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## TACTICAL MEDICINE

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### Introduction: Defining TEMS

When most people hear the term “tactical emergency medicine,” they picture the combat medic holding an intravenous bag aloft, supporting a patient, all the while dodging enemy fire. But modern tactical emergency medical support (TEMS) is much more. It is a subspecialty of emergency medicine that involves an individual or team of professional and paraprofessional healthcare providers delivering a full spectrum of care. The tactical medical officer’s responsibility goes far beyond the acute management of trauma under fire. TEMS primary roles in mission support include injury control, the provision of preventive medicine and health promotion, nutrition, hydration and fitness, and the minimization of performance decrements. It is precisely because this practice is a comprehensive approach that the term tactical emergency medical support is preferred over the term tactical emergency medical services. TEMS medical officers buttress law enforcement and special operations in order to enhance the probability of mission success.

### Development of TEMS

The use of TEMS has grown rapidly since its conception in the late 1980s, gaining widespread acceptance in the field of prehospital emergency medicine and within the law enforcement community as well. In the

USA, the National Tactical Officers Association and the Counter Narcotics and Terrorism Operational Medical Support (CONTOMS) program developed by the Casualty Care Research Center of the Uniformed Services University were the first organizations to develop national training programs. Fortunately, within the USA there are multiple organizations that offer state-of-the-art training for tactical medical officers (Table 1). There is also a considerable growth in international acceptance of the TEMS concept for civilian law enforcement, especially in the UK.

In law enforcement, special operations denote those tasks that are too complicated, too dangerous, or too technical to be handled by patrol units. Instead, those tasks are assigned to special, highly trained and well-equipped teams of officers who constantly operate at the edge of the safety envelope. These teams, referred to as special weapons and tactics (SWAT) or emergency response teams (ERTs), are able to bring improved technology and training to bear on the resolution of the crisis situation. Tactical medicine is just one of the tools they may use to conclude the mission successfully.

### Benefits of TEMS

Contributing to the success of the primary law enforcement mission is the principal goal of TEMS; there are other significant benefits concomitant with the employment of a tactical medical program. First, it is likely to decrease mortality and morbidity among law enforcement personnel, perpetrators, and innocent third parties. Second, a TEMS program that includes preventive medicine and injury control strategies will also reduce line-of-duty injury and disability costs for public safety agencies. Since highly trained, difficult-to-replace human assets are the most precious resource of any special operations team, the reduction of lost work time for these operators is the third major benefit of tactical medicine. Special operations team members usually have skills and certifications acquired through long-term training and testing, and lesser-trained officers cannot

**Table 1** Tactical emergency medicine support/training programs**Casualty Care Research Center**

Department of Military and Emergency Medicine  
 Uniformed Services University  
 4301 Jones Bridge Road  
 Bethesda MD 20814-4799  
 USA

Tel: 301-295-6263

Website: [www.casualtycareresearchcenter.org](http://www.casualtycareresearchcenter.org)

**International Tactical EMS Association (ITEMS)**

PO Box 504  
 Farmington MI 48322-0504  
 USA

Tel: 248-476-9077

Website: [www.ITEMS.org](http://www.ITEMS.org)

**Heckler & Koch, USA, Inc.**

International Training Division  
 21480 Pacific Boulevard  
 Sterling VA 20166-8903  
 USA

Tel: 703-450-1900

Website: [www.tacticalmedicine.com](http://www.tacticalmedicine.com)

**National Tactical Officer Association (NTOA)**

PO Box 797  
 Doylestown PA 18901  
 USA

Tel: 800-279-9127

Website: [www.ntoa.org](http://www.ntoa.org)



**Figure 1** Tactical officers operate in dangerous environments and are at risk for serious injury. The presence of a tactical medical officer provides a high level of medical care at the incident scene and increases the probability of mission success.

temporarily replace them. Fourth, the provision of TEMS has a positive effect on the overall morale of the team.

