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# J SOM

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THE JOURNAL FOR OPERATIONAL MEDICINE AND TACTICAL CASUALTY CARE



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

A Peer-Reviewed Journal that Brings Together the Global Interests of Special Operations' First Responders

## Committee on Tactical Combat Casualty Care Meeting: 3–4 February 2014, Atlanta, Georgia

*Meeting Minutes: 17 April 2015*

3 February 2015

### Combat Medic Presentation: SFC Matt Hoard

SFC Hoard, a Special Forces medic, discussed a casualty scenario in Afghanistan in 2013 in which a rocket-propelled grenade round impacted an RG-33 armored vehicle and resulted in bilateral lower extremity injuries to a team member. The Junctional Emergency Treatment Tool (JETT™; North American Rescue LLC; <http://www.narescue.com>) was applied and was effective at controlling the bleeding. However, two issues arose. First, the JETT became dislodged during patient transfer; second, the receiving Forward Surgical Team was unfamiliar with the JETT and cut it off when the casualty arrived at that facility. The Soldier subsequently died of his wounds.

The Abdominal Aortic and Junctional Tourniquet™ (AAJT; Chinook Medical Gear Inc.; [www.chinookmed.com](http://www.chinookmed.com)) was also discussed and it was noted that the AAJT is now approved for a 4-hour application. In testing at the US Army Institute of Surgical Research (USAISR), however, a Combat Ready Clamp (CrOC™; Combat Medical Systems; [www.combatmedicalsystems.com](http://www.combatmedicalsystems.com)) was applied at the umbilicus to occlude flow in the distal abdominal aorta (analogous to the AAJT) for 2 hours. This application 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.

### Tactical Combat Casualty Care (TCCC) Update: Dr Frank Butler

CAPT (Ret) Frank Butler, chair of the Committee on Tactical Combat Casualty Care (CoTCCC), provided a review of recent changes to the TCCC Guidelines and other current TCCC issues.

A. QuikClot® Combat Gauze™ (Z-Medica; [www.z-medica.com/healthcare](http://www.z-medica.com/healthcare)) remains the first choice for a hemostatic dressing in TCCC. ChitoGauze® (HemCon Medical Technologies Inc.; [www.hemcon.com/Home.aspx](http://www.hemcon.com/Home.aspx)) and Celox™ gauze (Medtrade Products Ltd.; [www.celoxmedical.com/usa/products/celox-gauze](http://www.celoxmedical.com/usa/products/celox-gauze)) have now been recommended by the CoTCCC as 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 (USAISR) safety model, as Combat Gauze has, but both are chitosan-based products in a gauze format (similar to the previously used HemCon dressings). No adverse events were noted as a result of HemCon use during the

4 years that it was fielded as the US Army and US Special Operations Command (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 red blood cells (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 (Hospira, Inc.; [www.hospira.com](http://www.hospira.com))
9. (Tie) lactated Ringer's or Plasma-Lyte A (Baxter International Inc.; [www.Baxter.com](http://www.Baxter.com))

C. Damage control resuscitation, as developed by the USAISR and implemented by the Department of Defense (DoD) Joint Trauma System (JTS), has been definitively proven to save lives. Efforts to expand prehospital blood product use, especially whole blood, should be continued and expanded.

D. Normal saline (NS) is NOT recommended as a resuscitation fluid, because of studies showing that NS is associated with hyperchloremic metabolic acidosis.

E. Tourniquets: a 2-hour recheck of tourniquets applied during Care Under Fire or Tactical Field Care is now mandated to determine if tourniquet removal is feasible and hemorrhage control can be maintained with Combat Gauze or other means. This does not replace the frequent rechecks of tourniquets to assess for continued efficacy in bleeding control. Also, if the site of extremity bleeding is not immediately obvious to the TCCC provider, initial tourniquet placement during Care Under Fire should be “high and tight” until circumstances permit a more precise determination of the location of the bleeding site; if this option is used, it should be followed by a subsequent relocation of the tourniquet to a site just proximal to the bleeding, when feasible.

F. The CoTCCC now recommends the use of ondansetron, as opposed to the previously recommended promethazine, for control of opioid- or trauma-induced nausea and vomiting. This recommendation was approved by a vote of 41-0. The dose is 4mg with a repeated dose of another 4mg in 15 minutes if the first dose is ineffective. The maximum dose is 8mg every 8 hours. Ondansetron may be given intravenously (IV), intramuscularly (IM), interosseously (IO), or by oral dissolvable tablets (ODT), but the

oral formulation is not recommended. Ondansetron has a more favorable side-effect profile than promethazine.

- G. The use of tranexamic acid (TXA) to promote hemostasis was discussed at length. The CRASH-2 and MATTERS studies showed that early use of TXA can be lifesaving. Multiple papers in the orthopedic and spinal surgery literature have shown that TXA reduces surgical blood loss without causing an increase in thromboembolic events. Since TXA has been shown to be effective at reducing blood loss, it should be used by prehospital care providers as soon as possible after injury in penetrating torso trauma. Delaying administration of TXA until arrival at a medical treatment facility is not supported by the available evidence.
- H. TCCC has been shown to reduce the incidence of preventable deaths in combat casualties, but it has not been implemented evenly throughout the Armed Services and the Geographic Combatant Commands. Having physicians who have not been trained in TCCC in the position of supervising combat medical providers who have been trained in TCCC is clearly not optimal. Strategies to mitigate this unfavorable situation are being explored by the JTS.
- I. The Army Department of Combat Doctrine Development recently recommended the SAM® Junctional Tourniquet (SAM Medical Products; [www.sammedical.com/products](http://www.sammedical.com/products)) as the Army solution for junctional hemorrhage control. This recommendation was approved by the US Army Medical Command.

### Joint Theater Trauma System Prehospital Director Brief: MAJ Neil David

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

### Trauma Considerations in Operation United Assistance: COL Jim Czarnik

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

### Proposed Change: iTClamp: MAJ Kyle Faudree

MAJ Faudree, the Regimental Physician Assistant for the 160th Special Operations Aviation Regiment, discussed the Innovative Trauma Care iTClamp® ([www.innovativetrauma.care.com](http://www.innovativetrauma.care.com)). This is a small device (similar to a "chip clip" but

much sturdier) designed to close skin lacerations and wounds and, therefore, promote hemorrhage control. Dr John Holcomb, Dr Don Jenkins, and MSG Curt Conklin also expressed their support for this device. It was noted to be especially useful for controlling bleeding from scalp lacerations.

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

### Far-Forward Blood Product Options: Dr Phil Spinella

Dr Spinella, a pediatric intensivist and a recognized expert in transfusion medicine, discussed options for far-forward blood product administration on the battlefield. Options include whole blood, RBCs, thawed plasma, and freeze-dried plasma. Dr Spinella believes that whole blood is the simplest and most effective blood product to use in the prehospital tactical environment. He noted that the Royal Caribbean Cruise Line has a whole-blood transfusion program for use in their ships at sea. In a 40-month period, there were 40 emergent whole-blood transfusions, with patients receiving between 1 and 6 units of blood. There was one allergic reaction and no infectious complications in this series. Dr Spinella favors a low-titer Group O strategy for far-forward whole blood transfusions.

