Committee on Tactical Combat Casualty Care Meeting Minutes

10–11 September 2019 – San Antonio, Texas

Dr Frank K. Butler, Chairman;
Dominique J. Greydanus

TUESDAY – 10 September 2019:
Day 1

1. **Chairman's Welcome:**
   Dr Frank K. Butler, Chairman of the CoTCCC, called the meeting to order and thanked Mrs Danielle Davis and Mr Dallas Burelison for their hard work to get the meeting approved. He then asked attendees to introduce themselves. Dr Butler briefly reviewed the CoTCCC's progress in prehospital combat trauma care since 2001, its current knowledge products, and its performance improvement methodology. He then reviewed the agenda for the meeting and requested that any potential conflicts of interest among the attendees be disclosed. Departing CoTCCC members we recognized, as were the newly selected members who are replacing them.

   Dr Butler announced his intention to stop down as Chairman of the CoTCCC following this meeting in order to spend more time with his family and to make room for a fresh perspective in the CoTCCC leadership.

   Dr Butler reminded all attendees on government-sponsored travel to have their receipts into Ms Davis no later than 3 days after the committee completion.

   Dr Butler thanked Mrs Danielle Davis for her 10 years of outstanding service to the CoTCCC, for which she received a TCCC Special Award in the past.

2. **Combat Medic Presentation:**
   SGT Patrick Murphy, medic from 2/75th Ranger Regiment, presented a unique case involving a massive ocular hemorrhage to an adult male local national. The individual fell from a second story building following and IED blast close to his location. When SGT Murphy arrived the right eye, socket was hemorrhaging. Trying to get hemorrhage control on the unorthodox bleed (eye socket) did not involve using clamps or ligation but packing with hemostatic gauze into the eye socket and suturing the eye lids together to hold pressure. The patient received 6 units of blood and blood products in order to adequately resuscitate the patient and restore his radial pulse.

   SGT Murphy ended his presentation with some lessons learned: 1) you can bleed to death from an eye injury, 2) the use of epinephrine or TXA soaked gauze for either vessel constriction or clots, and 3) we were packing blindly and did not think there could be shrapnel imbedded.

   In the question and answer period that followed, there was great discussion.

   Q1: Where were you treating him?

   A1: Small Forward Operating Base (small schoolhouse), a few kilometers from the FOB.

   *Dr Peter Rhee stated, *"he had a police officer that bled out from a gunshot to the eye. The bleeding that killed him was not necessarily from the eye but the brain."*

   Q2: Was there any facial fractures?

   A2: No

   Q3: How long until you achieved hemostasis?

   A3: SGT Murphy could not remember the amount of time it took but said they packed the socket with hemostatic gauze and held pressure until no further bleeding was observed.

   Q4: Was the patient's eye completely gone?

   A4: Yes

   Q5: What was the final outcome?

   A5: Unknown – the patient was alive when he was evacuated to a local hospital.

   Q6: What was the timeline from injury to hemorrhage control?

   A6: 20–30 minutes

   Q7: What blood products were used?

   A7: US medical stock and walking blood bank from indigenous forces. We were well stocked.

   Q8: How much was used?

   A8: 60 units of blood and/or blood products.

   Q9: What was your logistical chain for the blood?

   A9: Rangers are trained to draw and administer blood on target. Prior to mission we receive blood from ASVP housed in Golden Hour containers.

   Q10: How do you train nonmedical personnel for blood (US and indigenous)?

   A10: Unit Level: Ranger medics and ROLO program (nonmedic draw).

- Indigenous: Type, blood and screen for HIV . . . walking blood bank.
  - o ASVB: draw from them prior to mission and put in blood box.

Q11: Are you using any warming devices?

A11: We used the "Buddy Light" but do not like them but are looking at new products.

*British officer commented on the CRASH 3 trial.

Q12: Has the Ranger regiment implemented any new training due to this case?

A12: No, but the medical officer and sergeant are planning on making personnel aware of this type of injury for the future.

Q13: Was the patient conscious?

A13: No

Q14: What was your goal for resuscitation when administering blood?

A14: Trying for a radial pulse.

Q15: How aggressive were you in blood sweeping in the eye and were you worried about a fracture of the eye socket?

A15: I was tentative because this is not a common injury.

Q16: How aggressive in packing?

A16: I packed to the bone.

Q17: How much gauze was used?

A17: One hemostatic gauze.

Q18: CAPT Timby agrees with comments on blood warmer but asks why are we still using it?

A18: No better option presently.

*Brad Bennet followed up by stating, *"The IDF are using the Quinn Flow Warrior (NAR Quantum). AFMES – did a review and it did not meet standard. The NAR Quantum is also available but has not had an independent evaluation."*

Q19: What would you change for TCCC?

A19: Awareness

There were numerous comments from the attendees, one by Dr Jay Johannigman stated that, *"one should pack the eye socket if the eye is completely gone."* Dr Butler stated we are going to have to change the TCCC outlines to reflect this kind of injury. He went on further to explain how there are people who literally take and translate the Bible saying, *"to pluck out your eye" and have died from hemorrhaging.*

SGT Patrick Murphy was awarded a specially made knife by Dr Frank Butler for his presentation and service to country.

3. **Combat Medic Review of equipment:**
MSG Simon Gonzalez, senior medical advisor of 75th Ranger Regiment, reviewed all the literature and information collected at the Ranger regiment and they have banned the purchase of the "Cric-Key™" after second occurrence of a critical design failure on a real-world casualty. Additionally, they are very expensive, $291.99 each, compared to other kits that are available at approximately $50.00 each. The cost makes it prohibitive to train effectively. In the end it is the procedure not the device.

MSG Gonzalez demonstrated the one major flaw. When the BVM is attached and then removed, it could not be reattached. This is a critical failure, because the green attachment stays in BVM and will not allow for reattachment. This then forced the medic to blow air in the tube with his mouth. There was discussion on how manufacture changed the design of the Cric-Key™ after being recommended by CoTCCC. When they talked with the company representative, Chris Murphy, he stated, *"They were instructed to have BVM rotatable."*

Harold "Monty" Montgomery stated that the Cric-Key™ is only the "grey" part (bougie) of the "Control Cric-Key" kit and only the Cric-Key™ component was CoTCCC-recommended in 2013. However, one cannot purchase just the Cric-Key™, you have to purchase the whole Control CricKey™ kit. In addition, he stated that when the CoTCCC voted on this device they made it a requirement to include the bougie and that the product was approved before the final product was delivered. In the future we need to be more rigid on standards and get out to the business of recommending products. MSG Gonzalez was asked what the Ranger regiment is now using; he said a homemade kit comprised of an ET and scalpel.

Further discussion by attendees brought up the point that they will need to relook at this capability for training; both the SIM Center OIC and NEMTI representatives stated this. Dr Dorlac reminded everyone why the CoTCCC even looked at these devices and referred to Dr Mabry's paper where he was able to show a 33% failure rate—this was the best option at the time. Additionally, CRICs now-vs-then . . . 90% casualties are treated by SOF medics compared to 80% treated by conventional medics.

MSG Simon Gonzalez also wanted address the use of Dsuvia by the Ranger regiment. There were some issues in ordering oral transmucosal fentanyl because DoD was removed by prime vendor for purchase, so the regiment looked into the use of TM sufentanil (Dsuvia). One note is that Dsuvia is three times more expensive than TM fentanyl. Dr Butler asked if there were any documented cases of Dsuvia use. MSG Gonzalez confirmed that they have

two recorded cases to date with one of them being a failure. He felt the failure was due to poor training on how to administer the product.

4. **TCCC Update(s):**
Dr Butler Presented COL (Ret) Jim Geracci with the 2019 TCCC CAPT Frank K. Butler Award. Dr Geracci served as a unit surgeon at all levels of the conventional Army from battalion to corps and has been instrumental in implementing a number of TCCC initiatives over the last decade. From fielding junctional tourniquets to the updated DD1380 to corps-level TCCC training initiatives, his name has been synonymous with making TCCC happen in the Army. He integrated TCCC training as a requirement for physician credentialing and privileging at MTFs supporting III Corps. As a CJTF Command Surgeon, he ensured that our joint and coalition forces were well-supported medically and that the US military sustained the advances in battlefield trauma care that TCCC has helped to pioneer. He has been involved with the DHA-sponsored deployed medicine project to enhance TCCC curricula and utilize modernized web-mobile applications to improve training and has advocated for TCCC recommendations through all levels of the US Army.

