

**Committee on Tactical Combat Casualty Care  
Meeting Minutes  
16-17 November 2010**

**New Orleans, LA**

**Attendance:**

**CoTCCC Members**

COL (ret) Frank Anders	USA
CMDCM Chris Angstead	MARFORPAC
Dr. James Bagian	University of Michigan
Dr. Brad Bennett	NMCP
Dr. David Callaway	Beth Israel Deaconess Medical Center
Dr. Howard Champion	USUHS
COL Virgil Deal, Jr	USSOCOM
Col Warren Dorlac	USAF Trauma Consultant
CAPT James Dunne	USN Trauma Specialty Leader
Dr. John Gandy	Emergency Medicine-Las Vegas, NV
COL Jonathan Jaffin	OTSG
CAPT Kenneth Kelly	Tripler AMC
Dr. James Kirkpatrick	AMEDD Center and School
LTC (P) Russ Kotwal	USASOC
LTC Robert Mabry	USAISR
Dr. Edward Otten	University of Cincinnati
Mr. Donald Parsons	DCMT
Mr. Gary Pesquera	MARFORCOM
Dr. Peter Rhee	University of Arizona
CMSgt Thomas Rich	58RQS
HSCM Glenn Royes	USCG
HMCM Eric Sine	3 <sup>rd</sup> MARDIV
Mr. Richard Strayer	JSOMTC

**CoTCCC and Defense Health Board Staff**

Ms. Christine Bader	DHB
Dr. Frank Butler	CoTCCC
Ms. Danielle Davis	CoTCCC
Dr. Stephen Giebner	CoTCCC
Ms. Olivera Jovanovic	DHB
Ms. Hilary Peabody	DHB

**Guests**

Mr. Tyler Adams	DMRTI
Dr. David Baer	USAISR
CAPT (S) Linda Beltra	BUMED
COL Peter Benson	USASOC
CDR Tim Bleau	NM MPT&E
Dr. Jeffery Cain	SWAT - McKinney, TX
HM1 Heather Casey	USMC

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CDR Martha Cutshall	HQMC
Col George Costanzo	JTTS
Mr. Steven Couty	USASOC
MSgt David Dahl	ACC
Mr. Martin Deleno	DMRTI
Dr. William Fabbri	FBI
SrA Lucas Ferrari	48 <sup>th</sup> Rescue Squadron
SFC Ricardo Flores	JFKSWCS
LTC Jim Fulton	DMMPO
LTC Robert Gerhardt	USAISR
MSgt Bruce Graybill	USAF
SFC Kenneth Hale	82 <sup>nd</sup> Airborne Division
COL Annette Hildabrand	OTSG/DoDVSA
COL Andy Jose	OTSG British Liaison Medical Officer
Mr. Kevin Joyner	MARCORSYSCOM
Mr. Mark Kane	MEF MED
CPT Carl Kusbit	82 <sup>nd</sup> Airborne Division
MAJ Julio Lairer	USAISR
Lt Col Pamela Lucas	AF/SG
Mr. Mark Lueder	PHTLS
Mr. Lyle Lumsden	State Department
LTC Rob Malsby	82 <sup>nd</sup> Airborne Division
LCDR Anne McKeague	NMRU-SA Combat Casualty Care
Mr. John Miles	FMTB East
SSG Daniel Morissette	75 <sup>th</sup> Ranger Regiment
LCDR Steven Parks	TECOM
Dr. Perry Malcolm	OSD
Dr. Peter Pons	PHTLS
Major Brandi Ritter	DMMPO
Cpt Rory Saliger	USA
MAJ Erin Savage	Canadian Forces
Dr. Martin Schreiber	OHSU
COL Colleen Shull	DMMPO
CPO Rashad Waller	MARFORCOM
Mr. Scott Williams	USSOCOM
SFC Fred Ziems	USASFC

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### Tuesday 16 November 2010 CoTCCC Public Session

#### Administrative Remarks

**Dr. Frank Butler**

Dr. Butler called the meeting to order and asked CoTCCC members and guests to introduce themselves. He reviewed the agenda for the meeting and asked that individuals in the audience reveal any financial interests in the agenda items to be discussed. There were no financial interests disclosed. The next CoTCCC meeting is planned for 8-9 February 2011 in Tampa, FL. Dr. Butler recognized Ms. Danielle Davis, Mr. Dom Greydanus, and Dr. Steve Giebner for their outstanding efforts in setting up the CoTCCC meetings.

#### Combat Medic Presentation

**SrA Lucas Ferrari**

The combat medic presentation was made by Senior Airman Lucas Ferrari, a Pararescueman from the 48th Rescue Squadron.

On 09 June 2010, the 66th Expeditionary Rescue Squadron launched two HH-60's to evacuate a wounded British soldier. Each had a standard flying crew; in addition, there were 2 Pararescuemen (PJs) and a Combat Rescue Officer in the lead aircraft (Pedro 66) and 3 PJ's in the trail aircraft (Pedro 67). The casualty was reportedly a single Category Bravo with a broken arm that was upgraded to an Alpha due to a possible neurological deficit. This was the first mission of the day and in every way seemed to be normal. The threat, though constant, was believed to be low.

Approximately 30 minutes after launching, we were "eyes on" and approaching the landing zone. The Trail aircraft was poised for the pick-up and following the Lead aircraft when Pedro 66 began spinning out of control. Pedro 66 impacted the ground within seconds just outside the wire and almost immediately caught fire. The trail aircraft assumed an aggressive flying posture (one in which the good aircraft places itself between the perceived threat and the troops on the ground or, in this case, the crash site) and immediately landed nearby to deploy their 3-man Pararescue Team. We were unable to reach anyone via secure or open communications. Once the team exited the aircraft, trail took off to provide cover for the personnel on the ground.

Initial assessment in a TCCC environment indicated one survivor trapped in the aircraft. Within minutes, a coalition ground team took up security and we assessed that there were a total of 3 casualties and 4 souls lost. The back of the aircraft was crushed and on fire. The gunner was alive and trapped in the aircraft with his legs burning. The flames were causing rounds in the helicopter's weapons boxes to cook off. There was confusion about whether the crash had been a hostile shoot-down. (It was later confirmed that this was in fact the case.) There were numerous coalition forces and Afghan National Army troops milling around.

Casualty One, the pilot, was still seated upright in the aircraft. His helmet was in two separate pieces. He had a large, open skull fracture with exposed brain matter. He was found to be breathing. He was removed from the aircraft, his head was wrapped with a large compression bandage and his airway was secured via a cricothyroidotomy

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performed by two coalition force medics. He was placed on a Talon litter and moved to a waiting helicopter.

Casualty Two, the co-pilot, was in his seat, was conscious but confused, and was attempting to evacuate the aircraft. Once he was removed, he became unconscious and was moved by coalition forces to a waiting helicopter without treatment. In the helicopter, he experienced decorticate posturing and trismus. He was exhibiting Kussmaul-type respirations while attempting to breathe through his teeth with a large amount of secretions noted. His airway was secured via cricothyroidotomy and he was placed on an auto-vent with 100% oxygen breathing at 15 times a minute. No other injuries were noted.