### Far-Forward Fresh Whole Blood/TXA in TCCC: CDR Geir Strandenes

CDR Strandenes, from the Norwegian Navy Special Operations unit, also recommends the use of whole blood for resuscitation from hemorrhagic shock in far-forward environments. His unit uses Group A blood for blood type A recipients and Group O (preferably low titer) blood for all others. He also discussed how this program has been implemented with Norwegian Maritime Special Operations. His unit's program includes a donor pool of unit personnel, blood donor pre-screening, protocols for emergency whole-blood collections, and a blood administration protocol. CDR Strandenes recommends designating low-titer Group O whole blood as the universal whole blood choice and increasing use of serum lactate levels to guide transfusion volume.

He also recommends re-evaluation of the present strategy for using TXA in the US Military: using the mechanism of injury as a trigger for administration; giving TXA via slow IV push rather than as a 10-minute infusion; and drawing up doses of TXA prior to the mission.

### 75th Ranger Regiment Blood Program: MSG Curt Conklin

MSG Conklin, the Senior Medic in the 75th Ranger Regiment, outlined the Regiment's plan to implement a low-titer Group

O whole-blood transfusion program for use on the battlefield. Using only prescreened donors known to be low-titer Group O minimizes the likelihood of the most significant complication of prehospital whole-blood administration, an ABO-incompatible transfusion.

### Proposed Change: AAJT: COL Samuel Sauer

COL Sauer, Dean of Graduate Medical Education at the US Army School of Aerospace Medicine, 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 may accompany lower extremity junctional bleeding.
- b. Pelvic hemorrhage, whether blunt or penetrating, is a common cause of morbidity and mortality in multiple settings.
- c. The AAJT has a lower profile and it easier to handle during casualty transport than other options for junctional hemorrhage control.
- d. Pelvic stabilization has not been definitively shown to decrease hemorrhage in pelvic fractures, but the AAJT is recognized by the Food and Drug Administration (FDA) to stabilize pelvic fractures.
- e. The AAJT is the only device to not show the return of arterial flow through collateral blood flow within 60 seconds.
- f. The AAJT is the only device to date that has actually saved human life through use at both upper and lower junctional bleeding sites.
- g. The AAJT is the only device with human research that supports its safety and efficacy at each of its application sites. Why use any device that has not been tested on live humans for safety and efficacy?

Potential concerns with the AAJT include:

- a. The potential for pulmonary compromise. Pressure on the abdomen may create a restrictive physiology; however, one published case noted improved end-tidal carbon dioxide and oxygenation after application of the AAJT in a combat casualty with bilateral lower extremity amputations. Umbilical application of the AAJT eliminates aortic blood flow to distal vascular beds and may provide hemodynamic benefits through increasing perfusion of the brain, heart, and lungs.
- b. Bowel ischemia. This has not been adequately researched, but COL Sauer pointed out that death from uncontrolled hemorrhage is also bad for the bowel. Animal studies showing tissue necrosis with umbilical application of the CRoC for 2 hours may not be relevant, due to markedly different tissue pressures.
- c. Acute kidney injury. This potential concern has also not been well researched but a periumbilical AAJT application that compresses the aorta below the level of the renal arteries would theoretically increase renal perfusion pressure.
- d. Pain from AAJT application can be treated with TCCC-recommended analgesic agents.

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

### JTS/AFMES Combat Fatality Reviews: Lt Col Ed Mazuchowski

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

### Joint First Aid Kit: CDR Rick Zeber

CDR 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 9,000 of the new JFAKs. Naval Forms Online is the lead print office for the New DD 1380 TCCC Card and interested parties can find it there by searching for "DD 1380." The Revision date for the form is June 2014.

### New Business: Dr Frank Butler and Dr David Marcozzi

Dr Butler and Dr Marcozzi (LTC, USAR) discussed the translation of military trauma care lessons learned into civilian practice. A pending publication will show that 86% of US trauma centers that responded to a recent survey use damage control resuscitation guidelines, but only 20% use tourniquets. A recent case from San Diego, California, was discussed in which a former Navy Corpsman applied a field expedient tourniquet to a motorcycle accident victim who had suffered a traumatic amputation. The tourniquet stopped the hemorrhage, but was subsequently removed when a 911 operator instructed the caller to do so. The patient then expired due to his renewed blood loss. This incident highlights the need to expedite the transition of lessons learned in prehospital trauma care from Afghanistan and Iraq into the civilian sector, and ways in which this might be accomplished were discussed by the group.

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. These courses have been taught all over the United States and in 20 other nations around the world. There was strong agreement from the group that the DoD should require military medical physicians, physician assistants, and Combat medical providers to obtain TCCC certification, just as we do with other medical courses such as Advanced Cardiac Life Support, which have less applicability to battlefield trauma care than TCCC. This certification should be renewed every 2 years. NAEMT also teaches the TCCC-inspired but civilian-oriented Tactical Emergency

Casualty Care, Law Enforcement First Responder, and Bleeding Control (B-Con) courses, and these courses are excellent alternatives for organizations that would prefer not to use military-style courses to train their personnel.

4 February 2015

### Senior Leader Remarks: MG Brian Lein

MG Lein, the Commander of the US Army Medical Research and Materiel Command, outlined his views on TCCC and the need to bring advanced care far forward. He stated that care should not be role dependent but rather casualty dependent. He recalled that the Joint IED Defeat Organization initiative took lessons learned from real-world improvised explosive device (IED) events and incorporated them into training at the National Training Center within 2 weeks, greatly improving the response and capabilities of deploying Military units. The question was posed: why can't advances in battlefield trauma care be implemented in a similarly expeditious manner?

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 noted 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 to consider new weapons systems and different wounding patterns in planning for CCC in possible future conflicts.

Finally, MG Lein shared a recent experience with a trauma victim here in the United States, where the tenets of TCCC and care we have learned on the battlefields of Iraq and Afghanistan were not performed, demonstrating the need to further educate all first responders and further awareness on forward resuscitation techniques.

### Combat Medic Presentation: SSG Jonathan Talbot

SSG Talbot, from the 4th Infantry Brigade Combat Team, 4th Infantry Division in Fort Carson, Colorado, presented a casualty scenario in which an Afghan National Army Soldier arrived at a Role 1 Aid Station after having stepped on an IED outside of his vehicle. The casualty had suffered a partial amputation of his right leg and a complete amputation of his left leg just below the knee. The patient also had multiple amputated digits on both hands. Point of injury (POI) care consisted of CAT tourniquets to both lower extremities and his left arm.

