ACTIVE SHOOTER RESPONSE:

Equip your team to save more lives
EDITOR’S NOTE

At any mass casualty incident, especially one involving an active shooter, emergency responders have two priorities: stop the killing and stop the dying. From a training standpoint, stopping the killing includes planning for terrorism incidents and practicing warm zone entry with law enforcement, as well as equipping EMS providers with appropriate personal protective equipment, like body armor.

Stopping the dying requires preparation for immediate action by EMS providers, firefighters, police officers and bystanders to provide hemorrhage control, ensure an open airway with adequate ventilation using basic adjuncts and moving patients to casualty collection points for rapid transit to definitive care.

Use this e-book to understand the obligation that all emergency responders and bystanders have to stop the dying. These articles will help you plan appropriate training for mass casualty incidents and determine what supplies are needed. Learn about the importance of identifying the most severely injured, controlling severe bleeding with commercial or improvised tourniquets, using basic maneuvers to maintain an open airway and moving patients toward casualty collection points.

No community is immune from these incidents. Train to respond, train to survive, and equip your providers with necessary supplies and protective gear.

Greg Friese, MS, NRP
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A few months ago, we invited the EMS community to share their thoughts on agency and community readiness to respond to a mass casualty incident or high-threat situation, such as an active shooter. Our intent was to better understand how EMS providers are preparing for these events and what they need in terms of training and supplies.

More than 400 respondents who took the survey provided us with valuable insight into several important gaps in preparation – namely training, supplies, community awareness and protective gear for providers. The survey participants were a convenience sample and not randomly selected, meaning the results are not applicable across the entire EMS universe.

To give you an idea of who responded, 21.2 percent serve urban areas, 31.9 percent identified as suburban and 46.9 percent serve rural areas. Responses were evenly distributed among a variety of population sizes, from fewer than 1,000 people to more than 1 million.

Survey respondents had a lack of awareness of the federal “Stop the Bleed” initiative to provide public access to emergency bleeding control supplies. More than half of respondents (57.4 percent) were not aware of Stop the Bleed, and only 9.5 percent said that yes, supplies are available in the community to equip bystanders to respond to a high-threat situation like an active shooter.

In addition, 34.3 percent of respondents said they are trained in the Tactical Combat Casualty Care (TCCC) standards established by the Department of Defense. This highlights an area where training is needed to better understand the kind of trauma care needed during a high-threat situation.

The key finding, however, is that EMS providers are clamoring for better training and funding, especially when it comes to preparing for these large-scale responses. Less than one-third (28.6 percent) said they feel their organization is prepared for high-threat situations and nearly half (43.6 percent) do not feel prepared. Almost all (93.3 percent) said additional training would help them better prepare for an active}

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**Are you located in a rural, suburban or urban community?**

- Rural: 46.9%
- Suburban: 31.9%
- Urban: 21.2%
shooter or other high-threat situation, followed closely by additional supplies (73.1 percent).

Medics are also concerned for their personal safety when responding to a high-threat situation. Only 15.7 percent said they use ballistic vests (body armor), and slightly more (25.5 percent) use helmets. Several respondents added “ballistic vests for everyone” under “other” for what would help them better prepare.

When asked to share any additional concerns on the subject, many respondents expressed frustration with a lack of leadership, communication, training and personal protective equipment. Funding is also a major issue.

Roughly one-quarter of those who provided comments said they need better training, but many lack the funding or simply don’t know where to find it. Others want increased inter-agency communication and cooperation.

Sample comments:

- “While our county has protocols in place for MCIs, training for EMS providers is poor (know your protocol, which is vague, and boring online videos).”
- “We still have a long way to go in preparation from a fire/EMS standpoint, and grants for equipment and training would be a huge help.”
- “I’m concerned about our inter-agency cooperation and the availability of PPE specific to mass casualty incidents if EMS were to respond to a warm or hot zone.”
- “I have yet to receive any training on police getting EMS into the warm zone to triage and treat patients faster.”
- “Our leadership has never addressed the issue. The culture is still ‘Let the cops handle it – we’ll go in after the scene is stable.’”
- “Our EMS service does not have the protective equipment for an MCI involving an active shooter, riot or bombing. EMS would not be properly protected in this event.”
- “When will we see an OSHA mandate for vests?”

