

Committee on Tactical Combat Casualty Care 7-8 September 2016 Atlanta, GA

Meeting Minutes

Dr. Frank Butler

Dr. Stephen Giebner

7 September 2016

1. Chairman's Welcome: Dr. Frank Butler, the Chairman of the Committee on Tactical Combat Casualty Care (CoTCCC), convened the meeting. After a review of the agenda, there were no conflicts of interest reported by the attendees. Dr. Butler gave a brief overview of the CoTCCC and Joint Trauma System (JTS) organization and the standard procedures of the CoTCCC for updating the TCCC guidelines. Dr. Butler presented TCCC certificates of appreciation to CoTCCC members COL Samuel Sauer and CMDCM Steve Viola, who are retiring from active service. He also presented a TCCC Special Award to COL (Retired) John Kragh and noted that, without Dr. Kragh's landmark research on tourniquet use in Iraq, "We would still be arguing about whether or not to use tourniquets, rather than discussing how to use them most effectively."

2. Combat Medic Presentation: SSG Ernest Parish and SSG Myles McKenzie (medics from the 75th Ranger Regiment) and LTC David King (surgeon) discussed the care of two casualties on a Special Operations mission in southeastern Afghanistan. Insertion was by helicopter and the landing zone was in difficult terrain. The enemy lay in wait in the target building. Ambient temperatures were 35-40° F, so all casualties had 3-4 layers of clothes on, complicating their care.

Six men were wounded on this mission. The comments that follow apply to the first two casualties. The first casualty was wounded by enemy fire from portholes in the walls as the team approached the target. He was moved to a secondary casualty collection point 50-75 meters further away from the target.

Casualty #1 had three gunshot wounds to his chest and other less critical wounds. He received a total of six needle decompressions (NDCs) for recurrent tension pneumothorax. The reconstituted freeze-dried plasma did not infuse well, so it had to be

administered with a syringe. Tranexamic acid (TXA) was given over two minutes in two boluses of 500 mg each. Events were unfolding rapidly and there was no time for vital signs, so this casualty was monitored throughout Tactical Field Care (TFC) by following only his mental status, which worked well.

It took about ten minutes to move the two casualties 100 meters to the landing zone for extraction. They waited another 10 minutes for the helicopter to arrive. When it did arrive, the planned loading order was reversed, which caused some initial confusion in Tactical Evacuation Care (TACEVAC) care.

LTC King then discussed the initial surgical care of casualty #1. When a chest tube was inserted on the right side, some air and a small amount of blood came out. The chest tube on the left side, however, produced over 2 liters of blood. At surgery, one of the gunshot wounds was found to have damaged the left inferior pulmonary vein, resulting in a traumatic cardiac arrest. Resuscitation required multiple units of plasma and red blood cells infused as rapidly as possible. It was so cold in the operating room that the pulse oximeter did not function properly and protective goggles fogged up. The blood products given were cold, despite being infused through a fluid warming device. The casualty reached a core temperature of 91° F as measured by esophageal probe. He was still hypothermic when he reached the Role III, but not coagulopathic. Dr. King believes that volume-restricted resuscitation (i.e. no crystalloids) contributed to this casualty surviving his very severe injuries.

Casualty #2 had gunshot wounds to one arm and one leg and a gunshot wound to his neck. Bleeding from both of the extremity sites was controlled with limb tourniquets.

Both casualties were also treated with a Hypothermia Prevention and Management Kit.

3. Senior Leader Remarks: Dr. Kathryn Brinsfield is the Assistant Secretary for Health Affairs and Chief Medical Officer for the Department of Homeland Security (DHS). The Office of Health Affairs is the principal authority for all DHS medical and public health issues related to homeland security. Her organization has about 3500 Emergency Medical Technicians and 140 paramedics. With regard to changing standards for pre-hospital trauma care in the United States, Dr. Brinsfield noted that:

- The American College of Surgeons Committee on Trauma now recommends applying a limb tourniquet if the wound is amenable and direct pressure is either ineffective or impractical. It recommends a topical hemostatic when the wound is not amenable to tourniquet placement. This algorithm is becoming the standard of care in the U.S.
- The Hartford Consensus proposes that no one should die from uncontrolled external bleeding. It calls for an integrated response by EMS systems, law enforcement, and Fire/Rescue following the T.H.R.E.A.T. acronym (**T**hreat suppression, **H**emorrhage control, **R**apid extrication to safety, **A**ssessment by

medical providers, and Transport to definitive care.) It also recommends training for civilian bystanders to enable them to act as immediate responders.

- *First Responder Guidance for Improving Survivability in Improvised Explosive Device and/or Active Shooter Incidents* (a DHS publication) calls for TCCC recommendations regarding hemorrhage control to be used in civilian mass casualty scenarios.

4. Senior Leader Remarks: Brigadier General Michael Talley is the FORSCOM Surgeon. Because of the success of the 2009 Secretary of Defense mandate to transport casualties in Afghanistan to a medical treatment facility within 60 minutes of mission approval, the public has come to expect rapid casualty evacuation. This may not be possible in the initial phase of our country's next war. The military will therefore need to be ready to perform Prolonged Field Care. The line community is ready to embrace what the CoTCCC recommends for prehospital care on the battlefield. Additionally, combat forces are now adapting to a readiness model where units must be constantly prepared to deploy instead of gradually ramping up for deployments over a two-year work-up period. Furthermore, units may be called upon to deploy in partial strength if their total capabilities are not needed. Our military will likely be used in novel ways in the future, such as responding to infectious disease epidemics or in support of humanitarian crises such as earthquakes or other natural disasters.