On arrival at the Aid Station, the casualty displayed signs of hemorrhagic shock. He was alert, but incoherent, and had absent radial pulses. His initial vital signs were: blood pressure, 60 mmHg palpable; respiration rate, 10/minute; and heart rate, 154/minute. Aid Station treatment consisted of the following:

- Assessment and reinforcement of initial POI tourniquets
- Administration of high-flow oxygen
- IV access (right arm)
- Wound packing
- Pressure bandages (all four extremities)
- Splints placed on both lower extremities

- Central line (right subclavian)
- 5 units of O-positive RBCs
- Zofran 8mg IV
- Fentanyl 100µg, followed by three additional doses of 50µg each
- TXA, 1g
- ANCEF, 2g

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

### III Corps TCCC Overview: COL Jim Geracci

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

### JTS Director Brief: COL Kirby Gross

COL 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 its subsequent evolution. Among the many functions performed by the JTS by the end of the recent conflicts were ownership of the DoD Trauma Registry; a robust CCC performance improvement process; predeployment training for Joint Theater Trauma System (JTTS) teams; advocacy in the contiguous United States for the deployed trauma care mission; mentorship of JTTS leaders; ongoing review and update of the JTS Clinical Practice Guidelines; and conduct of the weekly, worldwide CCC performance-improvement teleconference.

### Proposed Change: XStat: SGM Kyle Sims

SGM Sims, from the USSOCOM, discussed a new hemostatic device, XStat® (RevMedX Inc.; www.revmedx.com), which is an injectable chitosan-coated compressed sponge system. The device is currently FDA approved only for junctional hemorrhage and only for use on the battlefield. Testing at the Naval Medical Research Unit, San Antonio, using a porcine bleeding model of subclavian artery and vein injury, found that XStat could be applied in half the time of Combat Gauze (31 seconds versus 60 seconds) Blood loss was also significantly reduced, although there was no difference in survival between the XStat group and the Combat Gauze group in this study. A similar device that is chitosan-free and intended for smaller entrance wounds is also

being developed. A change paper proposing the incorporation of XStat into the TCCC Guidelines is being prepared.

### Prehospital Trauma Life Support (PHTLS) TCCC Courses: Mr Mark Lueder

Mr Lueder, from the PHTLS organization, discussed the PHTLS TCCC training program. PHTLS courses are taught under the sponsorship of the NAEMT and use the JTS-developed TCCC curriculum. Course graduates are maintained in a central TCCC training registry and receive a TCCC certification card upon completion of the course. These courses have been taught all over the United States and in 20 other nations around the world.

There was strong agreement from the group that the DoD should require all medical personnel to obtain TCCC certification cards just as we do for Basic Life Support, Advanced Cardiovascular Life Support, and Advanced Trauma Life Support. This training should be repeated every 2 years. As noted, NAEMT also teaches the TCCC-inspired but civilian-oriented previously Tactical Emergency Casualty Care, Law Enforcement First Responder, and Bleeding Control courses in addition to its PHTLS and TCCC courses.

### Tactical Evacuation Care (TACEVAC) Time and Survival: Dr Russ Kotwal

COL (Ret) Kotwal presented the abstract for a manuscript that he and his coauthors submitted to the *New England Journal of Medicine* for publication consideration. Their study evaluated the concept of the “Golden Hour” by comparing outcomes before and after the 2009 mandate by Secretary of Defense Gates to conduct prehospital Tactical Evacuation (TACEVAC) missions in 60 minutes or less (aircraft call to medical treatment facility arrival). Their study findings support the importance of expeditious TACEVAC and include significant reductions of Killed in Action deaths as a result of more rapid prehospital helicopter transport as well as early blood transfusion.

### Prolonged Field Care: COL Sean Keenan

COL Keenan, the 10th Special Forces Group Surgeon, discussed Prolonged Field Care (PFC) and his group’s endeavors to define optimal care for casualties who must be managed for long periods in austere, remote environments while awaiting evacuation. One of the goals of the PFC effort is to answer the question: What happens at the end of TCCC? It is challenging to develop protocols for all possible contingencies that an isolated medic might face. The answer, therefore, likely lies in improved medic training and in the use of advanced telemedicine technology, rather than trying to develop protocols for every contingency.

### PHTLS 8 Military Textbook/New TCCC Curriculum: Dr Steve Giebner

Dr 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 and the terminology used in this version of the curriculum is aimed at the nonmedical individual.

### TCCC Issues: Medic Perspective: MSG Harold Montgomery

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

### Stellate Ganglion Block for PTSD: COL Sean Mulvaney

COL Mulvaney, from Walter Reed National Military Medical Center, discussed his recent *Military Medicine* paper describing the use of stellate ganglion block (SGB) to treat Servicemembers suffering from posttraumatic stress disorder (PTSD) when their symptoms fail to respond to first-line therapy. In a series of 166 patients from a military population with multiple combat deployments who were treated with SGB, more than 70% had a clinically significant improvement that persisted beyond 3–6 months after the procedure. Selective blockade of the right cervical sympathetic chain at the C6 level was found to be a safe, effective, and minimally invasive procedure with which to treat patients suffering from PTSD. Despite this published success, SGB is not being widely used in the DoD at this time to treat refractory PTSD symptoms.

### TCCC Research Priorities: Dr Frank Butler

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

17 April 2015  
Frank K. Butler, MD, CAPT, MC, USN (Ret),  
Chairman, Committee on TCCC

**Enclosures:**  
(1) Attendance  
(2) Agenda 12  
Enclosure (1)

## TCCC MEETING

3–4 February 2015

### Attendance

#### CoTCCC Voting Members

Col Jeff Bailey  
CDR Sean Barbabella  
COL Peter Benson  
SGM F. Bowling  
Dr Frank Butler  
MSG Curt Conklin  
COL Jim Czarnik  
COL Brian Eastridge  
COL Erin Edgar  
Cpt Kyle Faudree  
HMCM Mike Grohman  
COL Kirby Gross  
CAPT Matt Hickey  
Dr Jay Johannigman  
CAPT Ken Kelly  
Mr Win Kerr  
LTC Bob Mabry  
LTC Dave Marcozzi  
MSG Harold Montgomery  
COL Kevin O'Connor  
LCDR Dana Onifer  
Dr Mel Otten  
Mr Don Parsons  
Mr Gary Pesquera  
CMSGT Tom Rich  
Lt Col Steve Rush  
COL Samuel Sauer  
CMSGT Ryan Schultz  
Mr Rick Strayer  
HMCS Jeremy Torrisi

#### Designated TCCC Subject Matter Experts

COL Frank Anders  
Dr Brad Bennett  
Dr Jeff Cain  
Dr Dave Callaway  
Dr Howard Champion  
Dr Warren Dorlac  
Mr Bill Donovan  
Dr Jim Dunne  
Dr Rocky Farr  
Dr John Holcomb  
Dr Russ Kotwal  
Dr Norman McSwain  
Mr Eric Sine

#### CoTCCC Staff

Dr Steve Giebner  
Ms. Danielle Davis

## Military Liaisons

COL Lance Cordoni  
COL Jim Geracci  
LTC Dan Irizzary  
LtCol Ed Mazuchowski  
Mr John Miles  
SGM Kyle Sims  
Ms. Mary Ann Spott  
CAPT Zsolt Stockinger  
COL Hal Walker  
Lt Col Rich Weber  
COL Ian Wedmore  
Mr Ed Whitt  
COL Mike Wirt  
CDR Richard Zeber

