Hartford Consensus: A Call to Action for THREAT, a Medical Disaster Preparedness Concept

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It is a regrettable, but undeniable fact that our world is beset by intentional mass casualty events from either active shooters or improvised explosive devices. Such violence has been a growing part of the American experience for years; from 1999 through December 2012, there have been 30 episodes of mass shootings.[1] Throughout the world and in the United States, this pattern of episodic, unpredictable violence targeting members of the public shows no likelihood of abating in the future. Although efforts to mitigate these tragedies are commendable and should continue in earnest, strategies to improve the response to such events are needed to improve victim survival. The current response standard needs to change. This is a challenge because these events are complicated, multifaceted emergencies that require rapid management by various responders.

The Joint Committee to Create a National Policy to Enhance Survivability from Mass Casualty Shooting Events was formed to further delineate the problem and to identify the needed changes to improve survival. It was initiated by the American College of Surgeons (ACS) in an effort to ensure that victims receive expeditious treatment of their injuries. The ACS has long history of defining and promoting standards of trauma care.[2] Members of the Committee include individuals from select public safety organizations including health, law enforcement, fire, prehospital care, trauma care, and the military. The first meeting of the Committee was held on April 2, 2013 and a second meeting was held on July 11, 2013. Attendance at the second meeting was increased and included representatives from the Federal Emergency Management Agency (FEMA) and the National Security Staff of the Office of the President. These meetings became known as Hartford Consensus I and Hartford Consensus II. Two documents were produced—1 from each meeting—and these are also referred to as Hartford Consensus I and II.[3,4] The first paper is a concept document and the second is a call to action. Collectively, the ideas put forth and supported by both meetings are referred to as the Hartford Consensus. Participants of the Hartford Consensus are listed in Table 1.

National response to the Hartford Consensus has been swift and robust. In September 2013, the US Fire Administration of FEMA, US Department of Homeland Security, published a resource document to support planning and preparation for active shooter and mass casualty incidents.[5] The document indicates that the principles outlined by the Hartford Consensus should be incorporated into standard operating procedures because they are simple, basic, and proven to increase survivability. In addition, the US Fire Administration recommends the use of a checklist that incorporates the elements promulgated by the Hartford Consensus to evaluate responses to active shooter and mass casualty incidents.[5] Besides the US Fire Administration, national organizations have formally recognized the Hartford Consensus. These organizations are listed in Table 2.

Background

An analysis of past events helped to inform the Hartford Consensus. Notable occurrences include:

- The 1999 Columbine High School shooting in which 2 senior students shot to death 12 fellow students and a teacher, then killed themselves. Their actions were the result of a year-long plot that included plans to blow up the school and kill as many as 500 people.[6]
- In 2007, Virginia Tech became the site of the deadliest school shooting in US history when a student gunned

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Abbreviations and Acronyms

ACS = American College of Surgeons
ATLS = Advanced Trauma Life Support
EMS = emergency medical services
TCCC = Tactical Combat Casualty Care
TEMS = Tactical Emergency Medical Support
THREAT = Threat suppression, Hemorrhage control, Rapid Extrication to safety, Assessment by medical providers, and Transport to definitive care

down 56 people; 33 people including the shooter died in the massacre.[1]

- At the 2009 Fort Hood shooting, a US Army psychiatrist opened fire at a deployment center with a handgun, killing 13 and wounding 32 others.[1]
- On January 8, 2011, former US Congresswoman Gabby Giffords was shot in the head when a man opened fire at a public event in Tucson, AZ. Six people died and 13 others were wounded.[1]

Table 1. Participants of the Hartford Consensus

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Table 2. Organizations Formally Recognizing the Hartford Consensus

American College of Surgeons
American Trauma Society
Eastern Association for the Surgery of Trauma
Major Cities Chiefs Association
National Association of State EMS Officials
Society of Trauma Nurses
US Fire Administration

- In July 2012, during the midnight premiere of The Dark Knight Rises in Aurora, CO, a gunman killed 12 people and wounded 70 more.[7]
- On December 14, 2012, a 20-year-old man fatally shot 20 children and six adult staff members at Sandy Hook Elementary School in Newtown, CT.[8]
- On May 13, 2013, Mother's Day, in New Orleans, a parade in a local community was interrupted by a gunman who shot 19 individuals.[9] Four of the injured required immediate surgery for their life-threatening injuries. Tourniquets were used on at least 2 of the victims.