Clearly, EMS leaders and providers face a host of challenges in preparing to respond to high-threat situations and mass casualty incidents. To help bridge the knowledge gap, we’ve prepared this e-book to provide information on how to buy body armor to protect caregivers, how to organize training to prepare an appropriate response and how to engage the public in preparedness with bleeding control kits, as well as a list of resources for grant funding and patient care lessons from military trauma teams. It’s critical that all first responders work together to protect each other and their communities, particularly when seconds count.

Rachel Zoch is a writer and editor for EMS1’s BrandFocus division.

Which personal protection products does your organization currently use?

- **Ballistic Vests**: 15.7%
- **Helmets**: 25.5%
- **Individual First Aid Kits (IFAKs)**: 24.5%
EMS personnel are becoming receptive to the idea that body armor is now the accepted level of all-hazard personal protective equipment. Much like the cultural shift to the routine wearing of gloves and eye protection for protection against infectious disease exposure, the appropriate use of body armor must become an organizational norm for incident response, even for incidents that are not obviously violent or likely to become so.

The need for EMS body armor is in part from the changing role and operations of EMS personnel during and after an active shooter/multiple casualty incident has been changing for several years. The FEMA guide “Fire/Emergency Medical Services Department Operational Considerations and Guide for Active Shooter and Mass Casualty Incidents” describes incorporating tactical medicine into active shooter events. The FEMA information came along with other lectures during the Special Operations Medical Association conference in 2013 that talked about ways to get EMS and fire department personnel into the warm or hot zone.

The National Fire Protection Association chiefs support the Rescue Task Force concept. This medical response method equips fire and EMS personnel with body armor and sends them into the warm and hot zones, which has been almost unheard-of up until recently.

Considerations, planning and interagency training should occur around the concept of properly trained, armored medical personnel who are escorted into areas of mitigated risk, which are clear but not secure areas, to execute triage and medical stabilization at the point of wounding and provide for evacuation or sheltering in place. Some jurisdictions accomplish this through the deployment of Rescue Task Forces.

In addition to active shooter response, EMS agencies are also considering body armor to protect personnel from the daily risk of violent patient encounters. A volunteer firefighter was shot and killed by an Arkansas man when the firefighter responder for a medical emergency call at the man’s home. Ambulances have been shot at, and EMS personnel in Detroit and San Diego were stabbed by bystanders.
TYPES OF BODY ARMOR

Before purchasing body armor, paramedic chiefs and EMS leaders need to understand its construction to make an informed decision about the level of protection EMS providers need.

Soft armor panels are typically constructed of multiple layers of ballistic-resistant materials, which are sometimes called aramid fibers. The number of layers within the panel and the order in which these layers are placed influence its overall performance. Additional energy from the projectile is absorbed by each successive layer of material.

A soft armor panel works much like a baseball catcher's mitt. When a handgun bullet strikes the panel, it is caught in a web of strong fibers. These fibers absorb and disperse the impact energy that is transmitted to the panel from the bullet. This process causes the bullet to deform or mushroom.

Hard armor plates may be constructed from ceramics, compressed laminate sheets, metallic plates or composites that incorporate more than one material.

Generally speaking, hard armor plates work in one of two ways: They can either capture and deform the bullet, or they can break up the bullet. In both instances, the armor then absorbs and distributes the force of the impact.

WHAT LEVEL OF PROTECTION DO EMS PROVIDERS NEED?

Do EMS providers need protection from pistol threats or rifle threats? Soft aramid fiber ballistic vests stop pistol and fragmentation threats, but it takes a rigid rifle plate to stop a rifle bullet.

For handgun protection, it is important to know that Level IIA, Level II and Level IIIA all stop the overwhelming majority of pistol projectiles an EMS provider will ever likely encounter (plus 12 gauge, 00 buckshot). It is also important to know that NO vest is ever 100 percent bulletproof under all conceivable circumstances.

There is always a tradeoff between more protection and wearability or concealability, so the level of protection chosen is a personal preference.