## Allied Liaisons

LTC Kazumichi Yoshida  
LCDR Wade Brockway  
Dr Geir Stranden 14

## Interagency Liaisons

Dr Bruce Cohen  
Mr Josh Knapp  
Mr Jeff Rutherford

## Guest Speakers

MAJ Neil David  
SFC Matt Hoard  
COL Sean Keenan  
MG Brian Lein  
Mr Mark Lueder  
COL Sean Mulvaney  
Dr Philip Spinella  
SSG Johnathan Talbot

## Invited Guests

COL Dave Barber  
Dr Dave Bear  
CDR Tyson Brunstetter  
MAJ Robert Carter  
Dr Victor Convertino  
MSG John Dominguez  
CAPT Barbara Drobina  
Dr Dennis Filips  
COL Shawn Kane  
Dr Rob Mazzoli  
Mr John Miles  
Danny Morissette  
MAJ John Robinson  
MAJ Stuart Tyner

## ENCLOSURE 2 COTCCC MEETING AGENDA

3–4 February 2015

Tuesday, 3 February 2015

AM

0800 Butler – Administrative Remarks and Introductions  
0830 Hoard – Combat Medic Presentation  
0900 Butler – TCCC Update  
0930 Break  
0945 David – JTTS Prehospital Director Brief  
1015 Czarnik – Trauma Considerations in Operation United Assistance  
1045 Faudree/Holcomb – Prop Change – iTClamp  
1115 Group iTClamp Discussion  
1145 Lunch

PM

1300 Spinella – Far-Forward Blood Product Options  
1330 Strandenes – Far-Forward FWB/TXA in TCCC  
1400 Conklin – 75th Ranger Regiment Blood Program  
1430 Break  
1445 Sauer – Prop Change – AAJT  
1515 Group AAJT – Discussion  
1545 Mazuchowski – JTS/AFMES Combat Fatality Reviews  
1615 Zeber – JFAK  
1630 Group New Business  
1700 Finish  
1800 Dinner

Wednesday, 4 February 2014

AM

0800 Butler – Administrative Remarks  
0815 MG Lein – Senior Leader Remarks  
0845 Talbot – Combat Medic Presentation  
0915 Geracci – III Corps TCCC Overview  
0945 Break  
1000 Gross – JTS Director Brief  
1030 Sims – Prop Change – XStat  
1100 Group XStat Discussion  
1130 Lueder – PHTLS TCCC Courses  
1145 Kotwal – TACEVAC Time and Survival  
1200 Lunch

PM

1300 Keenan – Prolonged Field Care Update  
1330 Giebner – PHTLS 8 Military Textbook; New TCCC Curriculum  
1400 Timby – USMC TCCC Overview  
1430 Break  
1445 Montgomery – TCCC Issues – Medic Perspective  
1515 Butler – TCCC Research Priorities  
1600 Butler – CoTCCC Action Items  
1630 Group New Business  
1700 Finish

## Change to Replace Promethazine With Ondansetron

The proposed change to replace Phenergan (promethazine) with Zofran (ondansetron) as the preferred antiemetic medication in Tactical Combat Casualty Care (TCCC) has now been approved by the Committee on Tactical Combat Casualty Care (CoTCCC).

The original selection of promethazine over ondansetron for the TCCC Guidelines was made at a time when ondansetron was still being sold under patent. Generic forms of the drug were not available and Zofran was prohibitively expensive for use as a battlefield anti-emetic.

Ondansetron is now off patent and available at a much lower cost than in the past. It is increasingly being used as the medication of choice for the treatment of nausea and vomiting in emergency departments (EDs) and the prehospital environment, as well as in inpatient, obstetrical, and postsurgical settings.

Ondansetron is approved by the US Food and Drug Administration (FDA) for the treatment of nausea and vomiting in cancer patients who are being treated with chemotherapy or ionizing radiation. It is also FDA approved for postoperative nausea and vomiting. There is, however, an extensive body of literature describing its successful use in many other settings,

including undifferentiated nausea and vomiting in the ED. It has a well-established record of efficacy and safety and has a side-effect profile more favorable for use on the battlefield than that of promethazine.

The wording for ondansetron use in TCCC (in both Tactical Field Care and Tactical Evacuation Care) is:

**13k. Ondansetron, 4mg ODT/IV/IO/IM, every 8 hours as needed for nausea or vomiting. Each 8-hour dose can be repeated once at 15 minutes if nausea and vomiting are not improved. Do not give more than 8mg in any 8-hour interval. Oral ondansetron is NOT an acceptable alternative to the ODT formulation.**

The updated TCCC Guidelines (dated 9 February 2015) are included this issue of the *Journal of Special Operations Medicine*. The position paper that supports this change has been approved for release and will be published in the near future in JSOM.

Thanks to LCDR Dana Onifer from the Marine Corps Special Operations Command and his coauthors for their work in preparing this change to the TCCC Guidelines.



# Tactical Combat Casualty Care Guidelines

9 February 2015

\*All changes to the guidelines made since those published in the 2014 *Prehospital Trauma Life Support Manual*, 8th ed., are shown in bold text. The most recent changes are shown in red text.

\*These recommendations are intended to be guidelines only and are not a substitute for clinical judgment.

## Basic Management Plan for Care Under Fire

1. Return fire and take cover.
2. Direct or expect casualty to remain engaged as a combatant if appropriate.
3. Direct casualty to move to cover and apply self-aid if able.
4. Try to keep the casualty from sustaining additional wounds.
5. Casualties should be extricated from burning vehicles or buildings and moved to places of relative safety. Do what is necessary to stop the burning process.
6. Airway management is generally best deferred until the Tactical Field Care phase.
7. Stop life-threatening external hemorrhage if tactically feasible:
  - Direct casualty to control hemorrhage by self-aid if able.
  - Use a CoTCCC-recommended **limb** tourniquet for hemorrhage that is anatomically amenable to tourniquet use.
  - Apply the **limb** tourniquet over the uniform clearly proximal to the bleeding site(s). If the site of the life-threatening bleeding is not readily apparent, place the tourniquet “high and tight” (as proximal as possible) on the injured limb and move the casualty to cover.

## Basic Management Plan for Tactical Field Care

1. Casualties with an altered mental status should be disarmed immediately.
2. Airway management
  - a. Unconscious casualty without airway obstruction:
    - Chin lift or jaw thrust maneuver
    - Nasopharyngeal airway
    - Place casualty in the recovery position
  - b. Casualty with airway obstruction or impending airway obstruction:
    - Chin lift or jaw thrust maneuver
    - Nasopharyngeal airway
    - Allow casualty to assume any position that best protects the airway, to include sitting up.
    - Place unconscious casualty in the recovery position.
    - If previous measures unsuccessful:
      - Surgical cricothyroidotomy (with lidocaine if conscious)
3. Breathing
  - a. In a casualty with progressive respiratory distress and known or suspected torso trauma, consider a tension pneumothorax and decompress the chest on the side of the injury with a 14-gauge, 3.25-inch needle/catheter unit inserted in the second intercostal space at the mid-clavicular line. Ensure that the needle entry into the

chest is not medial to the nipple line and is not directed towards the heart. An acceptable alternate site is the 4th or 5th intercostal space at the anterior axillary line (AAL).