In reviewing these instances, what becomes apparent is the large number of individuals shot, the number of wounds per individual, and the short span of time in which the violence occurs. In the Virginia Tech attack, the perpetrator fired at least 174 rounds in a shooting spree that lasted 8 to 9 minutes; all of the victims were shot at least 3 times.[10,11] At the Fort Hood shooting, the gunfire lasted approximately 10 minutes, during which time the assailant and responding law enforcement officers expended at least 214 rounds.[12,13] During the Sandy Hook assault, the school shooting occurred in less than 5 minutes, with 154 shots from a Bushmaster .223-model rifle and a final bullet, fired from a handgun, that the attacker used to take his own life.[8] Connecticut's chief medical examiner said, "I believe everyone was hit more than once."[14]

At Columbine, no officers entered the building until about 40 minutes after the first 911 call from the school. After the 1999 Columbine massacre, law enforcement adopted "active shooter" policies. Instead of surrounding a building and waiting for the Special Weapons and Tactical (SWAT) team, officers now rush into the building and attempt to immediately end the threat.[15] This change in police tactics has undoubtedly saved lives.[16]

Noting the bombing of the Oklahoma City Federal Building in 1995 and the Boston Marathon in 2013, the devastating injuries associated with domestic improvised explosive devices are now added to active shooter incidents as a potential cause of intentional mass casualty penetrating injury. As the events above demonstrate, these

mass casualty incidents are not necessarily limited to large cities; any community can be the scene of a devastating attack. Because the principal cause of death from penetrating trauma is hemorrhage,[17] controlling bleeding during and after an event has emerged as a pressing need in the effort to improve survival from these acts of violence. As witnessed in Aurora and Boston, traditional roles and protocols assumed by police, emergency medical services (EMS)/fire/rescue, and bystanders need to be assessed in light of controlling exsanguinating hemorrhage and saving lives. Because death due to exsanguination from a proximal extremity vascular disruption can occur in as little as 4 to 5 minutes,[18] the typical sequential response of law enforcement followed by EMS/fire/rescue cannot happen fast enough to avoid preventable death.

Hartford Consensus I

The wisdom that evolved from the first consensus meeting was that expeditious control of victims' bleeding must be a priority. Because law enforcement officers are typically first on the scene and the first to encounter victims, they must accept hemorrhage control as one of their core responsibilities.[3] Currently most law enforcement personnel are not trained for the potential for external and internal hemorrhage. The acronym THREAT was established to describe the needed response to active shooter and intentional mass casualty events. T stands for threat suppression; H indicates hemorrhage control; RE stands for rapid extrication from the scene; A denotes assessment by medical providers; and T stands for transport to definitive care. The consensus is that basic "tactical" medical training is necessary for law enforcement officers. They should act in these events to control victims' bleeding. In doing so, they can serve as a critical, lifesaving link between the law enforcement phase of the operation and the rescue response. The need for early control of victims' hemorrhage by law enforcement is the primary principle set forth by the first Hartford Consensus.[3]

Hartford Consensus II

Given the very positive response to the April 2013 Hartford Consensus Statement, discussions began in early June 2013 to assemble a slightly larger group of leaders from the first responder, law enforcement, and medical communities to build on the momentum generated. Participants in Hartford Consensus II are listed in Table 1. The theme of a second meeting was to move from concept to action. The group met on July 11, 2013 and crafted the Hartford Consensus Statement II, which was available on July 18, 2013 and published in September 2013.[4] The fundamental principle underlying the Hartford Consensus efforts is that to maximize survival from an intentional mass casualty event there must be a continuum of care from the initial response to definitive care. The Hartford Consensus II Statement is a call to action: no one should die from uncontrolled bleeding.