Dr, Butler discussed the US Air Force Surgeon General's letter of 13 August 2019 that mandated TCCC for Medical Personnel training for all active duty 4N0X1 and 4 N1X1 personnel within 18 months and directed that – until the DHA-approved TCCC curriculum is finalized – this training should be obtained through the National Association of Emergency Medical Technicians (NAEMT) educational infrastructure. She also encouraged TCCC training for physicians, physician assistants, nurse practitioners, nurses, dentists, and optometrists."

The TCCC for All Service Members Course was released on 1 August 2019. It is designed for military personnel who are not expected to be combatants but may be called upon to treat trauma victims as lay individuals, as in the civilian "Stop the Bleed" program. TCCC-ASM is a 6-hour course and will be taught as part of basic training by all of the armed services.

Mr Dominque Greydanus recently conducted a pilot series of four Tactical Combat Casualty Care for Medical Personnel (TCCC-MP) course appraisals and found that TCCC-MP courses are not presently presenting all of the course material recommended by the JTS, despite TCCC training being mandated for all US military personnel. Some of the material omitted is very significant. Further, there was incorrect messaging presented in the TCCC-MP courses that were appraised, some of which, if actually performed on the battlefield, could reasonably be expected to result in adverse casualty outcomes. Further, post-course written testing was found to be inadequate in all courses.

In Texas, it's now a state law in Texas that – if you have a school – then you have to have "Stop the Bleed" kits. The tourniquets contained must be "approved for battlefield trauma care by the Armed Forces of the United States."

A recent paper by Eastridge, Holcomb, and Shackelford published in *Transfusion* noted that "A turning point in military prehospital trauma care came in 1996 when a review of battlefield deaths and the medical requirements to support special operations forces led to the development of a new paradigm for combat casualty care on the battlefield." (28) The core principles of Tactical Combat Casualty Care (TCCC) were based on the premise of eliminating preventable deaths and combining good medicine with good tactics. . . . These early iterations of TCCC guidelines recommended immediate application of limb tourniquets as the first-line treatment of extremity hemorrhage. Over the ensuing decade, the US military gradually adopted widespread implementation of extremity tourniquets for all deployed forces, ultimately resulting in an 85% decrease in deaths attributed to limb hemorrhage. (20) This battlefield lesson was subsequently translated to the civilian population, fostered by the strong advocacy of the Hartford Consensus (29, 30) and by the evolution of community bleeding control courses, "Stop the Bleed." (31,32)

Another recent paper by Howard et al published in *JAMA Surgery* examined the impact of various interventions and their relative contributions to the marked reduction in case fatality rate in the 56,763 US military casualties injured in battle in Afghanistan and Iraq from October 1, 2001, through December 31, 2017. In achieving a 44% total reduction in mortality, 474 deaths were found to have been prevented by tourniquet use; 873 by blood transfusion, and 275 by shorter prehospital transport times.

5. **Ketamine Use in Prehospital**
Dr Margaret M. Moore, LSU Health New Orleans, introduced "Ketamine use in the Prehospital and Hospital Treatment of the Acute Trauma Patient: A Joint Position Statement" with the caveat that this version is a DRAFT and has not yet been officially approved or endorsed by any organization.
- Dr Moore began with the ketamine position statement:
- Uniform guidance on the use of ketamine in the care of the trauma patient.
  - Includes prehospital and in-hospital
- Based on peer-reviewed published evidence and expert opinion.

Target audience:
- EMS personnel, EMS medical directors, emergency physicians, trauma surgeons, nurses and pharmacists.

*****NOT a comprehensive discussion of pain control options in the trauma patient.***

Dr Moor discussed two cases where ketamine was used successfully. Case 1 was a 19-year-old male patient who was climbing a wrought iron fence, slipped and fell while trying to get back to his airbnb. The patient was brought into the ED/trauma bay with a patent airway but was agitated and intoxicated. He had two 4cm lacerations on his right chest with diminished breath sounds and low BP and O_2 saturation. He had no sensation or motor below the nipples. He had received 50mg of ketamine by EMS.

Case 2 was an 18-month-old boy with a GSW to the head. He had a GCS score of 9 and was moving all four extremities with stable vital signs. He had received 25mg of ketamine by EMS prior to arrival.

Some of the key take-aways they have observed in the administration of ketamine:
- Few absolute "contraindications."
  - Children <3 months of age

- Dosing
  - o IV, IM, IO, etc. . . .
  - o Half-life is 180 minutes
  - o Begins to wear off in 10–15 minutes
- Rapid push = transit apnea
- RSI: 2mg/kg IV (max 200)
- 5mg/kg high intubation note
- Need "deep sedation privileges" in L.A. and other states
- Transit apnea with IM dose (seeing more of it)

Head Injuries:
- Based on "old studies"
- New studies show no ICP elevation
- Safe to administer to head injured

Eye Injuries:
- Slight intraocular pressure but not clinically important
- Do not administer if you are going to do an eye exam

Ketamine and Opioids:
- Potentate analgesic effects of opioids.
  - o Great for patients who cannot take any more opioids
- Ketamine + benzo + alcohol
  - o Potent sedative effects

Kids:
- Safe and effective for kids and adults
- Safe if you use weight-based dose

***Need deep sedation privileges in Los Angeles and other states*

In the question and answer period the following her presentation there was great discussion.

Q1: Pregnant and breastfeeding + >3 months old is this contraindicated?

A1: No

Q2: What is the way ahead for your paper?

A2: Back through working committee and then through all our endorsing bodies before we can release it for publication.

Q3: 0.5–0.9 dose, have noticed combativeness?

A3: Yes, but there are little data to support not using this dosage level.

Q4: (from Germany) Are there any studies comparing benzo to ketamine in acute agitated prehospital patients with delirium?

A4: Yes, there are studies that compare ketamine to benzos in patients with acute agitation and what they show is there is less hemodynamic stability issues as observed with large doses of benzos.

Q5: Can you reinforce if you should pre-dose with a small dose of benzo to avoid emergence as the nursing staff feel this is important?

A5: I would not recommend it.

Q6: If you are in a deployed environment and do not have US dosage of ketamine but have access to European S-ketamine is there any difference in the dosing? (Warren)

A6: Presenter did not feel comfortable commenting due to the fact she did not have experience with the product.

Dr Mann-Salinas, JTS PI, stated, *"there are twelve (12) CPGs with different doses, there is the SMOG that preflight paramedics use . . . What is correct?"*

6. TCCC Awards:

Dr Butler recognized the following organizations and individuals for their outstanding support of the CoTCCC and TCCC:

Uniformed Services University (USU)

Accepted by: Gen. Sharon Thomas

USUHS continues to provide exceptional thought leaders in battlefield trauma care. The USU faculty helped to inspire the original TCCC concept and has been part of the TCCC effort since 1993. USU has produced more TCCC-fluent physicians than any other medical school in the world. USU is also currently a national leader in transitioning the TCCC-inspired "Stop the Bleed" program to the citizens of America and many other nations.

The 75th Ranger Regiment

Dr Butler noted that the 2017 TCCC Award was given to LTC Ethan Miles, SGM Curt Conklin, and to the entire 75th Ranger Regiment. The regiment continues to be synonymous with excellence in TCCC and leads the way for the rest of the DoD in caring for our combat wounded.

National Association of EMTs

Accepted by Mr Dennis Rowe and Ms Pam Lane

The NAEMT was TCCC's first and most important civilian strategic partner. With 72,000 members, NAEMT is a worldwide leader in prehospital trauma care and has been facilitating TCCC courses globally since 2009. NAEMT also publishes the Prehospital Trauma Life Support (PHTLS) textbook, which has included TCCC material since 1998. The current PHTLS Textbook (Military 9th Edition) is the single best reference for TCCC concepts available in print.