- b. All open and/or sucking chest wounds should be treated by immediately applying a vented chest seal to cover the defect. If a vented chest seal is not available, use a non-vented chest seal. Monitor the casualty for the potential development of a subsequent tension pneumothorax. If the casualty develops increasing hypoxia, respiratory distress, or hypotension and a tension pneumothorax is suspected, treat by burping or removing the dressing or by needle decompression.
  - c. Casualties with moderate/severe TBI should be given supplemental oxygen when available to maintain an oxygen saturation >90%.
4. Bleeding
    - a. Assess for unrecognized hemorrhage and control all sources of bleeding. If not already done, use a CoTCCC-recommended **limb** tourniquet to control life-threatening external hemorrhage that is anatomically amenable to tourniquet use or for any traumatic amputation. Apply directly to the skin 2–3 inches above the wound. **If bleeding is not controlled with the first tourniquet, apply a second tourniquet side-by-side with the first.**
    - b. For compressible hemorrhage not amenable to **limb** tourniquet use or as an adjunct to tourniquet removal, use Combat Gauze® as the CoTCCC hemostatic dressing of choice. Celox Gauze® and ChitoGauze® may also be used if Combat Gauze is not available. Hemostatic dressings should be applied with at least 3 minutes of direct pressure. If the bleeding site is amenable to use of a junctional tourniquet, immediately apply a CoTCCC-recommended junctional tourniquet. Do not delay in the application of the junctional tourniquet once it is ready for use. Apply hemostatic dressings with direct pressure if a junctional tourniquet is not available or while the junctional tourniquet is being readied for use.
    - c. Reassess prior tourniquet application. Expose the wound and determine if a tourniquet is needed. If it is, replace any **limb** tourniquet placed over the uniform with one applied directly to the skin 2–3 inches above wound. **Ensure that bleeding is stopped. When possible, a distal pulse should be checked. If bleeding persists or a distal pulse is still present, consider additional tightening of the tourniquet or the use of a second tourniquet side-by-side with the first to eliminate both bleeding and the distal pulse.**
    - d. **Limb tourniquets and junctional tourniquets should be converted to hemostatic or pressure dressings as soon as possible if three criteria are met: the casualty is not in shock; it is possible to monitor the wound closely for bleeding; and the tourniquet is not being used to control bleeding from an amputated extremity. Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled with other means. Do not remove a tourniquet that has been in place more than 6 hours unless close monitoring and lab capability are available.**

- e. Expose and clearly mark all tourniquet sites with the time of tourniquet application. Use an indelible marker.
5. Intravenous (IV) access
  - Start an 18-gauge IV or saline lock if indicated.
  - If resuscitation is required and IV access is not obtainable, use the intraosseous (IO) route.
6. Tranexamic acid (TXA)

If a casualty is anticipated to need significant blood transfusion (for example: presents with hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding)

  - Administer 1g tranexamic acid in 100mL normal saline or lactated Ringer's as soon as possible but NOT later than 3 hours after injury.
  - Begin second infusion of 1g TXA after Hextend or other fluid treatment.
7. Fluid resuscitation
  - a. **The resuscitation fluids of choice for casualties in hemorrhagic shock, listed from most to least preferred, are: whole blood\*; plasma, RBCs and platelets in 1:1:1 ratio\*; plasma and RBCs in 1:1 ratio; plasma or RBCs alone; Hextend; and crystalloid (lactated Ringer's or Plasma-Lyte A).**
  - b. Assess for hemorrhagic shock (altered mental status in the absence of brain injury and/or weak or absent radial pulse).
    1. If not in shock:
      - No IV fluids are immediately necessary.
      - Fluids by mouth are permissible if the casualty is conscious and can swallow.
    2. If in shock and blood products are available under an approved command or theater blood product administration protocol:
      - Resuscitate with whole blood\*, or, if not available
      - Plasma, RBCs, and platelets in a 1:1:1 ratio\*, or, if not available
      - Plasma and RBCs in 1:1 ratio, or, if not available;
      - Reconstituted dried plasma, liquid plasma or thawed plasma alone or RBCs alone;
      - Reassess the casualty after each unit. Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80–90mmHg is present.
    3. **If in shock and blood products are not available under an approved command or theater blood product administration protocol due to tactical or logistical constraints:**
      - Resuscitate with Hextend, or if not available;
      - Lactated Ringer's or Plasma-Lyte A;
      - Reassess the casualty after each 500mL IV bolus;
      - **Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80–90mmHg is present.**
      - Discontinue fluid administration when one or more of the above end points has been achieved.
    4. If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse, resuscitate as necessary to restore and maintain a normal radial pulse. If BP monitoring is available, maintain a target systolic BP of at least 90mmHg.

5. Reassess the casualty frequently to check for recurrence of shock. If shock recurs, recheck all external hemorrhage control measures to ensure that they are still effective and repeat the fluid resuscitation as outlined above.

**\*Neither whole blood nor apheresis platelets as these products are currently collected in theater are FDA-compliant. Consequently, whole blood and 1:1:1 resuscitation using apheresis platelets should be used only if all of the FDA-compliant blood products needed to support 1:1:1 resuscitation are not available, or if 1:1:1 resuscitation is not producing the desired clinical effect.**

8. Prevention of hypothermia
  - a. Minimize casualty's exposure to the elements. Keep protective gear on or with the casualty if feasible.
  - b. Replace wet clothing with dry if possible. Get the casualty onto an insulated surface as soon as possible.
  - c. Apply the Ready-Heat Blanket from the Hypothermia Prevention and Management Kit (HPMK) to the casualty's torso (not directly on the skin) and cover the casualty with the Heat-Reflective Shell (HRS).
  - d. If an HRS is not available, the previously recommended combination of the Blizzard Survival Blanket and the Ready Heat blanket may also be used.
  - e. If the items mentioned above are not available, use dry blankets, poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry.
  - f. Warm fluids are preferred if IV fluids are required.
9. Penetrating eye trauma

If a penetrating eye injury is noted or suspected:

  - a) Perform a rapid field test of visual acuity.
  - b) Cover the eye with a rigid eye shield (NOT a pressure patch).
  - c) Ensure that the 400mg moxifloxacin tablet in the combat pill pack is taken if possible and that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken.
10. Monitoring

Pulse oximetry should be available as an adjunct to clinical monitoring. All individuals with moderate/severe TBI should be monitored with pulse oximetry. Readings may be misleading in the settings of shock or marked hypothermia.
11. Inspect and dress known wounds.
12. Check for additional wounds.
13. Analgesia on the battlefield should generally be achieved using one of three options:

