

**Committee on Tactical Combat Casualty Care
Meeting Minutes
5-6 April 2011**

Houston, TX

Attendance:

CoTCCC Members

Dr. James Bagian	University of Michigan
Dr. Brad Bennett	NMCP
Dr. David Callaway	Beth Israel Deaconess Medical Center
Dr. Howard Champion	USUHS
Col Warren Dorlac	USAF Trauma Consultant
CAPT James Dunne	USN Trauma Specialty Leader
COL Brian Eastridge	USA Trauma Consultant
Dr. Douglas Freer	Raytheon
Dr. John Gandy	Emergency Medicine-Las Vegas, NV
Dr. John Holcomb	University of Texas Health Sciences Center
Dr. Donald Jenkins	Mayo Clinic
CAPT Kenneth Kelly	Tripler AMC
LTC (P) Russ Kotwal	USASOC
LTC Robert Mabry	USAISR
Dr. Norman McSwain	Tulane University
MSG Harold Montgomery	75 th Ranger Regiment
Dr. Edward Otten	University of Cincinnati
Mr. Donald Parsons	DCMT
Mr. Gary Pesquera	MARFORCOM
CMDCM Eric Sine	3 rd 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. Hillary Peabody	DHB

Guests

CAPT Linda Beltra	BUMED
Ms. Heather Casey	USMC Medical Training & Ed.
Col George Costanzo	JTTS
MSgt David Dahl	ACC
LT Brian Drzewiecki	FMBT-West
Maj Joe Dubose	C-STARS
Dr. William Fabbri	FBI
CPT Kyle Faudree	160th SOAR

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MAJ Colleen Forestier	Canadian Forces
COL Jon Fristoe	G3 MEDCOM
Lt Col John Gaffney	RAF
Dr. Thomas Gross	FBI
SFC George Hildebrandt	USAARL
COL Andy Jose	OTSG British Liaison Medical Officer
Mr. Kevin Joyner	MARCORSYSCOM
CPT Carl Kusbit	82 nd Airborne Division
Lt Col Pamela Lucas	AF/SG
Mr. Mark Lueder	PHTLS
Mr. Lyle Lumsden	State Department
LTC Rob Malsby	82 nd Airborne Division
LCDR Anne McKeague	NMRU-SA Combat Casualty Care
Mr. John Miles	FMTB East
Mr. K. Scott Mohr	160 th SOAR
Maj Rich Morton	USA
CMSgt Anthony Negron	ACC
CDR William Padgett	HQMC - Health Services
LCDR Steven Parks	TECOM
COL Andre Pennardt	USASOC
Col Tom Piazza	USAF SG Office
Major Brandi Ritter	DMMPO
Lt Col Robert Russell	UK Prof ADMEM
MAJ Erin Savage	Canadian Forces
COL Colleen Shull	DMMPO
MSG Kyle Sims	USASOC
MSG John Steinbaugh	USASOC
HMC Jeremy Torrasi	MARSOC
SFC Fred Ziems	USASFC

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Tuesday 5 April 2011 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 present at the meeting reveal any financial interests in the agenda items to be discussed. There were no financial interests disclosed. The next CoTCCC meeting is planned for 2-3 August in Portland, OR. 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

HMC Jeremy Torrisi

HMC Torrisi presented a casualty scenario from his recent deployment to Operation Enduring Freedom. During this deployment, his unit, a Marine Special Operations Team, was engaged in training Afghani commandos. The mounted patrol on this operation had nearly 50 passengers total with two Recon Corpsmen providing medical support. Primary casualty evacuation was assigned to two UH-60s and was estimated to take approximately 15 minutes. Secondary evacuation by ground vehicles could take anywhere from 2 to 8 hours depending upon enemy presence and traffic.

At about 1000 in the morning, while the convoy was moving at about 45 MPH, the second to last vehicle went out of control and rolled over several times. This was an open-backed Humvee with seven passengers aboard. (The pre-operation passenger list indicated eight passengers, but one of these had elected to ride in another vehicle. Searching for the eighth passenger caused some confusion with the initial triage.) Non-medical personnel established scene security and a casualty collection point, while Chief Torrisi conducted initial triage and the second Corpsman and the Marines began treating the casualties. The recently graduated Afghani Commandos failed to initiate self-aid or buddy-aid because they were psychologically overwhelmed by the number and severity of the injuries. The 9-line request was sent within 10 minutes of the accident. The following is a brief description of the seven casualties and their care:

- Casualty 1 – unresponsive (TBI), multiple internal injuries and fractures, open fracture of the left leg. Care included a tourniquet to the left leg, an NPA which was thought to be ineffective, Hextend, and C-spine stabilization. A cric was done successfully.
- Casualty 2 – unresponsive (TBI), multiple internal injuries and fractures, no pulse palpated, obstructed airway. The casualty's airway was secured initially through positioning and then by intubation. His C-spine was stabilized, an EZ-IO was started in the left humerus. He later had a surgical airway performed due to trismus.