RESOURCES FOR GRANTS AND OTHER FUNDING

Funding is a critical challenge for most EMS agencies. Consider these resources for EMS grants to help expand your organization’s access to training, medical supplies and PPE.

EMSGrantsHelp.com
Search extensive grant listings for available opportunities by state, federal, response category and more. Grant writing services and application assistance also available.

FEMA Assistance to Firefighters Grant (AFG)
Fire departments and EMS agencies are able to apply for grant funding through the Homeland Security Grant Program and Tribal Homeland Security Grant Program to purchase ballistic personal protective equipment for fire/rescue and EMS personnel.

Grants.gov
This is an excellent source for government grants. Search broadly and don’t forget to use keyword synonyms if your initial search doesn’t produce good results.

Bound Tree Medical Grants Division
Bound Tree customers can complete a free online needs assessment for the company’s help in identifying funding opportunities and applying for grants.

Other Resources
FEMA provides guidance and grant writing advice for finding alternative funding. Some insurance companies offer grants for community responders involved in disaster recovery. Also check out your state’s website for grant opportunities.

A quick internet search can reveal other sources closer to home. Local charitable organizations also provide funding for first responders. Ask around in your community.
choice. It is better to purchase a lower protection level that personnel will wear consistently than the highest protection that isn’t regularly worn by personnel. The best vest for you is the one you are actually wearing when shot.

The biggest difference between the levels is the amount of blunt trauma impact protection.

- **Level IIA** has become quite rare, but this could actually be the best choice if thinness, comfort and concealability are the most important factors over blunt trauma protection. Level IIA vests are generally ~4 mm thick.

Average cost: $400-$500 (new).

- **Level II** is often worn by police officers and provides a good balance between blunt trauma protection, cost and thickness/comfort. Level II vests are generally ~5 mm thick.

Average cost: $500-$700 (new).

- **Stab-resistant vests** are available but are generally not recommended, due to the added cost, unless there is a significant knife threat. Stab resistance makes the vest a little heavier and thicker and significantly stiffer, and therefore less comfortable and concealable. Also, a regular ballistic vest does offer some knife protection from a slashing knife attack.

**WHAT IS THE LEAST EXPENSIVE AND GOOD PROTECTION?**

Level IIA is adequate and may be the best choice if light weight and comfort take priority over top blunt trauma protection. A cost-effective solution for EMS agencies on a tight budget may be a police surplus Level II ballistic vest.

In ballistic tests, used body armor performed as well as new according to the NIJ research. The aramid fiber used in the construction of ballistic vests is good for many years, as demonstrated in the NIJ research. Surplus vests can be purchased for approximately $200 and up.

**Before you buy:**

- Choose a reliable and licensed supplier when making a purchase. This will ensure that you are getting the best quality possible.
- Don’t forget to check the background and number of years of experience of the manufacturer before you actually make a deal.
- Choose a manufacturer that is NIJ accredited for guaranteed safety use.
- If you are going to buy a used vest, make sure it was taken care of properly.

**WEARING YOUR ARMOR**

Regardless of your chosen level of protection, it is paramount that the armor fit correctly. Most carriers or vests are designed to fit slightly below or at your collarbones and rest an inch or two above the waist. The armor you wear should enable you to reach your portable radio and other equipment. The wrong time to find out that your trauma scissors hang up on your vest is when you need them.

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A National Academy of Medicine paper describes best practices for EMS responses to active shooter, bombing and terror attacks

By Arthur Hsieh

In June 2016, the National Academy of Medicine released a discussion paper that considers the challenges of an EMS response to a major terror attack. In the paper, “Health and Medical Response to Active Shooter and Bombing Events,” members of the National Academies of Sciences, Engineering and Medicine’s Forum on Medical and Public Health Preparedness for Catastrophic Disasters describe potential best practices on how to respond effectively to sudden, dramatic mass casualty events, based on data gleaned from recent attacks in Europe and the United States.

Most of us are still relatively complacent about what we would do in case of a Boston or Aurora-style attack in our community. Indeed, chances are very remote that such attacks will occur.

