

CoTCCC Meeting 3-4 February 2014 Atlanta, GA

Selected Meeting Highlights

15 February 2015

Dr. Frank Butler

COL Lance Cordoni

3 February 2015

1. Combat Medic Presentation: SFC Matthew Hoard, a Special Forces medic, discussed a case in Afghanistan in 2013 where an RPG-7 round impacted an RG-33 armored vehicle and resulted in bilateral lower extremity injuries to a team member. The Junctional Emergency Treatment Tool (JETT) was applied and was effective at halting the junctional bleeding; however, two issues arose. Firstly, the JETT became dislodged during patient transfer; secondly, the receiving FST was unfamiliar with the JETT device and cut the tourniquet off upon patient arrival. The Soldier later died of wounds.

The AAJT was also discussed and it was noted that the AAJT is now approved for a 4-hour application; but a Combat Ready Clamp (CrOC) applied at the umbilicus in order to occlude flow in the distal abdominal aorta (analogous to the AAJT) for 2 hours resulted in muscle necrosis and bowel ischemia. Application of the AAJT also results in significant pain (as do extremity tourniquets) and is difficult for a casualty to tolerate.

2. TCCC Update: CAPT (ret) Frank Butler, Chairman of the CoTCCC provided a review of recent changes to the TCCC Guidelines and other current TCCC issues.

a. Combat Gauze remains the first choice for a hemostatic dressing in TCCC. ChitoGauze and Celox gauze are acceptable alternatives if Combat Gauze is not available. These two hemostatic dressings have been shown to be equal in efficacy to Combat Gauze, They have not been tested in the US Army Institute of Surgical Research safety model, but both are chitosan-based products in a gauze format (similar to the previously used HemCon dressings) and no adverse events were noted as a result of HemCon use during the 4 years

that it was fielded as the US Army and USSOCOM hemostatic dressing of choice.

b. The recent change in fluid resuscitation from hemorrhagic shock in TCCC recommended the following order of precedence:

1. Whole Blood
2. 1:1:1 RBCs:thawed fresh frozen plasma (FFP):platelets
3. 1:1 RBCs: FFP
4. (4-way tie): Liquid (never frozen) plasma, thawed FFP, reconstituted dried plasma, RBCs only
8. Hextend
9. (Tie) Lactated Ringers or Plasma-Lyte A

c. Damage Control Resuscitation, as developed by the c. US Army Institute of Surgical Research (USAISR) and implemented by the DoD's Joint Trauma System (JTS), has been definitively proven to save lives. Efforts to expand pre-hospital blood product use, especially whole blood, should be continued and expanded.

d. Normal Saline (NS) is NOT recommended due to studies showing that NS is associated with hyperchloremic metabolic acidosis.

e. Tourniquets: A 2 hour re-check of tourniquets applied during Care Under Fire or Tactical Field Care to determine if tourniquet removal is feasible and hemorrhage control can be maintained with Combat Gauze or other means is now mandatory. This does not replace the frequent re-checks of tourniquets to assess for continued efficacy in bleeding control. If the site of extremity bleeding is not immediately obvious to the TCCC provider, initial TQ placement during Care Under Fire should be "high and tight" until time permits a more precise determination of bleeding location and subsequent relocation of the tourniquet to a site just proximal to the bleeding.

f. The CoTCCC now recommends the use of ondansetron, as opposed to the previously-recommended promethazine, for control of opioid or trauma-induced nausea and vomiting. This recommendation was approved by a vote of 41-0. The dose is 4 mg with a repeat dose of another 4 mg in 15 minutes if the first dose is ineffective. 8 mg every 8 hours is the maximum dose. Ondansetron may be given IV, IM, IO, or by Oral Dissolvable Tablets (ODT), but the oral formulation is not recommended. Ondansetron has a more favorable side effect profile as compared to promethazine.

g. The use of tranexamic acid (TXA) to promote hemostasis was discussed at length. The CRASH-2 and MATTERS studies showed that early use of TXA can be lifesaving. Multiple papers in the orthopedic and spinal surgery literature have shown that TXA reduces surgical blood loss without causing an increase in thromboembolic events. Dr. Butler's presentation on this topic suggested that, since TXA has been shown to reduce blood loss, it should be used by prehospital care providers as soon as possible after injury in penetrating torso trauma. Delaying administration of TXA until arrival at a medical treatment facility is not supported by the available evidence.