Tactical operators are expected to take enormous risks in very dangerous situations (Figure 1). Their willingness to engage fully in the mission, at a time when life-and-death decisions must be made by their commanders and colleagues in fractions of a second, is enhanced by the knowledge that management has assured the availability of the best possible medical care should they be injured. Finally, tactical operations are, by their very nature, liability-prone circumstances and the provision of tactical medicine to bridge the gap from point of injury to appropriate entry into the healthcare system can significantly enhance agency posture. The actions of the tactical team invariably contribute to the creation of some degree of hazard, even if the ultimate objective is to reduce a greater potential hazard. To create such risk and recognize that people might be harmed, yet fail to



**Figure 2** Tactical medical officers should be integrated and trained as part of the tactical team. Such training will facilitate tactically appropriate responses in the midst of an emergency.

provide any countermeasure to the risk created, may incur liability for the law enforcement agency.

### The Daily Routine Doctrine

The daily routine doctrine is a term coined to describe a basic tenet of disaster and multicasualty response. It states that the activities in which one engages on a regular basis will be performed reasonably well during a time of crisis, while those activities that are done only in response to the crisis will be performed relatively poorly. This concept has application in tactical medicine. Since the actions of a tactical team are carefully choreographed and highly dependent on each operator's knowledge of how each other operator is likely to respond in an emergency, it follows that tactical medics should train on a regular basis with the team they support and be fully integrated into all team activities (Figure 2). This facilitates effective utilization of tactical medical assets in mission accomplishment and keeps the medical component from becoming a burden to the team.

## Emergency Medical Services and TEMS: Major Differences in Medical Care

The principal difference between TEMS and everyday prehospital emergency medical services (EMS) is not the specific treatment procedures that are utilized, but rather the context in which treatment decisions are made. For example, the physiology of controlling hemorrhage does not change when the patient is in an operational environment: direct pressure, elevation, and pressure points are still options for stemming life-threatening bleeding. However, the tactical medic might be more inclined to move rapidly to a tourniquet since he/she may not be able to monitor the effectiveness of the pressure dressing during an extraction and the patient could bleed out over that time period (Figure 3). Tactical medics, based upon current military protocols, will elect to infuse crystalloid only when a patient's blood pressure drops to a level that affects brain perfusion, whereas traditional EMS providers would start two large-bore intravenous infusions and pour intravenous fluids in to the patient. Such treatment with large amounts of intravenous fluids can dilute the patient's clotting factors and cause increased blood loss.



**Figure 3** Tactical medical officers monitor a suspect's gunshot wound to the thigh. Exsanguinating injuries in the tactical environment may require the application of tourniquets if transport is delayed until the scene is secure.

Due to the multidisciplinary and comprehensive approach to the practice of tactical medicine, the tactical medic requires an expanded scope of practice that includes injury control, preventive medicine, field sanitation and hygiene, nutrition, sports-injury assessment and management, sick call, and selected specialty skills, such as managing dental injury without narcotic analgesia. In addition to the modified decision-making process, some treatment protocols should be modified for application in the tactical environment while other skills are unique to the practice of TEMS.

Although management of the airway remains an important basic skill, airway compromise is a relatively rare occurrence in the tactical setting. Patients who cannot manage their own airway usually have penetrating wounds to the central nervous system that portend a poor outcome regardless of airway intervention. As reported in the CONTOMS database, an airway adjunct of any kind was used in only 2% of all treatments rendered, and only one-third of these casualties survived to arrival at the hospital. Digital intubation is an alternative airway technique that is practiced by tactical medics because only a tube and stylet are needed, intubation can be accomplished with minimal head and neck movement from a low-profile position, and it does not require the use of white light associated with a laryngoscope. Of course, the patient must be fully unconscious to reduce the likelihood of bite injury to the caregiver.

Although patients may ventilate adequately on their own after establishment of a patent airway, an extender tube should be used if a bag-valve mask device is employed. The extender tube allows movement between the endotracheal tube and the bag without dislodging the tube during patient extraction. The bag-valve mask must have an exhalation valve that can be removed from the bag and placed on the "downstream" side of the extender tube, that is, the end closest to the endotracheal tube. This prevents the extender tube from becoming dead space that traps exhaled air during resuscitation.