However, in such cases, the actions of dispatch centers and field personnel may play a critical role in the victims’ chances of survival. It is common sense that EMS, fire and law enforcement personnel should jointly prepare and train for a variety of sudden mass casualty events.

WORK TOGETHER, TRAIN TOGETHER

As the National Academy of Medicine discussion paper implies, a variety of political, fiscal and bureaucratic barriers exist to hinder the development of such plans. Both government and private sector agencies charged with public safety and public health must put aside territorial differences and work together to determine who will respond, how teams will operate and where patients should be transported, all in a very short operational period.
**Bleeding control** is a major priority when managing large numbers of injured patients after an attack. In many situations, direct pressure bandages and tourniquets can rapidly control bleeding and free up field providers to provide care to other injured victims.

Unfortunately, ambulances and engine companies often do not carry enough trauma supplies to handle more than a few victims simultaneously. Disaster caches or trailers can be helpful, but only if they can be rapidly moved to the scene within minutes of the initial dispatch.

**RURAL AND REMOTE AREAS**

Rural regions face especially difficult challenges in a mass casualty response. Underfunded agencies and scattered resources can hinder an adequate response.

One simple solution is to have policies in place that initiate mutual aid from neighboring agencies automatically at the original response, rather than waiting precious minutes for the first responding units to arrive. This would include air medical services, volunteer organizations and even agencies that are a fair distance away from the incident but still would be expected to respond in large-scale events.

The delay in sending an appropriate response level can result in lives lost. Dispatch protocols should be developed that result in an adequate number of units and personnel being sent to initial reports of a major event, similar to fire service alarm assignments.

This can reduce the human judgment factor during dispatch and improve the chances of getting off on the right foot early in the incident. If it turns out that the incident is smaller than reported, no harm is created in downgrading the response.

**COOPERATION WITH RECEIVING FACILITIES**

Emergency departments and hospitals will not be immune to the effects of a large-scale event. Not only do such facilities have to be able to rapidly scale up their internal disaster response, they must also work in cooperation with each other to spread the multitude of patients around the region.

No one wants to think about a major violent event happening in his or her community. As EMS providers, we have to prepare for the worst and hope for the best.

While field operations may perform the initial sorting and destination decisions, resources such as staff, blood products and equipment may be rapidly depleted, necessitating a rapid region-wide response by other facilities and organizations. Again, interagency agreements, policies and procedures should be in place to facilitate complex decision-making processes.

No one wants to think about a major violent event happening in his or her community. As EMS providers, we have to prepare for the worst and hope for the best. As the National Academy of Medicine paper points out, continuous planning and preparation will be the major tools used by field providers and agencies alike in mitigating the effects of a terror attack.

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STOP THE BLEEDING
Bystander application of a tourniquet to ‘Stop the Bleed’ may mean the difference between life and death for a patient with severe hemorrhage

By Kenny Navarro

Although large-scale mass casualty incidents such as the Boston Marathon bombing and the San Bernardino shooting capture the nation’s attention, smaller-scale MCIs are much more common. The National Association of State EMS Officials provides one definition of an MCI as any incident that “generates more patients at one time than locally available resources can manage using routine procedures.” Using that definition, researchers estimate the yearly incident rate in the United States is about 13 MCIs per 100,000 people.

Hemorrhage is the second leading cause of death for patients injured in the prehospital environment, accounting for 30 to 40 percent of all mortality. Many of the patients who hemorrhage do so after suffering vascular injuries in one or more extremities. The annual incidence of extremity vascular injuries in the United States ranges from a low of 12.4 injuries at a rural trauma center in Missouri to a high of 55 lower extremity injuries at a high-volume urban trauma center in Houston. In a study of isolated penetrating injuries to the extremities, 57 percent of the patients who died had injuries that might have been amenable to tourniquet application.

Bleeding control a critical first step

There is little debate about the value of rapid hemorrhage control for improving outcomes in critically injured trauma patients. The American College of Surgeons Committee on Trauma has stated that bleeding must be controlled by prehospital providers as quickly as possible.

For maximum efficiency, health care providers must apply tourniquets before the patient has developed shock. During Operation Iraqi Freedom, tourniquets applied in the field and before the onset of shock were strongly associated with survival.