#### Option 1

Mild to Moderate Pain

Casualty is still able to fight

- TCCC Combat pill pack:
- Tylenol—650mg bilayer caplet, 2 PO every 8 hours
- Meloxicam—15mg PO once a day

#### Option 2

Moderate to Severe Pain

Casualty IS NOT in shock or respiratory distress AND Casualty IS NOT at significant risk of developing either condition

- Oral transmucosal fentanyl citrate (OTFC) 800µg
- Place lozenge between the cheek and the gum
- Do not chew the lozenge

### Option 3

Moderate to Severe Pain

Casualty IS in hemorrhagic shock or respiratory distress  
OR

Casualty IS at significant risk of developing either condition

– Ketamine 50mg IM or IN

OR

– Ketamine 20mg slow IV or IO

\*Repeat doses q30min prn for IM or IN

\*Repeat doses q20min prn for IV or IO

\*End points: Control of pain or development of nystagmus (rhythmic back-and-forth movement of the eyes)

\*Analgesia notes

- a. Casualties may need to be disarmed after being given OTFC or ketamine.
- b. Document a mental status exam using the AVPU method prior to administering opioids or ketamine.
- c. For all casualties given opioids or ketamine – monitor airway, breathing, and circulation closely
- d. Directions for administering OTFC:
  - Recommend taping lozenge-on-a-stick to casualty's finger as an added safety measure OR utilizing a safety pin and rubber band to attach the lozenge (under tension) to the patient's uniform or plate carrier.
  - Reassess in 15 minutes
  - Add second lozenge, in other cheek, as necessary to control severe pain
  - Monitor for respiratory depression
- e. IV Morphine is an alternative to OTFC if IV access has been obtained
  - 5mg IV/IO
  - Reassess in 10 minutes.
  - Repeat dose every 10 minutes as necessary to control severe pain.
  - Monitor for respiratory depression
- f. Naloxone (0.4mg IV or IM) should be available when using opioid analgesics.
- g. Both ketamine and OTFC have the potential to worsen severe TBI. The combat medic, corpsman, or PJ must consider this fact in his or her analgesic decision, but if the casualty is able to complain of pain, then the TBI is likely not severe enough to preclude the use of ketamine or OTFC.
- h. Eye injury does not preclude the use of ketamine. The risk of additional damage to the eye from using ketamine is low and maximizing the casualty's chance for survival takes precedence if the casualty is in shock or respiratory distress or at significant risk for either.
- i. Ketamine may be a useful adjunct to reduce the amount of opioids required to provide effective pain relief. It is safe to give ketamine to a casualty who has previously received morphine or OTFC. IV Ketamine should be given over 1 minute.
- j. If respirations are noted to be reduced after using opioids or ketamine, provide ventilatory support with a bag-valve-mask or mouth-to-mask ventilations.
- k. Ondansetron, 4mg ODT/IV/IO/IM, every 8 hours as needed for nausea or vomiting. Each 8hour

dose can be repeated once at 15 minutes if nausea and vomiting are not improved. Do not give more than 8mg in any 8hour interval. Oral ondansetron is NOT an acceptable alternative to the ODT formulation.

l. Reassess – reassess – reassess!

14. Splint fractures and recheck pulse.

15. Antibiotics: recommended for all open combat wounds

a. If able to take PO:

– Moxifloxacin, 400mg PO one a day

b. If unable to take PO (shock, unconsciousness):

– Cefotetan, 2g IV (slow push over 3–5 minutes) or IM every 12 hours

OR

– Ertapenem, 1g IV/IM once a day

16. Burns

a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early surgical airway for respiratory distress or oxygen desaturation.

b. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines.

c. Cover the burn area with dry, sterile dressings. For extensive burns (>20%), consider placing the casualty in the Heat-Reflective Shell or Blizzard Survival Blanket from the Hypothermia Prevention Kit in order to both cover the burned areas and prevent hypothermia.

d. Fluid resuscitation (USAISR Rule of Ten)

– If burns are greater than 20% of total body surface area, fluid resuscitation should be initiated as soon as IV/IO access is established. Resuscitation should be initiated with lactated Ringer's, normal saline, or Hextend. If Hextend is used, no more than 1000 ml should be given, followed by lactated Ringer's or normal saline as needed.

– Initial IV/IO fluid rate is calculated as %TBSA × 10mL/h for adults weighing 40–80 kg.

– For every 10kg ABOVE 80kg, increase initial rate by 100mL/h.

– If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock. Administer IV/IO fluids per the TCCC Guidelines in Section 7.

e. Analgesia in accordance with the TCCC Guidelines in Section 13 may be administered to treat burn pain.

f. Prehospital antibiotic therapy is not indicated solely for burns, but antibiotics should be given per the TCCC guidelines in Section 15 if indicated to prevent infection in penetrating wounds.

g. All TCCC interventions can be performed on or through burned skin in a burn casualty.

17. Communicate with the casualty if possible.

– Encourage; reassure

– Explain care

18. Cardiopulmonary resuscitation (CPR)

Resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilations, and no other signs of life will not be successful and should not be attempted. However, casualties with torso trauma or polytrauma who have no pulse or respirations during

TFC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax prior to discontinuation of care. The procedure is the same as described in section 3a above.

#### 19. Documentation of care

Document clinical assessments, treatments rendered, and changes in the casualty's status on a TCCC Casualty Card (DD Form 1380). Forward this information with the casualty to the next level of care.

### Basic Management Plan for Tactical Evacuation Care

\*The term "Tactical Evacuation" includes both Casualty Evacuation (CASEVAC) and Medical Evacuation (MEDEVAC) as defined in Joint Publication 4-02.

#### 1. Airway management

- a. Unconscious casualty without airway obstruction:
  - Chin lift or jaw thrust maneuver
  - Nasopharyngeal airway
  - Place casualty in the recovery position
- b. Casualty with airway obstruction or impending airway obstruction:
  - Chin lift or jaw thrust maneuver
  - Nasopharyngeal airway
  - Allow casualty to assume any position that best protects the airway, to include sitting up.
  - Place unconscious casualty in the recovery position.
  - If above measures unsuccessful:
    - Supraglottic airway or
    - Endotracheal intubation or
    - Surgical cricothyroidotomy (with lidocaine if conscious).
- c. Spinal immobilization is not necessary for casualties with penetrating trauma.

#### 2. Breathing

- a. In a casualty with progressive respiratory distress and known or suspected torso trauma, consider a tension pneumothorax and decompress the chest on the side of the injury with a 14-gauge, 3.25-inch needle/catheter unit inserted in the second intercostal space at the midclavicular line. Ensure that the needle entry into the chest is not medial to the nipple line and is not directed towards the heart. An acceptable alternate site is the 4th or 5th intercostal space at the anterior axillary line (AAL).
- b. Consider chest tube insertion if no improvement and/or long transport is anticipated.
- c. Most combat casualties do not require supplemental oxygen, but administration of oxygen may be of benefit for the following types of casualties:
  - Low oxygen saturation by pulse oximetry
  - Injuries associated with impaired oxygenation
  - Unconscious casualty
  - Casualty with TBI (maintain oxygen saturation >90%)
  - Casualty in shock
  - Casualty at altitude
- d. All open and/or sucking chest wounds should be treated by immediately applying a vented chest seal to cover the defect. If a vented chest seal is not available, use a non-vented chest seal. Monitor the casualty for the potential

development of a subsequent tension pneumothorax. If the casualty develops increasing hypoxia, respiratory distress, or hypotension and a tension pneumothorax is suspected, treat by burping or removing the dressing or by needle decompression.