5. JTS Director's Remarks: CAPT Zsolt Stockinger discussed the possibility that the service military medical departments may be extensively restructured in the near future. The Military Compensation and Retirement Modernization Commission report dated 29 January 2015 noted that 15 of the 18 studies conducted between 1948 and 2011 recommended a unified medical command and that CONUS medical treatment facility (MTF) workload and case mix are insufficient to sustain the readiness of the medical force. It recommended that low-volume MTFs should close inpatient facilities. It also called for a 4-star Joint Readiness Command with 3-star Joint Service Medical Readiness Directorate.

The Military Health System (MHS) Modernization Study dated 29 May 2015 found that even though MTF productivity is generally below civilian metrics, closing MTFs is bad for medical readiness. The Defense Health Board (DHB) recommended in "Combat Trauma Lessons Learned from Military Operations of 2001-2013" that:

- A senior organization (e.g., DHA) should oversee trauma care;
- Command Surgeons should be fully competent to plan for trauma care;
- MTFs should partner with civilian trauma centers;
- There should be a registry of battlefield data;
- Each COCOM should have a trauma system; and
- TCCC is the battlefield standard of care and everyone should be trained in it.

There are provisions in the Senate version of the National Defense Authorization Act (NDAA) for 2017 that call for:

- Creating specialized care centers of excellence at major MTFs;
- Expanding military-civilian trauma training sites and requiring integrated trauma team training;
- Establishing quality of care outcome measures for combat casualty care;
- Focusing medical research on combat morbidity and mortality;
- A trauma care registry'
- Standardized Tactical Combat Casualty Care training.

There are similar provisions in the House version. The NDAA may lead to sweeping changes in military trauma care. The role and alignment of the Joint Trauma System is currently under review within the MHS, and will be addressed in a DoD instruction to be signed in the near future.

6. Point of Injury Antibiotics: COL Clint Murray, Infectious Disease Consultant to the Army Surgeon General, discussed the factors involved in the selection of antibiotics for combat wounds. These factors can be grouped into host, agent and environmental categories that together make up the epidemiologic triangle. Host factors include hygiene, nutritional status, immunological status, wound characteristics, co-morbidity, co-medication, host microbial flora, obesity, and age. Characteristics of the infectious agent(s) to be considered include which organisms are present, pathogenicity, inoculum size, colonization versus infection, aerobic versus anaerobic, and drug resistance. Environmental factors include water exposure, fecal contamination, prolonged field care, adequate supplies and healthcare infrastructure, plant material, open fracture, penetrating hollow/viscous organ injury, mechanism of injury, evacuation time and distance, nosocomial environment, and the presence of embedded objects. The choice of antibiotics should consider weight and cube limitations along with stability of the agent. Timing to initial antibiotic treatment, wound irrigation, wound closure, and evacuation time are also important considerations. COL Murray carries ertapenem for gut and head wounds and levofloxacin for gram negative extremity wounds in his personal medical kit.

7. US Border Patrol Special Operations Group: Supervisory Border Patrol Agent Matthew Curnoles is the Austere Paramedic Program Manager for the Border Patrol Search Trauma and Rescue Team (BORSTAR). He briefed the Committee on the mission, capabilities and training of BORSTAR.

The mission of the BORSTAR unit is to provide law enforcement, search, rescue, and medical response capabilities for the U.S. Border Patrol in support of the Border Patrol National Strategy. The BORSTAR unit also provides assistance to local, county, state, tribal, and federal entities by responding to law enforcement search and rescue requirements, acts of terrorism, potential terrorism, and natural disasters throughout the

United States. It also provides training, support and operational guidance when directed.

Members of BORSTAR have the following in their skill set:

- Incident Command System/ National Incident Management System training
- Land navigation
- Tactical Medic/Operator - TCCC
- Technical Rescue
- Air Operations/ Helicopter Rope Suspension Technician Master
- Swift-water Rescue Technician
- Emergency Medical Technician
- Paramedic/Austere Medicine
- Police Safety Diver
- Search and Rescue and Human Remains Detection Canine Handler

The Border Patrol conducts many missions in austere environments. BORSTAR members provide TCCC for these missions and provide the link to EMS.

8. Army Medical Department Center and School (AMEDDC&S) Capabilities

Development and Integration Directorate (CDID) Update: COL Lance Cordoni, the Senior Medical Consultant at CDID, noted that his organization helps develop future operational medicine capabilities for the Army. Its current primary focus is the incorporation of TCCC concepts (as recommended by the CoTCCC) throughout the Army, to include fentanyl lozenges, ketamine, TXA, and SAM Junctional Tourniquets. Other initiatives include an exportable TCCC training package, the Enhanced Combat Medic, Forward Surgical Teams conversion to Forward Resuscitative and Surgical Teams, and concepts of operation for early entry to new theaters including Field Hospital redesign.

9. Limb Tourniquet Update: Dr. John Kragh, a bleeding control researcher at the USAISR, discussed recent findings of interest to the CoTCCC.

- Prolonged exposure of limb tourniquets to the environment is associated with considerable degradation. Tourniquets to be used for treatment should be protected from the weather prior to use.

- Belts designed to serve as both trouser supports and limb tourniquets are now commercially available. Four models studied performed adequately for most metrics of performance.