Unfortunately, in cases of severe bleeding, trained professionals may not always arrive in time to prevent exsanguination. Researchers in Austria and Germany found that when traumatic injury occurs, bystanders with varying levels of first aid training are often present on scene before EMS arrives.

In addition, these bystanders often attempt to provide hemorrhage control for patients suffering from an exsanguinating injury. Although prior first aid training increased the probability of successful hemorrhage control by the bystander, the lack of first aid training
did not prevent bystanders from attempting to control bleeding, and a significant percentage were successful.

**CAN THE PUBLIC HELP?**

A central question is whether these bystanders who are present on the scene and are willing to help control severe bleeding can become part of a trauma chain of survival. There is very little data in support of this position. However, studies involving a cardiac arrest chain of survival demonstrate that trained bystanders can safely and effectively use defibrillators to resuscitate victims of out-of-hospital cardiac arrest.

Even **sixth graders** with no previous medical training can achieve performance goals similar to those achieved by trained medical responders. Similarly, limited available evidence suggests it is reasonable to think ordinary citizens would be able to safely and effectively apply tourniquets when indicated before the arrival of EMS personnel.

During a simulated explosion, one in five people with no medical training were able to correctly apply a commercially available tourniquet to a manikin’s leg in less than 60 seconds. Providing instructions on a notecard with the tourniquet more than doubled the rate of successful placements.

During the Boston Marathon bombing, 29 patients with life-threatening limb exsanguination had **27 improvised tourniquets** applied in the field. EMS personnel applied one-third of those tourniquets, and non-EMS personnel or an unknown person applied the remainder.

In a 10-year evaluation of isolated penetrating or blunt extremity injury requiring either arterial revascularization or limb amputation at Boston Medical Center, only 2 percent of patients had a tourniquet applied before arriving at the trauma center, and all were improvised tourniquets applied by police officers or bystanders. An additional 2 percent of patients had a tourniquet applied by emergency department staff within one hour of arrival. While a very small number of patients without a tourniquet exsanguinated, no patient with a tourniquet died.

During a seven-year period, researchers at Boston Medical Center identified 11 patients who had an improvised tourniquet applied in the field by EMS.

Only one patient died; however, that patient was in cardiac arrest when EMS arrived on the scene. Of the 10 patients who survived, all had complete neurologic function in the affected extremity despite having the tourniquet in place for as long as 167 minutes (mean 75 ± 38 minutes).

One concern about bystander application of a tourniquet is whether the bystander will be able to apply the device tightly enough to be effective. Indeed, a manikin study involving non-medical trained bystanders found that 70 percent of the incorrectly placed tourniquets were judged to be too loose. However, a battlefield evaluation found that although morbidity remained high with partially ineffective tourniquet application (persistent distal pulses), mortality actually improved when compared to totally ineffective tourniquets (continued bleeding). This suggests that even when tourniquets are not tight enough to be totally effective, they may still be better than no tourniquet at all.

**HEMORRHAGE CONTROL TRAINING COURSES FOR THE LAY RESCUER**

The American College of Surgeons convened a **special committee** to identify changes necessary to improve survival following active shooter and MCIs. One of the major themes to emerge from these series of meetings, known as the **Hartford Consensus**, is that the public will act as responders to provide aid before the arrival of professional rescuers.
Another major theme of the Hartford Consensus, which was the focus of the second Hartford Consensus Conference, is the value of a comprehensive educational program for all members of this trauma chain of survival. Critical to this concept and the focus of third Hartford Consensus Conference, is educational campaigns targeting members of the general public, which should include training on how to apply direct pressure, how to use hemostatic dressings and how to apply tourniquets.

In response to the Hartford consensus, the EMS Education Department of the Denver Paramedic Division, in cooperation with the Prehospital Trauma Life Support committee of the National Association of EMTs, developed training program targeting ordinary citizens. The two-and-a-half-hour Bleeding Control for the Injured course combines didactic lectures with hands-on training to teach the lay rescuer important life-saving skills such as hemorrhage control and how to open an airway.

