wound, due either to adrenaline surge from the tactical event or distracting pain from the humerus fracture. Such circumstances aren't necessarily far-fetched. During the April 1986 FBI shootout in Miami, the first round to strike one of the suspects followed a similar trajectory and caused injuries which, at autopsy, were determined to be non-survivable.29 Despite this lethal wound, the suspect was capable of sustained activity, during which he was able to shoot four FBI agents. He was struck by 11 more rounds before eventually dying.

In the setting of dramatic injuries to the first officer, it would be easy to overlook the apparently minimal wound of the second officer. By focusing on the first officer, however, respiratory distress secondary to tension pneumothorax was allowed to develop in the second.

Focused medical assessment of any wounded officer should be rapidly undertaken on scene by the most medically skilled personnel. Only after a rapid but thorough assessment can any patient be safely triaged for further management and evacuation decisions. Triage decisions should not be based upon the assessments of non-medically trained tactical personnel.

As part of the tactical primary survey, a blood sweep should be performed in a search for occult trauma. This can be performed simply and rapidly by running gloved hands over all non-bloody parts, then checking the gloves for the presence of blood. The course of all penetrating wounds should be rapidly and specifically assessed. When feasible, and when it would not place the patient at further risk, the patient should be rapidly exposed in a search for occult trauma.

General Aspects of Tactical Medical OperAtions

The military experience with combat casualties has demonstrated that the only definitive medical care appropriate for the hot zone is rapid control of exsanguinating hemorrhage. Time spent on medical procedures in the hot zone places both the patient and the responders at additional risk of injury. In contrast to traditional EMS operations, subsequent medical procedures, including definitive airway control, are deferred until the patient is extracted to an area of relative safety (potentially still within the inner perimeter).

As a consequence, in the management of patients under fire, all materials needed for immediate lifesaving interventions should be immediately available without the need to open a medical bag (**Figure 1**). Such equipment should be part of the basic second-line gear of the tactical medic, and arguably the entire tactical team. At a minimum, it should consist of hemorrhage-control measures (**pressure dressing and tourniquet, Figure 2**). Additional supplies to consider include an occlusive dressing, nasopharyngeal airway and needles for decompression of a tension pneumothorax. By stopping to open and rummage through a large medical bag, the medical team increases its exposure and loses situational awareness while still under threat of fire.

Several Medic Up teams found that once they were forced to manage two patients simultaneously, they no longer had adequate medical equipment. The typical scenario involved the second medic, tasked with assessment of the decompensating second patient, needing to emergently perform needle decompression or endotracheal intubation. However, airway equipment was typically left with the medic managing the first patient, resulting in the medics throwing equipment back and forth between them. One frequently overlooked solution for this problem is to use tactical officers as liaisons between the separated medics. The tactical officers can also provide extra sets of hands for patient management once the medical team is split.

The scenario highlighted the need for realistic competency-based medical training. Simply having the tactical medic say "I apply a tourniquet" during a simulated patient-care scenario results in neither training nor adequate assessment of the medic's ability to do so, especially under exigent circumstances. If a tourniquet is never used in a training scenario, it's unlikely that its use will be considered during an actual operation. Under stressful circumstances, one tends to regress to those skills with which they're most comfortable, even if those skills are inappropriate for the situation. An old military adage is "Train how you fight, fight how you train." Response to circumstances should be preprogrammed and instinctive. Moreover, once forced to use their equipment in a simulated tactical environment, medics discovered they didn't know the exact locations of lifesaving equipment in their medical packs, or that their packs might have been more useful if configured differently. Making such discoveries in a training setting may save lives in an actual operation.

Tactical Aspects

For the tactical medic operating in the inner perimeter, safe and successful mission completion requires not only knowledge of medical skills, but integration into the tactical plan. Without being tactically aware, medics in the inner perimeter present an operational risk.30

Considerable controversy exists over the arming of tactical medics. Proponents of unarmed medics argue that their posture limits role confusion, reduces legal liability and diminishes issues of weapons retention while operating around a suspect. Proponents of armed medical support argue that it improves personal protection to the medical team operating in an inherently less-safe environment and may help overcome team size constraints.2,31 While the decision to arm a TEMS provider is complicated and beyond the scope of this paper, one thing is clear: Tactical medical providers should be comfortable operating around firearms and skilled in procedures to render them safe. In the Medic Up scenario, each wounded officer had at least one firearm in his possession. An armed patient in shock has the potential to become increasingly confused and therefore a threat to safety.

In contrast to the military environment, where mission objectives may take precedence over medical care, the primary role of civilian tactical EMS is patient care. Once access to the first patient was successfully gained, the medics immediately started providing care. To a degree, situational awareness was relinquished to the tactical operators as the medics concentrated on their patient. However, it remains critical to have some degree of situational awareness and tactical discipline in order to minimize exposure of the team or patient to any threats. In this scenario, the potential for secondary devices existed from the onset. Additionally, unbeknownst to the team, an armed individual waited in close proximity.

During the scenario, patient extraction remained problematic from the tactical standpoint. The role of tactical operators during patient extraction is to provide situational awareness and fire support for the patient and medical

team. The medical team should consider itself as part of a larger package, and its movement to cover should be cohesive. Once the decision was made by the tactical team leader and lead medic to move, medical teams consistently outpaced the slow and deliberate movement of the tactical element (**Figure 3**). Although this scenario involved injury to a tactical officer, the tactical medics, encumbered by their patient, represented a better target of opportunity. By failing to keep the package together, the medical team potentially put themselves and their patient at risk.

Conclusion

The purpose of this article is to highlight lessons learned during a highly structured, reproducible scenario presented at ITEMS's annual Medic Up competition. Although typically referred to as an "officer rescue" scenario, in this new age of international terrorism, the skill set and lessons learned can apply to any injured emergency responder. As this scenario demonstrates, realistic tactical training is within the realm of all departments, and need not be overly complicated to be educational. Such drills can and should be varied-and, as is an unfortunate fact of life, sometimes medics should be among the injured, and officers should not survive even if everything is done correctly. Subsequent video review of the scenario accompanying the debriefing may further highlight useful information for both the medical and tactical elements of the unit.

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