IACP Police Physicians Section
Emergency Trauma Care

Law enforcement officers are frequently the first responders to incidents that involve serious personal injury. With a minimum of knowledge and training, officers can take essential first steps that often make the difference in a victim's ability to survive.

Disclaimer

This series is not intended to provide comprehensive medical training or to replace such training. Techniques and practices discussed in these documents are subject to local regulation and control and should not override department policies and procedures. These documents present tactical medicine material that may conflict with conventional civilian emergency medical services (EMS) practices. Routine civilian EMS care is not designed to address care for victims in situations where rescue personnel are exposed to an ongoing threat of violence. These documents are specially designed for law enforcement officers who will be the first responders to situations that require balancing both tactical and medical issues.

Part 1

I. The Law Enforcement Officer as a Medical First Responder

Currently, more than 900,000 sworn law enforcement officers serve in the United States, all of whom act as first responders for the communities that they serve.[i] Frequently, law enforcement personnel arrive on scene prior to EMS and are tasked with providing basic medical care to injured individuals. In one study, more than 80 percent of law enforcement agencies responded to medical emergencies, and approximately 50 percent of agencies provided some form of on-scene patient care.[ii] A more recent survey found that 40 percent of the officers in two large agencies had worked the scene of a seriously injured fellow officer.[iii] A full 70 percent of that subset had arrived prior to civilian EMS.

Medical interventions carried out by the law enforcement first responders can be lifesaving. Studies have shown that police arrive before EMS at cardiac arrest calls more than 50 percent of the time, and decrease the average response time from 7.6 to 4.9 minutes.[iv] Automated external defibrillator (AED) used by law enforcement is associated with a doubling of survival rates in shockable cardiac arrests that occur outside of a hospital.[v]

In addition to providing medical care to injured members of their communities, law enforcement officers may find themselves providing care to colleagues, either during periods of active threat when conventional EMS cannot enter the scene due to safety concerns or prior to the arrival of EMS.

On average, 156 line-of-duty deaths are reported each year.[vi] FBI data show that, on average, 54 officers are murdered in the line of duty each year.[vii] An officer is assaulted somewhere in the United States on average every 9 minutes, and one is injured every 33 minutes. According to data compiled by the National Law Enforcement Officers Memorial Fund (NLEOMF), the leading causes of death among law enforcement officers in the past decade are the following:

1. Motor vehicle accidents (unintentional trauma)
2. Gunshot wounds (intentional trauma)
3. Job-related illnesses (medical)

In 2011, line-of-duty deaths due to firearms became the leading cause of law enforcement officer deaths for the first time in 14 years, exceeding motor vehicle accidents. For officers killed by gunfire, the vast majority died from gunshot wounds to the head. The second most common location was the chest, followed by the neck/throat region.

The changing nature of law enforcement deaths, and the significant number of assaults resulting in injuries, highlights the need for law enforcement-specific medical care, emphasizing sound tactical decision making and appropriate medical interventions while under threat.

II. Scene Safety

Upon arrival at the scene, whether it is a medical call or a crime in progress, the officer (along with other rescuers) has multiple priorities. Prior to medical care, the scene must be carefully assessed to ensure the safety of all involved parties. Situational awareness must be maintained at all times; actual or potential threats must be managed; and casualties must be rapidly sorted and prioritized in order of treatment. In most situations, casualty care should wait until the scene is secured.

The risk of conducting a rescue is best broken down into two basic components: ongoing risks to the rescuers and the original situation that created the initial injuries.

A. Risks to the Rescuers

Individual safety should be a high priority for responding officers. Should the officer become a casualty, he or she may no longer be able to provide assistance and will become an additional burden that now must be assessed, treated, and evacuated. While officers put themselves at considerable risk in the performance of their duties, these risks should be minimized and officers should not needlessly be placed in harm's way. The nature of the mission will dictate the degree of acceptable risk and the priority placed upon medical care – for instance, a hostage rescue mission might require a higher level of risk than a seizure of contraband.

Potential threats include the presence of an assailant; weapons; hazardous materials (such as blood, body fluid, or chemicals); fire; explosive material or devices; electrical lines; water hazards; traffic; and the current weather and light conditions.

B. Situation

The situation that precipitated the need for a rescue creates threats that must be anticipated and recognized. Rescuers should develop a plan to mitigate known and potential threats.

The first information regarding the situation often comes from the dispatcher, and the dispatcher continues to relay information as law enforcement and EMS arrive on the scene. In cases that involve an assailant, the officer must first determine whether the assailant continues to pose a threat. Other issues regarding the specific situation include what happened at the scene, how many people were involved, and if additional assistance has been or needs to be summoned.

Maintaining situational awareness allows the officer to recognize and react to any threats that may compromise the safety of individuals at the scene. It is critical to maintain a high suspicion for danger, understanding that new threats may emerge at any time. Ongoing communication with dispatch and with fellow officers allows for the rapid sharing of information, intelligence, and warnings. Awareness should be maintained for the possible locations of suspects, casualties, or others who may be impacted by the situation

III. Prioritization of Care

Routine EMS care can be initiated once the scene has been assessed and deemed safe. However, should the tactical situation still present a high threat (such as an active shooter, barricaded gunman, etc.), the first priority becomes management of the tactical problem to prevent further casualties. In such cases, officers may have to provide selected first aid interventions to themselves, fellow officers, suspects, or members of the public, since the scene is not yet safe for civilian EMS providers. Regardless of the initial law enforcement mission, medical care in the tactical environment has three distinct phases.

A. Care under Threat

This phase is defined by the existence of an immediate risk to the officers and to the public. The mission of the first responders is then focused on stopping the threats and avoiding further injuries. First aid is a secondary issue and is typically limited to the control of life-threatening bleeding. Victims may be extracted, directed to move to cover on their own, or await neutralization of the threat prior to first aid interventions.

B. Tactical Field Care

Tactical field care occurs once the injured party and rescuers are in a position removed from an immediate threat, often after relocating to some form of cover. It must be noted that, because of the dynamic nature of the event, tactical field care may once again become care under threat as circumstances unfold. During this phase, immediate lifesaving interventions are performed. Control of major external bleeding not addressed in the care under threat phase is the main focus of medical care. The victim is prepared to be safely moved from the scene of the emergency.

C. Casualty Evacuation

Casualty evacuation is the final phase on the scene of an incident and involves delivering victims to appropriate medical care, such as a hospital emergency department. In a tactical situation, this may require use of an armored rescue vehicle. In addition, this phase may involve the use of police patrol vehicles to transport injured parties—when either EMS is overwhelmed, or if EMS response would take too long.

IV. Initial Triage and Assessment

Triage is a medical term derived from the French word for “sorting.” At its most basic, triage is an ongoing process of casualty assessment designed to identify who needs and will benefit from immediate treatment. In most field situations, resources such as time, equipment, and manpower are limited. The responding officer plays a critical role in determining who needs treatment first and who can wait.

Assessment begins the moment the first officer arrives on the scene. Casualty triage is not necessarily a hands-on technique. Careful examination of the scene will give valuable clues as to the potential risks. In a tactically compromised scene, the ability to assess a victim from a safe distance can protect the officer from harm. Understanding the patterns of injury associated with specific types of injury will allow officers to perform a systematic search that can confirm the officer’s initial impression of the seriousness of the risk to the victims.