Casualty Three, the trapped gunner, was alert and oriented. A full set of extrication gear was present but ultimately was not needed to free the casualty. Extrication efforts were hampered by the need to simultaneously fight the fire that was present. He was finally extricated from the burning wreckage after removing his personal protective equipment and pulling him out through the window. He was then moved to the helicopter waiting approximately 150 meters away. His injuries included a 7-inch chin laceration, a fractured jaw, 6 broken ribs and blunt trauma to the right chest with suspected pulmonary contusion. There were third-degree burns to both legs at greater than 9% per leg.

The trail aircraft left the scene with all three casualties, one PJ, and one Navy corpsman approximately 25 minutes after the crash. In-flight treatment was limited due to numerous factors. The primary concerns were Casualty One and Two's airway and respirations. Casualty One's breathing began to deteriorate and he required bagging, which the corpsman did at 1 breath every 3 seconds without supplemental oxygen. During this time, Casualty Three was still alert and oriented and maintaining his own airway. His vital signs were all within normal limits. His boots and his pants were cut off to help stop the burning process and mitigate the heat he was still experiencing. Prior to landing at Bastion after a 25-minute flight, we were able to pass all the pertinent information to higher care in order to ensure an expedient and smooth handover. Sr Airman Ferrari also gave a verbal turnover to the Navy corpsman and receiving physician, reiterating his casualty severity order, casualty status, injuries, treatments undertaken, and concerns.

All three casualties were taken rapidly into surgery. All three were transported back to the United States through the theater hospitals and evacuation system. Casualty One underwent several operations during his 3 weeks at Bethesda National Naval Medical Center but showed little improvement. He was taken off life support on July 2, 2010 and died as a result of his wounds shortly thereafter. Casualty Two is currently at James A. Haley Veterans' Hospital in Tampa, FL. He has undergone several neurosurgical procedures. A large portion of his skull has been removed and a surgical implant is planned in the near future. He has improved dramatically since the accident, but he still has severe left-sided neurological deficits. His speech is also impaired, but is reportedly improving. Casualty Three is still in the process of healing but is expected to make a full recovery. He was intubated for some time and had a chest tube on the right side for a hemopneumothorax. His chin laceration and jaw are both healed. He underwent several skin grafts to his legs, but has already begun to walk.

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Senior Airman Ferrari's comments, observations, and lessons learned from this casualty scenario included:

- 1) Dismount the aircraft with all necessary casualty treatment gear.
- 2) There should be a contingency plan for establishing communications when signals jamming is present.
- 3) Establish a security perimeter as soon as possible in casualty scenarios to reduce civilian activity at the site and protect against threats to the evacuating assets and personnel.
- 4) Carry necessary personal equipment at all times.
- 5) All medics should carry or wear fire rescue gloves.
- 6) Stronger medical continuity should be established among all service medics.
- 7) Speed is security.
- 8) Fight against complacency.
- 9) Always ADAPT to your conditions.
- 10) Talon IIs are the preferred litters.

The question and answer period following his presentation revealed that:

- 1) The evacuation aircraft did not carry blood products.
- 2) The burn casualty did not request pain medication.
- 3) SrA Ferrari strongly believes that the live tissue training that he received within 30 days of his deployment was a major factor in his being able to successfully perform a surgical airway in a very challenging tactical setting.
- 4) When asked about using the LMA, SrA Ferrari replied that British forces in the area liked this option, but that he did not think that it is a definitive airway for casualties such as the ones described.
- 5) Some units in his area of operations have noted that they would like to have Talon II litters, but do not have the funds to purchase them.
- 6) It is very important for a medic or PJ in such a situation NOT to do things for his casualties that do not really need to be done.

### **TCCC Update**

#### **Dr. Frank Butler**

A brief on the Joint Theater Trauma System (JTTS) was conducted by COL George Costanzo for the Defense Health Board (DHB) on 14 July 2010. There was no vote on supporting permanent DoD funding for the JTTS at that meeting. A site visit to the JTTS was planned for DHB Core Board members after the brief. In the interim, however, a Force Health Protection (FHP) Council brief on the JTTS was scheduled by Dr. Taylor and held on 8 Sept. Support for long-term funding for the JTTS was approved by the FHP Council. Discussions on resourcing issues have been conducted between the JTTS and the service medical resource managers. Service Surgeons General review is pending.

A brief on the proposed changes in the TCCC Guidelines on hypothermia prevention was conducted for the DHB on 18 Aug 2010. The proposed change was approved by the Core Board of the DHB and will be incorporated into the TCCC Guidelines and the TCCC training curriculum.

A TCCC brief was done at the Military and Civilian Emergency Medicine Conference in Birmingham, UK on 12 Sept 2010. UK forces presentations on

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prehospital care at the conference indicated that they are using the following techniques and technologies with success:

- Celox Gauze
- Tranexamic Acid (TXA)
- IV Ketamine for analgesia
- MERT Team evacuations
  - Packed Red Blood Cells and plasma in a 1:1 ratio
  - Rapid Sequence Intubation
  - Thoracostomies with aortic cross-clamping

Other items of note are that the London EMS system began using both tourniquets and Celox after the July 2005 bombings. There is interest in the UK in fielding a lyophilized plasma product for fluid resuscitation in the field.

The results of the CRASH-2 study on tranexamic acid use on mortality in patients at risk of death from hemorrhage were discussed at the last CoTCCC meeting. This study was discussed further at a teleconference meeting of the Army Medical Research and Materiel Command Hemorrhage Control Steering Committee on 27 October 2010. Points from that meeting included:

- CRASH-2 is an important study with significant implications that cannot be ignored.
  - Major research questions remain to be answered, especially for patients that do not have a diagnosed hyperfibrinolytic state.
  - A JTTS Clinical Practice Guideline (CPG) on TXA use is currently being written. The CPG development should be oriented toward patients with a suspected hyperfibrinolytic state, as indicated by laboratory parameters, injury pattern, or other parameters that the CPG may specify. The TXA CPG should include collection of data on patients treated and outcomes.
  - The committee will establish a working group that will meet to delineate research requirements and work-out details of proposed studies. Simultaneously, funding for this research will be sought.
  - Additional research on TXA needs to be better focused, needs to include clotting parameter measurements, and needs better adverse events reporting.

CAT tourniquets have been added to the USMC Individual First Aid Kit per the Marine Corps Systems Command message of 4 Oct 10 .

A letter from the Air Force Surgeon General on 21 Aug 2010 noted that TCCC is the military counterpart to PHTLS and that changes to the TCCC Guidelines are proposed by the CoTCCC and approved through the DHB. Once approved, the updated TCCC Guidelines are posted on the Military Health System and USAF websites. The letter directed that "Effective immediately, all applicable Air Force training courses and programs will incorporate the most current TCCC guidelines consistent with their level of knowledge and proficiency instruction related to battlefield medical care. "

The TCCC input to the Seventh Edition of the PHTLS Manual (Military Version) has been completed and submitted to Elsevier. PHTLS Seven was delivered to the printer on 13 Oct 2010.