- Pneumatic limb tourniquets have been designed for field use. Of those studied, the Emergency and Military Tourniquet (Delfi Medical) performed best. US Army doctrine developers are currently reconsidering pneumatic tourniquets for inclusion in some medical equipment sets. The process of officially considering a medic as an advanced battlefield trauma care provider worthy of a tourniquet that is more advanced than that used by the infantryman is valued for its psychological boost to the medic as well as for the improved device performance.

10. Comprehensive TCCC Guidelines Review: MSG (Ret.) Harold Montgomery, Operational Forces Liaison for the CoTCCC, briefed the Committee on his proposed Comprehensive Review change to the TCCC Guidelines. There are over 20 individual elements in this proposed change. These items were grouped together for consideration as components of a single change if they met at least one of three criteria:

- 1) the item is primarily tactical rather than clinical in nature;
- 2) the item is a relatively minor wording modification of an existing TCCC Guideline;
- 3) the item is one that is straightforward and non-contentious.

Mr. Montgomery reviewed the current list of items anticipated for inclusion in the change. Items that were met with general agreement were retained. Other items, such as eliminating the second dose of TXA as an element of prehospital care, were found to have less general acceptance and were removed from the Comprehensive Review change. These items will be considered separately at a later date.

11. TCCC RDT&E Update: Dr. David Baer, Civilian Deputy Director of the MRMC Combat Casualty Care Research Program (CCCRP) noted that the CCCRP remains dedicated to responding to capability gaps and requirements identified by the CoTCCC. Ongoing projects include: two dried plasma products (both freeze-dried and spray-dried) in development with FDA approval is anticipated by 2021; a plasma-only prehospital fluid resuscitation study; a DoD-FDA Panel to grant indications for medications or blood products of special interest to battlefield trauma care; a TATRC project to determine how to transmit unclassified medical data through classified networks; projects to examine new technology designed to determine the need for and adequacy of fluid resuscitation; a recent study documenting a reduced KIA rate associated with TCCC-recommended pre-hospital blood transfusion during TACEVAC in Afghanistan; and the Army TCCC “Squad Overmatch” project that is designed to improve the small-unit response – both medical and tactical – to combat casualty scenarios.

12. Prolonged Field Care: LTC Jamie Riesberg, the Officer-in Charge of the Special Operations Combat Medic (SOCM) course at the John F. Kennedy Special Warfare Center and School at Fort Bragg, presented an update on the work of the Prolonged Field Care Working Group. The Group’s mission is to: “Develop a forum for discussion, education and training, and suggest medical efforts to better prepare Special Operations Forces for medical and operational planning, and execution of medical evaluation, treatment and evacuation, of critical and serious casualties, managed in an austere environment.” Prolonged Field Care (PFC), as defined by the Working Group, is field medical care applied beyond doctrinal planning timelines. To date, ten capabilities have been recommended for PFC:

- Monitor the patient

- Resuscitate the patient
- Ventilate/oxygenate
- Maintain an airway
- Sedation/pain control
- Physical exam/diagnostic measures
- Provide nursing/hygiene care
- Advanced surgical interventions
- Telemedicine
- Prepare the patient for flight

LTC Riesberg presented the history and progress of the Working Group and discussed concepts for future development. PFC work products (clinical practice guidelines, background papers, discussion, etc) can be found at www.prolongedfieldcare.org.

13. TCCC Update: Dr. Frank Butler, the CoTCCC Chair, discussed recent developments in TCCC. Among other things, Dr. Butler touched on:

- The voting for the 2016 TCCC Award. For the first time ever, voting for this award resulted in a tie. This year's award will be therefore be shared by COL (Ret) Rocky Farr and Col Stacy Shackelford.
- The Army Chief of Staff has approved TCCC as a warrior battle drill.
- A number of recent publications indicate that there is an increasing awareness that fluid resuscitation for casualties in hemorrhagic shock is best accomplished with whole blood.
- We still need and do not have a Rapid Fielding Initiative for new TCCC medications and equipment. Examples of battlefield trauma care equipment items recommended but not yet fielded include junctional tourniquets, CricKey, and XStat.
- TCCC training is not being accurately and reliably accomplished throughout the DoD. The Military Training Network doesn't offer it. Available TCCC training courses are not standardized and incorrect messaging in some of these courses has resulted in a number of adverse casualty outcomes. The JTS-developed TCCC curriculum, as taught through the NAEMT training infrastructure, could address this training deficiency.
- The term "Tactical Combat Casualty Care (TCCC)" was developed as a US Military work product, and as such, should be in the public domain. A provisional trademark for this term that was inappropriately granted to a private sector individual several years ago and caused recurring issues in TCCC training and recommendations. This trademark has now been surrendered by the private sector individual after legal action contesting his ownership.
- New TCCC knowledge products that will soon be available include a bullet-formatted version of the TCCC guidelines, a TCCC Handbook, a TCCC Clinical Algorithm, and a TCCC Mobile application for personal electronic devices.

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14. Senior Leader Remarks: Major General Brian Lein, Commanding General of the U.S. Army Medical Command, noted that we need to get ready for the *next* war, not the last one. He expects that:

- Medics will need greater capabilities than they have today.
- The Golden Hour will not apply. Evacuation times will be longer.
- We will face different threats, such as thermobaric weapons.
- We must guard against overloading our medics with too much equipment, especially with items that serve only one purpose.
- Disease and Non-Battle Injury will continue to generate about 75% of evacuations in combat forces.