A checklist approach to casualty assessment is especially important for personnel who do not routinely provide medical care. Depending on the officer’s level of training, different interventions

may be appropriate. The victim's condition should be periodically rechecked to determine if the condition is improving or deteriorating. The following are suggested elements that should be found on the checklist:

Is the scene safe? What do I need to do to make it safe?

1. **Does the victim need to be moved now?**
2. **Control external bleeding immediately.** Direct pressure is the most efficient way to control bleeding. In a dynamic situation where the first officer may be called on to do other important tasks, the application of a trauma dressing is valuable. Use of a tourniquet has been shown to rapidly control severe limb bleeding and may be the best option for a severely bleeding victim in a rapidly evolving situation, or in the case of limb amputation.
3. **Airway-cervical (neck) spine control and level of consciousness** determinations can be performed simultaneously with the first hands-on contact with the victim. If the victim can talk and make sense of what has happened, the airway is intact and the brain is receiving adequate oxygenated blood. If the circumstances place the victim at risk for injury to the cervical spine, the head and neck should be held in place and he or she should not be moved.
4. **Breathing rate & quality** are checked next. The trachea (wind pipe) is checked to see if it is in the middle of the neck. If the scene is safe, the chest is exposed to look for bruises, penetrating wounds or very tender areas. How these are managed will depend on the rescuer's level of training and equipment.
5. **Circulation** can be checked by feeling for a pulse at the wrist if the arm is not severely injured. A strong steady pulse is good. The inability to feel a pulse or finding a weak, irregular, or "thready" pulse should raise serious concerns that the victim is in shock and needs to be delivered promptly to higher levels of care.

During the above primary survey, it is appropriate to correct problems found at each level. Stopping severe external bleeding takes precedence. The airway may need to be cleared of debris or blood. Loss of consciousness or severely altered mental status, an airway that is compromised, or the suggestion of serious blood loss—all identify a situation where immediate transportation to a health-care facility is necessary.

Further assessment of the victim using a checklist system can be completed within 90 seconds and will further refine the investigation for serious life-threatening injuries:

- Is the **abdomen** painful to a light touch? Is it swollen? Is the victim pregnant?
- Is the **pelvis** painful? A pelvic fracture can cause tremendous blood loss and rapid shock.
- Are the large bones of the **arms and legs** tender or deformed? Significant blood loss can occur with fractures of the thighs. These may need to be straightened into normal alignment and then splinted to limit pain and stop blood loss or to restore circulation to the lower leg and foot. Performing such procedures depends upon the level of training and protocols.

The neurologic exam consists of looking for evidence of injury to the brain, spinal cord, and nerves. Large cuts to the head, blood from the ears or nose, and different sized pupils should raise suspicion

for brain injury. The ability to move and feel the arms and legs should also be checked. Pain along any portion of the spine may suggest a fracture. Individuals exhibiting any of these signs, or those whose injuries cannot be accurately assessed by the first responder, should be immobilized until they can be assessed by medical professionals.

Although it may be necessary to briefly expose areas for evaluation, removal of body armor is a tactically driven concern and the individual should be covered appropriately once the exam is completed. The exam should be repeated if time permits to check for any change in status. If interventions are done or if the victim's condition is worsening for an unknown reason, the exam should be repeated.

V. Moving Injured Persons: When and How

A. Terminology

- *Extraction:* Moving victims from the point of wounding to a position of relative cover and safety.
- *Evacuation:* Transporting victims from the extraction site to a safe treatment location or to an appropriate treatment facility.
- *Extrication:* Process by which fire or other rescue personnel use specialized techniques and equipment to remove an individual trapped in a motor vehicle, building collapse, or other physical obstacle.

B. Extraction

The most basic form of extraction is self-extraction, wherein the injured person moves him- or herself to a position of relative safety and, where possible, begins self-aid for appropriate injuries. In other situations, an officer responding to a victim may decide the immediate environment is unsafe for any number of reasons. It may be appropriate to extract the individual to a safer position before initiating any treatment. In tactical situations when an officer or citizen is injured and down, responding officers may decide on immediate action and rescue, moving under appropriate cover to extract the victim. However, when a high threat exists, extraction may be difficult; often the first line of action is stopping the immediate threat.

As a general rule, to avoid further injury, attempts should be made to handle victims as gently as possible. Rescuers should have a clearly defined plan and assigned roles, and must work in unison and maintain adequate communication. Ideally, rescuers should develop a medical treatment plan based on anticipated injuries prior to approaching the victim.

C. Remote Assessment Methodology

Remote Assessment Methodology (RAM) is a technique unique to tactical medicine. It is designed to evaluate the victim while minimizing rescuer risk. In RAM, the rescuer visually and verbally assesses the victim from a safe location behind good cover or concealment. The goal is to determine if he or she requires an immediate extraction. Is the victim dead or alive? In cases where the scene is clearly unsafe and the casualty is clearly dead or beyond treatment, additional personnel should not be put at risk for a rescue.

When available, officers should use optics such as binoculars, scopes, or night vision to enhance scene assessment. If the victim is a fellow officer and it is tactically feasible, responding officers should attempt contact via radio. Often times, the injured may be scared, confused, and/or

unaware of available cover or treatment options. They should be guided to the rescuers or another safe location and prompted to begin self-treatment. Individuals who are still breathing and moving but have obvious severe injuries require immediate treatment. Once all available information regarding the scene has been acquired, the risks and benefits of undertaking a rescue should be assessed and appropriate action taken.

D. Drags, Carries, and Extraction Devices

There are numerous techniques and tools for dragging or carrying a victim and numerous devices designed to aid extraction. The personnel present, equipment available, and the current situation will determine what techniques are used. As a general rule, to move an injured person, the rescuer will have to overcome inertia (a body at rest prefers to stay at rest) and friction (force preventing motion of two surfaces that are in contact). To move a victim quickly, the rescuer must be able to efficiently apply his or her own strength, and decrease the victim's contact with the ground. Leg, rather than back, muscles should be used when lifting, dragging, or carrying. Walking backwards should be avoided and solid footing should be maintained at all times. Manual carries are manpower intensive, tiring for the rescuers, may worsen injuries to the victim, and leave all parties exposed to potential risk.

Drags are the simplest extraction techniques and may be performed by one or multiple rescuers. Advantages of drags are that they offer speed and simplicity in a high-threat environment. Efficiency is maximized by dragging along the long axis (head to feet) of the victim, and lifting as much of him or her off the ground as possible.

Specialized drag straps, harnesses or litters are available and may prove useful. The use of drag straps and harnesses makes it much simpler for a rescuer to elevate the victim off the ground and overcome momentum. It is good preplanning to have some type of commercial rescue device available such as nylon webbing drag harnesses, throw bags containing nylon rope, and roll- or fold-up stretchers that can be used to drag or carry an injured person. Devices may be stored in the trunk of a vehicle or, space permitting, on a duty rig or tactical vest. As always, the risk and benefit of any tool should be weighed. Such devices may be difficult to use under stress, and any delay due to application may expose individuals to a prolonged period of threat.