A brief on the proposed changes in the TCCC Guidelines on fluid resuscitation was conducted for the DHB by CAPT Jeff Timby on 1 November 2010. CAPT Timby's thorough documentation of the levels of evidence involved in the different aspects of

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change was very well received by the Board. The proposed change was approved unanimously by the Core Board of the DHB and will be incorporated into the TCCC Guidelines and the TCCC training curriculum.

The Holbrook NEJM paper documenting the association of effective early analgesia in reducing post-traumatic stress disorder was discussed at a previous CoTCCC meeting. Oral transmucosal fentanyl (OTFC) has proven very effective at treating combat trauma on the battlefield, but its use is currently limited by concerns over the FDA warning that limits its approved use to opioid-tolerant cancer patients. Previous discussion has noted that the FDA Black Box warning is not well supported by the published literature for the doses recommended by TCCC. The military experience documented to date has shown OTFC to be safe and effective in relieving pain on the battlefield. The CoTCCC has contacted the FDA and requested the adverse events reports submitted to the FDA on OTFC. The OTFC (Actiq) Adverse Events Report for 2007 was forwarded and reviewed. The year 2007 was noted to have had most adverse events (61 events with 9 deaths) reported in a single year to date. Overdoses were reported in 52% of cases (50% of those were intentional and 25% were in children). Drug dependence and dental caries were the most commonly reported other adverse effects. Seven of the nine deaths were associated with known overdoses of OTFC – the other 2 fatalities had an indeterminate cause of death. The median daily dose of OTFC for patients reporting adverse events was 3900 mcg in 2007 (range 400-15,500). Note that the TCCC-recommended dose is 800 mcg. The following observations were made regarding OTFC use on the battlefield:

- The FDA warnings refer to prescribing information.
- The reported adverse events reflect experience with OTFC prescribed for patient use in unmonitored settings. TCCC use of OTFC is a one-time administration of the medication under the immediate supervision of a skilled combat medic
- There are multiple published reports that document the safety of OTFC use for non-breakthrough cancer pain indications in civilian setting.
- There are multiple reports of OTFC efficacy and safety as used by combat medics to date in Iraq and Afghanistan.
- The evidence at hand continues to support the TCCC-recommended use of OTFC for pain relief on the battlefield. The CoTCCC will continue to monitor this item.

### Publications

The CoTCCC maintains a Journal Watch to ensure that current publications relating to TCCC are reviewed. Recent publications of interest include:

#### Needle Decompression Outcomes as a Function of Catheter Length

Ball et al - Canadian J Surg 2010

- Grady Hospital study on needle length and needle thoracostomy (NT) failure
- 4 year study period – 101 blunt trauma patients
- Helicopter service: 14 ga 5 cm (2") needle with 4.5 cm sheath (75)
- Ground ambulances: 14 ga 3.5 cm (1.4") needles with 3.2 cm sheath (26)
- Implies NT done at the midclavicular line at the second intercostal space
- Success: EFAST exam results showing residual pneumothorax
- Failure rates: 65% with 3.2; 4% with 4.5 (p=0.001)

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- Patients with penetrating trauma were excluded
- Clinical results at time of NT not described
- Mortality?
- Authors suggested an axillary approach for NT because of the thinner chest wall at that location, the location being further from heart, and better access for patients wearing personal protective equipment

### Ultrasound Determination of Chest Wall Thickness

McLean – Am J Emerg Med 2010

- University of New Mexico
- 51 subjects evaluated with ultrasound at the midclavicular line at the second intercostal space – also at the lateral chest wall
- No attempted NT
- Males - mean chest wall thickness was 2.1 cm; females - 2.3 cm
- Most patients will have chest wall thickness < 4.5 cm
- Lateral chest wall thickness was greater at 2.36 cm for males
- Chest wall thickness may not be the cause of failed NTs
- Consider kinking or obstruction

### TACEVAC Skills Sets

Calderbank - BMJ 2010

- MERT-E is a high-value asset which makes an important contribution to patient care
- Physicians were present on 283 of 320 missions (88%)
- There were relatively few (approximately 25%) of the missions that required interventions beyond the capability of a paramedic
- There were 62 physician-level interventions
  - RSIs (28)
  - Analgesia, sedation, blood products (21)
  - Chest drain/thoracostomy (3)
  - Pronouncing death (4)

### Outcomes of Extremity War Injuries

**COL Jim Ficke**

COL Ficke is an orthopedic surgeon stationed at the Brooke Army Medical Center in San Antonio, Texas and the Army Surgeon General's Consultant on Orthopedics. He presented a synopsis of the complex extremity war injuries that members of our Armed Forces are sustaining and the care that is being provided for these injuries. To date, there have been over 17,000 evacuated casualties in the two current theaters with 1097 major limb loss patients as of October 2010. Blast injury predominates as a mechanism of injury and creates devastating wounds that are difficult to manage. Improvements in personal protection equipment, battlefield trauma care, and evacuation times have enabled many polytrauma casualties to survive their injuries. Battlefield tourniquet use to date has saved lives without causing amputations due to ischemia. Additional points made by COL Ficke include:

- Current injury severity scales are poor predictors of viability and functional



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outcomes for injured limbs.

- The concept of Damage Control Surgery (sequential, prioritized procedures) applies in Orthopedics as well as General Surgery.

- Debridement, reperfusion, stabilization, and fasciotomies, if needed, are early priorities. Temporary vascular shunts have saved many extremities in the war and should be in the skill set for general surgeons in theater.

- Principles of management of war-related extremity injuries include: 1) war wounds are contaminated and should not be closed primarily; 2) longitudinal incisions; 3) excise foreign material and devitalized tissue; 4) low-pressure irrigation; 5) IV antibiotics; 6) ex-fix or splint for transport/comfort; 7) multiple debridements as required; 8) vacuum-assisted closure; 9) do not do circular amputations – save whatever tissue that you can; and 10) aggressive fasciotomies when indicated.

- The goals of Damage Control Orthopedic procedures are: 1) stop the bleeding; 2) remove the contamination; 3) restore blood flow; 4) stabilize fractures; and 5) don't burn bridges.

- Absolute indications for amputation include a non-reversible vascular injury, a complete tibial nerve transection, and a tourniquet time greater than 6 hours (although COL Ficke notes that the 6 hour tourniquet time is not supported by data and that there is a report of one limb survival with good function after a tourniquet time of 14 hours.

- Extremity injury issues for TCCC include decisions about systemic antibiotics, antibiotic beads, and combat medic use of ex-fixes. If ex-fixes are to be included in the combat medic skill set, then this skill must be adequately trained and sustained.

- Current challenges include segmental bone loss, massive muscle defects, and expectations of the wounded for a very high level of function after treatment and therapy.