15. Combat Medic Presentation: SSG Matt Decker is a reserve component flight medic and an Emergency Department nurse in his civilian job. He presented a case from Helmand Province in Afghanistan from early 2016 that involved Prolonged Field Care. His helicopter answered a 9-line request for evacuation of a casualty with a gunshot wound to his right thigh. He treated the casualty in place for 17 hours because several problems prevented evacuation. Treatment included red blood cells, whole blood via Vampire protocol, fentanyl, ketamine drip, multiple attempts (finally successful) to convert the limb tourniquet to other means of hemorrhage control, and more.

SSG Decker's lessons learned included:

- A ketamine drip is good analgesia for PFC. (200 mg in 100 ml NS)
- It is important to have blood products in the field.
- Limb tourniquet conversion can be difficult - be persistent.
- Nursing care is important, especially when evacuation is delayed.
- Field expedient treatments can be very important.
- Expect the unexpected.

His recommendations:

- Teach medics how the body works, not just procedures.
- Provide medics with hospital clinical rotations.
- Sustain realistic point of injury care training.
- Arrange for Flight Medic-specific pre-deployment training.

16. Senior Leader Remarks: Dr. Paul Cordts, the Senior Executive Service Deputy for Medical Operations at the Defense Health Agency, discussed high-level guidance that supports CoTCCC and JTS initiatives.

- DoD Instruction (DoDI) 6040.GH codifies the JTS, the COCOM Trauma Systems, and the DoD Trauma Registry. This new instruction is at the 13th step (signature) of a 14-step procedure for promulgating DoD instructions. It will require that

the JTS publish a CoTCCC charter, publish updated TCCC guidelines annually, and establish a CAC-free access point for all DoD personnel to access TCCC training material.

- DoDI 1322.24 covering Medical Readiness Training, is under revision. It will provide standardization of TCCC training for both medical and non-medical personnel throughout the DoD.

- DoDI 6000.11, Patient Movement, and DoDI 5154.06, Armed Services Medical Regulating, are being updated and combined into one instruction.

17. Fresh Whole Blood at the Point of Injury (POI) in the 75th Ranger Regiment:

LTC Ethan Miles, the Regimental Surgeon, discussed their “Ranger Type O Low Titer program. All Regiment members are typed and their anti-A, anti-B titers determined. They may be asked to donate fresh whole blood in theater. In testing to date, 45% are type O, and of these, 59% are low-titer. This means that approximately 1/3 of the Regiment’s Soldiers are potential universal whole blood donors. This works out to about 12 per platoon and 1 to 2 per squad.

In addition to performing Ranger-to-Ranger transfusions at the POI, the Regiment is working with the Armed Forces Blood Program Office to have Type O Low Titer blood obtained from the general population and shipped forward. Cold-stored whole blood is shipped to the active theaters weekly and can be stored for 21 days. A transfusion protocol is in place.

18. Three Things I Would Change About TCCC: Col Ray Fang, is an Air Force trauma surgeon and Associate Professor of Surgery at the University of Maryland R. Adams Cowley Shock Trauma Center. He is also the Director of the Air Force C-STARs program there. He noted that his recommendations about TCCC are more strategic than clinical. He suggested that the DoD should:

1. Specify consistent TCCC training requirements for deploying personnel, preferably including field and simulation training.
2. Mandate TCCC-based training for all DoD personnel, both deployed and in garrison.
3. Revise TCCC educational materials to optimize retention for adult learners with diverse medical backgrounds.

19. Saving Lives on the Battlefield: Return to Iraq: COL James Geracci, the III Corps Command Surgeon, described the state of TCCC capability of his forces in Iraq during the period from September 2015 to August 2016. During that time, COL Geracci has been deployed as a Task Force Surgeon, so he has in essence “spent the last year fighting our next war.” He reports that in Iraq presently there is:

- Non-doctrinal employment of Health Service Support (HSS) assets universally across the theater
- Inadequate trauma care policy guidance and implementation

- An absence of deployed trauma systems
- Significant training gaps (TCCC, trauma CPGs, CBRN, etc.)
- Significant documentation and information Technology gaps
- Inadequate operational medicine leadership

COL Geracci concluded that:

- HSS doctrine/organization is lagging and does not support evolving operational requirements.
- Medical policy requires amplification, command emphasis, and enforcement.
- Trauma training (initial and sustainment) is inadequate to provide a trained and ready deployable medical force.
- Leader development and talent management is inadequate to meet operational medicine leadership requirements.
- Equipping processes (procurement/ fielding/supply chain management) for medical equipment are inadequate.

COL Geracci recommends that:

- 1) We should accelerate changes in doctrine (how we support) and organization (the way we organize to support), making them more reflective of lessons learned and evolving operational constructs.
- 2) We should institute initial and sustainment TCCC training at appropriate skill levels for all.
- 3) We should accelerate the fielding of new medical equipment.
- 4) Talent development and management in battlefield trauma care delivery must be deliberate, longitudinal, and properly valued.
- 5) We must be innovative in maintaining combat casualty care skills in a peacetime environment.
- 6) Command buy-in and mandates at all levels (Company-level to SecDef) is essential for success in combat casualty care.
- 7) The DHA and the services should establish Battlefield Medicine Directorates.
- 8) Subject Matter Expertise, Quality Assurance and Continuous Process Improvement must be sustained.

COL Geracci's observations and recommendations are being compiled as a follow-up publication to the "*Saving Lives on the Battlefield*" 1 and 2 reports.