The Hartford Consensus recognized that the current methods of responding to active shooter or intentional mass casualty events can be further improved.[4] Traditionally law enforcement, EMS/fire/rescue, and definitive trauma care have distinct responsibilities. Responses to intentional mass casualty events and their deployments have been viewed as separate actions conducted sequentially. Command structures and the language to manage events frequently differ between law enforcement and EMS/fire/rescue. Additionally, in the United States, public safety services are decentralized, with each jurisdiction implementing organization constructs that conform to local customs and resources. A more effective integration of actions is needed to further increase survival. Efforts are underway by the FBI and local police organizations to bring standardization of the law enforcement response to these events.[19] However, the standardization must cross the boundaries of the responding disciplines. Besides the focus on suppressing the cause of the event, coordinated attention must also be on the expeditious control of external hemorrhage at the scene and management of internal hemorrhage by rapid evacuation and transport to definitive care.

The Hartford Consensus II describes fundamental concepts that are needed to support the call to action. The call to action identifies specific groups that will respond to active shooter and intentional mass casualty events.[4] New considerations by each of the responding groups for the early control of hemorrhage are delineated.[4] A group not recognized before this is the public who will attempt to render care. The public can, and will, act as responders.

Public response

As has been demonstrated at the Boston Marathon bombings, the uninjured or minimally injured public will act as nonprofessional first responders.[20] Indeed, bystanders in Boston are credited with playing a critical role in the response by providing direct aid and comfort.[21] These bystanders assisted medical responders placing tourniquets, applying pressure to wounds, and transporting survivors to medical facilities. They demonstrated that people spontaneously help each other regardless of cultures, ethnicities, or nationalities.[22] It is now time to formally recognize the general public as a source of aid in mass casualty incidents. Communities everywhere should include the bystander-as-responder concept into

their planning, preparation, and training for active shooter and intentional mass casualty incidents.[21]

Law enforcement response

Many law enforcement professional organizations have endorsed the idea of tactical first aid for specialized law enforcement officers in high-risk units.[23] However, hemorrhage control techniques and equipment cannot be limited to those who respond well after the incident has been initiated. Wider and earlier deployment is clearly indicated to achieve maximal survival. One of the core concepts in improving survival from the active shooter is to ensure that first responding law enforcement officers have all the training needed to be proficient at hemorrhage control. As much as threat mitigation and evidence preservation are viewed as core law enforcement responsibilities, external hemorrhage control must also be viewed as a core law enforcement skill. In addition, law enforcement officers need to efficiently evacuate the wounded to places where they may be assisted by responding medical providers. Early prehospital hemorrhage control requires simple, but specialized equipment that should be readily available. Recent developments in federal and state grant funding should enable departments to acquire and deploy tourniquets and hemostatic dressings to all responding officers.[24]

Emergency medical services/fire/rescue response

The US fire Administration of the FEMA, US Department of Homeland Security, has issued the *Fire/Emergency Medical Services Department Operational Considerations and Guide for Active Shooter and Mass Casualty Incidents.*[5] This document was developed in consultation with individuals and groups involved in law enforcement, prehospital EMS, definitive hospital care, and public safety organizations and federal agencies. It is intended to serve as a resource for planning and preparation for active shooter and mass casualty incidents. This resource calls for fire and EMS agencies to incorporate the THREAT principles into their standard operating procedures and to jointly develop protocols and engage in mutual training programs. Further, the document calls for the use of common communication; EMS/fire/rescue must understand common law enforcement terms and law enforcement must understand common EMS/fire/rescue language. A unified command structure must be used so that it is clear who, what, when, where and how actions will be carried out. Although all tactics must be determined by local agencies, a specific recommendation of the Hartford Consensus is that the integration of EMS/fire/rescue much earlier in the response continuum is warranted. In addition, EMS must be brought closer to the scene of the victims to rapidly assess and treat the injured. In the event of fire, the firefighter leadership must provide and declare safe zones as soon as possible. To achieve these goals, federal, state, and local law enforcement agencies must seek new and different novel partnerships with EMS/fire/rescue that have never before been explored. Cooperation is critical.