h. TCCC has been shown to reduce the incidence of preventable deaths in combat casualties, but is still being implemented unevenly throughout the Armed

Services and the Geographic Combatant Commands. Having physicians who have not been trained in TCCC supervising combat medical providers who have been is clearly not optimal. Mitigation strategies to remedy this situation are currently being explored by the JTS.

i. The Army Department of Combat Doctrine Development (DCDD) recently recommended the SAM Junctional Tourniquet as the Army solution for junctional hemorrhage control. This recommendation was approved by the US Army Medical Command.

3. MAJ Neil David gave a presentation based on his experience as the Deployed Prehospital Director for the Joint Trauma System. He noted the need to develop a way to train deployed personnel on the TCCC updates. He also noted that medics like the new TCCC cards (DD 1380s), but that they do not reliably get into the casualty's medical record. We must train medical treatment facility personnel to ask for the casualty's TCCC card when he or she arrives at the medical treatment facility and to ensure that the information on the card is entered into the medical record.

4. COL Jim Czarnik, the Surgeon for Army Forces in the US Africa Command, discussed trauma considerations in Operation United Assistance. He observed that US military operations in recent years have been centered on the conflicts in Afghanistan and Iraq and that we must now begin to plan and train for early entry into much more austere deployed environments, as typified by those in AFRICOM.

5. MAJ Kyle Faudree, Regimental Physician Assistant for the 160th Special Operations Aviation Regiment, discussed the Innovative Technologies iTClamp. This is a small device (similar to a chip clip but much sturdier) designed to close skin lacerations and wounds and therefore promote hemorrhage control. Dr. John Holcomb, Dr. Don Jenkins, and MSG Curt Conklin also expressed their support for this device. It was noted to be especially useful for controlling bleeding from scalp lacerations.

There was concern from the group that this device would work only on linear wounds and perhaps hide bleeding as opposed to stopping it. Packing a wound with Combat Gauze followed by application of the iTClamp to seal the wound would perhaps be a more effective approach if the wound morphology is favorable for this approach. A proposed change paper suggesting the incorporation of this device into the TCCC Guidelines is being prepared.

6. Dr. Phillip Spinella, a pediatric intensivist and a recognized expert in transfusion medicine, discussed options for far-forward blood product administration on the battlefield. Options include whole blood, RBCs, thawed plasma, and freeze-dried plasma. Dr. Spinella believes that whole blood is the simplest and most effective blood product to use in the prehospital tactical environment. He noted that the Royal Caribbean Cruise Liner has a whole blood transfusion program for use in their ships at sea and that in a 40-month period,

there were 40 emergent whole blood transfusions. (1-6 units per patient). There was one allergic reaction and no infectious complications in this series. Dr. Spinella favors a Low-Titer Group O strategy for far-forward whole blood transfusions.

7. CDR Geir Strandenes from the Norwegian Navy Special Operations unit, also recommended the use of Low-Titer Group O whole blood in far-forward environments and discussed how that program has been implemented with Norwegian Maritime Special Operations. His unit has a program that includes a donor pool of all unit personnel, blood donor prescreening, protocols for emergency whole blood drives, and the use of cold-stored Low-Titer Type O whole blood to resuscitate casualties in hemorrhagic shock.

8. MSG Curt Conklin, the Senior Medic in the 75th Ranger Regiment outlined the Regiment's plan to implement a Low Titer Group O whole blood transfusion program for use on the battlefield. Using only pre-screened donors known to be Type O Low Titer individuals minimizes the likelihood of the most significant complication of prehospital whole blood administration, an ABO-incompatible transfusion.

9. COL Samuel Sauer discussed a proposed change to the TCCC Guidelines to recommend the use of the Abdominal Aortic Junctional Tourniquet. (AAJT).