20. A National Trauma Care System: Dr. John Holcomb, formerly the Commander at USAISR and Trauma Consultant for the Army Surgeon General, discussed the findings and recommendations of the recent National Academy of Sciences, Engineering, and Medicine (NASEM) study on the trauma care lessons learned from Iraq and Afghanistan and their implications for civilian trauma systems. Dr. Holcomb was a member of the NASEM panel that produced this report and noted that the goal in both the military and civilian sectors is to achieve zero preventable deaths after injury.

Findings from the NASEM study include:

1) The absence of any higher authority to encourage coordination, collaboration, standardization, and alignment in trauma care across and within the military and civilian sectors has resulted in variations in practice, suboptimal outcomes for injured patients, and a lack of national attention and funding directed at trauma care.

2) Within the military leadership structure, there is no overarching authority responsible for ensuring medical readiness to deliver combat casualty care.

3) Responsibility, authority, and accountability for battlefield care are diffused across central and service-specific medical leadership, as well as line leadership.

4) An inconsistent level of understanding by senior medical and line leadership of the value of a learning trauma care system impedes continuous learning and improvement.

5) There is no one person who is responsible for all of combat casualty care, every day.

6) Authority and accountability for civilian trauma care capabilities are fragmented and vary from location to location, resulting in a patchwork of systems for trauma care in which mortality varies twofold between the best and the worst trauma centers in the nation.

7) There is no federal civilian health lead for trauma care (including prehospital, in-hospital, and post-acute care) to support a learning health system for trauma care, despite past recommendations that such a lead agency be established.

8) The collection and integration of trauma data across the care continuum is incomplete in both the military and civilian sectors.

9) Military and civilian trauma management information systems rely on inefficient and error-prone manual data abstraction to populate registries.

10) Data are fragmented across existing trauma registries and other data systems, and data sharing within and across the military and civilian sectors is impeded by political, operational, technical, regulatory, and security-related barriers.

11) In both the military and civilian sectors, performance transparency at the provider and system levels is lacking.

12) Providers lack real-time access to their performance data.

13) No process exists for benchmarking trauma system performance across the entire continuum of care within and between the military and civilian sectors.

14) Military participation in national trauma quality improvement collaboratives is minimal; only a single military hospital participates in an ACS TQIP.

15) Despite its significant societal burden, civilian investment in trauma research is not commensurate with the importance of injury.

16) Sustainment of DoD's trauma research program is threatened, although gaps identified in DoD's Guidance on Development of the Force remain less than 50 percent resolved.

17) Trauma care practices developed through a focused empiricism approach need to be validated by higher quality collaborative research studies.

18) In the civilian sector, no mechanism exists for directing research investments toward identified gaps, a problem exacerbated by the absence of a centralized institute dedicated to trauma and emergency care research.

19) The ambiguity between quality improvement and research slows and even impedes quality improvement and research activities.

20) FDA and DoD requirements for informed consent impede needed trauma research; ironically, these regulations make minimal risk research the most difficult to perform.

21) Common misperceptions about HIPAA regulations present barriers to using and sharing data across systems for both direct patient care and research purposes.

22) Greater flexibility in evidentiary standards (within legal constraints) could enable better leveraging of large bodies of clinical data for critically needed life-saving products.

23) More systematic interface between the FDA and the DoD is needed to facilitate more timely fielding of diagnostic and therapeutic products.

24) The greatest opportunity to save lives after injury is in the prehospital setting.

25) Prehospital care is not currently linked to health care delivery reform efforts.

26) Variable standards of care, a paucity of universal protocols and current reimbursement practices for civilian EMS (i.e., pay-for-transport) are major impediments to the seamless integration of prehospital care into the trauma care continuum.

27) The military's teleconsultation programs in theater are jeopardized by a lack of funding and institutionalization.

28) While best practices in telemedicine exist within the United States (e.g., Project ECHO), this tool is not used to its full potential in military or civilian trauma care.

29) Expansion of the scope of the Senior Visiting Surgeons program to providers other than surgeons could broaden its impact and improve the exchange of tacit knowledge between military and civilian providers.

30) More formal methods for military-civilian collaboration could better translate military best practices and its agile approach into civilian guideline development processes.

31) Policy and operational barriers—variable trauma workload, beneficiary care responsibilities, and the lack of defined trauma care career paths—impede the military's ability to recruit, train and retain an expert trauma care workforce.

32) The DoD lacks validated, standardized trauma training and skill sustainment programs.

33) The military's reliance on just-in-time (e.g., trauma courses, short-duration pre-deployment training programs) and on-the-job training does not provide the experience necessary to ensure an expert trauma care workforce. Providers need to regularly care for trauma patients.

34) Officer and enlisted leadership courses attended by senior line and medical leaders do not provide education and training on trauma system concepts, resulting in a lack of understanding of such concepts by those who are responsible for the execution of the theater trauma system.

35) Promotion incentives for military medical personnel are misaligned; current promotion structures do not encourage or reward the growth of clinical trauma-focused expertise.

The recommendations from the NASEM report include:

1) The White House should set a national aim of achieving zero preventable deaths after injury and minimizing trauma-related disability.

2) The White House should lead the integration of military and civilian trauma care to establish a national trauma care system.

3) The Secretary of Defense should ensure that combatant commanders and the Defense Health Agency (DHA) Director are responsible and held accountable for the integrity and quality of the execution of the trauma care system in support of the aim of zero preventable deaths after injury and minimizing disability.