E. Indications for Spinal Immobilization

Spinal immobilization is the use of techniques and equipment to protect potentially unstable spinal injuries from being worsened by movement. Traumatic injury to the bones of the neck or back may damage the spinal cord immediately or damage may occur following movement - immobilization protects the spinal cord from new or further damage. Spinal immobilization begins with manual in-line stabilization of the head and neck to maintain a neutral position. Rigid cervical collars can then be applied, and the victim secured onto a rigid board device.

Spinal immobilization is usually appropriate when the injury was caused by activities that put the spine at risk, such as falls from significant heights, moderate- to high-speed motor vehicle collisions, and violent impacts to the head; there are complaints of spinal pain or tenderness; the victim exhibits confusion, intoxication, coma, or other abnormalities in level of consciousness; and neurological abnormalities, such as weakness, paralysis, numbness, or tingling exist. Victims with injuries such as gunshot wounds or stab wounds, even to the neck, without any of the preceding complaints, do not routinely require spinal immobilization.

VI. Evacuation of Injured Persons

Beyond initial bleeding control, the single most important first aid intervention that law enforcement officers can provide is facilitating prompt transport to an appropriate treatment facility.

A. Appropriate Facility

For trauma victims, the appropriate facility is a hospital verified as a trauma center. Level 1 trauma centers are teaching hospitals, where a general surgeon is in-house 24 hours a day, and multiple surgical subspecialists are on call. Level 2 trauma centers have multiple surgical subspecialists on call at all times. Level 3 trauma centers have a general surgeon on call 24-hours a day. All of these hospitals possess special expertise in trauma care. Officers should know the locations of trauma centers and other hospitals in their area. Rushing a victim to the nearest hospital may not be the best option, if that hospital does not have the capability to adequately treat the victim. In many cases, it is better to bypass the nearest hospital, and transport the victim to a trauma center, ideally a level 1 or level 2 facility. Officers should ensure that receiving hospitals are notified directly or by EMS dispatch before the victim is transported.

B. Prompt Transport

The "golden hour" concept of trauma means that, in case of life-threatening injuries, interventions in the field are centered on bringing the victim to appropriate care as quickly as possible. Transport options include police vehicles and EMS ambulances and helicopters. Police vehicles should be used if EMS is delayed or overwhelmed. A medical helicopter can be called from the scene if severe trauma is present, depending on the distance to the trauma center.

C. Evacuation Protocols

Law enforcement agencies should develop evacuation protocols for trauma victims with penetrating injuries, such as gunshot wounds or stabbings, that account for available forms of transportation (i.e., ground ambulances and helicopters) and constraints (i.e., roads and weather), in cooperation with EMS agencies and receiving hospitals. Items that may serve as guidelines in protocol development include the following:

- Consider transporting victims by police vehicle if an appropriate hospital is located within 10 minutes of the scene.
- If an appropriate hospital is located farther away, consider initiating transport by police vehicle and then intercepting the transporting police vehicle with an ambulance, depending on EMS response time.
- EMS or police dispatchers should be permitted to initiate a medical helicopter response and/or trauma center activation based on a law enforcement request—without waiting for a ground EMS crew to assess the victims.
- Law enforcement officers should receive training on how to transport trauma victims in police vehicles.
- Law enforcement officers should plan and receive training on how to close down streets, clear highway entrances and exits, and otherwise direct traffic as needed to facilitate victim transport.

Law enforcement agencies need to learn the following:

- What is the local EMS response time?

- What are the local EMS capabilities (basic life support, advanced life support, air assets)?
- What and where are the local hospitals? What are their phone numbers?
- Which local hospitals are the best destinations for trauma care?
- Which local hospitals are the best for special situations, including burns and hazardous materials?
- How can law enforcement officers activate the trauma team in these hospitals?
- How can law enforcement officers access a medical helicopter?
- How can law enforcement officers communicate directly with EMS?

In summary, this document introduces the trauma concepts and interventions critical to the responding law enforcement officer. While emphasis has been placed on response to motor vehicle accidents and violent crime, officers are often first on the scene during tornadoes, floods, and other unique hazards. The core concepts are no different: Responding officers should be able to assess the scene for threats and manage them once found. Parts II and III of this document will explore the various aspects of providing emergency trauma care in greater detail

Part 2

I. The Role of CPR in Trauma

Over the years, many thought that traditional CPR was the appropriate approach to handling trauma, as well as the heart attacks it was designed to help. In recent years, the medical community has come to understand that traumatic injury is a very different problem from nontraumatic cardiac arrest, so a very different approach to treatment must be taught.

The current approach to resuscitation of a trauma victim is different from the A-B-C approach that has been taught for decades in first aid classes. Since the majority of traditional training is oriented toward sudden cardiac arrest (i.e., heart attack), the protocols that were created decades ago virtually ignore trauma. The traditional A-B-C approach says to focus on **A** (Airway) first, then **B** (Breathing), and finally **C** (Circulation). The C portion is primarily ensuring and assisting the function of the heart. This includes the chest compression component of CPR, if there is no pulse. Any control of bleeding is almost an afterthought. It is now known that trauma victims die mostly from bleeding. Therefore, the current teaching is as follows: ***When treating trauma victims, think C-B-A instead of A-B-C***. Once the hemorrhage is controlled, assess the breathing and airway.

In traditional first aid training, officers are taught to provide "rescue breathing," usually mouth-to-mouth, or mouth-to-mask, breathing. Such techniques are rarely appropriate in the setting of penetrating trauma, such as gunshot or stab wounds. If the victim has stopped breathing, it is usually due to either an external issue preventing breathing, such as a blocked airway, or the victim being dead or close to death from the trauma due to blood loss, low blood pressure, lack of oxygen, or destruction of the vital organs.

Likewise, chest compressions are often useless in trauma injury, since the victim will have lost his or her pulse primarily due to blood loss or the destruction of vital organs. Pumping on the chest will not make up for the lack of blood available to pump, or close the holes in the vital organs that prevent their proper function. The only possible exception is the victim that loses pulse and respiration in front of the rescuer, and surgical intervention by appropriate personnel is moments away.

Similarly, electrical shocks to the heart are generally useless in the setting of a cardiac arrest caused by trauma. The problem with the heart is not an electrical problem; it is usually a lack of blood to be pumped.

This is a unique and emotionally difficult area for many people to grasp. They want to "do something," and standing aside watching someone is something they cannot fathom. In these situations, the statement that "Well, it can't hurt!" is incorrect. If an individual has uncontrolled hemorrhaging, pumping on the chest will push blood out of the wounds, and make things even worse.

Traditional CPR has a limited role in the treatment of trauma victims. It is unlikely to be of benefit, consumes time and resources, and places the provider at risk for blood and body fluid exposure. In the tactical environment, it takes the provider out of the fight and places him or her at risk of injury. Most importantly, it diverts attention away from injured parties who may benefit the most from treatment.

It should be remembered that a victim at the scene of a trauma may have gone into cardiac arrest due to a medical problem. If a medical cause of cardiac arrest is suggested (elderly victim, minimal evidence of injury, etc.) then CPR may be initiated. In addition, injuries resulting from lightning strikes,

drowning, or hypothermia may respond to resuscitation efforts. In these cases, CPR should be initiated until arrival of EMS. Prolonged CPR is particularly beneficial in case of lightning strike, cold-water submersion, and hypothermia.