Advantages of the AAJT include:

- a. The AAJT is the only device to have an approved indication for bleeding in the pelvis, which is a common complication in lower extremity junctional trauma.
- b. Pelvic hemorrhage, whether blunt or penetrating, is a common cause of morbidity and mortality in multiple settings.
- c. It has a lower profile and it easier to handle during transport than other options for junctional hemorrhage control.

Potential concerns with this device are:

- a. The potential for pulmonary compromise. Pressure on the abdomen may create a restrictive physiology, however one published case noted an improved end-tidal CO₂ and oxygenation after application of the AAJT in a combat casualty with bilateral lower extremity amputations. Theoretically, umbilical application of the AAJT may markedly reduce the perfused intravascular volume with hemodynamic benefits. There would then be higher perfusion pressures to vital organs (brain, heart, lungs).
- b. Bowel ischemia. This has not been adequately researched, however COL Sauer pointed out that death from uncontrolled hemorrhage is also bad for the bowel. The CROc animal studies with umbilical application may

not be relevant due to markedly different tissue pressures.

- c. Acute Kidney Injury – Has not been adequately researched, but anatomically, a periumbilical AAJT compressing the aorta below the level of the renal arteries would theoretically increase renal perfusion pressure.
- d. Pain/Discomfort – Can be treated with TCCC-recommended analgesia.

A number of case reports and laboratory studies were reviewed and discussed. A proposed change paper suggesting the incorporation of this device into the TCCC Guidelines is being prepared.

10. Lt Col Ed Mazuchowski, the Director of the Armed Forces Medical Examiner System (AFMES) discussed the history and the present structure and function of the AFMES. AFMES is making significant contributions to combat casualty care through such efforts as: COL Ted Harcke's 2007 paper on the implications of observed chest wall thickness for the length of the needle to be used for decompression of suspected tension pneumothoraces; the "Feedback to the Field" program where AFMES reports on autopsy findings that have significant implications for combat casualty care providers; and the ongoing AFMES/JTS review of combat fatalities to determine the specific causes of death and whether or not the injuries observed were inevitably fatal or potentially survivable.

11. CDR Rick Zeber from Defense Health Agency - Medical Logistics (DHA-MEDLOG) provided an update on the Joint First Aid Kit. The working group for this project has identified and agreed upon the contents of the JFAK and the Air Force has an order pending for 9000 of the new JFAKs.

12. Dr. Frank Butler and Dr. David Marozzi (LTC, USAR) discussed the translation of military trauma care lessons learned into civilian practice. A pending publication will show that 87% of US trauma centers use Damage Control Resuscitation guidelines, but only 20% use tourniquets. A recent case from San Diego was discussed in which a former Navy Corpsman applied a field expedient tourniquet to a motorcycle accident victim who had suffered a traumatic amputation. The tourniquet stopped the hemorrhage, but was removed when a 911 operator instructed the caller to do so. The patient then expired due to his renewed blood loss. Methods to expedite the transition of lessons learned in prehospital trauma care from Afghanistan and Iraq into the civilian sector were discussed.

The National Association of Emergency Medical Technicians (NAEMT) uses the JTS-developed TCCC curriculum and teaches TCCC provider and instructor courses, which are certification card-producing courses like BLS, ACLS, and ATLS. These courses have been taught all over the US and in 20 other nations around the world. There was strong agreement from the group that the DoD should require military medical physicians, PAs, and combat medical

providers to obtain TCCC certification - just as we do with the previously mentioned courses which have less applicability to battlefield trauma care than TCCC - and have this certification renewed every two years. NAEMT also teaches the TCCC-inspired but civilian-oriented Tactical Emergency Casualty Care, Law Enforcement First Responder, and Trauma First Responder courses.

4 February 2015

13. MG Brian Lein outlined his views on TCCC and the need to bring advanced care far-forward. He stated that care should not be role-dependent but rather casualty dependent. He recalled that the Joint IED Defeat Organization (JIEDDO) initiative took lessons learned from real-world IED events and incorporated these into training at the National Training Center (NTC) within 2 weeks, greatly improving the response and capabilities of deploying military units. Why can't medical training to incorporate new lessons learned in battlefield trauma care be conducted in a similar fashion?