Also in response to the Hartford Consensus, the Obama White House launched the “Stop the Bleed” campaign in 2015. This campaign aims to provide public awareness of the simple steps that anyone can take to slow life-threatening bleeding. The campaign also promotes the placement of Bleeding Control Kits in public spaces that would allow members of the general public access to life-saving supplies, similar to public access defibrillation programs.

Bystanders are often present on the scene of a traumatic injury before professional rescuers. In some cases, bystander care may mean the difference between whether the patient survives or not. Experience with CPR and AEDs has demonstrated that bystanders will attempt to intervene, especially if they are trained and have easy access to the equipment.

Bystanders who self-report a feeling of competence to provide emergency first aid are more likely to help victims of traumatic injury. That feeling of competence is positively correlated to first aid training. Those with first aid training feel competent to provide care before EMS arrives on the scene to take over.

With untrained bystanders as part of the definition of a first responder, the Office of Health Affairs at the Department of Homeland Security recommends the availability of both tourniquets and hemostatic agents in the early management of severe bleeding. Lay rescuers play a vital role in providing immediate bleeding control while awaiting the arrival of traditional first responders.

In 2015, the Harvard School of Public Education and the Harvard School of Government began a bleeding control pilot program at Charlotte Douglas International Airport. The team placed bleeding control kits inside of each AED cabinet in the airport. Each kit contained pressure dressings, hemostatic dressings, tourniquets and personal protective gloves.

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Over the past decade, combat casualty care has rapidly evolved due to the military operations in the Middle East and Afghanistan. During this same period, civilian EMS has encountered domestic terrorist attacks and bombings that have caused civilian EMS to care for combat-type injuries. Like combat medics, civilian tactical EMS providers are likely to encounter penetrating trauma, blast-related mechanisms of injury, and multiple-casualty incidents while facing more complex casualty evacuation scenarios. Traditional EMS care and training in this new domestic combat environment has resulted in suboptimal safety paradigms and clinical outcomes.

The National Association of Emergency Medical Technicians’ Tactical Combat Casualty Care course trains the civilian EMS professional to consider and implement the special challenges of triaging and caring for trauma patients who have received combat injuries. The TCCC course is designed to train combat EMS/military personnel deploying to support military operations. However, the course can be adapted for civilian law enforcement special operations officers and EMS professionals. NAEMT also offers a special version for tactical emergency casualty care.

An increased influx of military research affords civilian EMS an effective means to incorporate new evidence-based practice toward leading causes of trauma mortality. Trauma injuries and scene safety challenges seen in domestic attacks and in combat are similar. A safe and responsible civilian EMS approach is reflected in a growing trend to prepare civilian EMS professionals for the domestic combat or tactical environment. This transition continues with application of evidence-based guidelines from the Committee on Tactical Combat Casualty Care. Here are a few guidelines regarding major causes of preventable combat-related mortality.

**STOP THE BLEEDING IS ESSENTIAL**

The leading cause of death during combat is uncontrolled hemorrhage, followed closely by injuries that affect airway and breathing. Recent studies confirm that many of these injuries are preventable if managed correctly.
These include:

- Compressible hemorrhage: 60 percent
- Tension pneumothorax: 33 percent
- Airway obstruction and ventilatory compromise: 6 percent

Evidence suggests that the majority of these hemorrhagic injuries can be successfully managed by using tourniquets in coordination with hemostatic agents.

Tourniquets work by drastically reducing or completely obstructing distal blood flow to the vascular injury of the affected extremity. Optimal use of a limb tourniquet must result in both controlling of hemorrhage and cessation of the distal pulses in the affected extremity.

Junctional bleeding occurs between the trunk and the limbs (high level amputations) and between the pelvic area and legs. The most common type of junctional bleeding is groin hemorrhage. Most commercial tourniquets are unable to be placed in these areas. Junctional tourniquets (also called truncal tourniquets or combat clamps) are fitted with target compression devices that can be specifically positioned over the junctional injury site and pumped up or inflated until the compressions stops the bleeding.

Common uses of junctional tourniquets include controlling inguinal hemorrhage, controlling axilla hemorrhage and stabilizing pelvic fractures. There are many commercial limb and junctional tourniquets available on the market.