#### 3. Bleeding

- a. Assess for unrecognized hemorrhage and control all sources of bleeding. If not already done, use a CoTCCC-recommended **limb** tourniquet to control life-threatening external hemorrhage that is anatomically amenable to tourniquet use or for any traumatic amputation. Apply directly to the skin 2–3 inches above the wound. **If bleeding is not controlled with the first tourniquet, apply a second tourniquet side-by-side with the first.**
- b. For compressible hemorrhage not amenable to limb tourniquet use or as an adjunct to tourniquet removal, use Combat Gauze as the CoTCCC hemostatic dressing of choice. Celox Gauze and ChitoGauze may also be used if Combat Gauze is not available. Hemostatic dressings should be applied with at least 3 minutes of direct pressure. If the bleeding site is **amenable** to use of a junctional tourniquet, immediately apply a CoTCCC-recommended junctional tourniquet. Do not delay in the application of the junctional tourniquet once it is ready for use. Apply hemostatic dressings with direct pressure if a junctional tourniquet is not available or while the junctional tourniquet is being readied for use.
- c. Reassess prior tourniquet application. Expose the wound and determine if a tourniquet is needed. If it is, replace any **limb** tourniquet placed over the uniform with **one** applied directly to the skin 2–3 inches above wound. **Ensure that bleeding is stopped. When possible, a distal pulse should be checked. If bleeding persists or a distal pulse is still present, consider additional tightening of the tourniquet or the use of a second tourniquet side-by-side with the first to eliminate both bleeding and the distal pulse.**
- d. **Limb tourniquets and junctional tourniquets should be converted to hemostatic or pressure dressings as soon as possible if three criteria are met: the casualty is not in shock; it is possible to monitor the wound closely for bleeding; and the tourniquet is not being used to control bleeding from an amputated extremity. Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled with other means. Do not remove a tourniquet that has been in place more than 6 hours unless close monitoring and lab capability are available.**
- e. Expose and clearly mark all tourniquet sites with the time of tourniquet application. Use an indelible marker.

#### 4. Intravenous (IV) access

- a. Reassess need for IV access.
  - If indicated, start an 18-gauge IV or saline lock
  - If resuscitation is required and IV access is not obtainable, use intraosseous (IO) route.

#### 5. Tranexamic acid (TXA)

If a casualty is anticipated to need significant blood transfusion (for example: presents with hemorrhagic shock, one

or more major amputations, penetrating torso trauma, or evidence of severe bleeding)

- Administer 1g of tranexamic acid in 100mL normal saline or lactated Ringer's as soon as possible but NOT later than 3 hours after injury.
- Begin second infusion of 1g TXA after Hextend or other fluid treatment.

6. Traumatic brain injury

- a. Casualties with moderate/severe TBI should be monitored for:
  1. Decreases in level of consciousness
  2. Pupillary dilation
  3. SBP should be >90mmHg
  4. O<sub>2</sub>sat >90%
  5. Hypothermia
  6. PCO<sub>2</sub> (If capnography is available, maintain between 35–40mmHg)
  7. Penetrating head trauma (if present, administer antibiotics)
  8. Assume a spinal (neck) injury until cleared.
- b. Unilateral pupillary dilation accompanied by a decreased level of consciousness may signify impending cerebral herniation; if these signs occur, take the following actions to decrease intracranial pressure:
  1. Administer 250mL of 3% or 5% hypertonic saline bolus.
  2. Elevate the casualty's head 30 degrees.
  3. Hyperventilate the casualty.
    - a) Respiratory rate 20/min
    - b) Capnography should be used to maintain the end-tidal CO<sub>2</sub> between 30–35mmHg
    - c) The highest oxygen concentration (F<sub>IO<sub>2</sub></sub>) possible should be used for hyperventilation.

\*Notes:

- Do not hyperventilate unless signs of impending herniation are present.
  - Casualties may be hyperventilated with oxygen using the bag-valve mask technique.
7. Fluid resuscitation
- a. **The resuscitation fluids of choice for casualties in hemorrhagic shock, listed from most to least preferred, are: whole blood\*; plasma, RBCs and platelets in 1:1:1 ratio\*; plasma and RBCs in 1:1 ratio; plasma or RBCs alone; Hextend; and crystalloid (lactated Ringer's or Plasma-Lyte A).**
  - b. Assess for hemorrhagic shock (altered mental status in the absence of brain injury and/or weak or absent radial pulse).
    1. If not in shock:
      - No IV fluids are immediately necessary.
      - Fluids by mouth are permissible if the casualty is conscious and can swallow.
    2. If in shock and blood products are available under an approved command or theater blood product administration protocol:
      - Resuscitate with whole blood\*, or, if not available
      - Plasma, RBCs, and platelets in a 1:1:1 ratio\*, or, if not available
      - Plasma and RBCs in 1:1 ratio, or, if not available;
      - Reconstituted dried plasma, liquid plasma or thawed plasma alone or RBCs alone;

- Reassess the casualty after each unit. Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80–90mmHg is present.

3. **If in shock and blood products are not available under an approved command or theater blood product administration protocol due to tactical or logistical constraints:**

- Resuscitate with Hextend, or if not available;
  - Lactated Ringer's or Plasma-Lyte A;
  - Reassess the casualty after each 500mL IV bolus;
  - **Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80–90mmHg is present.**
  - Discontinue fluid administration when one or more of the above end points has been achieved.
4. If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse, resuscitate as necessary to restore and maintain a normal radial pulse. If BP monitoring is available, maintain a target systolic BP of at least 90mmHg.
5. Reassess the casualty frequently to check for recurrence of shock. If shock recurs, recheck all external hemorrhage control measures to ensure that they are still effective and repeat the fluid resuscitation as outlined above.

**\*Neither whole blood nor apheresis platelets as these products are currently collected in theater are FDA-compliant. Consequently, whole blood and 1:1:1 resuscitation using apheresis platelets should be used only if all of the FDA-compliant blood products needed to support 1:1:1 resuscitation are not available, or if 1:1:1 resuscitation is not producing the desired clinical effect.**

8. Prevention of hypothermia

- a. Minimize casualty's exposure to the elements. Keep protective gear on or with the casualty if feasible.
- b. Replace wet clothing with dry if possible. Get the casualty onto an insulated surface as soon as possible.
- c. Apply the Ready-Heat Blanket from the Hypothermia Prevention and Management Kit (HPMK) to the casualty's torso (not directly on the skin) and cover the casualty with the Heat-Reflective Shell (HRS).
- d. If an HRS is not available, the previously recommended combination of the Blizzard Survival Blanket and the Ready Heat blanket may also be used.
- e. If the items mentioned above are not available, use poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry.
- f. Use a portable fluid warmer capable of warming all IV fluids including blood products.
- g. Protect the casualty from wind if doors must be kept open.