4) The Secretary of Health and Human Services (HHS) should designate and fully support a locus of responsibility and authority within HHS for leading a sustained effort to achieve the national aim of zero preventable deaths after injury and minimizing disability. This leadership role should include coordination with governmental (federal, state, and local), academic, and private-sector partners and should address care from the point of injury to rehabilitation and post-acute care.

5) The Secretary of HHS and the Secretary of Defense, together with their governmental, private, and academic partners, should work jointly to ensure that military and civilian trauma systems collect and share common data spanning the entire continuum of care. Measures related to prevention, mortality, disability, mental health, patient experience, and other intermediate and final clinical and cost outcomes should be made readily accessible and useful to all relevant providers and agencies.

6) To support the development, continuous refinement, and dissemination of best practices, the designated leaders of the recommended national trauma care system should establish processes for real-time access to patient-level data from across the continuum of care and just-in-time access to high-quality knowledge for trauma care teams and those who support them.

7) To strengthen trauma research and ensure that the resources available for this research are commensurate with the importance of injury and the potential for improvement in patient outcomes, the White House should issue an executive order mandating the establishment of a National Trauma Research Action Plan requiring a resourced, coordinated, joint approach to trauma care research across DoD, HHS, NIH, CDC, DOT, VA, FDA, the Agency for Healthcare Research and Quality, the Patient-Centered Outcomes Research Institute), and others (academic institutions, professional societies, foundations).

8) To accelerate progress toward the goal of zero preventable deaths after injury and minimizing disability, regulatory agencies should revise research regulations and reduce misinterpretation of the regulations through policy statements (i.e., guidance documents).

9) All military and civilian trauma systems should participate in a structured trauma quality improvement process.

10) Congress, in consultation with HHS, should identify, evaluate, and implement mechanisms that ensure the inclusion of prehospital care (e.g., emergency medical services) as a seamless component of health care delivery rather than merely a transport mechanism.

11) To ensure readiness and to save lives through the delivery of optimal combat casualty care, the Secretary of Defense should direct the development of career paths for trauma care. Furthermore, the Secretary of Defense should direct the Military Health System to pursue the development of integrated, permanent joint civilian and military trauma system training platforms to create and sustain an expert trauma workforce.

A free PDF of the 480-page report is available at <http://www.nationalacademies.org/hmd/Reports/2016/A-National-Trauma-Care-System-Integrating-Military-and-Civilian-Trauma-Systems.aspx>

21. Harnessing the Power of TCCC in Civilian Tactical Medicine: Dr. Alex Eastman is the Director of the Rees-Jones Trauma Center in Parkland, Texas. He is also a Lieutenant with the Dallas Police Department SWAT unit. He reviewed the history of active shooter events in the U.S. since 2000 and the response of law enforcement and fire and rescue to this increasing problem. Overall national progress in civilian prehospital trauma care is summarized in this chart:

	Yes	No
Data Collection System		
Evidence Based		
TCCC Extrapolation		
Public Access / NTP Programs		
LE Program Penetration		
Fire/Rescue/EMS Integration		
Evidence-Based Modeling		
TCCC Documentation		
Preventable Death Analyses		

Groups such as the Hartford Consensus, the White House (in its Stop the Bleed campaign), and the NAEMT (with its Bleeding Control course) have provided national leadership in translating TCCC advances into the civilian sector, but much work remains to be done in this area.

(Chairman’s note: Dr. Eastman is now a Special Government Employee for the Department of Homeland Security and was designated as the DHS liaison to the CoTCCC in the weeks following the meeting.)

22. DHA MEDLOG CoTCCC Brief: CAPT Rick Zeber, the Head of the DHA Medical Logistics section (DHA MEDLOG) reviewed the history, organization, function, and manning of DHA MEDLOG. The new DoD Instruction 6430.02 governing medical logistics will say “...The Military Departments and Defense Agencies shall participate in and support collaborative defense medical logistics programs and initiatives to promote jointness, fiscal sustainability, and readiness to support globally integrated health services.” Recent issues addressed or currently being addressed by MEDLOG include:

- The CAT Gen 7 tourniquet keeps the same NSN as CAT Gen 6.
- Ordering TXA in a vial that is not glass.

- The Combat Wound Medication Pack gets a second extended release acetaminophen tablet.

23. Medical Content Delivery Service Project Brief: Mrs. Cynthia Barrigan is a Senior Innovation Strategist in the Office of Strategy Management (OSM) at the Defense Health Agency and serves as the Program Manager for the Ready Medical Force initiative- a flagship initiative at the DHA focused on prototyping informatics solutions to assist the Services with improving medical readiness. She briefed the group on the purpose, goals and approach of this DHA project which will design new knowledge products to help medical personnel practice, prepare for, and perform medical duties in support of a range of overseas military operations. The project will ultimately address multiple topic areas in deployed medicine, but will start with TCCC. DoD medics, corpsmen, and PJs at present don't always receive new TCCC information in a timely manner and this may contribute to preventable deaths on the battlefield. A recent survey found that 86% of combat medical personnel believe that better access to TCCC information via personal mobile electronic devices would improve their medical readiness. The survey also found that 99% of military medical personnel between the ages of 17 and 34 own a personal mobile device.

The goals of the MCDS project are to improve discovery and usability of relevant medical content; to enhance retention of essential knowledge and skills; to provide metrics and track medical readiness; and to adapt and improve the delivery of medical knowledge products as driven by medic needs. The MCDS will identify and apply the most effective techniques for creating learning resources, engaging the audience, enhancing retention, and reducing error rates. It will then combine an optimized learning design with a modern delivery platform that feels familiar and mainstream to millennial users.

