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## *Inside this Issue:*

- › Case Report: Return to Duty After Severe Bilateral Lower Extremity Trauma
- › Case Report: CCTA With Biomarker Testing to Detect ACS
- › Case Report: DCS Following Altitude-Chamber Training
- › TCCC Limb Tourniquet Guidelines Change 14-02
- › Testing of Tourniquets Exposed to Prolonged Heat
- › Initial Tourniquet Pressure Does Not Affect Arterial Occlusion Pressure
- › Blood Flow Restriction Rehabilitation for Extremity Weakness
- › Effect of Movement on Hemorrhage Using QuikClot® Combat Gauze™
- › Excited Delirium Syndrome
- › Operational Point-of-Care Ultrasound Review
- › Prehospital Medical Documentation During Precombat Training
- › Battlefield Analgesia: TCCC Guidelines Are Not Being Followed
- › Ongoing Series: Human Performance Optimization, Preventive Medicine, Operational Medicine in the Austere Environment, Picture This, Clinical Corner, Injury Prevention, Infectious Diseases, and more!

*Dedicated to the  
Indomitable Spirit  
and Sacrifices of  
the SOF Medic*

## CoTCCC Meeting 3–4 February 2015 Atlanta, Georgia

### *Selected Meeting Highlights*

*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. First, the JETT became dislodged during patient transfer; second, the receiving FST was unfamiliar with the JETT device and cut it off upon patient arrival. The Soldier later died of wounds.

The Abdominal Aortic and Junctional Tourniquet™ (AAJT) was also discussed and it was noted that the AAJT is now approved for a 4-hour application, but in testing at the US Army Institute of Surgical Research (USAISR), 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 Hem-Con® 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. Four-way tie: Liquid (never frozen) plasma, thawed FFP, reconstituted dried plasma, RBCs only
  8. Hextend
  9. Lactated Ringer's or Plasma-Lyte® A
- c. Damage Control Resuscitation, as developed by the 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 prehospital blood product use 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” in tactical situations until circumstances permit a more precise determination of bleeding location and relocation of the tourniquet to a site just proximal to the bleeding.
- f. The CoTCCC has approved the use of ondansetron, as opposed to the previously recommended promethazine, for control of opioid- or trauma-induced nausea and vomiting by a vote of 41 to 0. The dose is 4mg with repeat of another 4mg in 15 minutes if the first dose is ineffective; 8mg every 8 hours is the maximum dose. Ondansetron should be given IV, IM, IO, or by Oral Dissolvable Tablets (ODT), but NOT in the oral formulation. Ondansetron has a very 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 early use of TXA reduces surgical blood loss without causing an increase in thromboembolic events. Dr Butler’s presentation on this topic suggested further research efforts into TXA autoinjectors and further promotion of immediate use of TXA as close to the time of wounding as feasible.
  - 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. 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 a junctional tourniquet. This recommendation was approved by the US Army Medical Command.
3. MAJ Neil David gave a presentation based on his time as the Deployed Prehospital Director for the Joint Trauma System. He noted the need to have a way to train deployed personnel on the TCCC updates. He also noted that medics like the new TCCC cards (DD 1380s), but that the TCCC cards do not reliably get into the casualty’s medical record. We must train medical treatment facility personnel to ask for them when the casualty arrives and ensure that they are entered into the medical record.
  4. COL Jim Czarnik 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 early to plan and train for much more austere deployed environments, as typified by those in AFRICOM.
  5. MAJ Kyle Faudree from 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.

There was concern from the group that this device would work only on linear wounds and hide the bleeding as opposed to stopping it. Packing the wound with Combat Gauze followed by application of the iTClamp to seal the wound would perhaps be more effective if the wound morphology was 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, 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 combat prehospital environment. He noted that the Royal Caribbean Cruise Liners have a whole blood transfusion program for use in their ships at sea and that in 40 months there were 40 whole blood emergent transfusions (1-6 units per patient, one allergic reaction, and no infectious complications). Dr. Spinella favors a low titer type 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 type O whole blood in far-forward environments. His unit uses group A for blood type A and type O (preferably low titer) for all others; he also 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 who are low titer type O, blood donor prescreening, protocols for emergency whole blood drives, and the use of cold-stored type O low titer 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 type O whole blood transfusion program for use on the battlefield. Using only prescreened donors known to be low titer type O 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 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 junctional trauma.
- b. Pelvic hemorrhage, whether blunt or penetrating, is a common cause of morbidity and mortality in multiple settings.
- c. Pelvic stabilization alone has not been found effective to decrease pelvic hemorrhage in penetrating trauma; however, the AAJT is recognized by the FDA to stabilize the pelvis.
- d. It is the only device to not show the return of arterial flow through collateral blood flow within 60 seconds.
- e. It has a lower profile and is easier to handle during transport than other options for junctional hemorrhage control.
- f. It is the only device to have actually saved human life in upper and lower junctional bleeding to date
- g. It is the only device with human research that supports its safety and efficacy at each of its applications sites. Why use any device that has not been tested on live humans for safety and efficacy?