9. Penetrating eye trauma

If a penetrating eye injury is noted or suspected:

- a. Perform a rapid field test of visual acuity.
- b. Cover the eye with a rigid eye shield (NOT a pressure patch).
- c. Ensure that the 400mg moxifloxacin tablet in the combat pill pack is taken if possible and that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken.

10. Monitoring  
Institute pulse oximetry and other electronic monitoring of vital signs, if indicated. All individuals with moderate/severe TBI should be monitored with pulse oximetry.
  11. Inspect and dress known wounds if not already done.
  12. Check for additional wounds.
  13. Analgesia on the battlefield should generally be achieved using one of three options:
    - Option 1  
Mild to Moderate Pain  
Casualty is still able to fight
      - TCCC Combat pill pack:
      - Tylenol—650mg bilayer caplet, 2 PO every 8 hours
      - Meloxicam—15mg PO once a day
    - Option 2  
Moderate to Severe Pain  
Casualty IS NOT in shock or respiratory distress AND Casualty IS NOT at significant risk of developing either condition
      - Oral transmucosal fentanyl citrate (OTFC) 800µg
      - Place lozenge between the cheek and the gum
      - Do not chew the lozenge
    - Option 3  
Moderate to Severe Pain  
Casualty IS in hemorrhagic shock or respiratory distress  
OR  
Casualty IS at significant risk of developing either condition
      - Ketamine 50mg IM or IN  
OR  
– Ketamine 20mg slow IV or IO
- \*Repeat doses q30min prn for IM or IN  
\*Repeat doses q20min prn for IV or IO  
\*End points: Control of pain or development of nystagmus (rhythmic back-and-forth movement of the eyes)
- \*Analgesia notes
- a. Casualties may need to be disarmed after being given OTFC or ketamine.
  - b. Document a mental status exam using the AVPU method prior to administering opioids or ketamine.
  - c. For all casualties given opioids or ketamine – monitor airway, breathing, and circulation closely
  - d. Directions for administering OTFC:
    - Recommend taping lozenge-on-a-stick to casualty’s finger as an added safety measure OR utilizing a safety pin and rubber band to attach the lozenge (under tension) to the patient’s uniform or plate carrier.
    - Reassess in 15 minutes
    - Add second lozenge, in other cheek, as necessary to control severe pain
    - Monitor for respiratory depression
  - e. IV morphine is an alternative to OTFC if IV access has been obtained
    - 5mg IV/IO
    - Reassess in 10 minutes.
    - Repeat dose every 10 minutes as necessary to control severe pain.
    - Monitor for respiratory depression
  - f. Naloxone (0.4mg IV or IM) should be available when using opioid analgesics.
  - g. Both ketamine and OTFC have the potential to worsen severe TBI. The combat medic, corpsman, or PJ must consider this fact in his or her analgesic decision, but if the casualty is able to complain of pain, then the TBI is likely not severe enough to preclude the use of ketamine or OTFC.
  - h. Eye injury does not preclude the use of ketamine. The risk of additional damage to the eye from using ketamine is low and maximizing the casualty’s chance for survival takes precedence if the casualty is in shock or respiratory distress or at significant risk for either..
  - i. Ketamine may be a useful adjunct to reduce the amount of opioids required to provide effective pain relief. It is safe to give ketamine to a casualty who has previously received morphine or OTFC. IV Ketamine should be given over 1 minute.
  - j. If respirations are noted to be reduced after using opioids or ketamine, provide ventilatory support with a bag-valve mask or mouth-to-mask ventilations.
  - k. Ondansetron, 4mg ODT/IV/IO/IM, every 8 hours as needed for nausea or vomiting. Each 8hour dose can be repeated once at 15 minutes if nausea and vomiting are not improved. Do not give more than 8mg in any 8hour interval. Oral ondansetron is NOT an acceptable alternative to the ODT formulation.**
    - l. Reassess – reassess – reassess!
14. Reassess fractures and recheck pulses.
  15. Antibiotics: recommended for all open combat wounds
    - a. If able to take PO:
      - Moxifloxacin, 400mg PO once a day
    - b. If unable to take PO (shock, unconsciousness):
      - Cefotetan, 2g IV (slow push over 3–5 minutes) or IM every 12 hours,  
OR  
– Ertapenem, 1g IV/IM once a day
  16. Burns
    - a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early surgical airway for respiratory distress or oxygen desaturation.
    - b. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines.
    - c. Cover the burn area with dry, sterile dressings. For extensive burns (>20%), consider placing the casualty in the Heat-Reflective Shell or Blizzard Survival Blanket from the Hypothermia Prevention Kit in order to both cover the burned areas and prevent hypothermia.
    - d. Fluid resuscitation (USAISR Rule of Ten)
      - If burns are greater than 20% of total body surface area, fluid resuscitation should be initiated as soon as IV/IO access is established. Resuscitation should be initiated with lactated Ringer’s, normal saline, or Hextend. If Hextend is used, no more than 1000mL (1L) should be given, followed by lactated Ringer’s or normal saline as needed.
      - Initial IV/IO fluid rate is calculated as %TBSA × 10mL/h for adults weighing 40–80 kg.

- For every 10kg ABOVE 80kg, increase initial rate by 100mL/h.
  - If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock. Administer IV/IO fluids per the TCCC Guidelines in Section 7.
  - e. Analgesia in accordance with TCCC Guidelines in Section 13 may be administered to treat burn pain.
  - f. Prehospital antibiotic therapy is not indicated solely for burns, but antibiotics should be given per TCCC guidelines in Section 15 if indicated to prevent infection in penetrating wounds.
  - g. All TCCC interventions can be performed on or through burned skin in a burn casualty.
  - h. Burn patients are particularly susceptible to hypothermia. Extra emphasis should be placed on barrier heat loss prevention methods and IV fluid warming in this phase.
17. The Pneumatic Antishock Garment (PASG) may be useful for stabilizing pelvic fractures and controlling pelvic and abdominal bleeding. Application and extended use must be carefully monitored. The PASG is contraindicated for casualties with thoracic or brain injuries.
18. CPR in TACEVAC care
- a. Casualties with torso trauma or polytrauma who have no pulse or respirations during TACEVAC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax. The procedure is the same as described in section 2a above.
  - b. CPR may be attempted during this phase of care if the casualty does not have obviously fatal wounds and will be arriving at a facility with a surgical capability within a short period of time. CPR should not be done at the expense of compromising the mission or denying lifesaving care to other casualties.
19. Documentation of care
- Document clinical assessments, treatments rendered, and changes in the casualty's status on a TCCC Casualty Card (DD Form 1380). Forward this information with the casualty to the next level of care.