- Post-traumatic arthritis causes a great deal of morbidity and loss from active duty. Not every amputee is boarded out, but among casualties who survive, extremity injury causes the most loss from active duty with 64% of "unfit for duty" findings caused by extremity injuries with post-traumatic arthritis being the most common diagnosis.

### **Surgical Airway Training**

### **Dr. Brad Bennett**

Dr. Bennett noted that both Joint Theater Trauma System (JTTS) and Armed Forces Medical Examiner System (AFMES) reports have noted some episodes of surgical airways being performed incorrectly, including at least two episodes of airways being performed superior to the thyroid cartilage. In response to these events, Dr. Bennett led a working group that reviewed the cricothyroidotomy teaching methods in the 4-day TCCC course taught at Naval Medical Center Portsmouth. This working group identified five training gaps in the instruction provided on this topic in the course: 1) limited airway anatomy instruction; 2) lack of "hands-on" human laryngeal anatomy demonstration; 3) non-standardized technique for the surgical airway procedure; 4) inferior anatomic detail in the cricothyroid membrane region on mannequins used to teach the cricothyroidotomy procedure; and 5) lack of standardized refresher training frequency. One proposed improvement was to replace the current TCCC clinical video on cricothyroidotomy with that produced by the New England Journal of Medicine and

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published in 2008. This video teaches a vertical incision technique in order to reduce potential damage to vascular structures and the recurrent laryngeal nerve. In Dr. Bennett's initial conversations with the Senior Permissions Coordinator at the New England Journal of Medicine, his request to use this video in the TCCC files was favorably received.

Additional modifications to the training included the use of an anatomical model for hands-on anatomy familiarization, having the students use a skin marker to mark the proposed cricothyroidotomy incision site on other students, and use of a SIMULAB Trauma Man procedure as the final step to confirm that this skill has been mastered. Dr. Bennett noted that the Trauma FX mannequin may be a better device for use in teaching this procedure in that it has better representation of the anatomy. Dr. Bennett closed by emphasizing that there must be improved teaching of the pertinent anatomy for this procedure and that this skill should be sustained annually. Drs. McSwain and Champion voiced some reservations about the NEJM video; Dr. Rhee offered to supply one that was made in his trauma center. Dr. Giebner will follow up on obtaining formal written permission from NEJM to use this video in the TCCC curriculum posted on the Military Health System and PHTLS websites. Dr. Bennett offered to share his recent manuscript as submitted to Military Medicine on Portsmouth's cricothyroidotomy training "bottom-up review" with CoTCCC members and for possible implementation into the TCCC curriculum.

### **Live Tissue Training**

#### **COL Annette Hildabrand**

COL Hildabrand is the Deputy Director for DoD Animal Use Programs. She presented an overview of the interactions between animal rights groups and the DoD regarding the use of animals in medical training programs. Animal rights groups continue an aggressive political and legal campaign aimed at eliminating the use of live animals in training and research, while many in the DoD believe that live tissue training is critical in preparing combat medical personnel to be ready to treat combat trauma on the battlefield. Animal use for medical training is governed by both law and DoD policies and regulations.

COL Hildabrand notes that there is a very high casualty survival rate at present and that improved battlefield trauma care has been an important facet of this success. The DoD uses a mixture of training modalities in medical education venues. Live animal use is a significant component of combat medical training in some combat units. A recent DoD survey noted that among the skills that medics and corpsmen need to master are surgical airways, tourniquet use, hemostatic agent application, needle decompression of tension pneumothoraces, and chest tube placement. Recently proposed legislation would limit or eliminate the ability of the DoD to use live tissue training.

In response to concerns over animal use in medical training in the DoD, the Department chartered the "Use of Live Animals in Medical Education and Training" Joint Analysis Team. It was co-chaired by Dr. Bob Foster, Ms. Ellen Embrey, and RADM Dave Smith. It's mission was to evaluate the use of animals and state of technology maturity in military medical training programs. The Joint Analysis Team found that: DoD programs use an integrated methodology that includes alternatives teaching modes as

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well as live animals; that there is wide variation in student levels; that there were no programs in need of immediate change to alternative modality; that there is a lack of validated alternatives; and that a standardized mechanism is needed to integrate alternatives into curricula. The team made 9 recommendations as noted below:

ASD(HA) will lead a DoD-wide effort to:

1. Establish policy to standardize core attributes (e.g., objectives) of medical training.

2. Establish policy to standardize the use of animals and alternatives in medical training.

3. Establish a plan to validate medical simulation technology and direct technology integration into training curricula.

4. Establish a standing work group (e.g., IPT) to provide persistent monitoring of simulation technology ready for adoption.

DDR&E will lead a DoD-wide effort to:

5. Establish a process for senior leadership review of Institutional Animal Care and Use Committee decisions.

6. Establish DoD Component Management Plan for DoD Directive 3216.1 compliance.

7. Develop a portfolio of studies comparing different training modalities.

8. Research metrics for measurement of training outcomes.

9. Establish a process to periodically identify gaps in medical simulation technology for future development.

Although live tissue training is the best currently available model for teaching life-saving interventions to combat medics, this conflict between optimizing casualty survival and animal rights will continue, and the DoD will continue to aggressively pursue alternatives to the use of live animals in medical training and is currently funding a research effort to evaluate training effectiveness and measure outcomes.

### **Observations on Prehospital Trauma Care from the Deployed Director of the JTTS**

**LTC Marty Schreiber**

LTC Schreiber recently returned from a tour as the Deployed Director of the JTTS. He discussed the importance of trauma systems in reducing trauma mortality and noted that the JTTR is now the largest combat injury database in history with records on over 17,000 casualties. The JTTS Vision is that every Soldier, Sailor, Airman and Marine injured on the battlefield or in the theater of operations has the optimal chance for survival and maximal potential for functional recovery.

LTC Schreiber presented descriptive statistics on both the casualties and the performance of the system. IEDs are currently the most frequent mechanism of injury in OEF, followed closely by gunshot wounds. To date, 31 JTTS Clinical Practice Guidelines (CPGs) have been developed to address specific elements of casualty care based upon opportunities to improve identified by the system. These CPG both provide an evidence-based metric for care and enable new trauma personnel arriving in theater to have the benefit of lessons learned from their predecessors.

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He noted that more than 90% of casualties currently arrive at MTFs by MEDEVAC. The “Dustoff” MEDEVAC platforms are staffed by 68W (EMT basic) flight medics.

As described in the paper by Borgman, the JTTS practice of recommending a plasma to PRBC transfusion ratio of 1:1 based on the observed decrease in mortality (19% vs 65%) of massive transfusion patients who receive a high ratio of these products (> 1:1.4) versus a low ratio (1:8). This ratio is now used in many civilian trauma centers as well.

LTC Schreiber's observations on prehospital trauma care included:

- There is a need for a central authority in the deployed JTTS structure to create standardization of clinical capability on all extraction platforms.
- Hextend is being used much less than normal saline based on his experience with casualties arriving at the MTF.
- Hypotensive resuscitation is being used and is working well.
- Lyophilized plasma holds great promise as a prehospital resuscitation fluid. The Germans are using it at present. It is alkalotic and must be reconstituted with an acidic solution to counter this.