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 improved end-tidal CO<sub>2</sub> and oxygenation after application in a combat casualty with bilateral LE amputations. Theoretically, periumbilical application of the AAJT may markedly reduce the perfused intravascular volume with hemodynamic benefits. The remaining blood would have higher perfusion pressures to vital organs (lungs, heart, and brain).
- b. Bowel ischemia. This has not been adequately researched; however, death from uncontrolled hemorrhage was also noted to be 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 is compressing the aorta below the level of the renal arteries and would theoretically would increase renal perfusion pressure.
- d. Pain/discomfort – Can be treated with TCCC recommended analgesia.

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. The 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 they report key observations on combat casualty care noted at autopsy; and the ongoing AFMES-JTS review of combat fatalities to determine the specific cause of death and whether 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 (JFAK). 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 these kits.
12. Dr Frank Butler and Dr David Marcozzi (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 lost his leg. The tourniquet stopped the hemorrhage but was removed when a 911 operator instructed the caller to do so. The patient then expired due to blood loss.

Ways 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 providers and combat medics to obtain certification just as we do a CPR card and have this training renewed every 2 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 spoke about 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 real-world IED events and incorporated these into training at the National Training Center (NTC) within 2 weeks, greatly improving the response and ability of deploying military units. Why can't medical units conduct similar training using real-world events?

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 at Fort Knox, KY, 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. He started CPR and asked the first responders for trauma shears; they had none. In addition, the first responder medics told him to stop CPR since there was an ECG tracing on the monitor; he declined, knowing this was pulseless

electrical activity. When the patient's clothing was finally removed, it was noted that he had died from a single gunshot 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 Role 1 Aid Station after stepping on an IED outside of his vehicle. The casualty had suffered a partial amputation of his right leg and complete amputation of his left leg just below the knee. The patient also had multiple amputated digits on both of his hands.

Point of injury care (POI) 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 was showing signs of hemorrhagic shock. He was alert but incoherent and with absent radial pulses.

His initial vital signs were: BP 60/P, respirations 10, and pulse 154. Aid station treatment consisted of:

- Assessment and reinforcement of initial POI tourniquets
- Administration of high-flow oxygen
- IV access (right arm)
- Wound packing
- Pressure bandages (all four extremities)
- Splints (both lower extremities)
- Central line (right subclavian)
- 5 units of O+ PRBCs
- 8mg IV Zofran
- 100µg fentanyl followed by 3 additional doses of 50µg of fentanyl
- 1g TXA
- 2g ANCEF

The unit's liaison at the NATO Role 3 medical treatment facility at Kandahar Air Field called a week later and reported that the patient was doing well and his family was by his side.

15. COL Jim Geracci, III Corps Surgeon, discussed the time crunch 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) Kotwal when he was the 75th Ranger Regiment Surgeon, showing that the incidence of preventable deaths was much lower in the 75th than in the US military as a whole and attributed that drop to the fact that every Ranger in the Regiment was trained on TCCC.

16. 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 at the end of the recent conflicts were ownership of the DoD Trauma Registry, combat casualty care performance improvement, 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 the weekly worldwide combat casualty care performance improvement teleconference.
17. XStat®: SGM Kyle Sims from the US Army Special Operations Command discussed a new hemostatic device, the XStat 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 was applied in half the time of Combat Gauze (31 seconds vs 60 seconds). Blood loss was also significantly reduced, although there was no difference in survival in this model. Another device, which is chitosan-free and intended for smaller entrance wounds, is also being developed. A proposed change paper advocating for the incorporation of XStat into the TCCC Guidelines is being prepared.
18. Mr Mark Lueder from the PreHospital Trauma Life Support (PHTLS), organization discussed that organization's 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. These courses have been taught all over the US and in 20 other nations around the world.
19. COL (Ret) Russ Kotwal discussed data that he and his co-authors submitted to the *NEJM* for publication that clearly show that the concept of the Golden Hour appears valid for combat casualties; mortality was decreased in Afghanistan after Secretary Gates' 2009 directive that the time from TACEVAC mission approval to arrival at an MTF should be 60 minutes or less.
20. COL Sean Keenan, the 10th Special Forces Group Surgeon, discussed Prolonged Field Care (PFC) and his endeavors to define the optimal care for longer periods in austere, remote environments. While still being developed, one of the concepts 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; therefore, perhaps the answer lies in training as opposed to more guidelines, and in the use of advanced telemedicine technology.
21. 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 nonmedical combatants. The advanced skills sets and interventions that are intended for medics have been removed or much abbreviated, and the terminology used in the curriculum is aimed at the nonmedical individual.
22. MSG Harold Montgomery, the Senior Enlisted Medical Advisor for USSOCOM, presented an overview of TCCC issues from the combat medic perspective. He pointed out that the easy part of

improving combat trauma care is behind us. Remaining challenges for the future include small military groups widely dispersed over large geographic areas, few medical treatment facilities, and long evacuation times. TCCC in this setting may 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.

23. COL Sean Mulvaney from Walter Reed National Military Medical Center discussed his recent *Military Medicine* paper describing the use of stellate ganglion block 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, this procedure is not being widely used in the DoD at present.

24. Dr Butler reviewed the previous CoTCCC-recommended battlefield trauma care research, development, test, and evaluation priorities 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/or email communications.

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#### 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.