II. Airway

Ensuring that the airway is unobstructed is a high priority for safeguarding the survival of any victim. Any alteration of consciousness may let the face and neck fall into a position that obstructs the flow of air into the lungs. The victim may also vomit, which can clog the airway. Vomit or blood that is inhaled into the lungs can block the critical exchange of oxygen and carbon dioxide. Failure to make this gas exchange will affect different body tissues and organs depending on their oxygen requirements. The brain may be permanently damaged with loss of adequate oxygen in as little as four minutes, whereas most muscles may recover with up to four hours of limited oxygen.

Placing an unconscious, breathing victim on his or her side in the "recovery position" will make it easier to maintain an open airway. When there is a concern of an associated neck injury, the injured person's nose, mouth, and belly button should be kept in the same line. Victims with fractures of bones in the face who are still conscious may be able to keep their airway open by assuming a "tripod" position, leaning forward and supporting the upper body with hands on the knees or on another surface, to allow blood and fluid to drain from their mouths. The Heimlich maneuver is used to help clear a large blockage from the airway of a victim who has choked on food.

III. Breathing

Adequate breathing is equally as important as providing oxygenated air intake for the body. One of the major waste products of the body, carbon dioxide is removed through the lungs. Failure to breath adequately may impair the removal of carbon dioxide with resulting organ injury. The ability of the chest to expand the same on both sides provides negative pressure in the chest that helps return blood to the heart, aiding proper circulation. Multiple rib fractures can cause a "flail chest," which results in unequal chest expansion and ineffective breathing. Placing the victim in the aforementioned recovery position with the injured ribs towards the ground may splint the ribs enough to improve breathing. A puncture wound in the chest can cause problems with breathing as well. A resulting collapsed lung can be managed by placing a dressing that is closed on all four sides over the chest wound before the victim takes a deep breath. If air is trapped in the chest and continues to build up pressure with successive breaths, the victim may develop what is called a tension pneumothorax. This overpressure may be relieved by briefly removing the dressing that has been applied.

IV. Circulation

A. First Things First: Assess the Wound

The initial assessment of penetrating trauma, such as a gunshot or stab wound, must start with a quick evaluation of the seriousness of the wound. Good lighting is helpful, so a flashlight should be used if available. However, if there is a persisting threat of violence, light or noise that could attract unwanted attention should be avoided.

Visualization is best done by removing the clothing surrounding the wound. In a hospital emergency department, trauma victims have all their clothes removed as one of the very first steps in their care. However, in the field, cutting or tearing clothing to get a better look at a wound is not only impractical—it might be tactically foolish and serve to delay time to care. Instead,

responding officers should take simple steps such as removing a jacket to look at an arm wound. Remaining calm is critical. The presence of blood may agitate the victim or rescuer. It is important to remember that while the average human body contains five quarts of blood, even modest blood loss may look severe.

B. Stop the Bleeding

Direct pressure on a wound, preferably with a cloth or dressing, is usually adequate to control most types of mild to moderate bleeding by helping the blood to clot. A pressure dressing should be used, but, if one is not available, a clean piece of clothing may be substituted. The cloth dressing is applied directly onto or into the wound with the rescuer applying pressure on top EMS arrives.

Arterial injuries exhibit brisk bleeding, even squirting from the wound in a pulsing jet. Arteries are under higher pressure than veins or capillaries, and a much larger amount of blood can be lost in a short period of time. One of the larger arteries is the femoral artery, located in the inner thigh. An injury that cuts completely through the femoral artery can cause death in a few minutes. Immediate action to stop the bleeding in arterial wounds is vital. If such bleeding is not controlled with direct pressure, a tourniquet is needed.

For many years, it was taught that a tourniquet was to be used only as a last resort. The assumption was that if a tourniquet was applied, the victim would be forced to have an amputation. In the past few years, it has been determined that this is not true. Tourniquets are used electively in various types of surgery, and it is known that the blood flow to a limb can be stopped for several hours (probably up to four hours, depending on circumstances), without any permanent tissue damage. Additionally, years of battlefield injury data from Iraq and Afghanistan have led to refined protocols for using tourniquets. In fact, many of the commercial tourniquets on the market today are designed specifically by and for combat troops. It has been proved beyond question that tourniquets can save lives and limbs, when used appropriately.

If a responding officer does not have a commercial tourniquet, one can be improvised by using a belt, jacket, scarf, or similar material. ***The most important aspect of improvising a tourniquet is to use a material 1-2 inches wide, if possible.*** Recent studies have shown that a tourniquet 1-2 inches in width will be most effective in compressing the tissue, without cutting it. If the tourniquet is too narrow, it may cut into the tissue, and actually cause more bleeding.

Something is then needed to tighten the tourniquet—this object is referred to as a windlass. A stick, marking pen, or even pistol magazine can be used in this role. The officer should lay the windlass on the knot tied in the tourniquet, and tie another square knot on top. Then, the windlass can be used as a handle and turned to tighten the tourniquet and help to compress the large blood vessels deep inside the muscles. To get enough force for the tourniquet to be effective, the officer must tighten it to the point where it is actually painful. The officer should tighten the tourniquet until the bleeding has stopped, regardless of the victim's pain level.

If the tourniquet slows but does not stop the bleeding, a second tourniquet should be applied. Using all the same techniques as with the first, the officer should apply the second tourniquet next to the first one, between the first tourniquet and the torso.

After applying the tourniquet, the officer should apply an appropriate dressing on the wound. This not only helps control bleeding, but also keeps the wound clean, helping to prevent infection.

C. Hemostatic Agents

Another means to stop bleeding is a category of medications called hemostatic agents. These are chemicals that cause the blood to clot faster than normal. While possibly useful, they do not replace tourniquets for severe injury to the limbs. They may be used in wounds where a tourniquet is not useful due to the location of the injury (such as high in the armpit or groin) or wounds that continue to bleed despite tourniquet application. Some of these agents, originally in a loose powder form, have been replaced by gauze treated with the hemostatic agent. The hemostatic gauze should be packed directly into the bleeding wound with the tail hanging out of the wound, and direct pressure applied on top of the gauze.

V. Neurotrauma

Traumatic brain injury remains a major source of death and permanent injury in trauma victims. Aside from direct injury to the brain, disability and death can result from increased pressure in the skull from active bleeding or from injured and swollen brain tissue, which is known as cerebral edema. With uncontrolled swelling or bleeding, the brain becomes compressed. Without medical or surgical intervention, the brain will eventually be squeezed down towards the spinal canal. This compression or squeezing is known as herniation and is usually instantly fatal.

This catastrophic chain of events can happen quickly after an injury. Time is of the essence when it comes to a head injury. Rapid evacuation to hospital care is crucial.

When concerned for a traumatic head injury, responding officers should search for clues based on key questions.

- Is the victim responsive?
- Is he or she less than fully responsive?
- Were injured motorists wearing a seatbelt?
- Did the airbag deploy?
- Were motorcycle and bicycle riders wearing helmets? If so, was the helmet significantly damaged?

Signs of increased skull pressure, known as intra-cranial pressure, include nausea, vomiting, intense headache and altered mental status. These more subtle findings of head injury are also very common, making observation of the victim's behavior and good communication all the more important.

