Tactical Medicine: A Joint Forces Field Algorithm

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INTRODUCTION

Tactical emergency medical support (TEMS) is a specialized area of emergency medical services (EMS). Its primary goal is to provide medical care under tactical environments to help save lives and accomplish the team’s mission. It may reduce the likelihood of death, injury, permanent disability, and illness among tactical operators, civilians, and suspects; reduce lost work time; decrease liability for the law enforcement agency; and enhance team morale.1–3 In addition, TEMS providers can train officers to treat themselves and others, a valuable capability if medical personnel are not immediately available.

Much of the medical care administered by TEMS providers is based on local or regional EMS protocols and on a number of tactical medical curricula, including Tactical Combat Casualty Care (TCCC), the STORM (Specialized Tactics for Operational Rescue and Medicine) family of courses, and CONTOMS (Counter Narcotics and Terrorism Operational Medical Support).4,5 The primary objectives of these curricula are to treat the casualty, prevent further casualties, and complete the mission.6,7 The TCCC curriculum addresses rapid hemorrhage control, including early tourniquet application; airway management; fluid resuscitation; field analgesia, antibiotic administration; and hypothermia prevention.

Efforts are ongoing to expand the role of, and standardize the care administered by, TEMS providers. How to incorporate a military-based TEMS component into civilian Special Weapons and Tactics (SWAT) teams and how tactical commanders can use this potentially valuable asset receive less attention. Medical personnel can be an important addition to a SWAT team, but they can also be a liability. Tactical leaders tasked with integrating a medical component in their team must learn to utilize providers in a safe and effective fashion. They should have an appreciation for the potential benefits and limitations of on-scene medical care, how to manage victim evacuation and the timing for that evacuation, and how to balance the needs of the patient with the success of the mission. Although law enforcement and medical providers focus on different aspects of a mission, either addressing the threat or caring for the injured, the joint mission in scenarios such as an active shooter is to save lives. The medical and tactical efforts should be complementary and by this synergistic to the mission. Based on our experience in the Israeli Special Forces and in civilian EMS, TEMS, and SWAT teams in the United States, we propose a joint forces field algorithm that addresses the medical and tactical considerations of patient care in a hostile environment. It can be followed by medical providers and tactical operators to better coordinate their efforts. It may assist civilian SWAT leaders working with TEMS personnel to incorporate medical providers into their teams and medical considerations into their tactics. The aim is to narrow the gap that may exist between law enforcement and medical priorities in the field and provide higher-quality patient care so SWAT teams can better accomplish their mission.

JOINT FORCES FIELD ALGORITHM

The joint forces field algorithm (Fig. 1) is designed to match the timeline of an evolving tactical event based on the operational procedure used by the Israeli Special Forces when dealing with a high-risk military or civilian scenario, such as an active shooter incident. It provides guidelines that are applicable to both law enforcement officers (LEOs) and TEMS providers. However, specific elements carry different meanings for, and involve different actions from, medical and tactical personnel. As an example, for a medic Evacuation Procedure implies triage, initial treatment, spine stabilization when appropriate, and packaging patients for transport. For the SWAT team leader, the same phrase implies managing and coordinating evacuation with the
surrounding forces while assigning operators to carry stretchers and provide a 360° secured corridor for evacuation.

The algorithm is launched immediately in response to an actual attack. If not predetermined, a Scene Manager is identified who will oversee the overall response. Even when all decisions are of a medical nature, such as victim evacuation in an active shooter scenario after the threat has been neutralized, Israeli protocols always designate a tactical commander as scene manager. The first LEO on scene assumes this role until there is an organized transfer of command to a higher ranking responder. An immediate and ongoing Situation Analysis is begun, whereby information is gathered and forwarded by the scene manager in the form of a situation report to the command post. This report will be processed and transmitted to all forces on scene. This enables the tactical commander to make informed decisions and formulate a plan for engagement. As taught in the Israeli Defense Forces (IDF), two key features of such a plan are that it should be flexible and simple to accomplish. It may be modified as the operation proceeds based on analysis of additional intelligence from the field, such as actions taken by the adversary or deteriorating medical status of the wounded.