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- Casualty 3 – bilateral tibia/fibula fractures (open on the right), responsive, extreme pain, possible internal injuries. Care included bilateral lower extremity tourniquets, C-spine stabilization, OTFC 800 ug, and 10 mg morphine IM. The casualty's pain was unrelieved by the narcotics; he became combative and had to be restrained with tape.
- Casualty 4 – deceased (decapitated)
- Casualty 5 – deceased (massive head trauma with exposed brain tissue)
- Casualty 6 – scalp avulsion, decreased level of consciousness. The scalp bleeding was addressed with a pressure dressing. Mental status was difficult to ascertain due to language difficulties.
- Casualty 7 – decreased level of consciousness, possible distal radius fracture. A SAM splint was applied. Mental status was difficult to ascertain due to language difficulties.

Movement to the air evacuation landing site was hampered by poor radio communications and difficulty communicating through the interpreter while under rotor wash. The Urgent and Urgent Surgical casualties went to a Role III MTF and were treated by the coalition surgical team. Casualty #7 was later returned to duty. Casualty #6, the driver, was lost to follow-up. The other casualties did not survive.

The driver of the rolled vehicle was a member of a different clan than the other six passengers, and these two clans had a long history of conflict. There was speculation that this driver may have been chemically impaired or may have caused the wreck purposely in an attempt to kill the others as an act of tribal hostility.

HMC Torrasi's comments, observations, and lessons learned were:

1. Be creative in your training experience. Include mass casualty events. The shock created by a mass casualty event can greatly reduce the combat effectiveness of inexperienced personnel.
2. The two Corpsmen were overtasked by the large number of severe injuries and treatment of the wounded suffered from too few translators.
3. Rehearse the response to mass casualties with your team and your partnered forces. Stress accountability for people and gear.
4. Consider both the acute and the long-term psychological effects of a mass casualty event on everyone involved, to include partner forces.

In the follow-up questions, Dr. Otten asked how the spine was stabilized and the answer was taped boots. Dr. Butler asked if HMC Torrasi had a pulse oximeter; he did. Dr. Bennett asked for additional information about the surgical airways. HMC Torrasi did not recall the oxygen saturation prior to the crics; he carried a self-assembled cric set with a #10 blade, a cut-down ET tube, and a mosquito clamp. Dr. McSwain asked about HMC Torrasi's predeployment trauma training. The Chief had had refresher training to include live-tissue training accomplished through a contract training company approximately 6 weeks prior to deployment. CAPT Dunne asked about ventilation in flight. HMC Torrasi responded that the fight took approximately 10 minutes. One casualty was bagged and one mechanically ventilated.

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TCCC Update

Dr. Frank Butler

The following is an excerpt from an e-mail from LTC Dan Irizzary, the Senior Medical Advisor at NATO Special Operations Headquarters, dated 8 Feb 11: “As we discussed, US and Croatia are sponsoring a multinational TCCC train the trainer and we are looking to establish a medical training standard for NATO SOF elements using this training event. **We see TCCC as the first guideline and curriculum to be recommended for NATO SOF Medicine standardization.** I have spoken with Mark Ervin, the SOCEUR Surgeon, and as long as you agree, the plan will be to execute this curriculum as provided and our certificates will bear the TCCC copyrighted logo with my signature as the NATO SOF HQ Surgeon. We will also write TCCC training as a requirement into the Allied Command Operations Force Standards required to validate NATO SOF units for missions.”

In a letter dated 22 February 2011, ABCA (American, British, Canadian, Australian, and New Zealand Armie’s Program) proposed that ABCA nations adopt common attributes required of combat first-aid training. It went on to recommend that the U.S. Tactical Combat Casualty Care program or a similar system be adopted by member nations.

The CoTCCC has been following the transition of TCCC concepts into civilian prehospital practice. Dr. Steve Flaherty, now a civilian trauma surgeon at Cape Fear Valley hospital in Fayetteville, NC, noted in a telephone conversation on 11 Feb 2011 that their hospital had just received a patient who exsanguinated from a brachial artery injury caused by a knife wound. In a follow-up e-mail dated 16 March 2011, Dr. Flaherty noted that there was a recent presentation at the University of North Carolina Medical Center in which the front seat passenger in a small plane crash had suffered bilateral traumatic below-the-knee amputations, but had survived because two SOF medics had responded to the scene and quickly applied field-expedient tourniquets. The patient arrived at the Emergency Department alert and fully oriented. UNC is now moving to add tourniquets to their prehospital trauma protocols.

Mr. Mark Lueder, who is a paramedic from Chicago, also noted that the Chicago EMS has now added tourniquets and combat gauze as standard equipment on the ambulances in their EMS. He went on to say that recently one of their ambulances responded to a scene in which a person put their arm through a glass window. When the paramedics arrived, the person had a belt wrapped around their arm, but there was still active bleeding from the radial artery. The victim was estimated to have lost about a liter of blood. The paramedics bypassed direct pressure and applied a C.A.T. tourniquet immediately and the bleeding was promptly stopped.