Naval Operation Medicine Institute (NOMI)

CAPT (Ret) Doug Freer and CAPT (Ret) Stephen Giebner

Both of these individuals have been recognized with TCCC Special Awards in the past, but Dr Butler wanted to again acknowledge their leadership in providing the first home for the Committee on TCCC. Without Doug Freer, Steve Giebner, and NOMI, there would be no CoTCCC.

United States Army Institute of Surgical Research (USAISR)

Accepted by the Commander, COL Jerome Buller

The USAISR has been responsible for a great many advances in the science of battlefield trauma care. It has helped establish the methodology for DoD preventable death analyses and to develop a number of TCCC's most important lifesaving interventions including tourniquets, hemostatic dressings, whole blood, and chest seals. USAISR has played a key role in updating the TCCC guidelines for many years. It is also the home of the world-famous ISR Burn Center and the Burn Flight Team. USAISR truly lives up to ADM William McRaven's quote that it is "The finest battlefield trauma care research laboratory in the world." Dr Butler also recognized COL (Ret) John Holcomb, the former commander, who was instrumental in assisting the CoTCCC in its transition from the Naval Operational Medicine Institute to the Defense Health Board.

Armed Forces Medical Examiner System

Accepted by Lt Col Ed Mazuchowski and Dr Ted Harcke

The AFMES has worked with the USAISR and CoTCCC since 2004, when the first preventable death analysis from

the recent Middle Eastern conflicts was performed. Since then, the AFMES has helped to identify preventable deaths among combat casualties which is the most important metric in evaluating the effectiveness of battlefield trauma care and guiding improvements to that care. The AFMES "Feedback to the Field" series of presentations that identified specific opportunities to improve found in autopsies has been key to many CoTCCC recommendations in the TCCC guidelines. AFMES has truly lived up to their motto of "Making Good from the Bad."

Journal of Special Operations Medicine

Accepted by the publisher, Lt Col (Ret) Michelle Landers

The *JSOM* has served as the voice of battlefield and tactical trauma care for over a decade and has been CoTCCC's most important strategic messaging partner. The *JSOM* publishes all the TCCC change papers as TCCC Guidelines are updated as well as publishing CoTCCC meeting minutes and TCCC updates. The *JSOM*'s status as an Index Medicus publication ensures that the evidence and rationale for TCCC changes will be maintained as a permanent part of the indexed and searchable medical literature, which will be of immense value to battlefield trauma care researchers and providers in the future.

Joint Trauma System (JTS)

Accepted by COL Stacy Shackleford, Dr Mary Ann Spott, and MSG Michael Remley

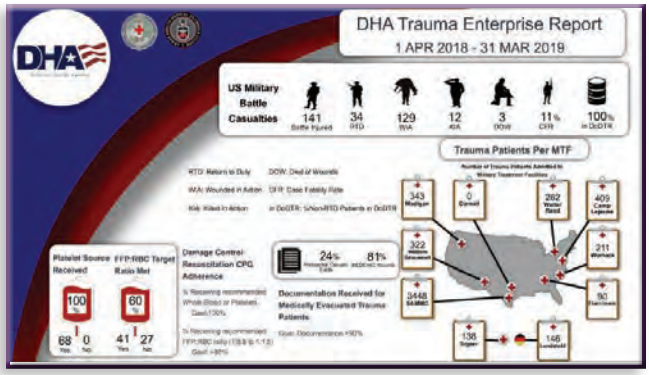
The JTS truly lives up to its designation as the DoD Center of Excellence for Trauma. The JTS is the natural home for the CoTCCC and the undersecretary of defense directed that it be moved there in 2013. From the weekly trauma conferences reviewing combat casualty cases to the monthly preventable death reviews to maintaining the DoD Trauma Registry of casualty data, the JTS leads the effort for the Department of Defense to provide optimal care for every one of its combat wounded.

Ms Cynthia Barrigan

Ms Cynthia Barrigan was presented a TCCC Special Award for her work as the principle investigator and project lead for the Learning Strategy, Tactics, & Technology Research Program (aka Deployed Medicine). This project has assisted in the development of the TCCC for All Service Members (TCCC-ASM) curriculum that was recently released. Her vision of combining up-to-date education methodology with web-mobile based platforms will greatly assist in the transmission of TCCC knowledge products to the next generation of medics, corpsman and pararescue men.

7. **Joint Trauma System Director Remarks:**
   Col Stacy Shackelford, the director of the JTS, discussed and reviewed the following items:
   1. Organizational Chart
      a. Reflects JTS mission
      b. Defense Committee on Trauma (DCoT) encompasses:
         i. Committee on Tactical Combat Casualty Care
         ii. Committee on
         iii. Committee on
      c. Defense Medical Readiness Training Institute (DMRTI)
      d. Publication Branch
   2. DHA AD Combat Support Organizational Chart
      a. JTS belongs to this organization and critical to informing and directing what is important for medical care
   3. Defense Trauma Enterprise
      a. Looks complicated because it is – but vital
      b. Trauma care delivery and management on the battlefield
      c. JTS's mission within the enterprise is to "Improve Care" wherever there is an opportunity to improve
   4. JTS Organization Assessment
      a. Conducted by members of all Services
      b. 64 tasks identified to get the JTS up to full operating capability
         i. 31 tasks – Serve as the reference body for trauma care
         ii. 13 tasks – Establish standards of care
         iii. 8 tasks – Translation of research
         iv. 7 tasks – Standardized combat casualty care instruction
         v. 5 tasks – Enter into partnerships with civilian MTFs
   5. DoDI 6040.47
      a. DoD instruction that made JTS a requirement
      b. In this instruction, it requires every combatant command to set up a combatant command system (CTS) modeled after the CENTCOM JTTS
   6. 12 Core Functions of the Combatant Command Trauma System
      1. Address the full spectrum of injury
      2. Establish authority to enforce standards
      3. Establish multidisciplinary advisory group guidance – DcoT
      4. Conduct trauma system planning – CTS
      5. Verify readiness
      6. Provide infrastructure support
      7. Collect and analyze data
         o Ensure trauma names/lexicon are established
      8. Ensure patient identification and confidentiality
      9. Monitor performance
      10. Establish a research capability
         o JTS will not do research but ensure they have an IRB-approved protocol before getting information
         o JTS will guide researchers to ensure they know what needs to be researched
      11. Ensure preparedness
      12. Facilitate interoperability and cooperation
   7. Discussed a case that implemented all the medical advances from POI-to-Role 4
      a. Casualty received 189 blood products in theater
      b. Alive and at BAMC
         i. Similar case in the Battle for Mogadishu who did not survive
   8. DHA Trauma Enterprise Report
      a. Report that gives a high-level breakdown of what kind of casualties are on the battlefield
      b. Report also reports trauma patients per MTF
      c. TCCC Card submission
         i. Only about 25% compliance rate at the current time
         ii. Need to increase the submission rate
            1. You can do an after-action review (AAR) on the JTS website
            2. If you did not do one or it was lost, fill it out again and submit through AAR portal

EXAMPLE of the DHA Trauma Enterprise Report



9. Top 10 Battlefield Issues
   a. Improve capability and capacity for whole blood transfusion throughout the continuum
   b. Improve ways to sustain trauma skills
   c. Recruit and retain medical personnel to support operations
   d. Facilitate documentation and data collection
   e. Standardize trauma care training across the Services
   f. Facilitate interoperability and standardization of devices for patient movement items (monitors and materiel products) throughout the continuum
   g. Standardize Joint evacuation platforms and communication plans
   h. Optimal number, mix, and training of personnel for variety of missions/scenarios
   i. Improve capability and capacity for FDP transfusion throughout the continuum
   j. Relationship between time to definitive care and outcomes
   k. Validating and clarifying the "golden hour" concept
10. Survival-vs-Time (24 hours)
    a. time to mortality study
11. Joint Trauma Lexicon
    a. On the JTS website
12. Joint Trauma Education and Training (JTET)
    a. Working on standardization of Combat Casualty Care Instruction
       i. TCCC Tiers 1-4
          1. Start date: 1 June 2018
          2. Delivery date: 30 April 2020
          3. On Deployed Medicine website
       ii. Prolonged Field Care

    EWSC

    And many other projects
    b. Facilitate military-civilian partnerships for trauma skill sustainment
13. Fifty-eight (58) clinical practice guidelines (CPGs)
    a. On the JTS website
    a. All CPGs will have at least one metric to track them and will be reportable on the JTS website dashboard

Col Shackleford concluded with a couple stories of assisting Dr Butler while in theater.