Situation Analysis is directed at resolving the scenario. It forms the basis for decision making regarding engagement of the target and scene management. It is the end point of all preceding steps and strives to answer the questions “What is happening, what do we know, and what can we do?” Situation Analysis includes three separate components: Combat Status, Intelligence, and Force Capabilities. Their combined goal is to locate and neutralize the threat, while locating and treating the injured. Combat Status answers the question “what is happening?” It refers to the current fighting and actions that need to be taken immediately so the scenario does not deteriorate. The product of this step is the initial breaching or intervention plan. Intelligence refers to all information that could impact decision making. This step will answer the question “what do we know?” This includes number, location, and description of the attackers; types of weapons they have; adversary goals and demands; and actions they have taken so far (Table I). Other relevant details include whether hostages are involved and, if so, their medical status, including the nature of any injuries; and the presence of at-risk civilians, such as those in hiding. Force Capabilities are tactical and medical assets the team currently has, including numbers and expertise, as well as expected reinforcements. The term takes into consideration the estimated time of arrival of incoming assets, their level of training, and the additional equipment and capabilities they are bringing. This step will answer the question “what can we do?” For example, initially there may be 2 LEOs and an EMT on scene, but an entire SWAT team and two advanced life support ambulances are expected within 20 minutes. The scene manager

FIGURE 1. Joint forces field algorithm.
should request more tactical teams and medical components based on the scope and nature of the incident. The information collected regarding Combat Status, Intelligence, and Force Capabilities may be organized in a field log, listing the chronological order in which that information is obtained and the location of specific incidents or events. The log should be supplemented with a working map or aerial photographs, detailing location of assets, adversaries, civilians, and key structures or routes of ingress or egress. The map is updated in real time as additional information is obtained.

Two branches are represented in the algorithm under the headings Approach and Scene Management. These are addressed simultaneously and involve micro and macro perspectives. Best decisions are made by integrating input from tactical teams on site (micro perspective) and direction received from those at a remote command post who have a wider view (macro perspective) of the incident. Approach refers to team movement toward the threat and any civilians at risk. It includes medical care under fire, tactical field care, and casualty extraction while isolating and controlling the threat. Approach consists of three elements: Secured Team Movement, Establish Treatment Zone, and Extraction. Secured Team Movement refers to navigation to and from the target, clearance of buildings and other structures or obstacles, and the assignment of personnel for cover fire. As team members move, they should maintain radio and, when feasible, visual contact to avoid friendly fire. The tactical force must have the capability to rapidly and safely lead a medical team, or direct it by radio, to a location where medical assistance is needed, while efforts to locate and eliminate the threat continue. In the authors’ experience, this may be a significant challenge for both LEOs, soldiers, and medical providers. It may be addressed by adding tactical movement to the training of medical providers and by training combat teams to travel with medical personnel in the middle of their operation. Failure to do so may have serious consequences, such as when patient transport vehicles are blocked by other staged vehicles or when injured patients are transported to nontrauma centers.8 Tactical team personnel are tasked with the actual patient evacuation and securing the evacuation route in close cooperation with the medical providers. Vehicles capable of transporting casualties are designated and, ideally, prepared in advance. They should have sufficient room to accommodate critically injured patients in a supine position and adequate space for medical personnel to administer care en route to hospital. In some situations, a