Lack of enough oxygen reaching the brain remains a key cause of altered mental status. In the field, a quick assessment of a victim's mental state can help decide whether he or she can safely breathe on their own. Altered mental status can arise from a host of medical reasons, including trauma with increased pressure in the brain limiting blood flow, a stroke damaging critical areas of the brain, or drug and alcohol intoxication depressing a victim's respiration.

The simplest method in the field to evaluate and communicate a victim's mental status is known as **AVPU**. Simply stated, when a first responder speaks to a victim, is the victim **A**lert? Does he or she require a **V**erbal stimulus to obtain a response? Will the victim respond only to **P**ain, or, is he or she completely **U**nresponsive?

Physical signs of potentially serious injury can often be spotted on simple inspection. Officers should look for deep scalp lacerations and try to control any obvious bleeding. A victim can go into shock from blood loss even from a scalp wound. Deformities or depressions to the skull can be another sign

of fracture. Breaking ones skull takes a lot of energy, so if the skull is broken, the brain may be injured as well.

Bleeding from the ears is a tell-tale sign of fracture at the skull base, as well a sign of potentially serious injury to the bones or ligaments of the neck. The classic "black eye" is an especially sinister sign in these victims. Bruising around eye sockets can point to both serious facial fractures and head injury.

One of the most serious signs for life-threatening head injury is unequal pupils. A grossly enlarged or "blown" pupil occurs when brain swelling or brain bleeding creates so much pressure that the nerves to that eye no longer function. This is a telltale sign of a surgical emergency.

When confronted with possible neck injuries, an officer should assume that every victim has a cervical (neck) spine injury or the potential for one. Cervical spine injuries rarely require any intervention in the field aside from stabilizing the position of the head, neck, and spine. However, inappropriate or misguided attempts to stabilize the neck and spine can lead to devastating consequences for the victim in terms of permanent disability and paralysis.

In situations where there are possible cervical spine injuries, the responding officer should determine the following:

- If victims are conscious, do they complain of neck pain?
- Can they move their arms and legs?
- Do they have sensation in their arms, legs, and torsos?

First responders may be called upon to assist EMS personnel in stabilizing a victim's spine by helping to apply a cervical collar and moving him or her to a hard backboard. The neck and back should be kept in a straight line. These maneuvers require a minimum of two individuals to move a victim.

The key to mitigating any injury to the cervical spine or back is to both align and stabilize the spinal column—from skull base to hips. Cervical collars will align, but will not stabilize the neck on their own. Once safely on a backboard, towel rolls or foam blocks should be applied to each side of the victim's head to maintain stability.

VI. Temperature Management

There are several challenges associated with managing the body temperature of a trauma victim in the field. The victim may have a normal temperature and then sustain his or her injury. Or he or she could have a higher or lower than normal body temperature from an underlying disease or condition that helped cause the injury (e.g., a runner with heatstroke stumbles and breaks his arm). Identifying and treating the subset of trauma victims who have significant variations in their body temperature may be a matter of life or death.

Good temperature management begins with a clear understanding of how vulnerable the human body is to changes in temperature. In an average day, a person remains comfortable because he or she makes hundreds of adjustments to both internal and external environments. Since most of this takes places outside the usual level of awareness, individuals tend to underestimate the fragile nature of this equilibrium. The mechanisms humans rely on to keep us healthy function only within a very narrow temperature range. Bad things usually start to happen when the core body temperature deviates even a mere four degrees Fahrenheit (4°F) above or below what is considered "normal" (98.6°F). Keeping a trauma victim's temperature within this range not only makes him or her more comfortable, it also may improve the medical outcome.

The second problem an officer may face at the scene is the lack of accurate core body temperature readings to help guide decisions. An officer will have some idea of whether the victim is too hot or too cold based on the environment in which he or she is found, but this is only one piece of information to consider. Day hikers have died of hypothermia in 50-65°F weather because their clothes were wet and cross-country skiers have had heatstroke caused by being overdressed and overexerting themselves while racing in subzero temperatures.

The third challenge is the unreliability of the victim's signs (what the officer observes) and symptoms (what the victim tells the officer). Victims with abnormally high or low temperatures have been known to shiver; feel too cold or too hot; sweat or not sweat (unrelated to their actual temperature); or have uncoordinated muscles, numbness, tingling, mental confusion, seizures, dizziness, nausea, vomiting, or pale or flushed skin. Signs and symptoms can become even more unreliable when dealing with the very young or old and when victims are under the influence of certain medications or illegal substances.

The fourth problem is that major trauma in general, and certain types in particular, such as head trauma, can have an effect on the normal heat regulating system of the body. Therefore, even if the victim begins with a normal temperature, the officer should make certain that it doesn't become abnormal. This becomes more of an issue in situations where evacuation times are prolonged and first responders are forced to monitor victims over longer periods of time.

So what should the officer do when presented with a trauma victim who may also have a problem with his or her body temperature? The first step, of course, is to take the temperature. Ideally, the initial reading would be from a thermometer. However, with a good history, the officer can make an educated guess, in the absence of a thermometer, by answering such questions as: Did the victim have a prolonged exposure time, was he or she engaged in excessive exercise, dressed appropriately for conditions, and so forth. Without a history from the victim or reliable bystanders, treatment decisions must be based on the environmental conditions (hot, cold, wet, humid, etc.) and on impressions from examining the victim. In these situations, first responders must ask the following:

- Is the temperature of the victim normal? If so, there may be no need for any intervention.
- Is the temperature so high that he or she needs cooling?
- Is the temperature so low that he or she needs rewarming?

The body gains and loses heat using both internal and external mechanisms. Internally, heat is generated primarily through the process of metabolism and the activity of the muscles. If there are no reasons to deny victims food or drink, giving them sips of clear fluids (no caffeine or alcohol) and a high energy snack might stimulate their metabolism and increase heat production. This is a relatively slow process, but in milder cases of hypothermia this can support recovery. Since trauma victims usually should not be moved, increasing muscle activity to generate heat isn't a good option. The body may use shivering as a method of increasing heat production, even if the victim is kept still. The most effective way to increase core body temperature in these situations is to stop heat loss by taking off wet clothes; covering body areas most likely to lose heat like the head, neck, hands, and feet with clothing or space blankets; and applying external sources of heat such as warm blankets, body heat from others, and warm packs. For a variety of reasons, rubbing the victim's hands, arms, feet, and legs as they are being warmed is not recommended.

Heat is removed from the body by evaporation, such as breathing and sweating, and through direct losses into the environment, such as conduction, convection, and radiation. These principles can be

used to accelerate heat loss and cool victims of heat injury by applying external cooling sources like water, ice packs or cooling packs to the scalp, neck, arm pit and groin areas. Tight or overly thick clothing should be removed, and the victim should be moved to a cooler environment as soon as possible.

VII. Hydration Management

The purpose of this section is to provide the first responder with some guidelines about whether to give fluids by mouth to trauma victims. Due to the stressful circumstances they are in, many of these victims will develop a dry mouth and throat. A significant percentage will ask for something to drink.