8. **Proposed change for Hypothermia**

Dr Brad Bennett stated the reason for a relook at the TCCC guidelines was based upon two items: 1) Feedback from the field, 2) civilian sector, specifically the Wilderness Medical Society had not heard of the Hypothermia Prevention

----------AFTERNOON Day 1----------

Management Kit (HPMK) with the end goal of anticipating and preventing hypothermia in trauma casualties. He reviewed the current wording in TCCC on hypothermia since 2006, Paul Allen's paper out of ISR, TCCC guidelines show treatment and changes in red font in CUF, and TFC upgrade to insulated HPMK.

Number one recommendation is to use an HPMK (insulated hood) because currently patients are getting cold in the HPMK. If the HPMK is not available then one would need to use improvised hypothermia prevention from what they are carrying: poncho, poncho liner, dry clothing, etc.

Brought up the need for an IV warming device with one temperature as not to confuse the end user. Discussed the "*Quantum*" by North American Rescue, but stated that there has not been an independent study conducted yet to confirm if it meets the requirements. There was some discussion on the CoTCCC not naming or picking specific products as we had in the past.

In the question and answer period following his presentation, there was great discussion as this is a very important topic.

Q1: What about changing the wording from "anticipate" to "recognize" hypothermia in all trauma patients in all phases of care?

A1: Dr Bennett agreed and is not hung up on the wording at the present time.

Q2: When do we determine they are hypothermic and secondly when and where do they take a temperature to determine hypothermia?

A2: We would never take a temperature on the battlefield. Additionally, we are discussing "prevention" and the treatment for both prevention and actual hypothermia are going to be the same on the battlefield.

Q3: Why are we treating on the "X" or during care under fire?

A3: Agree that this might not be the appropriate place but wanted to get discussion on where is the best place to recognize and start treatment.

Q4: Hypothermia can be reversed by profusion . . . are we addressing it?

A4: This is not a relevant TCCC option, but at a receiving medical treatment facility.

Q5: Hypothermia is #7 on the TCCC guidelines . . . are we not addressing it?

A5: Yes, that is one of the reasons for the proposed update. It is also a training issue that needs to be addressed.

Q6: This should be in TFC as a "triage step."

A6: Agree, but wanted to get discussion on where is the best place to recognize and start treatment.

Q7: Are we really going to build a shelter? Or should we not get them ready to EVAC?

A7: These are guidelines and the idea is we need to get the casualty ready to transition out of wet clothing to dry clothing and an improvised shelter is something to consider.

Q8: Should we design "Best, Better, Good" of items that are practical for the medics or service members to carry?

A8: Not presently, but as the curriculum is developed that will be one of the teaching objectives.

Dr Erin Edgar made the statement that "Hypothermia can happen in warm environment; this might not be intuitive, but it can happen."

There was great discussion on what everyone considered important. Dr Bennett noted that there are two other competitors besides NAR that have comparable hypothermia prevention kits but no studies have been conducted on their products. Dr Giesbrecht and his lab are willing to do a study to compare the different products if someone is willing to fund it.

COL Andre Capp, USAISR, stated he is going to do a study on the "*Quantum*" and other devices to which the PJ representatives stated they do not like the Quantum based on their use of the device.

Conflict of Interest statement for Hypothermia Working Group:

1. COL (R) John Holcomb, Board of Directors QinFlow
2. COL Ethan Miles, product development consultant, North American Rescue; head, Aptus Volens Medical (medical consulting)

9. IT Clamp update

CDR Dana John Onifer, OIC of Fleet Surgeon 8, started the discussion with the statement that he has NO financial gain from the IT clamp or its sales.

The reason for interest in the IT clamp came from the *Eastridge* article, which pointed out the following:

1. Head and neck injuries: 7.5% potentially survivable
2. 0% of casualties will receive a head/neck would

Dr Onifer discussed the difficulty in treating head injuries, specifically scalp lacerations. This is an important note as the weapons used against our forces cause a disproportionate number of head, scalp, or neck wound. These wounds are frequently missed and very often under treated especially scalp wounds which can lead to shock or exsanguination. The current treatment is hemostatic gauze with direct manual pressure. However, now the IT clamp can be part of the treatment modality of packing the wound with hemostatic gauze or X-STAT and closing the wound up with the IT clamp. The provider does not need to apply direct pressure once the IT clamp has been applied.

Some of the contraindications are – if you cannot approximate wound edges because in order for the IT clamp to work properly the wound edges are approximated creating a fluid tight seal that traps the hemorrhaging within the wound until it equalized pressure with the compromised vessel and obtains hemostasis. There is an FDA warning not to leave on >24 hours, it has been studied up to 6 hours with no tissue damage or necrosis.

CDR Onifer discussed and showed the new Terminal Learning Objectives (TLOs) and Enable Learning Objectives (ELOs) for TCCC training (medical providers only). This includes videos on the application and removal of the device.

CDR Onifer concluded with the need for analysis of use, who is using it, how they are using it, how effective it is, and the outcome of casualties that have been treated with it. The manufactures of the IT clamp have collected 245 cases of actual use that was published in the JSOM article last year. He noted this is not for a complicated wound such as a traumatic amputation.

In the question and answer period the following his presentation there was good discussion on this topic.

Q1: Do you think this is good for skin closure and should we be endorsing a certain product?

A1: Yes, it is good for skin closure. There are no other products that do what the IT clamp does as it is patented.

Q2: Cost?

A2: $35.00 each

Q3: Shelf life?

A3: 5 years – due to sterility of packaging

Q4: How many should each medic carry?

A4: I would recommend a minimum of two but, there are a lot of other factors that can be weighed in on this number.

Q5: Can you use staples instead?

A5: Yes, but it does not work as well. It does not achieve hemostasis, only closes.

Q6: How did you get 7.5% from Dr Eastridge paper?

A6: The 7.5% of potentially survivable head and neck injuries included airway as well.

Col Shackleford, JTS director, stated that "*the list of products being endorsed by the CoTCCC is getting long and we should not be a product endorsement committee.*"

SGM Tim Springer, MRMC, stated "*We need to identify the requirement not the product.*"

10. TXA

CDR Brendon Drew, 1st Marine Surgeon, started with standard disclaimers. This change was done by a varied team from the Army, Navy, Air Force, and Marines from all walks of life within each branch of Service.

Some of the drivers for this relook are:

1. TBI study and paper by Dr Marty Schreiber
2. IM administration:
3. Auto injector or any other convenient way to use on the battlefield
   a. 0–60 minutes to onset
   b. Logistics: When the logistics are difficult then the compliance decreases
4. Dosage
5. IO

CDR Drew talked about the ability to give TXA IM but stated that we are not there yet but hopefully in the future this will be a possibility. One problem with giving it IM is you do not get peak serum viability for 40–60 minutes compared to IV administration with onset within five minutes and as we all know the sooner you give TXA the better. There are some pig studies that will be coming out and one that is being conducted by an Air Force trauma fellow that is showing the viability of giving high dose of TXA to an animal or human in hemorrhagic shock. Currently there are no studies that show giving TXA IM is a viable option.

The subject of giving TXA IO is more of a "why not" rather than why because anything you can give IV you should be able to give IO. The Ranger regiment and some civilian EMS personnel are giving it IO with no adverse effects, so we will be recommending giving TXA via IO for TCCC.

CDR Drew asked if anyone had thoughts on giving IO or IM?

Q1: Peak-vs-effective serum

A1: Varied to delayed

There was some discussion on the following question:

Q2: What if you have a patient with limited access?

A2: Part of our approach was that everyone is going to be very aggressive in their approach and at the minimum will get IO access. However, we need more human data to show if we can give it IM and get the peak serum level up. Our group concluded that we cannot wait 5 years but we need to do a relook in 2 years. IM use is considered.

Q3: What about intranasal?

A3: Yes, you can give it IN but that is a topical application. There is no evidence by giving it IN there will be any systemic effect. However, TXA soaked gauze is being used by Ortho as a hemostatic agent.