- He noted a number of unsuccessful surgical airways during his time in theater and believes that alternatives such as sit-up and lean forward positioning, the King LT, the LMA, and the Combitube may be underutilized at present. He emphasized the importance of adequate training if surgical airways are to be done in the prehospital phase of care.

Additionally, LTC Schreiber noted that studies in his lab in Portland have found that when Combat Gauze, Celox, and Kerlix are compared in a swine bleeding model in which the agents are NOT applied with accompanying direct pressure, that Kerlix performed better than the two hemostatic agents as measured by blood loss. He also noted that all animals survived in this model.

### **USASOC TCCC Issues**

### **COL Peter Benson**

COL Benson is the Deputy Chief of Staff/Surgeon for the United States Army Special Operations Command (USASOC). He started by reviewing the USASOC structure from both the Army and Special Operations perspectives. He described the command structure which includes over 28,000 Soldiers. USASOC currently has forces present in 57 countries around the world and its medics are frequently the only medical personnel present in remote areas of these countries. These medics practice their skills in an environment that has been called “the dark side of the moon.”

COL Benson then briefly reviewed Army Special Operations Forces (ARSOF) medical history going back to World War II, including the adoption and spread of TCCC starting with the 75th Ranger Regiment. TCCC is now seen as a standard across ARSOF, the Army, the other services, and coalition forces. Casualty response in tactical situations requires an organizational response; it is not a purely medical event. The Rangers have led the way in developing concepts and training for unit-based casualty response.

The current medical and team structure were reviewed for each of the major organizations within USASOC along with the TCCC training that each receives. The

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units have varying structures, unique cultures, and different training cycles. Training TCCC across these all of these units is a complex task and there is no standard field manual for TCCC. Nevertheless, user-appropriate TCCC training is provided to all combatants, 68W medics, Special Forces medics, and licensed providers within USASOC. The training requirement to cover TCCC training for all of these user levels is very significant.

The following prehospital trauma care initiatives are of interest to USASOC: rFVIIa, tranexamic acid (TXA), freeze-dried plasma, fresh whole blood transfusion, and emerging technology/devices.

The audience briefly discussed the lack of a coherent policy regarding TCCC training across all of the services and the significant variations in TCCC training and education methodologies. There are still reserve medical personnel deploying into theater with no training at all in TCCC. LTC Schreiber noted that he got no formal training in TCCC or the JTTS CPGs before going into theater. Mr. Parsons also noted that there is no consultant to OTSG in the field of battlefield medicine. COL Hildabrand added that only medics get combat trauma training that includes live tissue training.

### **USAISR Prehospital Interventions Study**

### **Major Julio Lairet**

Major Lairet presented preliminary data from a USAISR triservice observational study looking at prehospital trauma care interventions in OIF and OEF. The study was designed to answer such questions as: whether or not an intervention was indicated when it was done; if an intervention was indicated but not done; and how well the intervention was performed. Fourteen specific interventions are being tracked along with morbidity and mortality data out to 30 days after injury. Physician investigators at Bagram, Shank, Gazni, Kandahar, and Dwyer are enrolling the patients in this study. As of September, 2010, data had been collected on 524 casualties who had undergone 678 prehospital interventions. Preliminary findings include:

- 5% of casualties had an airway intervention with 9 cricothyroidotomies.
- Two of the nine cricothyroidotomies were incorrectly performed.
- 2% of casualties had a needle decompression for suspected tension pneumothorax.
- Normal saline was used for fluid resuscitation in 71% of the casualties with Lactated Ringers used in 16% and Hextend used in 10%.
- 83 of 192 casualties had only a wool blanket for hypothermia prevention.
- A TCCC casualty card was filled out on only 14% of casualties. (Major Lairet notes that medics might have filled out TCCC cards for other casualties, but the cards may not have made it to the CSH.)
- Twelve of 88 tourniquets were incorrectly applied, including two that were placed below the injury.
- There was one burn that resulted from an HPMK being placed directly on the skin.
- There were 112 interventions that were judged to have been indicated but not performed, including 23 airways (nasopharyngeal airways or cricothyroidotomies), 10 breathing interventions (needle decompression or chest seal), 18 hemorrhage

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control interventions (tourniquet, hemostatic agents), 15 hypotensive fluid resuscitations, 39 IV/IO placements, and 7 hypothermia prevention interventions.

Major Lairet's goal for the study is to enroll 1400 casualties and to link the interventions to outcome data from the JTTR. There was considerable positive response from the group on Major Lairet's presentation and the study in general.

### **PHTLS TCCC Courses**

#### **Mr. Mark Lueder**

Mr. Lueder reviewed the progress of the PHTLS-sponsored TCCC program. New teaching sites were added this year in San Francisco, Las Vegas, Dodge City, Roanoke, New York City and a number of other locations. The State Department is currently working with PHTLS to have TCCC courses taught for their personnel. International courses have been conducted or are planned in Germany, Peru, Mexico, Israel, Austria, Canada and Spain. Demand is growing rapidly.

### **TCCC for Tactical EMS**

#### **Dr. Peter Pons**

Dr. Pons noted that the demand for TCCC training as developed by the CoTCCC is growing rapidly. The PHTLS TCCC program teaches from the CoTCCC curriculum, which is written for military audiences. To create a civilian version of TCCC for use by civilian law enforcement, the language, documentation, situations (scenarios), and illustrations would have to be revisited and "civilianized." Another issue is the nature of the potential user systems; there are many potential customers for civilian tactical TCCC, with both law enforcement agencies and emergency medical services, each under their own medical director. Consensus building among these numerous organizations will be difficult and time-consuming, but a good core course would probably address the greatest needs of most of these organizations, and would, therefore, be highly desirable.

There was agreement that the CoTCCC should continue to coordinate on this issue and participate in the development of a civilian tactical TCCC course with PHTLS, the FBI, the Center for Operational Medicine at the Medical College of Georgia, and other major stakeholders. Interested members from the CoTCCC included Drs Giebner, Callaway, McSwain, and Otten.

### **Combat Ready Clamp**

#### **Dr. Mel Otten**

Combat trauma data indicate that hemorrhage from injuries to junctional areas may contribute to as many as 20% of combat deaths. Combat Gauze is currently TCCC's only effective intervention for bleeding in these areas. There is a need for an effective emergency truncal tourniquet (ETT). An ETT must be accurately placed to be effective and must not affect blood flow to the contralateral limb. Historically, these devices date back to the 1850s, but were out of use by the early 1900s. There is, however, some current research in the area. It takes approximately 120 pounds of correctly-positioned pressure to occlude a common iliac artery. The Combat Ready Clamp™ is the latest ETT. The FDA approved the Combat Ready Clamp™ in August,

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2010, as a device for use over the common iliac artery. The current price is \$300.00 per unit. The Combat Ready Clamp™ is well-designed to minimize weight and cube for the medic; the device would have to be deployed in a manner that would make it available to treat casualties at or near the point of wounding in order to optimize the device's lifesaving potential. At this time, however, there is very limited research data and no clinical data on the efficacy of this device. As with all ETTs, positioning is critical, and proper training will therefore be essential to using this device effectively. The presence of pelvic fracture is a major concern when using this device.