First, the word "fluids" means plain water or a small quantity of ice chips. These are given sparingly as "sips and chips" as opposed to slurps and gulps. Giving alcohol, energy drinks, caffeinated or carbonated beverages, juices, or milk products is considered unwise for a number of reasons. Sports drinks may be used if water is not available, but the high sugar content limits their usefulness in many situations. Ideally the fluid temperature should be neither too cold nor too hot. The objective is to make the victim more physically and psychologically comfortable, while preventing further dehydration from occurring.

Prolonged exposure to high temperatures; high humidity; wearing too much clothing or gear for the temperature; heavy exercise and sweating; poor water intake; poor urine output; and feeling hot, dizzy, confused, or nauseated; or vomiting are all indicators of possible dehydration. Significant blood loss, a rapid weak pulse, or signs of low blood pressure and poor circulation due to shock are also signs that fluids could be useful.

Fluids should not be given by mouth to victims with severe nausea and active vomiting; low levels of consciousness; facial trauma; severe trouble breathing; injuries so severe that undergoing anesthesia and major surgery within the next several hours is likely; or injuries to the gastrointestinal tract that might be aggravated. Instead, officers should rely on measures to comfort these anxious victims. There is nothing wrong with using a damp cloth to moisten their parched mouth or lips, even if a proper drink cannot be given.

On certain rare occasions, an officer may need to disregard some of these contraindications to properly care for the victim. If medical evaluation and evacuation is known to be hours away, the victim must be kept alive and comfortable. If oral fluids are the only options available, the officer should consider using them. It does not show bad judgment in such situations to start hydrating victims who are severely dehydrated or who have lost a lot of blood.

Part 3

I. Penetrating and Perforating Wounds

A penetrating wound has an entrance into the body with no exit. A classic example is a stab wound to the chest caused by a knife. A perforating wound has both an entrance and an exit. A wound caused by a bullet that was fired into the front of the chest, went through the chest, and exited out the back is an example. Victims may have combinations of both types of wounds, such as when a bullet travels through an arm (perforating) and then comes to rest inside the chest cavity (penetrating).

Impalements are a special type of penetrating wound where an object from outside the body enters an area and remains fixed inside the body. First responder care in the field for this type of trauma is relatively straightforward—get the victim to a trauma surgeon as soon as possible. Officers should secure all impaled objects in place so they can be removed in the controlled environment of the hospital and treat actively bleeding wounds with direct pressure or compression dressings.

In the event a wound is in a limb and there is a large amount of bleeding, a tourniquet should be placed above the level of the injury. Since there might be forensic evidence at the entrance and exit wound sites, it is best not to attempt to clean or wash the wound. Instead, a dry gauze pad should be placed over the site in order to prevent further wound contamination and the loss of valuable forensic evidence. If organs or tissue from inside the body (like intestines) are protruding from the wound, officers should not attempt to push anything back inside. The area should instead be covered with a clean or sterile moist cloth and secured in place. In all situations, victim movement should be kept to a minimum.

First responders should avoid expressing an opinion (verbal or written) as to whether they believe a wound is an entrance or exit wound. Criminal and civil cases have been lost by well-meaning emergency personnel (including physicians) who wrongly theorized what happened and then documented observations that were consistent with their theories. If such information conflicts with later forensic evidence it can lead to a mistrial or the wrong judicial outcome.

II. Blunt trauma

Non-penetrating trauma, blunt trauma, and blunt force trauma are terms used to describe the same basic type of trauma. Blunt trauma refers to injuries sustained when a flat or blunt object from outside the body (such as a baseball bat) strikes an area of the body and causes damage. It also refers to trauma that occurs within the body as organs and tissues speed up or slow down in response to events happening outside of the body. For example, in a car crash, the heart can sustain a bruise from hitting the back of the breast bone if the car and the occupant stop too suddenly.

Injuries due to blunt trauma vary in severity from mild to fatal. Whether specific trauma victims sustain bad injuries from the blunt force they were exposed to will depend upon many factors. Three important variables to identify while taking a history are (1) the body part being affected, (2) the magnitude of the forces involved, and (3) the direction of the forces through the body. Since there might not be any external signs of injury, knowing exactly what happened and where the body received the force will provide the information an officer needs to properly triage and treat the victim.

One of the most difficult things about helping blunt force trauma victims is the fact that their initial appearance and the number and severity of their injuries may be different. Contusions (areas on the skin that are bruised, swollen, and tender) may provide some clues, but, since the major injuries are

internal and victims don't always experience worrisome symptoms immediately, the first responder must base at least some of the decision making on other criteria. Therefore, it is recommended in all cases of significant blunt trauma to keep the victim calm and relatively immobile. Routine support of the airway and breathing should be provided while plans are made for immediate transportation to the nearest trauma center.

III. Strains, Sprains, Dislocations, and Fractures

First responders must be able to recognize and provide initial treatment for the types of injuries to bones, muscles, and joints that they are most likely to encounter. Early and appropriate treatment can sometimes control a victim's pain and anxiety, decrease the likelihood of further injury, reduce bleeding, restore normal circulation, decrease the risk of infection, shorten recovery times, and improve overall medical outcomes. It is sometimes difficult in the field to determine the seriousness of some injuries. For that reason, it is usually best to err on the side of overtreating an injury.

A strain is an injury of a joint and its ligaments or of a muscle and its tendons. Typically, this is caused by overuse or overstretching of the involved body part. Pain, swelling, instability, and deformity are usually not noticeable, and there is no associated numbness, weakness, or paralysis. The victim's pulse and circulation are usually normal. Treatment involves **R**est with no weight bearing on the injured part of the body, **I**ce, **C**ompression or immobilization, and **E**levation (**RICE**).

A sprain is also an injury of a joint and its ligaments or of a muscle and its tendons, but the trauma is more severe. Pain can be moderate to severe. The swelling is more significant than with a strain, and it may cause a joint to look deformed. There can be bruising or discoloration of the skin in the area of the injury or even below it as gravity moves the blood and tissue fluid. More aggressive treatment with RICE is indicated and pain can be controlled by what is available.

A dislocation is a forced movement of body part from its usual location. The two body parts we are referring to in this discussion are the bones and joints. Dislocations that just happened, as opposed to those that occur on a regular basis, deserve additional treatment because they can be life and limb threatening in some circumstances. The victim's pain level is usually moderate to severe and movement of the body part causes severe discomfort. There is usually swelling with an obvious deformity and the body part often cannot be moved. There may be underlying bone fractures associated with certain types of dislocations.

If the dislocation involves an arm or leg, a first responder must assess the function of the nerves and circulation of the portion of the body part away from the dislocation. It is not uncommon for the nerves and the blood vessels that pass through the injured area to be affected. If there is any indication that something is wrong with the blood flow or nerves, the victim requires immediate medical attention in a hospital. No one but a highly trained emergency medical provider should attempt to return the dislocated bones to their original positions. Treatment using RICE is appropriate with a few exceptions. The officer shouldn't attempt to elevate the injured body part; instead, it should be carefully immobilized so movement is kept to a minimum.

A fracture is the same thing as a broken bone. There are many different types of fractures and there are many factors that can affect the severity. Fracture treatment by first responders is usually meant to accomplish two goals: decrease the victim's pain and prevent the situation from getting any worse. In "closed" fractures where there is no open wound, the officer should try to splint the fracture in its normal position. This will decrease pain and prevent the sharp bone ends or fragments from doing

further damage. As with a dislocation, the officer should monitor nerve function and blood flow. RICE is still appropriate, but compression over the fracture site should be avoided.