Q4: Is there a contraindication if you give it IM initially and then give it IO later?

A4: Not at this time. Many European militaries propose this now in situations where there is no medical support. IM TXA with delayed onset is one intervention that can potentially be pushed to the level of nonmedical personnel.

Q5: Is there any absorption issues in IM injections if muscle has been exposed to trauma or cold environment?

A5: There are no real studies of muscle beds that have been exposed to hemorrhagic shock for TXA and absorption rate. There is a paper coming out soon on this subject.

Q6: Nebulizer?

A6: Only study he has seen in using TXA via nebulizer is for bronc procedures with biopsies.

There are currently three patient populations that get TXA after they are bleeding: 1) trauma, 2) postpartum hemorrhage, and 3) epistasis. Everyone else gets TXA prophylactically.

CDR Drew then moved onto a subject that has a lot of attention – dosage. He stated the current dosing is based off a 1995 cardiovascular surgery literature paper.

Current dosing:

- First dose: 1g over 10 minutes
- Second dose: 1g over 8 hours

Proposed dosing:

- 2g slow IV or IO push as soon as possible but NOT later than 3 hours after injury (for trauma and TBI).

Current dosing to women in post-partum bleeding:

- First time a current dosing protocol that follows what we are proposing.

Q7: What if you give TXA to someone with a mild TBI?

A7: That is still something that we are looking into. *(The CRASH-3 results had not yet been published at the time of this meeting.)*

Q8: What if overuse of TXA?

A8: Dr Mann-Salinas of JTS PI is doing a study/project on this matter.

Q9: What happens if you give it to fast?

A9: In theory you could cause hypotension. In a study with human volunteers who were given TXA rapidly, one patient complained of orthostatic symptoms. There are no publications with documented clinically relevant hypotension with TXA administration.

11. Tourniquet update

Harold Montgomery, JTS contractor, began with standard disclaimers. Mr Montgomery went over the timeline and decisions points of how the CoTCCC updated the tourniquet recommendations.

The CoTCCC voted on the tourniquet change recommendations in April/May time frame and as soon as we approved the current tourniquets new and possibly better ones have hit the market. The tourniquets that were voted on were split into two groups: 1) nonpneumatic and 2) pneumatic.

Recommended nonpneumatic tourniquets are:

1. Combat Application Tourniquet (CAT) Generation 6
2. Combat Application Tourniquet (CAT) Generation 7
3. SOFTT-Wide
4. Tactical Mechanical Tourniquet (TMT)
5. Ratcheting Medical Tourniquet Tactical (RMT-T) or TX2
6. SAM Extremity Tourniquet (SAM-XT)

Recommended pneumatic tourniquets are:

1. Delphi-EMT
2. Tactical Pneumatic Tourniquet (TPT2)

*NOTE: The pneumatic tourniquets would be primarily used for tourniquet conversions/replacement once the casualty reached a higher level of care but not at POI.

Mr Montgomery then reviewed the grading criteria that was used and will be published in the tourniquet change paper that will be released soon.

Criteria that were established by the working group and used for this project are:

1. Arterial occlusion (main factor)
2. Speed of application
   a. 60 seconds or less
   b. <90 seconds to complete

3. Simplicity of application
4. Pressure
   a. Optimal: 180–500mmHg
      i. Optimal pressure depended on size of thigh and arm
5. Specifications *(minimum)*
   a. 1.5 inches – width *(critical requirement)*
   b. 37.5 inches – length *(critical requirement)*
   c. Weight: <8.0 ounces *(critical requirement)*
   d. Did it have a locking mechanism?
6. Complications and safety
   a. Lots of hearsay but we only looked at actual documented cases.
7. User preference
8. Real-world cases use(s)
9. Logistics
   a. Did they have an NSN?
   b. Cost per tourniquet
      i. GSA cost
      ii. Commercial cost
10. Pain was not included
    a. A lot of studies did use this as a criterion
    b. Pain is subjective
    c. When a tourniquet is applied, it is going to hurt

Way ahead for the CoTCCC and tourniquets was discussed because between the time the tourniquet change was voted on in late May – early June there have been changes to the approved tourniquets and there are new tourniquets on the market. For example: There is the new SOFT-W Gen 4, TX3 added indication for pelvic binder and junctional. The issue is we just finished this review and recommendation and there is a need for a relook already. There was a brief question and answer session after this section.

Q1: Is the tourniquet review our (CoTCCC) responsibility?

A1: No, but all military look to the CoTCCC for guidance; All civilians look to the Military for what works. Example: Stop the Bleed program.

Q2: Should we set the standards and criteria for tourniquets rather than recommending one?

A2: Yes, because all the studies we reviewed were not consistent and used lots of confusing criteria. We have done this in the past with different products and industry reacted quickly and well. We should generate a "Preferred Features" document as part of the way ahead.

Q: Should 60-seconds be the minimum or maximum?

A: Yes, 60 seconds is the maximum.

Q: Why don't we endorse just one tourniquet?

A: That was not the purpose of this study but rather to look at what we recommended in the past and what has been used from 2012 to now. The services can now use this scrutinized list of tourniquets and decide what they want to purchase and outfit their people with. However, with this approach there will be tourniquets on the battlefield that service men and women will not be familiar with and this could lead to deadly results.

Mr Montgomery also discussed the need for "user feedback" so that we are truly looking at what the end users want and use. Some suggested user feedback forums are:
1. DD Form 1380 – casualty documentation
2. JTS after action review
3. Feedback from the field
4. Suggestion box
   a. Not anonymous – to keep vendors from submitting
   b. Should be from a .mil email

This topic created a lot of discussion within the meeting where multiple people stated their frustration that we do not have a real mechanism for feedback and suggestions. Additionally, the majority of members felt the CoTCCC should get away from naming a product but rather come up with a "Preferred Features."

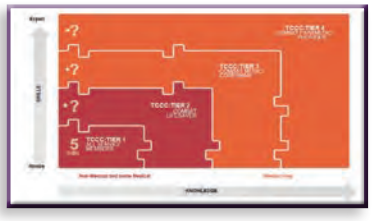
12. TCCC Curricula

Harold Montgomery, JTS contractor, began with standard disclaimers. Mr Montgomery went over some of the issues we (CoTCCC) need to overcome to move forward and realize our target population is the Service members that were born on or after 9-11.

1. How do they learn?
   a. Online
   b. They figure it out on their own
      i. YouTube
   c. They don't know what life was like before mobile devices and computers

Reviewed why there is a push for change:

2. FY 17 National Defense Authorization Act
   a. Public law 114-328, Section 708 (b)(6) (OPR: DHA)
   b. Develop standardized combat casualty care instruction for all members of the Armed Forces, including the use of standardized trauma training platforms
3. DoDI 1322.24 (16 March 2018)
4. Assistant Secretary of Defense – Health Affairs memorandum
   a. Target Date: April 2020
      i. Standardize Joint curriculum delivered to Services
   b. Implementation: NLT 2023
      i. 85% of all Forces should be trained at this point
   c. Four TIERs or levels of care for TCCC
      i. Tier 1 = All Service Members (ASM)
         1. Nonmedical personnel
         2. Student population: ALL Service members
         3. On deployed medicine: as of June 2019
      ii. Tier 2 = Combat Life Savers (CLS)
         1. Nonmedical personnel
         2. Student population: combatants
         3. Deployed medicine after 31 December 2019
      iii. Tier 3 = Combat Medic
         1. Medical personnel
         2. Student population: Medic/Corpsman – Junior Medics/Corpsman
         3. Deployed medicine after 31 March 2020
      iv. Tier 4 = Combat Paramedic
         1. Medical personnel
         2. Student population: SOF Medics, Flight Medics, Physicians/PAs/Providers at Role 1 (and II)
         3. Deployed medicine after June 2020



v. Health Affairs chartered working groups for each tier level:
   1. Tier 1 Chairman: COL Mike Charlton/MSG Michael Remley
   2. Tier 2 Chairman: LTC Ethan Miles
   3. Tier 3 Chairman: Master Chief Jeremy Torrisi
   4. Tier 4 Chairman: CSM Dave Hasac

vi. Army and Navy – all combatants will do Combat Life Saver (CLS).