Mr. Harold Montgomery is the primary CoTCCC liaison for this effort and leads a medic working group established to provide TCCC input to the project. A temporary CoTCCC website (CoTCCC.com) has already been set up to start the process of organizing the delivery of TCCC knowledge products through a single authoritative resource. In 2017, the system will offer TCCC content that can be converted to multiple mobile formats; an editorial suite that provides for authoring and publishing new content; and delivery of content across the mobile formats. In 2018, the system will include interactive learning services and personalized tracking and assessment. CoTCCC.com also enables combat medical personnel, physicians, and PAs to provide feedback and suggestions about how to improve TCCC.

The designed end state isn't just the website. It is a platform that will facilitate knowledge transfer and promote engagement in the TCCC process to the entire TCCC stakeholder community. Since it is intended to be a website and mobile platform "By the Medics and For the Medics," it will be a network that medics will want to return to repeatedly to find content that matters. It is a readiness tool that informs individuals, unit leaders, and commanders. It will ultimately be a resource for all deploying personnel

and will be able to help provide support to other federal agencies, state and local agencies and partner nations. A demonstration of Version 1 of the prototype TCCC Mobile is planned for the next CoTCCC meeting.

(Chairman's Note: The "Medical Content Delivery Service Project" has now been renamed the "Ready Medical Force (RMF) Initiative." Their website is: ReadyMedicalForce.com.)

24. TCCC in the Bureau of Alcohol, Tobacco, Firearm, and Explosives (ATFE):

Special Agent Josh Knapp described the Operational Medical Support Program in ATFE. ATFE currently has approximately 5,000 employees, including 2,500 Special Agents. Its personnel are stationed nationwide with a small OCONUS presence in Canada, France (Interpol HQ) and Central America. The mission of the ATFE is to investigate violent crime related to firearms, explosives, and arson as well as to regulate the explosives and firearms industries.

The ATFE Operational Medical Support Program (OMSP) is modeled on the US Army's 68W medic program. Administrative control is centralized under a program manager at ATFE headquarters. Medical oversight is provided via a contractual arrangement with the Johns Hopkins Hospital Department of Emergency Medicine. The OMSP has 70 Special Agent Medics stationed nationwide. NREMT EMT-Basic is their baseline certification, and the medical director grants an extended scope of practice based upon training and protocols. Their skills include:

- Standard EMT BLS skills
- Advanced skills (King Airway, needle decompression, IV/IO)
- Non-prescription and prescription medications including TXA. (Narcotics are excluded because of regulatory constraints.)
- Sick Call training

After the experience of the Border Patrol's BORSTAR program, the OMSP adopted TCCC, and it is now integrated into their tactical training scenarios for their Special Response Teams (SRT). The SRT medic prehospital trauma skill set is focused on CAT tourniquets, NPAs, chest seals, hemostatic dressings, hypothermia prevention, and pressure bandages. Following the Ranger First Responder Program, SRT non-medical operators are also required to be proficient in tourniquet application, hemostatic dressings, NPAs, chest seals, and hypothermia prevention. Bureau-wide, all ATFE Special Agents are participating in TCCC-based training (classroom and scenarios) provided by the SA medics as part of tactical sustainment training. Special Agents carry the ATFE Gunshot Wound Medical Kit (their version of an IFAK).

In summary, ATFE tactical medical training - using lessons learned from TCCC - has vastly increased the survivability of ATFE Special Agents and members of the public injured by criminal violence as well as suspects.

25. Junctional Tourniquets: Dr. Russ Kotwal discussed the current status of junctional tourniquets (JTs) in TCCC and reviewed recently published research and case reports of their use. Highlights from his talk:

- There are 4 JTs currently FDA-cleared to consider: the Combat-Ready Clamp (CRoC); the Junctional Emergency Treatment Tool (JETT); the Sam Junctional Tourniquet (SJT); and the Abdominal and Aortic Junctional Tourniquet.
- 3 JTs are currently recommended by the CoTCCC: the CRoC, the JETT, and the SJT.
- 3 JTs have published case reports documenting use and potential contribution to lives saved in prehospital setting: the AAJT, the CRoC, and the SJT.
- 2 JTs are dual purposed with the potential to both control external junctional hemorrhage as well as to stabilize pelvic fractures: the JETT and the SJT [the SJT is FDA-cleared for this indication.]
- 2 JTs have the most positive metrics from USAISR studies: the CroC and the SJT.
- Abdominal application of the AAJT for 2 hours has been shown in animal models to cause respiratory arrest in spontaneously breathing animals.

26. The Role of Pelvic Binders in TCCC: Dr. Butler reviewed the pending change to add pelvic binders to the TCCC Guidelines for COL Stacy Shackelford, who was deployed at the time of the meeting.

Regarding the epidemiology of pelvic fractures:

- 26% of service members who died in OEF/OIF had a pelvic fracture
- Bleeding pelvic fractures with hemodynamic instability have up to 40% mortality
- Pelvic fracture is often associated with extra-pelvic hemorrhage from other injuries (chest 15%, intra-abdominal 32%, long bones 40%)
- 93% mortality for pelvic fractures with severe sacroiliac joint disruption
- Open pelvic fractures in the combat wounded have a 68% mortality

Pelvic binding can be performed by medics in the field. Binding will reduce pubic diastasis and tamponade low-pressure venous bleeding. It may not control arterial hemorrhage. Discussion by the group favored the following indications for pelvic binder application:

Severe blunt force or blast injury with one or more of the following:

- Pelvic pain
- Any major lower limb amputation or near amputation
- Physical exam findings suggestive of a pelvic fracture

Also consider pelvic binders for:

- Unexplained shock (SBP < 100 or HR > 100)
- Unconsciousness

With respect to the type of binder used, there is weak evidence to suggest that a commercial device is more effective in controlling hemorrhage than an improvised sheet. There is no evidence that any of the 3 commercially available compression devices is superior to the others.