### Commentary

#### TABLE I. Intelligence Gathering by Order of Importance

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<thead>
<tr>
<th>Adversary</th>
<th>Friendly (Responders and Civilians)</th>
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</thead>
<tbody>
<tr>
<td>1. Location</td>
<td>1. At-Risk Locations (Hostages, Hiding Civilians)</td>
</tr>
<tr>
<td>2. Numbers</td>
<td>2. Task Force Locations</td>
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<tr>
<td>3. Armament</td>
<td>3. Medical Status of Injured</td>
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<tr>
<td>4. Goals and Demands</td>
<td>4. Task Force Information (ETA, Numbers, Capabilities)</td>
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<td>5. Identity</td>
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Medical procedures can be performed. It should be protected by tactical team members and situated so as to enable fast and efficient evacuation. The third part of the Approach branch, Extraction, is discussed below under Evacuation Procedure in the Scene Management branch. The logic behind this is that the physical point of contact between the forces engaging the target and the scene manager on-site is when victims are extracted and delivered to the medical assets prepositioned outside the perimeter. Therefore, the Extraction phase activities of the tactical–medical force and the Evacuation Procedure developed by the scene manager should be linked and coordinated.

Until now we have discussed the “micro” branch of the algorithm, which refers to actions being taken by the forces engaging the threat and assisting the victims. We will now discuss the “macro” branch, which refers to the command level that has a broader view of the scenario. Scene Management consists of three elements: Secure Perimeter, Evacuation Procedure, and Pass the Baton (when relevant). If resources permit, it is preferable that two separate but coordinated tactical teams be involved in Scene Management, one to deal with the threat and the other to tend to the injured. In such a case where two tactical forces are active, the majority of tactical medics and other medical resources should be assigned to the team engaged in patient care. If only one team is available, the threat must be stopped before medical care can be provided.

Secure the Perimeter involves identifying hot, warm, and cold zones as determined by TCCC and defining evacuation points and ingress/egress routes. Treatment areas for casualties are defined according to the severity of injury. Staging areas are designated for different resources (i.e., EMS, fire apparatus, SWAT, and Explosive Ordinance Disposal). When sufficient numbers of LEOs have arrived, they will control the perimeter and ensure that bystanders do not enter hazardous areas and that suspects do not escape.

Evacuation Procedure addresses the identification of primary and alternate evacuation routes, in advance if feasible. This phase also includes designating appropriate destination hospitals based on location and specialty capabilities. Means to alert the hospital must be established, taking into consideration patient well-being and operational security. In the authors’ experience, this is the phase that most impacts patient survival so must be addressed as soon as possible in the operation. Failure to do so may have serious consequences, such as when patient transport vehicles are blocked by other staged vehicles or when injured patients are transported to nontrauma centers.8 Tactical team personnel are tasked with the actual patient evacuation and securing the evacuation route in close cooperation with the medical providers. Vehicles capable of transporting casualties are designated and, ideally, prepared in advance. They should have sufficient room to accommodate critically injured patients in a supine position and adequate space for medical personnel to administer care en route to hospital. In some situations, a
helicopter may be used for evacuation of casualties. If this is the case, a safe landing zone should be established and a landing zone officer designated to communicate with the air crew and ensure safety at the site.9

Mode of casualty transfer from point of injury or casualty collection site to the transport vehicles should be considered. Depending on the circumstances, this may begin with extraction. In distinction from evacuation, extraction is the removal of casualties from the site of injury to a point of safety, such as the treatment zone, where medical care can be continued. It may include extraction from obstacles such as debris, and the use of a variety of patient transfer techniques, equipment, and cover fire.10 Following extraction, evacuation may involve getting patients down multiple flights of stairs or over rough terrain. Casualties with mild to moderate injuries can often walk. Although stretchers constitute a secure means to transfer seriously injured patients, they require more manpower from the tactical team than may be available and may not be appropriate for tight spaces or uneven terrain. The decision on the preferred mode of transport is made by the tactical team leader after consultation with the lead medical provider. In unsecured settings, safe evacuation may be provided by the tactical team using a variety of techniques. Techniques used by the IDF special forces include a 360° movement, also known as the circle of protection, where the wounded and medic are in the middle of a circle surrounded by the tactical team, with a primary tactical force leading to provide security. Another technique is the establishment of “safe corridors” where the tactical team deploys first, such as in a staircase with cover fire for the floors above and below and in each corner of the floor. After deployment, the medical team moves inside these “safe corridors.” Joint tactical-medical training is mandatory to the success of such patient movement.