5. Train-the-Trainer:
   a. Part 1: DoD common Trainer/Instructor course
      i. Service specific: 6 weeks
   b. JKO: 4hrs
   c. Part 2: TCCC Trainer Qualification course (online)
   d. Part 3: Proctored Instructor course
6. Milestones:
   e. 1 June 2018 to 30 April 2020

Q1: What about National Guard and Reserve units?

A1: That will be up to the Service or State to direct training.

Q2: Who will be the lead?

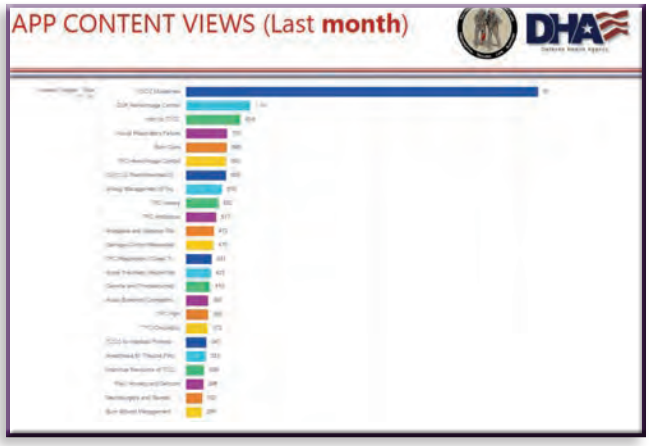
A2: Joint Trauma Education and Training (JTET) branch of the Joint Trauma System.

Recommendation: Stand up the Education and Training working group within CoTCCC to keep up with changes.

13. Web Mobile

Harold Montgomery, JTS contractor, began with standard disclaimers. Mr Montgomery went over the number of downloads from 61,500 downloads. There were over 5,000 hits for just the TCCC guidelines. Worldwide web traffic has risen as well to over 3,500 views per month.

Website: www.deplyedmedicine.com
JTS Website: http://jts.amedd.army.mil/



TCCC can be accessed and followed on any of the following social media sites:

1. Facebook
   a. @CoTCCC
   b. @JointTraumaSystem
   c. 27,000+ followers
2. Twitter
   a. @CommitteeonTCCC
   b. @JointTraumaSyst
   c. 2,700+ followers
3. Instagram
   a. tc3committee
   b. 10,800+ followers
4. LinkedIn
   a. https://www.linkedin.com/groups/12036508
5. You Tube
   a. Channel Name: CoTCCC Committee-on-TCCC

Q1: Are you working with Dr Sawyer, J9

A1: Not currently

14. Trauma Consultants: Three Things I Would Change in TCCC

1. Air Force and Navy: Brian Gavitt, Air Force Surgeon General Consultant, in collaboration with Dr Matt Tadlock, Navy Trauma Specialty Lead. Dr Gavitt stated that he spoke on behalf of both services (Air Force and Navy), Dr Tadlock was unable to attend the TCCC meeting. Dr Gavitt began with standard disclaimers and disclosures.
   a. Change #1: Increase target systolic blood pressure (SBP) from 90 to 110mmHg in patients with moderate to severe TBI.

Where did the original recommendation for a target SBP >90mmHg come from?
- o Based on observations of normal blood pressures in healthy subjects.
- o Not related to TBI.

Discussed multiple studies showing increasing harm with lower BP.
- o Sparite papers shows 19% increase in odds of death for each 10-point drop in SBP

What do other organizations recommend?
- o BTF Guidelines: target SBP of 110mmHg
- o JTS Neurosurgery CPG: target SBP of 110mmHg
- o JTS Prolonged Field Care TBI CPG: target SBP of 110mmHg

Q1: How does this correlate to/with noncompressionable chest injuries?

A1: Mainly isolated head injuries.

Q2: How does blood pressure correlates to blood volume in TBI patients?

A2: Pressure is the proxy for volume in the absence of accurate measurement of volume.

Q3: What is the difference between "blunt and penetrating" injuries?

A3: Could not recall the difference but can send if needed.

b. Change #2: Increase target oxygen saturation (SaO2) for TBI patients to 93–95%.

Dr Gavit's second recommendation is to increase the oxygen saturation (SaO2) goal in moderate to severe head injuries.

Current TCCC guidelines set an SaO2 target of >90%. Similar to hypotension, hypoxia is association with higher risk of death. Current literature tells us SaO2 of 90% and PaO2 of 60% or above is ideal for the average patient, but there is evidence that that may be too low for the patient with a brain injury and especially in an austere environment where monitoring and equipment challenges can predispose to desaturation events.

There is not a whole lot of literature describing the ideal saturation in brain injury but what is out there falls into one of two categories:

- Too little oxygen = bad
- Too much oxygen = bad

The main question is what is optimal PaO2 level of TBI patients?

- Davis et al out of San Diego County, found in their study that the optimal ranges was between 110 and 487. Other studies have shown that PaO2 between 200 and 300 were indicative of a worse outcome. Shock Trauma found <100 or >200 in first 24 hours = higher mortality. Surprisingly the Brain Trauma Foundation has no guidelines.

Current JTS CPGs for both the neurosurgery and severe head trauma recommends saturation levels between 93–95%, and for the performance improvement recommends saturation levels >93%. Prolonged field care recommends saturation level of >95%. There are some discrepancies between the current recommendations.

c. Change #3: Publish guidelines guiding the use of benzodiazepines in the prehospital setting.

Benzodiazepines are currently being used to frequently in conjunction with ketamine. Multiple JTS case reviews and personal experience identified a lack of standardized indications or standardized dosing for prehospital benzodiazepines.

It is being taught in the pipeline to administer versed in conjunction with ketamine to avoid emergence reaction.

We do know from literature that benzodiazepine administration to ICU patients is associated with a higher risk of death.

Q1: Emergence reaction?

A1: Any patient experience of waking up and saying never do that to me again!

Q2: Should we eliminate it or publish guidelines?

A2: Getting rid of benzodiazepines is not a realistic option. However, we do need to make it very clear on when, how, and what dose to give.

d. **ARMY**: COL Shawn C. Nessen, began with standard disclaimers and disclosures. COL Nessen stated he did not have any problems with the current TCCC guidelines and is thrilled that we took the time to give them to the medics.
   1. TXA is a tool to stop bleeding that is not surgery. In the CRASH 2 trial the difference between the control group and the TXA group was five patients. In COL Nessen's Crazy 4 trial (prolonged field trial), it showed increased survival in patients that received TXA. However, it left in question the roll of surgery in the patients. This trial never actually took place but was used as a demonstration.
   2. In 2015, when COL Nessen first addressed the CoTCCC every trauma patient bled out within 6 hours, usually within 2 hours. The goal is to give a patient that would have died time to get to the surgeons. However, if there are no surgeons then there is no help. We have to talk about the problems all the time!
   3. We train our medics and corpsman well, but we do not sustain them well except for the Ranger regiment. What are the requirements to be a surgeon in SOCOM? You have to be able to do surgery but if we don't have any surgeons, we can't do surgery. It has been said that Soldiers fight because medical personnel are there but the way our current organization is going, we are not going to be ready for the next conflict. Dr Butler pointed out a book, Citizen Soldiers, demonstrated how the medical personnel were out on the battlefield with the Soldiers.
   4. This topic created a lot of discussion within the meeting where multiple people stated their frustration with the situation.

WEDNESDAY – 11 SEPTEMBER 2019:
Day 2: 0800 hours

1. **Administrative remarks and introductions:**
   Dr Frank K. Butler, chairman of the CoTCCC, called the meeting to order, and gave some administrative remarks outlining the activities of Day 2. The CoTCCC will be observing the six events of 9-11 throughout the morning.

2. **Senior Leader Remarks:**
   Dr COL (R) Paul Cordts, started the senior leader remarks with the standard disclaimers and disclosures.

   Dr Cordts stated, "We want to keep our GME program with operational forces and jointness."

   0846: North Tower Hit – moment of silence observed

   This topic created a lot of discussion within the meeting where multiple people stated their frustration with the apparent disconnect between higher ups and what is going on at the ground level.