The treatment principles for "open" fractures, where there is an open wound, are essentially the same except the external wound must also be cared for. Sometimes it isn't clear whether the tear in the skin is from a bone or fragment moving from the inside out or from an object outside the body moving from the outside in. While knowing exactly how the injury occurred can be helpful information to hospital staff, in terms of immediate treatment—it doesn't make that much difference. The purpose of treatment in the field is to decrease the victim's chances of getting an infection from his or her original injury and to stop any further contamination of the wound by foreign materials. The wound should not be probed, as sharp pieces of bone may cut the first responder and contaminants might be driven deeper into the wound. The wound should be covered on all four sides with a moist dressing. Neither the dressing nor the tape that secures it should go all the way around the limb.

IV. Burn Care

A. Burn Characteristics and Assessment

Burns are not isolated to skin injury. Large burns may affect multiple organs in the body, creating life-threatening illness. Severe shock may follow large burns, resulting in rapid illness and death. Small burns may damage deep tissues, resulting in significant disability. All burns are considered serious injuries, regardless of size.

The severity of a burn injury is determined by its size and depth. Burns covering large portions of the torso, arms or legs, or on the face or genitals carry greater risk. Burn depth is described by degree or thickness. First-degree, or superficial burns, are red and painful. An example is sunburn. They are rarely serious, unless covering large areas of the body. Second-degree, or partial thickness, burns are painful and result in blistering. Burns sustained on a hot rifle barrel or automobile engine are examples. Most will heal without complication provided good wound care is provided. Third-degree, or full thickness burns, extend into the deep tissue. These burns may or may not be painful, depending on whether they destroy local nerve endings. These may occur when an individual's clothes catch fire, or when skin is exposed to open flame or a burning accelerant such as gasoline. They are disabling and potentially life threatening.

Injuries associated with burns depend on how the burn was sustained. Fire in enclosed spaces may result in inhalation of heated air and fumes. Resulting burns to the nose and mouth may rapidly affect the victim's ability to breath. Inhalation of smoke and fumes may cause injury through lack of oxygen, or poisoning with toxic gases such as carbon monoxide or cyanide. Burn casualties may sustain trauma when trying to escape from burning structures or from being struck by falling debris. Explosions may cause burn injury as well as other blast injuries.

B. Burn Treatment

The first step in burn care is to stop the burning process. Any clothing that is still on fire should be extinguished immediately. Burning is often most effectively stopped with application of room-temperature water, provided there is no risk of electrical injury, such as high voltage wiring or devices nearby. Cold or ice water should be avoided, as it may actually increase the size of the injury. Other options include smothering flames with a jacket, blanket, or other available material, or rolling the victim on the ground. A powder or CO2 fire extinguisher may also be used.

Although the burns themselves may be impressive, the next step should be focusing on the victim's airway. Anyone with evidence of inhalation injury, such as facial burns, burns or soot in the nose or mouth, or difficulty breathing requires immediate assessment by a medical provider. Officers should assist breathing as necessary by using basic maneuvers. Once breathing is controlled, the officer should loosely wrap burned areas in dry, sterile or clean dressings or in a plastic wrap such as Saran-Wrap. Creams, powders, or ointments should not be used. The victim should be kept warm to prevent development of hypothermia.

Any victim who has sustained significant burns should be transported to a hospital with a dedicated burn center. This includes inhalation injury; second-degree burns over more than 10 percent of the body; any third-degree burns; burns involving the face, hands, feet, genitals—or covering a major joint, such as the knee or wrist; and any electrical or chemical burns. An exception is victims with multiple traumatic injuries other than the burns; in these situations, officers should consider transport to a trauma center first for stabilization of life-threatening injuries. In cases of smaller burns, a dry dressing should be applied and the victim should be told to seek medical care as soon as possible.

V. Hazardous Material (HAZMAT)/Chemical-Biological-Radiological-Nuclear-Explosive (CBRNE) Situations

Hazardous material (HAZMAT) incidents pose a significant risk to law enforcement responders. Hazardous materials are defined as any substances that can harm people, property, or the environment. Due to physical properties, gases are most likely to cause harm to responders, followed by liquids and then solids.

The majority of HAZMAT incidents actually occur in fixed locations, as opposed to being transportation related. The most common chemicals causing injury are ammonia, chlorine, sulfuric acid, hydrochloric acid, and sodium hydroxide. All these chemicals are capable of causing severe skin, eye, and lung burns.

While release of gas-producing chemicals in an enclosed environment will likely result in high concentrations due to the limited space, exposure to chemicals in an open-air environment can still be harmful or deadly. Regardless of the specific chemical, some basic safety principles apply in every HAZMAT response:

1. Maintain a heightened sense of awareness of surroundings.
2. Try to maintain a safe distance from the scene of obvious contamination. As a general rule, stage at least 2,000 feet from the site.
3. Position yourself upwind from the contamination.
4. Never enter a potential HAZMAT hot zone without appropriate training and personal protective equipment or until cleared to do so by the appropriate command authority.
5. Do not add to the problem by becoming a victim yourself.

One commonly encountered HAZMAT situation in law enforcement is the methamphetamine laboratory (meth lab). More than 50 chemicals have been commonly associated with meth labs, including precursors, solvents, caustics, and catalysts. These chemicals may have both immediate and long-term effects on health. Solvents, including ether, acetone, methanol, and fuel, are the most common chemicals. They are highly flammable and the leading cause of flash fires in meth labs. Hydrochloric acid is used to salt out the methamphetamine base, and is found in almost all cooks.

Some chemicals are unique to the specific cooking method. Iodine and phosphine gas are associated with the RedP method, while ammonia is used in the Birch/Nazi method. Many meth lab chemicals are known cancer-causing agents.

Another HAZMAT event encountered in law enforcement is chemical suicide. In a chemical suicide, the suicidal person mixes chemicals to generate a toxic gas. Although historically, cyanide was the agent of choice, more recently hydrogen sulfide gas, a chemical with properties similar to cyanide, has been used for this purpose. Hydrogen sulfide is made by mixing an acid with a sulfur-containing product. The resulting gas rapidly reaches lethal levels in an enclosed environment like a car. There have been several incidents in which first responders have been incapacitated or died after breaking out car windows, and being overcome by the plume of hydrogen sulfide gas. Potential clues to chemical suicide include the presence of buckets used for mixing chemicals, the smell of sulfur (rotten eggs), and yellow-green residues in the car.

CBRNE is the term used to describe categories of weapons of mass destruction (WMD) – **c**hemical, **b**iological, **r**adiological, **n**uclear, and **e**xplosive. Explosives remain the most commonly encountered WMD. Chemical agents of concern include nerve agents (e.g., sarin), vesicants (e.g., mustard gas) and blood agents (e.g., cyanide). By definition, these chemicals are designed to kill large numbers of individuals. While U.S. law enforcement experience with chemical agents has been limited, cyanide and sarin have both been used in terrorist events. As a general rule, any situation in which large numbers of people rapidly lose consciousness or begin having seizures should be assumed to be a chemical event. The forward body line (FBL) refers to the collection of dead or incapacitated first responders who rush into the scene without the appropriate protective equipment and immediately succumb to the chemical. The FBL can be used to rapidly define the hot zone for the event.