The final phase of Scene Management, Pass the Baton, is the transfer of command or medical care to a higher ranking law enforcement officer or medical professional, respectively. Transfer between law enforcement will involve a situation report and an intelligence briefing, including a description of the current deployment of assets, with reference to a working map and aerial photos as indicated. Existing tactical gaps should be noted along with recommendations for addressing them. Transfer of medical care will include the number of casualties, injury severity, care rendered to that point, stage of evacuation, and designated destination hospitals, if already determined. The final step in Pass the Baton is to inform all team members in the field about the transfer of command, with acknowledgement that notification was received.

**DISCUSSION**

Tactical EMS is a relatively new area of specialization within military and civilian medicine. Interest in incorporating a medical component into tactical operations has increased over the past two decades and has arisen from recognition of the inherent risks of law enforcement work. According to the National Law Enforcement Officers Memorial Fund, on average one Law Enforcement Officer (LEO) is killed in the line of duty in the United States every 57 hours. In 2012, 120 LEOs were killed in the line of duty in 2012.11 According to FBI statistics, in 2012, 52,901 officers were assaulted while on duty.12 These data do not include nonviolence-related occupational injuries, either during regular duty activities or training. There is no equivalent database specifically addressing SWAT teams. Their use of sudden, overwhelming force may actually reduce the likelihood of violent injuries. However, the combination of elevated operational tempo, the high-risk nature of their missions, and their rigorous training schedules makes having an integral medical element in SWAT teams worthy of consideration.

The first TEMS course was hosted in 1989 by the National Tactical Officers’ Association (NTOA) and the Los Angeles Sheriff’s Department. Shortly thereafter, the Uniformed Services University of the Health Sciences introduced the course CONTOMS, which presented a standardized TEMS provider curriculum based heavily on military medical experience. In 1994, the NTOA published a position statement endorsing the inclusion of medical support into tactical operations.13 Subsequently both the National Association of EMS Physicians and the American College of Emergency Physicians issued position statements supporting TEMS as an integral part of military and tactical law enforcement teams.14,15 With recognition of the value of TEMS by these and other national professional societies, the number of programs across the country rapidly increased.

As mentioned previously, TEMS care is based heavily on regional EMS protocols and on TCCC.

TCCC was developed in the 1990s in response to battlefield casualty experience such as that gained during the Battle of Mogadishu, Somalia, in October 1993. Traditional civilian EMS trauma protocols proved inadequate for managing the types of injuries that were being encountered in combat situations, many of which were devastating extremity wounds that led to death by exsanguination. The Naval Special Warfare Command and the United States Special Operations Command undertook a study of combat deaths resulting from penetrating trauma. Their findings and recommendations were published in *Military Medicine* in August 1996.16 They became the foundation for subsequent training of military medical providers, initially in specialty units such as Navy SEALs and Air Force Pararescue Jumpers, but subsequently throughout all military units.

Although developed for the military environment, many TCCC principles are readily applicable to law enforcement and civilian settings. However, significant differences between battlefield and civilian prehospital care exist. These include different environment and safety considerations; different extraction, evacuation, and transport times; the providers’ scope of practice; team configuration; different patient populations, including the elderly, children, and those...
Commentary

with special needs; types of injuries most likely encountered; and different liability standards. In recognition of these differences, in May 2011 the Committee for Tactical Emergency Casualty Care (TECC) first convened. Consisting of individuals with expertise in military and civilian prehospital care, the committee has developed evidence-based civilian guidelines for patient care in tactical and rescue situations. This is an ongoing process. In California, the Emergency Medical Services Authority and the Commission on Peace Officer Standards and Training recently published Tactical Medicine Operational Programs and Standardized Training Recommendations, which serve as statewide guidelines intended to standardize training and patient care. There is also an effort by the NTOA and the National TEMS Initiative and Council to develop a standardized national TEMS curriculum and certification process that would define the level of training and core competencies of medical providers operating in a tactical environment.