Cardiopulmonary resuscitation (CPR) has limited value in the tactical setting. Performing CPR in this environment is likely to subject the provider(s) to increased risk for longer periods of time and may divert scarce resources from other mission essential tasks. Generally, there is no role for CPR or artificial ventilation in the warm or hot zone of the tactical environment. The successful resuscitation rate from cardiac arrest secondary to trauma is so low, and the risk to the provider of performing this procedure so high, that it cannot be justified. Given the added complications of an austere, resource-poor environment, extended evacuation times, and the

absence of a rigid, wheeled litter on which to perform CPR, it should only be considered under unusual circumstances. However, in those situations where arrest is secondary to primary respiratory embarrassment, short periods of CPR may restore normal function and can be considered if resources are sufficient. These situations include near drowning, hypothermia, toxic exposure, electrocution, and lightning injury.

Proper immobilization of the cervical spine requires a significant amount of time and personnel – at least two. Prehospital personnel are traditionally taught to immobilize the spine if there is the slightest possibility of spinal column injury and this is not unreasonable given the devastating consequences of an occult, unstable fracture that results in spinal cord damage. However, evidence indicates that immobilization does not contribute significantly to an improved outcome in cases of penetrating injury to the neck and it is probably reasonable to extrapolate this evidence to all penetrating injuries, but not to blunt trauma. Generally, the projectile either passes through the cord or it does not, but it rarely creates an unstable fracture. Therefore, it is probably inappropriate automatically to immobilize the spine in the hot or warm zone of the tactical environment. The provider's increased exposure to threats and hazards in a hot zone is unacceptable when weighed against the low probability of an unstable fracture that would benefit from immobilization. For penetrating trauma, immobilization should be delayed until the patient is in a safe area.

Traditional teaching in prehospital care is to treat all chest wounds as if they were a sucking chest wound and to seal them with an occlusive dressing. However, in the TEMS environment, the medic is often unable to monitor the patient closely after initial contact due to rapidly changing tactical circumstances, limited staffing levels, and difficult extractions, and may not have the opportunity to recognize a tension pneumothorax created by the seal itself. Although most training advocates the placement of a three-sided seal that will act as a one-way valve (permitting trapped high-pressure air to exit the chest, but preventing air from preferentially entering the chest via the wound on inspiration), these one-way valves rarely function as intended. Since most chest wounds are not truly sucking chest wounds, and since many patients will do well for a short period of time with a small open pneumothorax, it is suggested that a chest wound not be sealed unless the patient is in extremis, in which case the wound may be sealed, needle thoracostomy performed, and the patient must be closely monitored for continuing respiratory distress.

## TEMS Models

Across the USA and Europe tactical medical support for civilian law enforcement is provided through a variety of approaches based upon the local assets, resources, and foresight of community leaders. The two most common vehicles for rendering care in the tactical environment are with tactically trained emergency medical teams (EMTs) or paramedics via a fire-based or third-service emergency medical service. Some models include the training of a tactical team member as an EMT while other programs look to the local medical community and train paramedics, nurses, or physicians as a member of the law enforcement team. No matter what model a tactical team chooses to employ, it is imperative to have some level of medical care readily available during training as well as call-outs. Placing an ambulance on stand-by some distance away from the scene is an inadequate method of addressing tactical operational medical support and puts the well-being of team members at risk secondary to the inevitable delay distance imparts.

There are an estimated 5000 tactical medical providers in the USA. Data from the Casualty Care Research Center (CCRC) indicate that 86% of the medical care provided in the tactical environment is rendered by tactical EMTs and paramedics. Seven percent of the on-scene tactical medical care is provided by physicians and less than 1% by nurses.

A 1999 survey of tactical physicians in the USA revealed that 100% of the physicians were male, with an average age of 43. Seventy percent of the physicians were emergency medicine-trained but also included other specialties: family medicine, general surgery, critical care, and dermatology. The same survey found that 66% of the tactical physicians carried a firearm and 53% were sworn law enforcement officers. Seventy-seven percent of the physicians were armed for defensive purposes (i.e., defending a patient), while 23% of the physicians were armed as members of the tactical entry team, including one physician who was also trained as a sniper.