However, the organization and resource bases available to address these incidents vary widely across the country. Changes and improvements to the emergency response system must originate at the local level to be successful. Officials of the EMS/fire/rescue in each community must consider changes to emergency responses based on their collective judgment of relative risk to public safety professionals vs the benefit to victims receiving survivable yet life-threatening wounds. Defining the level of risk across the geography of the incident location requires use of common terms and definitions understood by all involved agencies. Methods of compressing the time period between first response by the police and access to victims by EMS may include establishment of casualty collection points and EMS access corridors protected by police reinforcements, enhanced interaction between police tactical medical units and conventional EMS, nontraditional transport methods, development of combined local response plans through common training exercises, and full use of the Incident Command System.[3,4]

Definitive care

Many states within the US have implemented trauma systems by a designation process that attempts to ensure that severely injured patients will be triaged from the scene to designated trauma centers. Such prehospital triage to level I and level II trauma centers has been shown to decrease the death rate by 25%.[25] However, in disaster or multiple casualty scenarios, it is likely that many patients will self-triage to local facilities. In addition, many patients may be transported to trauma centers distant from the scene. Indeed, under many disaster conditions, scene assessment and transport is challenging, limiting steps in patient management. Because local facilities may not be trauma centers, it is imperative that all hospitals be prepared to accept and manage severely injured patients, to practice implementation of disaster plans, and be able to treat multiple traumatized patients with internal injuries.

As a condition of accreditation by the Joint Commission, all hospitals that provide emergency services or are designated as disaster receiving stations must perform at least 1 drill per year[26] using an influx from an outside organization of volunteer or simulated patients. Since 2002, emergency exercises must include a "community

wide" practice component. Hospitals that are close to facilities where people may gather such as shopping malls, schools, sports arenas, or movie theaters should be encouraged to include multiple casualty and shooting incidents in community wide scenarios to practice the rapid mobilization of surgical resources to the acutely injured. The rapid transfer of injured patients at the time of the Boston Marathon to local level 1 trauma centers without overloading the nearest medical facility was instrumental in contributing to an increased survival of victims.[20] Hospital disaster plans and drills should not stop at the emergency department door, but should test and examine emergency department and hospital-wide activation. Hospital-wide activation embraces management of multiple unidentified trauma patients (together with a process for firm identification of these patients as soon as possible), hemorrhage control including the correct use of tourniquets by emergency department staff, mobilization of the blood bank, availability of CT scanning, and acute care surgical availability with operating room activation. Plans should also include mechanisms for active and continuous communication and coordination between the hospital and prehospital personnel. Besides personnel and resources, preparation and practice are fundamental requirements to achieve optimal care of patients with severe injury, including external and internal hemorrhage. Further requirements for hospital accreditation and verification as trauma centers should be specified to enhance both the prehospital and definitive care capabilities to respond to active shooter and intentional mass casualty incidents.

The military experience

Tactical Combat Casualty Care (TCCC) is a set of prehospital trauma care guidelines that are customized for use on the battlefield to avoid the most common causes of preventable death in combat.[27-29] The TCCC guidelines have been responsible for unprecedented decreases in preventable death in combat units such as the 75 Ranger Regiment that train all unit members in lifesaving TCCC skills.[30,31]

The weapons used in active shooter incidents and in terrorist bombings that occur in civilian settings may result in injury patterns that approximate combat trauma. Just as in the military, casualties from such incidents may suffer preventable deaths from conditions such as extremity hemorrhage, junctional hemorrhage, tension pneumothorax, airway obstruction from direct maxillofacial trauma, or noncompressible torso hemorrhage.[32] External hemorrhage is readily treatable with simple devices, but these interventions must be undertaken without delay in order to avoid hemorrhagic shock. Bleeding from large arteries such as the femoral vessels may cause death within several minutes.[18] There is no such thing as a "Golden Hour" for casualties with exsanguinating hemorrhage. Studies of combat fatalities have shown that far more deaths result from bleeding than from airway problems.[32,33] Therefore, TCCC guidelines place control of external hemorrhage ahead of airway control—replacing the traditional ABC mnemonic (for airway, breathing, circulation) with MARCH: (Massive hemorrhage control/Airway support/Respiratory threats/Circulation/Hypothermia).[34]

Survival of military service members wounded in battle during the Afghanistan and Iraq conflicts has been dramatically increased by the widespread fielding and use of tourniquets for extremity hemorrhage control and hemostatic agents (applied with direct pressure) for control of external hemorrhage at anatomic sites that preclude the use of tourniquets.