COL Shackleford recommends that, in TCCC, a pelvic binder should be considered in the control of hemorrhage during the “Circulation” phase of the MARCH algorithm, after control of massive external hemorrhage and addressing airway or respiratory compromise, but before reassessment of tourniquets and intravenous access. The recommendation for the Pneumatic Anti-Shock Garment is recommended for removal from the TCCC guidelines because of a relative lack of evidence for benefit in comparison to pelvic binders. Her proposed wording for the pelvic binder change is:

Tactical Field Care

4. Bleeding

- b. For compressible **external** hemorrhage not amenable to limb tourniquet use or as an adjunct to tourniquet removal, use Combat Gauze as the CoTCCC hemostatic dressing of choice.

Alternative hemostatic adjuncts:

- Celox Gauze or
- ChitoGauze or
- XStat (Best for deep, narrow-tract junctional wounds)

Hemostatic dressings should be applied with at least 3 minutes of direct pressure (optional for XStat). Each dressing works differently, so if one fails to control bleeding, it may be removed and a fresh dressing of the same type or a different type applied.

- c. Place a pelvic binder for suspected pelvic fracture:

Severe blunt force or blast injury with one or more of the following indications:

- Shock (SBP < 100 or HR > 100)
- Unconsciousness
- Pelvic pain
- Any major lower limb amputation or near amputation
- Physical exam findings suggestive of a pelvic fracture

Tactical Evacuation Care

Same wording for pelvic binders as above.

REMOVE from the Guidelines:

17. The Pneumatic Antishock Garment (PASG) may be useful for stabilizing pelvic fractures and controlling pelvic and abdominal bleeding.

Application and extended use must be carefully monitored. The PASG is contraindicated for casualties with thoracic or brain injuries.

The Chairman will conduct the vote electronically after a review by Col Shackelford of feedback from the meeting for this recommended change.

(Chairman’s note: The wording for the indications for pelvic binder portion of this change was subsequently revised by Col Shackelford and the proposed change was approved by electronic vote.)

27. TCCC Action Items: Dr. Butler reviewed the pending action items for the CoTCCC:

a. Opportunities to Improve in TCCC

	Yes	No
Evidence-Based	Green	Grey
Continually Updated	Green	White
Strategic Messaging	Green	Grey
Medical Rapid Fielding Plan	White	Red
TCCC Training Standardized and Mandated	Grey	Red
Physician TCCC Training	White	Red
DoD-FDA Panel	Grey	Red
TCCC Documentation	White	Red

b. Proposed Changes to the TCCC Guidelines

- Comprehensive Review – MSG (Ret.) Harold Montgomery
- iGel as the supraglottic airway of choice in TCCC – Dr. Mel Otten
- Increase ketamine initial dose - TBD

c. Potential Future Changes to the TCCC Guidelines

- Reword positioning for needle decompression
Injured side up

- Review options for decompression of tension pneumothorax
 - Finger thoracostomy
 - Veres needle (Dr. Peter Rhee)
 - ThoraQuik
 - 10 Fr Vygon thoracic trocar (IDF)
 - Donaldson Needle
 - Other?
- Foley balloon catheter treatment of head and neck bleeding vs XStat or Combat Gauze plus iTClamp
- Manual compression of the abdominal aorta for junctional hemorrhage if no junctional tourniquet is available and Combat Gauze is not working
- Review the use of c-collars and spinal immobilization in TCCC
- Traction splinting recommendations

d. Items for review following FDA Approval

- ResQFoam
- Compensatory Reserve Index Monitor OR POI lactate monitoring OR tissue O2 saturation monitor

e. Items for Review after USAISR Testing

- AAJT (1-hour limit)

e. TCCC Curriculum – Changes under Consideration

- New material on the Raid on Entebbe – compare to the 2012 SEAL hostage rescue operation in Afghanistan
- More emphasis on tightening the CAT encircling band before starting to turn the windlass
- Anatomic demonstration of NDC sites using training buddies (as is currently done for surgical airway incision site)
- Expansion of IV medication skill sheets and practical
- Suggestions for TCCC training beyond the 2-day JTS TCCC course?

Acknowledgments

The authors gratefully acknowledge the ongoing efforts of all of the members of the TCCC working group, our invited speakers, and other meeting attendees to improve the battlefield trauma care provided to our countries' combat wounded.

Disclaimers

The opinions or assertions contained herein reflect the events of the August CoTCCC meeting. They are not to be construed as reflecting the views of the Department of the Army or the Department of Defense.



31 Dec 2016

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CAPT, MC, USN (Ret)
Developmental Editor
Committee on TCCC

Date



31 Dec 2016

Frank K. Butler, M.D.
CAPT, MC, USN (Ret)
Chairman
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Date

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HMCS Mark Boyle
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Mr. Don Parsons
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Mr. Rick Strayer
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Ms. Cynthia Barrigan	OASD/HA
Mr. Matthew Curnoles	Border Patrol
SGT Matthew Decker	68WF3 Flight Medic
Dr. Alexander Eastman	Dallas PD/Parkland Hospital
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