Based upon training, departmental policies, sworn versus nonsworn, and armed versus unarmed, tactical medical officers will operate in different “zones of care.” The “cold” zone is defined as the area away from the threat or target where there is no immediate tactical threat or danger to the medical officer or patient. The command post is traditionally located within the cold zone away from the risk or threat. A “warm” zone is an area between the hot and cold zones, not directly in the line of fire with cover and concealment, but with some element of a threat. The “hot” zone is the area closest to the threat or hazard. Tactical medicine

may be practiced in all three zones, although, to reduce the risk to officers, medics, and patients, only life-saving measures should be applied in a “hot” zone: more extensive evaluations should wait until the patient can be removed to a warm or cold zone.

### Responsibilities of the Tactical Medical Officer

The tactical medical officer, from EMT to physician, is responsible for the medical well-being of the tactical team. These responsibilities include preventive medical services, determination of fitness for duty, medical risk assessments associated with a particular mission, providing the SWAT and on-scene commanders with medical intelligence involving a particular threat, hazard, medication, or patient condition, providing care to and evaluating team members during prolonged operations, and rendering life-saving care under fire. The success or failure of any tactical mission ultimately rests with the commander. By helping to ensure the physical well-being of the law enforcement team, the tactical medical officer increases the probability of mission success.

#### Preventive Medicine

Some of the most important work the tactical medical officer can perform is preventive medicine. Preventive medical issues include: monitoring immunization status, ensuring each member has the appropriate protective gear (such as eye and ear protection) during call-outs and training, providing predeployment and deployment hydration management, and ensuring appropriate dress for the environmental conditions. The medical officer should make certain all team members have up-to-date immunizations, including tetanus/diphtheria and hepatitis B. Additional immunizations may be required depending upon the location and nature of the operations. Recently, some tactical teams have offered smallpox and anthrax vaccinations to members who would respond to a terrorist event.

#### Fitness for Duty

The tactical or SWAT operator must be physically and mentally capable of responding to a life-threatening situation, operate in austere environmental conditions, perform at peak levels for extended periods of time, and make split-second decisions involving the use of firearms with mental clarity and focus. Tactical operators who are unable to perform these duties for whatever reason jeopardize their own life and the lives of other team members and civilians as well as mission success. The medical officer must be ready

to assist the team commander in addressing a particular officer’s fitness for duty and determining team work/rest cycles and hydration/nutrition requirements based upon environmental conditions. Tactical medical officers must also have the ability to remove officers from the mission if, based upon medical evidence or observation, they pose a risk to themselves or the team.

#### Medical Threat Assessments

Every tactical mission, whether a training session, a high-risk warrant, a barricaded gunman, a hostage rescue, a clandestine drug laboratory raid, a terrorist incident response, a hazardous device, or dignitary protection event, should include a medical threat assessment as part of mission preparation (Figures 4 and 5). The medical officer’s mission hazard assessment will include an evaluation of:

- environmental conditions and hazards – weather (heat, cold, humidity, rain, snow, ice), shelter, terrain, water, animals (guard dogs, farm animals), poisonous plants or venomous reptiles, and insect/parasite activity
- technical hazards – lab chemicals, nerve agents, biological or radiological material, booby traps, explosives, or special weaponry (Figure 6)
- medical facilities – location of and distance to closest hospital, trauma, and burn centers
- location of ambulance and aviation LZ
- availability of hydration and nutritional support
- sanitation, hygiene, and sleeping facilities for extended operations.

The tactical medical officer should make recommendations to the unit commander based upon the



**Figure 4** Unexpected hazards may await the tactical officer upon entry into an unknown clandestine drug laboratory. Medical preplanning as part of the medical threat assessment will facilitate a rapid and appropriate response.