MG Lein noted that future battlefields may be urban ones where, as in Mogadishu, we will not be able to land a helicopter and achieve rapid casualty evacuation. He said that he was happy to see a number of representatives from our coalition partner nations at the meeting and emphasized the need to continue and expand this international partnership dedicated to improving prehospital trauma care. He also discussed the need for consideration of future weapon systems and different wounding patterns in planning for combat casualty care.

Finally, MG Lein told the story of sitting on a board being held at Fort Knox, Kentucky, when someone came in and reported that there was a gunshot wound casualty in the parking lot. He ran out to respond and found the victim pulseless and bleeding profusely from an unknown location on his upper extremity. He started CPR and asked the first responders for trauma shears, but they had none. In addition, the first responder medics told him to stop CPR since there was an EKG tracing on the monitor; he declined, knowing that the observed pattern represented pulseless electrical activity. When the patient's clothing was finally removed, it was found that he had died from an injury to the brachial artery. A simple tourniquet could have saved his life.

14. SSG Jonathan Talbot from the 4TH Infantry Brigade Combat Team, 4th Infantry Division in Fort Carson, CO presented a casualty scenario in which an ANA Soldier arrived at a Role 1 Aid Station after having stepped on an IED outside of his vehicle. The casualty had suffered a partial amputation of his right leg and a complete amputation of his left leg just below the knee. The patient also had multiple amputated digits on both hands.

Point of injury (POI) care consisted of CAT tourniquets to both lower extremities as well as a CAT to his left arm.

On arrival at the Aid Station, the casualty displayed signs of hemorrhagic shock. He was alert but incoherent and had absent radial pulses.

His initial vital signs were: BP 60/P; respirations 10; and heart rate 154. Aid Station treatment consisted of:

- Assessment & reinforcement of initial POI tourniquets
- Administration of high flow oxygen
- IV access (right arm)
- Wound packing
- Pressure bandages (all four extremities)
- Splints placed on both lower extremities)
- Central line (right subclavian)
- 5 units of O- positive RBCs
- Zofran 8 mg IV
- Fentanyl 100mcg followed by 3 additional doses of 50mcg each
- TXA - 1gm
- ANCEF – 2 gms

The unit's liaison at the NATO Role 3 medical treatment facility at Kandahar Air Field called a week later and informed SSG Talbot that the patient was doing well.

15. COL Jim Geracci, the III Corps Surgeon, discussed the time constraints that many units face in terms of medical training, and stated that TCCC must be integrated into other training events as opposed to receiving dedicated time. He discussed that Combat Lifesaver (CLS) and first responder-type courses (Ranger First Responder, Pegasus First Responder, etc.) do not require Medics to teach them; rather, NCOs in leadership positions can be trained by medics to conduct CLS and first responder training independently. COL Geracci showed data from COL (ret) Russ Kotwal when he was the 75th Ranger Regiment Surgeon, which noted that the incidence of preventable deaths was much lower in the 75th than in the US military as a whole. This decrease in preventable deaths was attributed to the fact that every Soldier in the regiment was trained on TCCC and could perform lifesaving interventions for their wounded buddies.

15. COL Kirby Gross, the JTS Director and the Army Surgeon General's Trauma Consultant, presented an overview of the JTS, including its inception early in the conflicts in Afghanistan and Iraq and subsequent evolution. Among the many functions performed by the JTS by the end of the two wars were ownership of the DoD Trauma Registry, a robust combat casualty care performance improvement process, predeployment training for Joint Theater Trauma System (JTTS) teams, advocacy in CONUS for the deployed trauma care mission, mentorship of JTTS leaders, ongoing review and update as necessary of the JTS Clinical Practice Guidelines, and conduct of the weekly worldwide combat casualty care performance improvement teleconference.

16. SGM Kyle Sims from the US Army Special Operations Command discussed a new hemostatic device, XSTAT, which is an injectable chitosan-coated compressed sponge system. The device is currently FDA-approved only for junctional hemorrhage and only for use on the battlefield. Testing at the Naval Medical Research Unit – San Antonio using a porcine bleeding model of subclavian artery and vein injury found that XSTAT could be applied in half the time of Combat Gauze (31 sec vs 60 sec.) Blood loss was also significantly reduced, although there was no difference in survival between the XSTAT group and the Combat Gauze group in this study. Another device which is chitosan-free and intended for smaller entrance wounds is also being developed. A proposed change paper suggesting the incorporation of XSTAT into the TCCC Guidelines is being prepared.