Dr. Otten recommended that the CoTCCC wait and watch as field testing continues and clinical data accumulates before considering this device for inclusion in the TCCC Guidelines. The Committee agreed with this plan.

### **Pyng FAST-X**

### **HMCM Eric Sine**

This new intraosseous (IO) device does not have 10 introducer needles like the FAST-1™; it has only one introducer needle, and a foot that helps to ensure insertion perpendicular to the sternum. This foot replaces the adhesive-attached guide patch used with the FAST-1™.

The initial shipment of this new product was recalled by the manufacturer due to an unspecified issue. HMCM Sine recommended that the CoTCCC wait for resolution of this issue to continue evaluation of this device.

### **TCCC RDT&E Priorities**

### **Dr. Frank Butler**

The CoTCCC last reviewed its prehospital trauma research, development, test and evaluation (RDT&E) priorities in April 2009 with the results published in the minutes from that meeting. The committee revisited this list of proposed research efforts in the light of new developments and observations since April of 2009. The research priorities list as endorsed by the committee is included as Appendix (1).

### **DMMPO TCCC Update**

### **LTC Jim Fulton**

MAJ Fulton presented an update on an ongoing project of the Defense Medical Materiel Program Office (DMMPO) which tracks the contents of the service IFAKs and Combat Medical Sets as compared to the TCCC recommendations on equipment and skill sets for individual combatants and combat medical personnel. There has been some progress since the last report in April 2010, but there are still a number of unfielded TCCC equipment items noted in the equipment overview charts. Some of the discrepancies shown are due to the logistical challenges of medication handling; others may be due to delays and inaccuracies in capturing updates to the equipment lists from the services. MAJ Fulton's TCCC overview equipment charts as of November 2010 are included in the minutes as Appendix (2).

**Wednesday 17 November**  
**CoTCCC Internal Administrative Session**

**Administrative Remarks**

**Dr. Frank Butler**

The agenda was reviewed and the Chairman called for disclosure of financial conflicts of interest - none were declared. The next meeting will be held on February 8th and 9th, 2011 at the Wyndham Westshore Hotel in Tampa, Florida. There will be an increased focus at that meeting on attendance and input by combat medics, corpsmen, and PJs. The April meeting will be held in Houston.

A conflict exists between CoTCCC language calling for clean packaging for some items for which the Committee has developed lists of preferred characteristics and the sterile packaging required for FDA approval for these items. "Clean" was preferred because sterility wasn't a clinical imperative on the battlefield and "sterile" carries a expiration date. The need to avoid expiration dates does not outweigh the need for FDA approval, so the Committee elected to remove "clean" from the preferred characteristics lists and continue the requirement for FDA approval.

The issue of the black box warning on OTFC was revisited. The evidence at hand documenting safety and efficacy as well as the fact that this medication is not prescribed for self-use in TCCC settings but administered by a trained combat medic make use of OTFC as a battlefield analgesic a good option.

The DMMPO review of Combat Medical Sets and IFAKs was discussed. Level 1 care in combat belongs to the line, so the discrepancies in the kits must be addressed by line commanders. This issue will be included in the next brief to the Defense Health Board as will the fact the DoD is still deploying senior and junior physicians (especially from the reserves) who are not trained in TCCC. This is an important audience that must be reached.

**Combat Medic Presentation Review**

**Group**

Points of interest from the PJ combat casualty case presentation:

- Extrication and airway intervention were the two most important interventions.

- In a multiple casualty scenario, there is a real need for analgesia that is not delivered via IV. With multiple casualties, there will be a significant delay before the medic gets around to starting an IV on anyone.

**TCCC Update Review**

**Group**

The Committee discussed potential future changes to the TCCC guidelines:

- King LT for unconscious patients with traumatic brain injury
- Additional criteria for surgical airways in unconscious patients without airway trauma
- Ketamine
- Recommended TACEVAC provider levels and skill sets



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- TXA for non-compressible hemorrhage with/without shock
- An axillary site for needle thoracostomy

With respect to airway interventions (the King LT, surgical airways, etc), a comprehensive airway algorithm has not yet been developed because the available data from the JTR has not yet well-reviewed. After prolonged discussion, the committee asked LTC Bob Mabry to develop an airway algorithm for its consideration.

There was insufficient data at present to address the use of ketamine or TXA. The Committee elected to make no guideline change with respect to an axillary site for needle thoracostomy since it is currently mentioned in the text (in the military version of the PHTLS manual) as an alternative site.

### **TCCC RDT&E Priorities Review**

**Dr. Frank Butler**

The CoTCCC reviewed the battlefield trauma care research priorities list from yesterday and made some modifications. The battlefield trauma care research priorities list as endorsed by the committee is included as Appendix (1).

### **TACEVAC Skills Level and Outcomes**

**LTC Bob Mabry**

In civilian Helicopter Emergency Medical Services (HEMS) systems, care rendered is determined by the nature of the patient's injuries (patient-centric). In military HEMS systems, the provider present on a given platform is determined by the manning assigned to the platform (platform-centric). In Operation Enduring Freedom, HEMS involves a mixture of patients; it is not only combat trauma. 62% of the casualties transported require EMT-P level care, but many casualties are transported with a 68W medic (EMT-B) in attendance. In the civilian sector, a flight nurse or a flight paramedic would be the standard of care for transport. LTC Mabry noted that it requires 3-5 years of paramedic experience to become a flight paramedic, while in the military, it is possible for a flight medic to have never touched a patient before flying in evacuation platforms in combat. Civilian air ambulance systems are also under the oversight of a trained emergency physician or trauma surgeon; this is not true in the military at present.

Available data (LTC Mabry's is not yet published) indicate that there is a direct relationship between increasing provider level in HEMS and survival. Casualty survival is significantly better when the casualties are cared for by Certified Flight Paramedics (FP-C) during TACEVAC flights.

LTC Mabry proposed that FP-C should be adopted as the new standard for in-theater HEMS, and that military flight medics should train to the same standard as civilian Flight Paramedics. He presented a training pipeline that would support this standard.

The Chairman recommended that when LTC Mabry's data has been fully analyzed and prepared for publication that his recommendations be considered for the Committee's endorsement and presentation to the DHB.

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### USSOCOM TCCC Issues

### COL Tom Deal

COL Deal presented a brief history of USSOCOM efforts to obtain a freeze-dried plasma (FDP) product for use by medics in the field. The use of pooled plasma in the U.S. was discontinued in 1968 due to infection hazard. Thawed plasma is not suited for carriage by medics on the battlefield, although it can be used on TACEVAC platforms. FDP was identified at the January 2010 Fluid Resuscitation Conference sponsored by USAISR as the most promising fluid for damage control resuscitation when SOF medics have to care for casualties in very remote areas where evacuation may be delayed for many hours or even days.