**Figure 5** Dignitary protection details require a medical threat assessment that includes medical information on the health of the protectee. This would include knowledge of the dignitary's current medical conditions, medications, and drug allergies. Pre-determined routes to local hospitals and trauma centers from anywhere along the detail are obligatory.

specific needs and threats associated with a particular mission. The earlier the medical assessment is completed, the more time the commander will have to evaluate the recommendations and obtain the needed support.



**Figure 6** Methamphetamine laboratories are potential toxic time bombs. Chemicals on site, including hydrochloric acid, can inflict career-ending and life-threatening injuries to unsuspecting tactical officers. Special protective clothing and self-contained breathing apparatus may be required for a tactical entry.

Tactical teams are increasingly called to missions involving potential terrorists, terrorist cells, and clandestine laboratories. These operations, in potentially hazardous environments, require that the tactical medic have advanced training and skills to operate safely and provide care at a contaminated scene. These advanced skills include: (1) recognition of cutaneous manifestations associated with class A biological agents (**Figure 7**); (2) recognition of symptoms associated with nerve agent toxicity and treatment (**Figure 8**); (3) ability to recognize and survey patients for the presence of radioactivity (**Figure 9**) and provide appropriate decontamination; and (4) knowledge of how to locate and attain hard-to-find antidotes for specific radiologic isotopes (**Figure 10**).

### Medical Intelligence

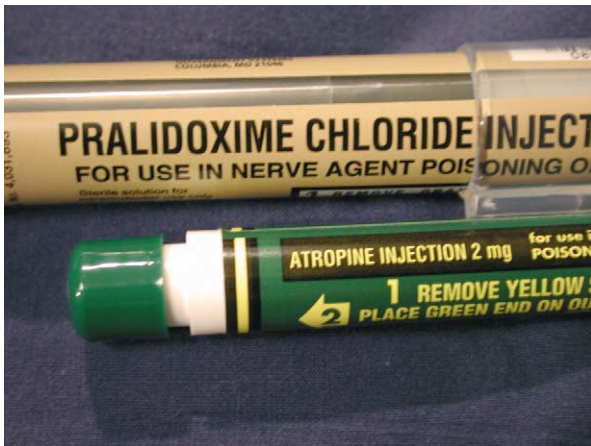
On-scene SWAT and hostage negotiator commanders will rely on the tactical medical officer for ongoing medical information during the mission. This may include information on medications, interpretation of medical histories and conditions, evaluation of a barricaded subject's or hostages' medical condition based upon a distant visual observation, or remote assessment via phone line. Medical intelligence also includes providing the commander with ongoing



**Figure 7** The ability to recognize smallpox lesions on a terrorist suspect is an advanced level of training that tactical medical officers should acquire. An unrecognized human biologic vector poses a very grave threat to public health.



**Figure 9** Tactical medical officers must be familiar with the use of survey meters so they can determine whether tactical officers have been exposed to radioactive material.

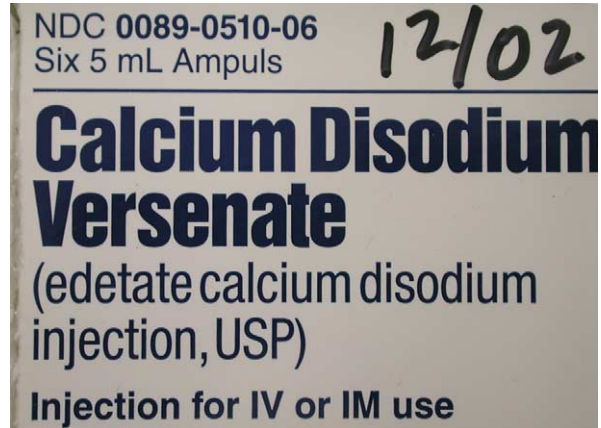


**Figure 8** Atropine and pralidoxime chloride, antidotes for some nerve agents, should be part of the tactical medical officer's pharmacopeia. Rapid injection of these medications is required after exposure to certain chemical nerve agents. The mark 1 nerve antidote kit (above) is carried by a number of tactical teams.

assessments of the officers and observations regarding performance decrements based upon the effects of time, heat, cold, hydration, and nutrition.