3. **TCCC in the White House**
   Dr Sean P. Conley, senior physician, started his remarks with the standard disclaimers and disclosures in addition he stated he is not speaking on behalf of the White House, EOP, Secret Service, or any other organization.

   Dr Conley gave an UNCLASSIFIED overview of the services they provide.

   0903: South Tower Hit – moment of silence observed

4. **RAPToR Course** ***(Resuscitation Adjuncts: Prehospital Transfusion & REBOA)***
   Dr Zaf Qassim, emergency/critical care physician at the University of Pennsylvania Health System, started his remarks with the standard disclaimers and disclosures with no financial compensation or interests. Dr Qassim is the director of the RAPToR course with MAJ Andrew D. Fisher as codirector.

   The course is designed to focus on potentially preventable prehospital death that is being experienced with torso hemorrhage. This has led to reports showing that about 20% of deaths in 2014 were potentially preventable, which led to the Hartford Consensus and Stop the Bleed campaign with great success but the ARC (advanced resuscitative care) article showed there needs to be augmentation to the TCCC guidelines by adding whole blood and REBOA (resuscitative endovascular balloon occlusion of the aorta).

Dr Qassim discussed a case between two coworkers at an airport where the casualty was stabbed in the groin and bled out due to a severed femoral artery. If EMS would have had whole blood and possibly trained on REBOA, he felt he had a good chance to survive. He went on to discuss how as a physician in England they are used in the prehospital environment and have been using REBOA in the field for the last 5 years. His team has trained EMS in Paris as well with good success. He has concerns on the training in the US due to the vast inapparencies between EMS agencies (voluntary vs nonvoluntary).

We have run two RAPToR courses that last approximately a day and a half, which includes 8 hours of lectures/discussion followed by hands-on training utilizing task trainers. Perfused cadavers were also used thanks to Dr Redman.

Dr Qassim has been working on getting national sponsors with some success. He is close to getting the National Association of EMS Physicians to assume overall responsibility for the course. There are other places you can get the components of this course, but all are separate. For example, the THOR website has information and an online training course for whole blood. Another is the STRAC website.

The way ahead includes: 1) standardizing the curriculum, 2) cross-discipline agreement, 3) military-civilian partnership, 4) regular courses (nationally), 5) ongoing skills, 6) maintenance/assessment (local), and 7) organizational sponsorship.

RAPToR Course website: https://www.raptorcourse.com/

Next course: 19–20 May 2020 in Houston, Texas

There was a brief question and answer session after this section.

0937: Pentagon Hit – Moment of Silence Observed

Q1: What is the legal aspect of using REBOA in prehospital vs hospital and at what level of medical care?

A1: No law specifically. It should ideally be a physician (or at least physician-directed). In hospital depends on credentials and individual training. Prehospital follows same guidelines. Remember REBOA is a team sport.

Q2: Is there an advantage in delaying transportation to perform this procedure because one cannot do this in a helicopter?

A2: It is a judgment call at the time.

Q3: Are there other options besides the REBOA to use in a prehospital environment?

A3: Yes, but in the RAPToR course we do not train in the AAJT.

Q4: Nonphysicians

A4: Yes – if appropriately trained and unit willing to take responsibility.

Q5: Is it realistic to train a nonsurgeon?

A5: Yes – nonsurgeons are placing in UK and France. Key is skill maintenance (same for surgeons).

5. **Fluid Resuscitation** ***(change)***

Dr/CDR Travis Deaton, chairman of emergency medicine at Naval Medical Center in San Diego and CoTCCC member, started his remarks with the standard disclaimers and disclosures with no financial compensation or interests.

Dr Deaton felt it necessary to go over the history of fluid resuscitation to show how far we have come. In 1993 we were using two large-bore IV lines and 2L of crystalloid (NS or LR) infused rapidly.

0959: South Tower collapsed – moment of silence observed

Then in 1994, the Ben Taub Report came out. In their data they pointed out that in hypotensive penetrating trauma patients who received large-volume crystalloid infusions before going into the operating room, these patients did much worse than the patients who had delayed resuscitation.

The CoTCCC came out with fluid resuscitation in 1996 – 1) At the point of injury fluid resuscitation was to be delayed until Tactical Field Care, 2) NO IV fluids for casualties not in shock, 3) NO IV fluids for casualties in shock resulting from uncontrolled hemorrhage, 4) for casualties in shock as a result of hemorrhage that is now controlled, give 1000mL of Hespan® initially, and 5) limit Hespan® to 1,500mL or less.

In 1999, USSOCOM funded a workshop with the Special Operations Medical Association to look at case studies from Mogadishu. One of the lessons learned from this workshop was to titrate to mentation. Dr Holcomb and Dr Champion held a series of fluid resuscitation conferences between 2001 and 2002, to lay out where are we going with fluid resuscitation. In 2014, the current TCCC recommendations for fluid resuscitation were implemented. Whole blood was at the top of the list.

The objectives for prehospital fluid resuscitation are 1) enhance the body's ability to form clots, 2) minimize iatrogenic coagulopathy, 3) provide sufficient intravascular volume for organ perfusion, and 4) optimize oxygen carrying capacity.

The question you are probably asking is what is the proximate cause for change?

i. Black box warnings
ii. Low titer O whole blood (LTOWB)
iii. Walking blood bank = 2% used
iv. ARC paper

1002: Flight 93 crashed in a field – moment of silence observed

Six (6) Questions that Dr Deaton presented to the Committee moving forward with fluid resuscitation.

1. Is there a continued role of crystalloids?
2. Is there a continued role of Hextend?
3. Is FFP an adequate alternative?
4. What is target BP for traumatic hemorrhage with concurrent TBI?
5. Should POC lactate or compensatory reserve index guide intervention?
6. Should calcium be considered with fluid resuscitation?

Challenges moving ahead:

1. A lot of overlapping guidance with ARC and other functional areas of TCCC.
2. Differentiating safety and efficiency of seven different whole blood options.
3. Outcomes data CS-LTOWB and stored walking blood bank products.

Opportunities ahead of us:

1. Guidelines ultimately influence logistics
2. Delineate between TCCC fluid resuscitation and ARC concepts
3. Initiate resuscitation earlier/further forward
4. Improve patient outcomes

There was a lot of discussion, statements and questions on this topic.

1. Statement by Shawn Anderson, "the PJs are pulling Hextend but crystalloids still in use. What blood products can we use in replacement of crystalloids, etc. . . .?"
2. Dr John Holcomb: Normal saline stays but are crystalloids out?
3. Dr Zaf Qassim: Burn resuscitation with blood is bad. Calcium is usually administered too late.
4. Col Stacy Shackleford: JTS CPG updated to add calcium after first unit of whole blood.
5. Shawn: If we leave Hextend as an option, units will default to it.
6. Ed Whitt: If a medic has it, he will use it. Take it out but then what do they have?

1033: NORTH TOWER collapse *(moment of silence)*

6. Abdominal Evisceration

LTC Jamie Riesberg, 10th SFG(A) physician, started his remarks with the standard disclaimers and disclosures with no financial compensation or interests.

Dr Riesberg started out with the question – SO WHAT? Why even look at this subject and what is the overall combat trauma burden of abdominal eviscerations? LTC Riesberg proposed the following questions:

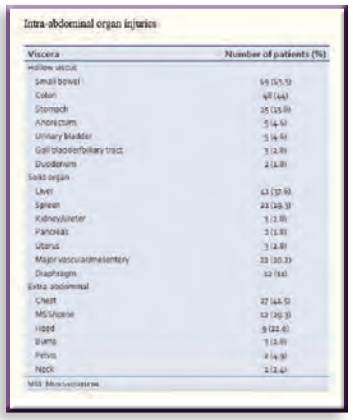
1. What are the *preventable causes of death* in abdominal injury and abdominal evisceration specifically?
2. What prehospital *interventions* reduce the mortality of abdominal eviscerations?
3. Does wound management in the pre-hospital setting favorably impact patient mortality?
   i. If so, what is the *preferred method for managing* abdominal eviscerations?
4. Does a requirement exist for a *novel wound management* device to best manage abdominal evisceration?