The Germans produce an FDP (LyoPlas) that is typed; type “AB” FDP can be given first if the casualty has not yet been typed. The German product costs \$100.00 per unit and must be buffered before administration. Attempts at establishing an IND have been impeded by the announced intention of the manufacturer not to seek FDA approval. The product is screened initially and donors are retested at 4 months for HIV, syphilis, hepatitis B and C, and parvovirus. There is no published data identified at present that documents the efficacy and safety of German FDP in the prehospital trauma setting.

The French field a product that is buffered, universally compatible, and leukocyte reduced. The units are prepared from a 10-donor pool. Donors are tested for infection, the product is held for 8 weeks, and the donors are then retested before the product is released. It costs \$800.00 per unit. The French product is also not approved by the FDA, but the manufacturer has expressed an interest in offering this product for sale in the U.S.

HemCon is currently developing an FDP product for FDA approval, but their product is still in Phase 1 of clinical trials; the anticipated date of fielding for this product is currently 2015.

COL Deal is working to arrange an initial limited deployment of an FDP product with SOF medics for evaluation. It is important to note that the consideration of this issue should not be limited to the Iraq and Afghanistan areas of operation.

The above discussion indicates a need to initiate a high-priority prospective study in the U.S. using FDA-approved plasma alone as the sole prehospital resuscitation fluid for patients with noncompressible hemorrhage. In order to better translate the findings of this study to the military setting, the study should preferably be done in EMS systems that have relatively long prehospital evacuation times. The prehospital resuscitation fluid choice may be less likely to alter outcomes in patients with only a 10 or 15-minute transport time to the hospital.

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*FK Butler*

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

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**4 Feb 11**

Date

**Attachments:**

- 1) Appendix 1 – Battlefield Trauma Care RDT&E Priorities**
- 2) Appendix 2 – TCCC Equipment Overview Charts**

## Appendix 1 Battlefield Trauma Care RDT&E Priorities

**Non-Compressible Hemorrhage Control – Follow-Up Tranexamic Acid Studies:** As a follow-on effort to the CRASH-2 study, trials should be performed to determine the benefits and risks of using tranexamic acid for the subset of trauma patients who have non-compressible hemorrhage.

**Tactical Damage Control/Hypotensive Resuscitation Studies - German Freeze-Dried Plasma Experience:** Documentation of the German experience with this agent in both the prehospital and hospital settings would help to define the potential benefits that might be obtained by the use of this agent in the prehospital setting by U.S. Forces.

**Tactical Damage Control/Hypotensive Resuscitation Studies – Prospective Study Using FDA-Approved Plasma Alone for Prehospital Resuscitation Fluid in Patients with Non-Compressible Hemorrhage:** This study would provide a basis for judging the benefit to be gained from fielding a freeze-dried plasma product when one becomes available in the U.S. Because the primary use of plasma alone would be in a delayed evacuation scenario, this study would best be done in EMS systems that have relatively long prehospital evacuation times. Innovations in prehospital resuscitation fluids may be less likely to improve outcomes with a short 10 or 15-minute transport time.

**Tactical Damage Control/Hypotensive Resuscitation Studies – MERT Team Experience with 1:1 PRBC: Plasma Experience:** Training prehospital personnel to administer blood products in Tactical Field Care and Tactical Evacuation Care entails a significant training and logistic cost. With British MERT teams routinely giving PRBCs and plasma in a 1:1 ratio during TACEVAC, the outcomes from their experience should be studied and compared to outcomes using Hextend alone during evacuation.

**Improved Battlefield Analgesia – Ketamine:** Narcotic analgesia carries the risk of cardiorespiratory depression, while ketamine entails the potential for emergence dysphoria. Additional case series detailing the benefits and risks of using ketamine for prehospital analgesia in trauma patients are needed, to include the experience of the British MERT Teams with this agent.

**Pre-Hospital Care Documentation and Databasing:** Research and transition efforts are needed to aid in the capture of battlefield trauma care rendered and the transfer of this information to both unit-based Prehospital Trauma registries, such as that pioneered by the 75<sup>th</sup> Ranger Regiment, and to a trauma system registry, such as the Joint Theater Trauma System's JTTR.

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**Enhanced Electronic TCCC Training:** This topic encompasses enhanced methods for accomplishing combat trauma management skills transfer to deploying personnel for a variety of purposes, to include: presenting tactical medical personnel with complex casualty scenarios to help develop sound tactical decision-making skills, e-training designed to teach physicians and nurses the principles of TCCC, and information technology to make trauma management informatics available to deployed medical personnel whenever and wherever they need it.

**Truncal Tourniquet:** A prototype truncal tourniquet designed to assist in controlling external junctional hemorrhage in the tactical environment has recently been approved by the FDA. Studies documenting the efficacy of this device in eliminating distal pulses on extremities as well as the ability of users to apply it effectively are needed. Case series describing outcomes from using this device in prehospital trauma management would also be useful.

**Use and Outcomes Data for Individual Elements of TCCC:** Studies such as those performed by Kragh on tourniquet use are essential to documenting the success or failure of recommended TCCC interventions and identifying areas for improvement. One such study is currently underway at the U.S. Army Institute of Surgical Research.

**Monitor-Driven Prehospital Fluid Resuscitation:** Prehospital fluid resuscitation has the potential to do harm as well as good and the data to support specific fluid resuscitation protocols needs to be stronger. There is currently an effort underway at Memorial Hermann Hospital in Houston to evaluate the benefit of using electronic physiological monitors to better define which trauma patients need prehospital fluid resuscitation and to assist in titrating the volume given.

**Comparison Testing of Celox Gauze, Combat Gauze, and ChitoGauze:**

Several new hemostatic agents have become available since Combat Gauze was introduced several years ago. Although there have been good reports from both prehospital and in-hospital use of Combat Gauze, it would be useful to compare the new agents to Combat Gauze in the consensus bleeding model developed at ISR to gain an understanding of their relative efficacy.

**Comparison Testing of New Tourniquets:** New tourniquets have become available in the years since the 2005 ISR tourniquet study was published. There have also been a number of modifications to the tourniquets that were recommended for use in that study. Although there have been good reports from both prehospital and in-hospital use of the CAT, SOFT-T, and EMT tourniquets, it would be useful to compare the new tourniquets to these currently-fielded devices.

**Surgical Airway Training Methods:** Surgical airways have been shown in multiple case presentations at COTCCC meetings and JTTS Trauma Teleconferences to be the most technically difficult prehospital trauma skill to train and sustain. Comparison studies of different training modalities used to teach this skill are needed. Live tissue

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training should be included in the training modalities evaluated. The proposed Gold Standards for skills mastery are the ability to successfully perform a surgical airway on a human cadaver and the time that it takes to accomplish this task.