### Care under Fire

The tactical medical officer must decide, based upon the severity of injuries and safety considerations, when a patient needs emergent evacuation for a life-threatening injury. If a patient, officer, or civilian has an obviously fatal and nonsurvivable injury, there is no need to risk additional injuries to others in order to evacuate a corpse. There are however situations where life-saving care, rendered within seconds or minutes, will determine if an officer or civilian



**Figure 10** Treatment of inhaled or ingested radioactive material requires the identification of the specific isotope for appropriate care. Tactical medical officers should have knowledge of where to obtain specific antidotes, like calcium disodium versenate, once the isotope is identified.

survives. Securing the airway and the control of exsanguinating hemorrhage are the two situations that require immediate attention by the tactical medical officer. Patients may require rapid extraction without medical care from the hot zone to a warm zone for evaluation and treatment before being transported to a medical facility for care. The medical officer is responsible for advising the tactical commander of the nature of injury and whether, based upon the severity of the injury, immediate extraction is necessary or if the patient can tolerate some delay in removal to the cold zone.

### Clearance for Incarceration

Upon completion of the mission, there may be suspects who have been injured and require medical

clearance for incarceration. The ability to clear a suspect for incarceration is dependent upon a number of variables but foremost is the level of medical training, that is, EMT versus medical doctor. If a suspect has any change or alteration in mental status, whether from intoxication, chemical impairment, or head injury, it is obligatory that he/she must be medically cleared by a physician within a medical facility. Other cases may not be so obvious. A nonimpaired suspect with a contusion for a less lethal kinetic device (Figure 11) may or may not require physician clearance. Less lethal impacts to the chest and abdomen (Figure 12) could induce injury to underlying organs and would require observation and computed tomography or ultrasound evaluation, whereas impacts to extremities, without bony pain, may be able to proceed



**Figure 11** This “sock” round is a less lethal kinetic device, fired from a 12-gauge shotgun. The round, designed to incapacitate a suspect through pain compliance, is capable of inflicting serious injury to internal organs.



**Figure 12** Pattern contusions on the lateral abdomen of a suspect from “sock” rounds and pepper balls. Patients with less lethal impacts to the head, neck, groin, chest, or abdomen require medical clearance before incarceration.

directly to jail. If the tactical medical officer is in doubt, the prudent action would be to send the suspect for an additional medical evaluation.

### Post-9/11 TEMS Response

Although tactical medicine was originally conceived as a support function for police tactical teams and counterdrug missions, it also has application in support of a counterterrorism investigation or event. Law enforcement investigation and interdiction of terrorist activities are carried out in a low-profile manner that protects operators, sources of intelligence, and pending actions, and avoids unnecessary interruption of essential infrastructure or commerce. These operations are conducted under strict operational security guidelines. Special operations medical providers should already have the requisite background investigations and security clearances, training in security practices, and needed technology, such as encrypted radios, to implement operational and communications security procedures.

TEMS providers must now be trained in the evaluation and treatment of nerve agents. TEMS operators should be supplied with and trained to administer antidotes: atropine, 2PAM chloride, and Valium to victims of a nerve agent exposure. Knowledge of other toxic materials of terrorism, including blister agents, radiation dispersion devices, and biological pathogens, is now part of the tactical medics mission.

### Summary

TEMS is an established subspecialty of prehospital emergency medicine designed to support civilian law enforcement in high-risk special operations. Utilization of professional and paraprofessional healthcare providers to address injury prevention, acute trauma care, nutrition and fitness, and special hazards will ensure tactical team well-being. In the current law enforcement environment, tactical teams must not compromise the safety of their officers by failing to apply TEMS but must realize that TEMS is an indispensable asset and an integral component of mission success. Post-9/11 TEMS is now required to expand beyond its traditional support of SWAT to support of domestic counterterrorism operations involving potential weapons of mass destruction.

### See Also

**Chemical Crowd Control Agents; Injuries and Deaths During Police Operations:** Shootings During Police Stops and Arrests; Special Weapons and Training Teams; **Occupational Health:** Police; **Restraint Techniques, Injuries and Death**



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