In a retrospective study by Rignault conducted of abdominal trauma in war nearly 20% of all battlefield wounds were abdominal and the significance of this is nearly 50% of those died of hemorrhage. Another significant study conducted by Dr George G. Davis in 1943 showed out of 2,525 cases under his care in WWI, only one survived. Further looking into WWI, the mortality rates were between 55-75% for abdominal (colorectal) injuries. However, anther surgeon, P. Santy, showed that if a casualty with an abdominal injury arrived under an hour to surgery the mortality rate was under 10%. The Golden Hour works.

WWII mortality from abdominal wounding dropped to 18–36%. Dr Herbert T. Wikle wrote of his experience in WWII and his recommendation for prehospital care was NOT to replace the intestines into the abdomen and to cover them with wet bandage.

The Korean conflict saw another drop in abdominal wounding mortality to 12%. This trend continued in the Vietnam conflict with abdominal wound mortality dropping as low as 4%. Some of the attributed success are due to antibiotics, rapid Medevac, and wide availability of blood.

A 2016 article featured in *Journal of Emergency Trauma Shock* by Olorundare et al: *Abdominal injuries in communal crises: The Jos experience*, outlined 897 combat-related injuries with 109 being abdominal injuries. The one thing that stands out is the interval between injury and arrival at definitive care – between 2 hours and 5 days, not one met the Golden Hour criteria. The fatality rate of these 109 was 10.8%, which is significantly lower than 13% in Afghanistan and 29.8% in Bosnia-Herzegovina; 31% of the 109 experienced eviscerated bowels.


Intra-abdominal organ injuries

Viscera	Number of patients (%)
Hollow viscus	
Small bowel	69 (63.3)
Colon	48 (44)
Stomach	16 (15.0)
Anorectum	5 (4.6)
Urinary bladder	5 (4.6)
Gall bladder/biliary tract	3 (2.8)
Duodenum	2 (1.8)
Solid organ	
Liver	43 (39.4)
Spleen	23 (21.1)
Kidney/ureter	3 (2.8)
Pancreas	3 (2.8)
Uterus	3 (2.8)
Major vascular mesentery	33 (30.3)
Diaphragm	12 (11)
Extra-abdominal	
Chest	37 (33.9)
MS/spine	12 (10.1)
Head	9 (22.6)
Burns	3 (2.8)
Pelvis	4 (3.7)
Neck	3 (2.8)
MSI Musculoskeletal	

A few "Civilian Experience" studies were looked at as well. One by W.S. Stebbings was out of London that reviewed 201 patients with stab wounds. They found that evisceration of small bowel or omentum was always associated with significant intraperitoneal injury. A Cook County study by K. Nagy from 1991 to 1999, reviewed 81 patients with evisceration after abdominal *stab* wound; 63 had intra-abdominal injury that required repair.

Prehospital, what should you do and how? The care of eviscerated organs requires attention to detail and the organs should be handled as little as possible. Cover the organs in sterile gauze or a sheet and wet them down with sterile saline. It is vital that they remain covered and moist during transport. However, the Wilderness Medical Society advises to reduce back into the abdominal cavity if the bowel is not perforated.

What are combat medics being taught? To cover the contents with sterile dressing and moisten with saline and covered with a large dry dressing to keep the casualty warm.

Dr Riesberg looked at what are the services teaching for the prehospital treatment *"If the wound margins are too tight, should you reduce or is there hemostatic benefit?"*

1. Navy: stop hemorrhage and use water. Do NOT attempt to push the intestine back in or to manipulate it in any way.

2. Marines: Wet dressing, prevent hypothermia.

Questions for CoTCCC:

1. Does wound management in prehospital setting favorably impact patient mortality?
2. If so, what is the preferred method for managing abdominal evisceration?
3. Wet vs dry dressing?
4. Sterile vs plastic/mylar *(garbage bags need to be clear)*
5. Irrigation?
   a. Yes or no
   b. If yes, what fluid?
6. Reduction?
7. AAJT?
8. Antibiotics?
   a. Combat Wound Pill Pack
   b. Ertapenem
9. XSTAT
   a. Potential 72-hour indication for prolonged field care.

TCCC Proposed Change?

1. Inspect and dress known wounds.
   a. Abdominal evisceration – cover exposed bowel with a moist, sterile dressing or sterile water – impermeable covering.
   b. Attempt may be made to replace abdominal contents by gently lifting the abdominal skin peripheral to the exposed viscera; DO NOT force contents back into abdomen or reduce obviously contaminated or actively bleeding viscera.

Dr Warren Dorlac agreed with covering and not reducing. Definitely need to cover it to prevent heat loss as well.

Dr Peter Rhee stated *"There is a bowel bag (wet moist dressing). Cover it, wet it."*

Mr Don Parsons stated *"A shower cap = bowel bag."*

Harold "Monty" Montgomery asked, "What about abdominal bleeds?"

7. ACTION ITEMS

Dr Frank Butler wrapped up the day-and-a-half of discussion by reviewing what is on the docket for the CoTCCC.

CoTCCC Changes Currently Under Consideration

19-01	Tourniquet Review	Mr Montgomery (Approved)
19-02	TXA Relook	CAPT Brendon Drew
19-03	Hypothermia Relook	Dr Brad Bennett
19-04	IT Clamp Relook	CDR Dana Onifer (Approved)
19-05	Evisceration Injuries	LTC Jamie Riesberg
19-06	Fluid Resuscitation	CDR Travis Deaton

Other Proposed Changes to TCCC

- Plasma for fluid resuscitation in burn patients
- Plasma for fluid resuscitation in TBI patients
- End-tidal CO_2 monitoring in TFC
- Calcium administration in TFC even for casualties not yet being transfused – give it for the same indications as TXA?
- Modify treatment of eye injuries to specify that life-threatening bleeding from the orbit should be treated while addressing massive hemorrhage?
- Input on "Three Things I Would Change About TCCC" from the Service trauma consultants presented at this meeting
- Replace moxifloxacin with levofloxacin? (COL Clint Murray)
- Increase initial ketamine dose? (MAJ Andy Fisher)
- Specify using the two vented chest seals with laminar vents? Or just don't treat open pneumothorax? (Dr Bijan Kheirabadi 2017)
- Incorporate sedation agents (benzos?) into the TCCC Guidelines? (Col Stacy Shackelford/MSG Mike Remley)
- Relook at Cric-Key™ (75th Ranger Regiment experience) and NPA use
- Tourniquets and hemostatic dressings: Need a combination of preferred features and routine (annual) review of recommended devices using comprehensive, standardized metrics for both new devices and previously recommended devices that have been modified since CoTCCC recommendation.
- Modify treatment of eye injuries to specify that life-threatening bleeding from the orbit should be treated while addressing massive hemorrhage?
- Snakebite?
- Near-drowning?
- CBRN Section in the TCCC Guidelines?
- Additional Measures in ARC?
  - o Calcium and bicarb prior to balloon deflation?
  - o Valproic acid for TBI?
  - o Vasopressin?
  - o Ventilators?
  - o Glideslope intubation?
  - o Progesterone?
  - o Suction for chest tubes?
  - o AED?
  - o Wound care – irrigation?
  - o Lateral canthotomy
  - o Pneumatic tourniquet?
  - o What else?

Future Technology Items

- After FDA approval and/or more studies
- ResQFoam™
- Compensatory Reserve Index Monitor
- AAJT? (when NCTH bleeding can be localized)
- AFMES Conference 4 Sept 2019
- 2 potentially preventable deaths
- Isolated iliac vessels injuries

TCCC Business Practice Decision

How do we handle situations in which a TCCC-recommended item is significantly changed?

- Tourniquets
- XStat® – chitosan removed
- Celox™ Gauze to Celox™ - Rapid
- Cric-Key™ packaging with Cric-Knife™

CoTCCC Way Ahead – Leadership Recommendations

- Interim CoTCCC Chairman: CAPT Brendon Drew
- Vice Chairman: Mr Harold "Monty" Montgomery

8. AFTERNOON: Breakout Sessions

Acknowledgments

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

Disclaimers

The opinions or assertions contained herein reflect the events of the 10–11 September 2019 meeting of the CoTCCC. They are not to be construed as reflecting the views of the Department of the Army or the Department of Defense.

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