### **Clinicopathological Review of Every U.S. Fatality in Iraq and Afghanistan:**

Current process improvement efforts in prehospital care suffer from a lack of comprehensive data about the incidence of preventable deaths on the battlefield and how they might have been prevented. A study patterned after the Holcomb Annals of Surgery study in 2007 and the Kelly Journal of Trauma study in 2008 should be undertaken to provide this data. Using a multidisciplinary team that would include trauma surgeons, forensic pathologists, and combat medics, Armed Forces Medical Examiner autopsy records for all fatalities in the current conflicts should be reviewed to determine the causes of death and which deaths were potentially preventable.

**Optimal Management of Traumatic Brain Injury in TCCC:** Studies that better define optimal airway and fluid resuscitation management for casualties who often have polytrauma in addition to their TBI offer the potential to enhance both survival and the clinical outcomes in survivors.

### **The Impact of TACEVAC Provider Level and Skill Sets on Survival:**

There are at least three models of evacuation platform staffing in use in the CENTCOM area of operations at present: the British MERT team model which includes a consultant in Emergency Medicine, U.S. air ambulance platforms with flight paramedics and U.S. air ambulance platforms with 68W (EMT-Basic enhanced) flight medics. Determination of the optimal model for TACEVAC platform staffing requires an analysis of the outcomes obtained to date using these different options.

**Hypothermia Prevention Equipment Comparative Studies:** Current TCCC Guidelines recommend the Ready-Heat Blanket and the Heat-Resistant Shell for the prevention of hypothermia in combat casualties. New and improved technologies to prevent hypothermia are being developed and there should be an ongoing program to evaluate these technologies as they evolve.

**Combat Medic/Corpsman/PJ Equipment Evaluations:** Formal data on the experience of seasoned combat medics/corpsmen and Pararescuemen with the battlefield trauma care equipment that they carry is remarkably lacking 9 years into the current conflicts. Equipment after-action evaluations conducted through such venues as the biannual refresher training for SOF medics conducted at the Joint Special Operations Medical Training Center and arriving new instructors at the Army Department of Combat Medic Training would allow for quantitative evaluations and specific comments about the merits of currently fielded combat medical equipment to be obtained from individuals who have actually used these items to care for casualties on the battlefield.

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**Focused Analysis of JTTR Data Regarding Specific TCCC Interventions:** Analysis of the information contained in the trauma system trauma registry may yield valuable insights about the success or deficiencies of the current TCCC Guidelines. The pending study by Mabry on surgical airways is an excellent example of how this type of analysis may be successfully undertaken.

**Veres Needle for Needle Thoracostomy:** The Veres Needle is a spring-loaded needle used in laparoscopic surgical procedures. It has a hollow outer cannula that is ground obliquely at its distal end to a sharp, penetrating point. A protective element is contained in the cannula; the blunt surface of this protective element projects distally forward over the sharp tip of the hollow cannula. Studies using this needle for needle thoracostomy will help to determine if it reduces the potential for iatrogenic injury during needle decompression of tension pneumothorax.

**Tactical Suction Devices:** Combat medics have voiced the need for improved suction devices for battlefield use. A market survey followed by testing of the currently available devices is the first step toward addressing this need.

**Improved TCCC Training Metrics:** Better definition of “Gold Standard” metrics to ascertain the relative merits of various training methodologies, to include Powerpoint presentations, buddy practice, simulators, and Live Tissue Training is needed for the various interventions and skills recommended by TCCC. The metrics should include decision-making and cognitive training as well as technical skills.

### **Spinal Cord Protection in Casualties with Suspected Spine Injury in**

**Tactical Settings:** The benefit of currently used techniques for spinal cord protection while transporting casualties who have suspected spinal fractures in the prehospital setting are not well supported by data. More information is required about tactically-appropriate techniques for combat medics to use when moving these casualties on the battlefield.

**Enhanced Pelvic Protection in Personal Protective Equipment:** Deployed forces currently sustain injuries to the pelvic, urogenital, and perineal areas from dismounted IED explosions. Research is needed to identify options to protect this region while minimizing additional weight and discomfort to the combatant. This is not a medical care issue, but is highly recommended for review and appropriate action by those responsible for oversight and development of personal protective equipment.

Appendix 2

TCCC Equipment Overview



Service IFAKs NOV 2010

TCCC Item	USA IFAK	USMC IFAK	USAF IFAK	SOF IFAK	Legend
Tourniquet					Legend ■ In Assembly ■ Not in Assembly ■ Policy to have available when deploying
CAT					
SOFT-T					
Nasopharyngeal airway		CAP			
Combat Gauze					
Elastic Bandage Pressure					
Chest Seal Dressing	Field Dressing used with tape	CAP			
Rigid Eye Shield					
TCCC Card	Issued When Deploying		DD Form 1380		
Combat Pill Pack					
Tylenol ER					
Moxifloxacin 400mg					
Mobic 15mg					

Slide 3



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## Combat Medical Sets NOV 2010

TCCC Item	USA 68W	USMC (CAP)	AFSOC PJ	SOF ATP
Tourniquet				
CAT				
SOFT-T				
Combat Gauze				
Elastic Bandage				
Nasopharyngeal Airway				
Surgical Airway	H&H set	H&H	Individual	H&H
14ga 3.25" needle				
Chest Seal	H&H	Bolin	Asherman	HyFin
Hextend		BAS 636		
IV Catheter Needle 18ga, and supplies				
Saline Lock				
Tegoderm or equivalent				
Intraosseous Device	FAST 1	FAST 1	FAST 1	FAST 1
Hypothermia Prevention	HPMK	HPMK	HPMK	HPMK
Rigid Eye Shield				
Pulse Oximeter		BAS 635		
TCCC Card	Issued when deploying	H&H CC	Issued when deploying	

Legend
<span style="color: green;">■</span> In Assemblage
<span style="color: red;">■</span> Not in Assemblage
<span style="color: yellow;">■</span> Policy to have available when deploying

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# Medications NOV 2010

Legend	
<span style="color: green;">■</span>	In Assembly
<span style="color: red;">■</span>	Not in Assembly
<span style="color: yellow;">■</span>	Policy to have available when deploying

TCCC Item	USA 68W	USMC (CAP)	AFSOC PJ	SOF ATP
Combat Pill Pack				Wound Pack
Acetaminophen 650mg ER (2)	MES BAS		325mg	
Moxifloxacin 400mg				
Mobic 15mg	MES Tactical Combat		**Also Motrin 800mg	
Narcotic Analgesics				
OTFC 800mcg			Issued when deploying	
Morphine 5mg IV/IO	Morphine 10mg IM		Issued when deploying	
Naloxone				
Promethazine 25 MG IV	MES SickCall			
IV/IM ABX				
Ertapenem 1gm	MES Tactical Combat			
Cefoxitin 2gm			915F,K	
* Ertapenem or Cefoxitin meet the recommendation for mixing meds if medication is found in another ground ass.				

\*\* Motrin is not recommended for use in the combat theater

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