Individual first-aid kits

No American service member goes onto a battlefield in 2013 without an individual first aid kit containing a tourniquet and a hemostatic dressing. Tourniquets used on the battlefield have been documented to be effective at decreasing preventable deaths due to extremity hemorrhage. A recent comprehensive study of 4,596 US combat fatalities from 2001 to 2011 noted that the incidence of preventable deaths from extremity hemorrhage dropped from 7.8% in a previous study to 2.6% by 2011, a decrease that coincided with the widespread fielding of tourniquets to US forces.[31,32] The number of US lives saved through the use of tourniquets alone is estimated to be between 1,000 and 2,000.[35] Despite previous warnings about limb ischemia, there was no preventable loss of limbs resulting from tourniquet ischemia in a case study of 232 patients with tourniquets on 309 extremities.[36,37] The Combat Application Tourniquet and the Special Operations Forces Tactical Tourniquet are 2 types of tourniquets in use at present by the US military.[28]

Direct pressure

Direct pressure can also be used to control bleeding from external bleeding sites. This technique works even with bleeding from major vessels such as the carotid or femoral arteries. However, casualties with such injuries often bleed to death despite attempts at direct pressure, because for direct pressure to be effective, it must be applied consistently and with significant force to stop the bleeding. Direct pressure is best applied with the patient on a firm surface so that effective counterpressure is present. To control severe bleeding, direct pressure must be sustained until the casualty reaches the operating room,

where surgical repair of the vessel can be performed. Direct pressure is not only external compression; it also includes wound packing.

Junctional hemorrhage control

Not all external hemorrhage is able to be controlled by extremity tourniquets. Some anatomic areas such as the neck, the groin, and the axilla contain large vascular structures that are not amenable to extremity tourniquet placement. The military now uses devices such as the Combat Ready Clamp, the Junctional Emergency Treatment Tool, and the SAM Junctional Tourniquet to control hemorrhage in these areas.[38]

Noncompressible hemorrhage control

Bleeding from internal organs or blood vessels as a result of trauma, referred to as noncompressible torso hemorrhage, requires rapid surgical intervention for definitive control. The emphasis for first responders of active shooter and intentional mass casualty events for these victims is on the REAT component of the THREAT acronym; they need rapid extrication, assessment, and transport to definitive care.

Tactical Combat Casualty Care in the civilian sector

Tactical Combat Casualty Care, as currently trained and executed throughout the US military, contains a number of interventions that are gaining increasing acceptance in civilian trauma care systems. The Committee for Tactical Emergency Casualty Care (C-TECC) has created guidelines to adapt TCCC principles for use in high threat civilian tactical and rescue operations.[39] These guidelines are referred to as Tactical Emergency Casualty Care (TECC). Although it may not be practical for the civilian sector to adopt all of the strategies used by TCCC to control hemorrhage, certain of the TCCC interventions seem likely to be helpful in improving survival from active shooter incidents or terrorist bombings. These interventions that should be easy to adopt in the civilian sector include:

1. Tourniquets to control extremity hemorrhage[36,37]
2. Hemostatic dressings to control bleeding from sites not amenable to a tourniquet[40,41]
3. "Sit up and lean forward" posture for casualties with direct maxillofacial trauma that results in either airway obstruction or bleeding into the airway.[42]

In addition, TCCC guidelines have been recognized by the civilian community as a beginning point for the standardization of protocols for Tactical Emergency Medical Support (TEMS),[42,43] which was initiated in the 1960s to support SWAT operations.[42] A goal of TEMS is to maximize survival of victims and minimize the threat to medical providers while supporting the law enforcement mission in hostile situations. Widespread support for TEMS now exists in the law enforcement and medical communities.[42] The National Tactical Officers Association (NTOA) recognizes TEMS as the standard of care for law enforcement special operations and views the TCCC guidelines as the foundation for TEMS protocols, practices, and training.[43-45] Further, the position of the National Tactical Officers Association is that every police officer should possess basic medical skills and equipment to save lives.[44] These skills include the control of life-threatening hemorrhage, triage of victims, security of casualty collection points and coordination with EMS.[44] This stance of the National Tactical Officers Association coincides with the recommendations of the Hartford Consensus.[3,4]