VI. Blast Wound Care

A. Mechanisms of Injury

The possibility of encountering explosives has increased as terrorists and other criminals increasingly turn to their use as a means of violence. Improvised explosive devices (IEDs) are homemade devices that cause injury or death using explosives alone or in combination with other hazardous materials, such as toxic chemicals. Additionally, legitimate use of explosives within normal law enforcement practice, such as explosive breaching or light/sound distraction devices may result in accidental injury.

Explosives cause injury in four main ways (mechanisms). Primary blast injury is unique to explosives; the pressure, or blast wave, generated by an explosion can damage air-filled organs, such as the ears, lungs, and digestive tract. Secondary blast injury occurs when the body is struck by flying debris from the explosion. This debris may be bomb fragments or shrapnel (wounding material intentionally placed in or around the explosive) or other objects (such as pieces of glass or metal) launched by the blast. Tertiary injury occurs when the victim is actually thrown by the blast into other objects that may injure the body. Quaternary injury is all remaining effects from the explosion, including burns and inhalation of dust and fumes. Individuals injured by a blast may suffer from any single or combination of these mechanisms. The closer an individual is to the blast, the greater the potential severity of injury and the more likely they are to have sustained injury from all four mechanisms. Some injuries, such as organ damage or penetration by very small debris, may not be readily apparent at first glance.

B. Scene Assessment

When a blast has occurred, law enforcement in the vicinity as well as those responding must be especially aware of scene safety. Extreme caution must be taken when entering the scene of a blast in order to prevent additional injury. The explosion may have released potentially toxic fumes or caused materials to catch fire that are now releasing toxic fumes. Fires may cause affected structures to become unstable or collapse. Broken glass and other debris scattered by the explosion may create physical hazards. The force of the blast may cause damage to the supports of surrounding buildings or other structures, rendering them unstable and at risk for collapse. A "dirty bomb" may intentionally release chemical, biological, or radioactive materials. At the very least, a protective gasmask or N-95 respirator mask should be worn until the scene has been found clear of contaminants.

Law enforcement and emergency services responding to the scene of an explosion should always be aware of the risk of a secondary device. This tactic has been used extensively by criminals and terrorists. The initial device is detonated to cause damage and/or casualties and to create a response from law enforcement and EMS. A secondary device is placed in the vicinity of the scene, often in an area where law enforcement and EMS are likely to stage. It is the responding officers and medics, as well as those fleeing the scene, who are targets of the secondary device. Responders should be on the lookout for anything out of place in the staging area, such as suspicious individuals, vehicles, boxes, trash cans, and so forth. If in doubt, responders should pull back and stage away from the scene, allowing explosive ordinance specialists to clear the area.

C. Field Care/Stabilization of Blast Injury

Treatment for victims of explosions should focus first on obvious injury and second on possible hidden injury. Obvious injuries include penetration injuries and amputations, blunt-force injuries, eye injuries, and burns. Hidden injuries include damage to internal organs from the blast wave, blunt trauma, or small penetrating wounds. Hearing loss caused by noise from the blast or from damage to the eardrums may make communication with victims difficult.

Penetrating wounds may be much deeper than they appear. Officers should control bleeding by using direct pressure or a tourniquet. Impaled objects should not be removed. Limbs that are partially or completely amputated should be treated with application of a tourniquet, even if initial bleeding is not heavy. Blunt injuries commonly include bone fracture in the arms, legs, skull, and spine. If there are external signs of injury to the head or neck, such as bruising, scrapes, or swelling, then full spine immobilization should be obtained prior to movement. Obvious injury to the arms or legs should be splinted in place or, at least, held splinted against the body prior to movement in order to help prevent further injury. Officers should not apply bandages or patches directly to the eyes, as pressure from dressings may actually worsen injury. Burn injuries should be treated as directed earlier in this document.

Hidden injuries from the blast can be life threatening. Anyone exhibiting symptoms of hidden injury should be rapidly assessed by medical personnel. These symptoms include difficulty breathing, chest pain, abdominal pain, nausea, vomiting, headache, vision problems, ear pain, or fluid coming from the ears or nose. As noted, hearing loss is common following a blast and need not be treated in the field. But anyone with blood or fluid coming from the ears, indicating a possible ruptured eardrum, was close enough to the blast to have potentially sustained other injuries and should therefore be transported to a hospital for closer evaluation.

VII. Equipment Review

Providing care to trauma victims in the field is challenging regardless of the amount of training. The first responder has no control over how many victims he or she might encounter, what problems those victims might present, or what kind of conditions will be faced. During the initial phase of a critical incident, it is not unusual for there to be a significant mismatch between what is needed and the equipment, supplies, and personnel that are actually available. First responders may be called upon to deliver care in situations that are far beyond the level of previous training scenarios. Their degrees of usefulness in these situations will primarily depend upon two things--how much they know and whether they have the necessary medical equipment and supplies on hand to put that knowledge into action. The first variable can be controlled through diligent study and ongoing training. The second requires forethought and preplanning. Officers may have no control over what kinds of medical equipment or supplies they may find on the scene but they do have control over what they carry intentionally. The greatest medical kit in the world in the patrol car could be rendered inaccessible by the tactical situation.

Law enforcement agencies that have taken the time to create tactical medicine policies and procedures usually divide their supplies and equipment into "levels." These levels can be designated by colors, numbers, letters, or the types of container used. The number of victims that can be cared for and the seriousness of the problems that can be dealt with usually rise with higher levels. The highest levels are usually reserved for tactical medical providers with extensive training. Overall there is an inverse relationship between capability and portability as one goes up the other usually goes down.

Patrol officers usually have to make decisions only about what they carry on their body (Level 1) or in their usual mode of transportation (Level 2). Lightness, compactness, and versatility are desirable attributes to look for when choosing items to carry. Each soldier in the military carries an individual first aid kit. Each team or unit carries the exact same kit, and it is carried in the exact same location. The designated medics carry one, as well as what they need for a given mission. Typically a soldier administers self-aid by using his or her own kit and buddy aid to a fellow soldier is administered by using that soldier's kit.

There will probably always be some debate about what an individual patrol officer's kit should contain. Most first responders want to be prepared for what they most commonly encounter and for those conditions where early treatment could really make a difference. These situations usually fall into five categories, problems with airways, breathing, circulation, wounds, or minor ailments.

The following is a list of items that officers can carry on their person or have immediately available in their mode of transportation. These items are presented as an example and are not to be construed as hard and fast recommendations. Routine first aid items, like pain medications, located in the patrol car should not be confused with lifesaving items that should be on the officer at all times, like tourniquets.

General

- flashlight
- nitrile rubber gloves
- antiseptic (alcohol, peroxide, iodine, etc.)
- Band-Aids
- eye wash

- pain medications (ibuprofen, acetaminophen, etc.)
- hand wipes

Airway

- nasopharyngeal airway

Breathing

- - CPR mask

Circulation

- tourniquets
- permanent marker
- compression dressings

Wounds

- trauma shears or scissors
- 1" or 2" wide tape
- gauze squares in various sizes
- gauze rolls
- simple splinting materials
- cellophane wrap

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