**COMMITTEE ON TACTICAL COMBAT CASUALTY CARE GUIDELINES FOR THE USE OF TOURNIQUETS**

All sources of bleeding should be controlled. A CoTCCC-recommended limb tourniquet should be used to control life-threatening external hemorrhage or for any traumatic amputation. It is recommended to apply the tourniquet directly to the skin two to three inches above the injury. If the bleeding does not stop with the first tourniquet, a second tourniquet should be applied side-by-side with the first. For those injuries in which a limb tourniquet is not possible, a junctional tourniquet should be used.

If the bleeding does not stop with the first tourniquet, a second tourniquet should be applied side-by-side with the first. For those injuries in which a limb tourniquet is not possible, a junctional tourniquet should be used.

As with any intervention, it is important to reassess the tourniquet to make sure that it has not slipped out of place or lost constriction integrity. Ensure that the hemorrhage is controlled. If bleeding continues or a distal pulse remains, consider tightening the tourniquet or use an additional tourniquet side-by-side with the first tourniquet. Then reassess to ensure that both bleeding and the distal pulse have ceased. Limb and junctional tourniquets should be replaced by hemostatic or pressure dressings as soon as possible if all of the following criteria is met:

- The patient is not in shock
- It is possible to monitor the wound closely for bleeding
- The tourniquet is not being used to control hemorrhage from an amputated extremity

Every effort should be made to convert tourniquets in less than two hours if bleeding can be controlled by other means. If possible, clearly mark all tourniquet sites with the time that the tourniquet was applied.
The CoTCCC 2014 guidelines approved the following limb and junctional tourniquets for military use:

- Combat Application Tourniquet (CAT)
- Special Operations Forces Tourniquet-Tactical (SOFTT)
- Emergency and Military Tourniquet
- Combat Ready Clamp (Croc) (junctional)
- Junctional Emergency Treatment Tool (JETT)
- SAM Junctional Tourniquet.

MANAGING AN OPEN PNEUMOTHORAX

Research indicates that an open pneumothorax (sucking chest wound) can be treated effectively with an occlusive chest seal. If an open chest wound is not treated correctly, it can develop into a life-threatening tension pneumothorax.

An open pneumothorax occurs when the chest wall injury extends through the parietal pleura into the pleural cavity. This creates two openings that allow air into the thorax. During inspiration, air enters the chest through both openings (chest wall and trachea). However, the only way air can enter the alveoli is from the trachea and bronchioles. The extra opening in the chest wall greatly decreases the volume of air available to the alveoli.

Chest seals work by closing the chest wall opening, allowing air to enter the chest through its normal pulmonary route. Traditional three-sided dressings have shown to be ineffective in preventing conversion of an open pneumothorax to a tension pneumothorax. Vented chest seals allow for the release of accumulated air or evacuation of blood and are effective in preventing the re-entry of air through the open chest wound. Non-vented chest seals adhere to the chest, creating a tight seal and do not allow air to escape or re-enter.

There are many commercial chest seals available on the market. They provide an effective rugged adherence property that allows them to stay in place in the presence of sweat, soil, air or blood.

COTCCC GUIDELINES AND THE CHEST SEAL

Development of a tension pneumothorax is a common life-threatening complication of an open chest wound. All open chest wounds should be treated by immediate application of a vented chest seal to cover the defect. If a vented chest seal is not available, use a non-vented chest seal.

Monitor the patient for the potential complication of a tension pneumothorax. If the patient develops increasing hypoxia, respiratory distress, or hypotension due to a tension pneumothorax, treat by removing or “burping” the dressing or by performing a needle decompression.

In summary, EMS professionals must realize the value of military research and incorporate the latest evidence-based practice regarding the use of tourniquets and chest seals. As the potential for domestic combat injuries remains high, prehospital professionals must focus on those preventable causes of combat death and implement the latest guidelines to improve patient outcome. EMS professionals serve a pivotal role as active participants in the development of protocols involving domestic combat injuries.

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DON'T WAIT TO GET PREPARED.

Only 28% of EMS providers feel their organization is prepared for high-threat situations*