Education for THREAT

Implementing the actions called for by the Hartford Consensus II will require a comprehensive educational endeavor. All groups will need specific educational content. The public, including teachers and others who are frequently in places where large groups of individuals congregate, should be educated regarding the use of direct pressure and the application of tourniquets. Campaigns to educate the public regarding external hemorrhage could follow the model already in use by the American Heart Association and the American Red Cross to teach cardiopulmonary resuscitation. Hemorrhage control could be added to these existing programs. In addition, because teaching these techniques would not require extensive time, education could take place via public service announcements.

Although education of the public will be limited to external hemorrhage control and rapid transportation of victims to definitive care, education of law enforcement personnel and EMS/fire/rescue will require content pertinent to THREAT. Specific educational objectives and content will be developed to correspond to each letter of the acronym. The 2 overarching topics that need to be addressed are assessment and control of hemorrhage and coordinated incident command activities in which law enforcement and EMS/fire/rescue learn and practice together in a unitary manner. The education must be multidisciplinary and emphasize an integrated response.

Implementation of THREAT education could follow the processes used by the ACS to offer Advanced Trauma Life Support (ATLS) and the Advanced Trauma Operative Management (ATOM) course, and those of the National Association of Emergency Medical Technicians

(NAEMT) to offer Prehospital Trauma Life Support (PHTLS).[46-48] Prehospital Trauma Life Support has begun to teach the military TCCC course, which is appropriate for EMS and tactical medics and the Law Enforcement First Response Tactical Casualty Care course, which has been customized for nonmedical law enforcement officers.[49] These courses are inexpensive and will allow civilian organizations to benefit from the US military's lessons learned from treating combat casualties on the battlefields of Afghanistan and Iraq for the past 12 years. Education on THREAT could be incorporated into Prehospital Trauma Life Support. However, THREAT education could also be a stand-alone course. What is needed regardless of the educational forum is that THREAT education is standardized; it teaches an integrated response by all emergency personnel and it is taught using sound education principles, strategies, and evaluation methods.

Evaluation of the implementation of Hartford Consensus recommendations

A national, comprehensive evaluation plan needs to be developed and implemented. It should clearly delineate the evaluation objectives, strategies, and metrics to be used to assess the responses of the public, law enforcement, EMS/fire/rescue, and definitive care. Participation of these groups to develop and participate in the evaluation plan is critical. The evaluation should include examinations of each incident at the local level as well as a composite examination of all events at the national level. Although the evaluation should include an analysis of preventable death and disability, as is typically done in hospital morbidity and mortality conferences, it seems that use of methods similar to the military model to present an all-encompassing picture of the responses and consequences would be most useful to supplement examinations of separate events. It would be advantageous if a national database could be created that would be readily accessible to store and analyze data. The evaluation plan should include strategies for the timely and consistent disseminations of results.

CONCLUSIONS

The Hartford Consensus II Statement is a call to action: no one should die from uncontrolled bleeding. Preventable death after an active shooter or an intentional mass casualty event should be eliminated through the use of a seamless, integrated response system. The responders in this system include the public, law enforcement, EMS/fire/rescue, and those who provide definitive trauma care.

Unfortunately, active shooter and mass intentional mass casualty events will continue to happen; they will never be entirely prevented. Although law enforcement and EMS/fire/rescue seek ways to bring about a standard approach to these events to lessen their horrific consequences of injury and loss of life, more attention needs to be on focused hemorrhage control. As a proponent for high quality trauma care in both the prehospital and hospital environments, it is fitting that the ACS has initiated and participated in the Hartford Consensus. Other organizations are needed to join and actively endorse the effort. The Hartford Consensus II is a call to action that must not go unheeded.

Author Contributions

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