There is a limited but growing body of literature on effective, evidence-based medical interventions in the combat prehospital setting. The early application of tourniquets for hemorrhage control is just one example. This literature from combat experience is helping to form the medical foundation for TEMS programs as well. However, operational issues such as the optimal way to integrate medical providers and LEOs into one cohesive, smoothly functioning unit continue to be a challenge. Little literature exists on the subject, and what is available is of necessity based on anecdote. Certain realities may help to explain this. First, no two EMS systems are alike. System configuration is affected by local population demographics; whether the system is public or private; what is the patient mix; whether EMS providers are paid, volunteers, or some combination, and whether or not they are unionized; geography; funding; local, regional, and state policies and regulations; and politics. Furthermore, while in the military medical providers are permanent, integral members of a unit and have formalized combat training, in the TEMS setting providers are often part-time team members who also have other EMS jobs. Some are LEOs, but many are not. On some teams the medical providers are armed and will accompany the tactical operators into the hot zone. However, on many teams the providers are not LEOs and so will stage in the warm or cold zones, where they provide tactical field care and casualty evacuation care respectively. As a result, there is great variation in training and experience among different TEMS providers.

In addition to the inherent variation among the EMS systems from which TEMS providers are drawn, a psychological separation exists on many teams between the LEOs and the medical staff. TEMS providers often lack a full understanding of the tactical scenario, just as tactical operators may not have a full appreciation of victims’ medical status and how it influences tactical decision making. This gap is compounded whenever TEMS providers and LEOs train and operate separately from each other. It may be narrowed, at least partially, by conducting joint training as well as by cross-training all team members in the basics of each other’s discipline.

We developed the Joint Forces Field Algorithm to further bridge this gap. It is based on algorithms used by the IDF special forces and on American EMS, TEMS, and SWAT experience. It presents an operational paradigm that can be adopted by tactical leaders and TEMS providers in planning, training, and operations.

Applying the Israeli approach to patient care in a military setting to the civilian TEMS environment in the United States or elsewhere has advantages and disadvantages. Israel is a country under near-constant threats. The majority of Israelis have military experience, and many have experienced combat. Thus, Israeli civilian EMS providers are accustomed to working in a combat situation under direct threat. In addition, response to terrorist attacks, hostage situations, or active shooter incidents involve collaboration between Israeli civilian medical providers and police, fire fighters, bomb squad, and military units. As a consequence, they have a very different experience, approach, and mind-set compared to civilian medical personnel in many other countries. Therefore it is unrealistic to superimpose this Israeli approach onto other settings without appropriate modification. That being said, because of their unique circumstances and their frequent exposure to combat and terrorism, Israeli medical and tactical providers have learned to overcome many obstacles that often prevent seamless integration of medical providers into tactical teams. These barriers include different law enforcement and medical cultures, bureaucracies, and liability concerns.

The Joint Forces Field Algorithm is meant to serve as a tool to assist both law enforcement and medical members of a tactical team in overcoming barriers so they can better accomplish their mission. It is not based on patient outcome studies and is not evidence-based. Unfortunately little if any such data regarding TEMS programs currently exist. It is also not intended to address the specifics of tactical medical care. Both TCCC and TECC, and the associated publications related to them, do that well. The Joint Forces Field Algorithm is meant to address the operational issues related to a tactical team providing that care. It presents 1 approach to enhanced coordination among team members. It assures that all forces are working concurrently in the same operational phase, for example, establishing a secured treatment zone and initiating treatment. By connecting the medical and tactical forces to the same operational order of actions, the gap that may exist between medical and tactical components of a SWAT team should be closed. This ensures that medical personnel can be utilized in a safe and effective fashion to care for the injured, save lives, and enhance the mission.

REFERENCES