17. Mr. Mark Lueder from the Prehospital Trauma Life Support organization discussed the PHTLS TCCC training program. PHTLS courses are taught under the sponsorship of the National Association of Emergency Medical Technicians (NAEMT) and use the JTS-developed TCCC curriculum. Course graduates are maintained in a TCCC training registry and receive a TCCC certification card upon completion of the course. These courses have been taught all over the US and in 20 other nations around the world.

There was strong agreement from the group that the DoD should require providers and combat medics to obtain TCCC certification cards just as we do for BLS, ACLS, and ATLS. This training should be repeated every two years. NAEMT also teaches the TCCC-inspired but civilian-oriented Tactical Emergency Casualty Care, Law Enforcement First Responder, and Trauma First Responder courses in addition to its PHTLS courses.

18. COL (ret) Russ Kotwal discussed data that he and his co-authors have submitted to the New England Journal of Medicine that documents that the concept of the Golden Hour is valid for combat casualties; mortality was decreased in Afghanistan after Secretary Gates' 2009 directive that the time from TACEVAC mission approval to the casualty's arrival at an MTF should be 60 minutes or less.

19. COL Sean Keenan, the 10th Special Forces Group Surgeon, discussed Prolonged Field Care (PFC) and his group's endeavors to define best-practice standards for the provision of care for long periods in austere, remote environments. While still being developed, one of the goals is to answer the question: "What happens at the end of TCCC?" It is challenging to develop protocols for all possible contingencies a remote medic might face; the answer, therefore, likely lies in improved medic training and in the use of advanced telemedicine technology, rather than trying to develop protocols that cover every contingency.

20. Dr. Steve Giebner, the CoTCCC Developmental Editor, discussed both the PHTLS Eighth Edition textbook and the TCCC curriculum. The textbook is

published by Jones and Bartlett Learning and the retail price is \$82.95. Dr. Giebner reviewed the titles of the 13 TCCC-submitted chapters and offered his thanks to the contributing authors.

The TCCC curriculum will now be updated annually each June with interim changes forwarded to TCCC users throughout the year as they are approved by the CoTCCC. The TCCC for All Combatants curriculum is a new version of the curriculum designed for non-medical combatants. The advanced skills sets and interventions that are intended for medics have been removed and the terminology used in this version of the curriculum is aimed at the non-medical individual.

21. MSG Harold Montgomery, the Senior Enlisted Medical Advisor for USSOCOM presented an overview of TCCC issues from the combat medic's perspective. He pointed out that the easy part of improving combat trauma care is behind us. Remaining challenges include planning for optimal trauma care for casualties sustained by small military groups widely dispersed over large geographic areas with few medical treatment facilities and long evacuation times. TCCC in this setting may have to transition to Prolonged Field Care. He emphasized the need to achieve constant medical readiness as opposed to "just in time" training and to convince physicians and line combat leaders of the need to train both their medics as well as all unit members in TCCC.

22. COL Sean Mulvaney from Walter Reed National Military Medical Center discussed his recent *Military Medicine* paper describing the use of stellate ganglion block (SGB) to treat PTSD. In a series of 166 patients from a military population with multiple combat deployments who were treated with SGB, over 70% had a clinically significant improvement which persisted beyond 3 to 6 months postprocedure. Selective blockade of the right cervical sympathetic chain at the C6 level was found to be a safe, effective, and minimally invasive procedure with which to treat patients suffering from PTSD. Despite this published success, SGB is not being widely used to treat PTSD in the DoD at present.

23. Dr. Butler reviewed the previous list of prioritized CoTCCC-recommended battlefield trauma care research, development, test, and evaluation projects from 2012 and solicited input for new items to add to the list. An updated ranking of these projects will proceed after the meeting via teleconference and email communications.

Acknowledgments

The authors gratefully acknowledge the ongoing efforts of all of the members of the TCCC working group to improve the battlefield trauma care provided to our countries' combat wounded.

Disclaimers

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.