Dr. Butler provided an update from the Defense Health Board (DHB) meeting on 7-8 March 2011. The DHB was briefed on two proposed action memos:

- TCCC training emphasis for combat leaders, medical department personnel and all deploying combatants
- Battlefield Trauma Care RDT&E Priorities

Both action memos were unanimously approved by the DHB and are currently being drafted by the DHB staff. Dr. John Holcomb also provided an information brief on the recent increased incidence of Devastating Dismounted IED Injuries. Dr. Rich

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Carmona, a trauma surgeon, DHB member, former CoTCCC member, and former United States Surgeon General, observed at the meeting: **“The nation owes a great debt to the Committee on Tactical Combat Casualty Care for the great work that they have done for the past 10 years.”** Dr. Butler added that this debt also extends to the entire TCCC team: the U.S. Army Institute of Surgical Research; the Joint Theater Trauma System; the Defense Health Board and their staff at Health Affairs; the Prehospital Trauma Life Support (PHTLS) organization; the Naval Operational Medicine Institute; the Defense Medical Materiel Program Office (DMMPO); representatives from the service Surgeon’s General, combatant units, combat medic schoolhouses, and other government partners; guest subject matter experts, and other regular CoTCCC meeting attendees.

Representatives from the CoTCCC participated in the in the Army Surgeon General’s Task Force on Dismounted Complex Blast Injuries as leaders of the prehospital section of the Task Force. Among the issues proposed for inclusion in the final Task Force report by the prehospital team were:

- The importance of the JTTS
- The need for TCCC training for doctors, nurses, and combat leaders
- The importance of preventing coagulopathy in DCBI casualties
 - ASA and motrin avoidance
 - Hypothermia prevention
 - Avoiding large-volume crystalloid fluid resuscitation
- Improved prehospital resuscitation of casualties in shock
 - Early blood products
 - Freeze-dried plasma for medics
- Improved TACEVAC capability
- Fielding and evaluation of interventions to control junctional hemorrhage

The increased incidence of dismounted blast casualties with associated urogenital injuries has elevated interest in protective undergarments (“Ballistic Boxers”) for combatants patrolling on foot. The following is an excerpt from an e-mail sent by COL Jeff Bailey, the Deployed Director of the JTTS, on 19 March 2011:

- “Among the injured there were a total of 6 patients with at or above knee traumatic amputations, 3 wearing the garment and 3 not.
- Among these traumatic amputation (AKA or TKA) patients:
- Garment "YES":
- One patient sustained genital injury which appeared to be blunt or nonfragmentation blast related (testicular hematoma). This injury was not associated with testicular loss. The other two patients wearing the garment did not have a significant genital or perineal injury identified. None appeared to require urinary or fecal diversion.
- Garment "NO":
- All 3 sustained fragmentation genital/pelvic injury. Two of three had injuries resulting in testicular loss (1 patient bilateral, the other unilateral). Two of the 3 required urinary diversion. Two of the three were anticipated to require fecal diversion.

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- So, based on this preliminary, (roughly) amputation case matched, small cohort it appears that patients wearing the garment did not sustain a penetrating/fragmentation injury to the genitals or perineum, or demonstrate injury that resulted in loss of urinary, anorectal, or reproductive structure or function based on findings and care in theater.”

Several recent cases from the JTTS weekly trauma teleconferences were reviewed and lessons learned discussed.

Publications

The CoTCCC maintains a Journal Watch to identify publications relating to TCCC. Recent articles of interest include:

Crystalloids in Trauma Patients – Ley et al - J Trauma 2011

- Retrospective study – 3,137 patients
- Subgroups: 1, 1.5, 2, and 3 liters of crystalloid infused
- Overall mortality was 5.2%; for elderly, 17.3%; non-elderly, 4%
- The study did not specify which crystalloid was received
- Conclusion: “ED volume replacement of 1.5 L or more was an independent risk factor for mortality.”

TBI and Tension Pneumo - Buschmann, et al - Forensic Sci Med Pathol 2011

- 60 y/o alcoholic patient
- Found dead in unlocked apartment
- 1 cm scabbed head wound; skin lesions of trauma
- Last seen 4 days earlier
- Generalized subcutaneous emphysema; rib fractures
- Cause of death: large tension pneumothorax
- A rib fracture led to lung injury and tension pneumothorax
- Forensic speculation was a fall backwards onto a rounded edge
- Estimated period from injury to death was several hours
- The paper noted that the incidence of tension pneumothorax may be as high as 5% in polytrauma patients

Prehospital Fentanyl - Krauss - J Emerg Med 2011

- Prospective safety study
- 500 patients
- Nurse and paramedic prehospital crew
- Both trauma and medical patients
- Max dose of IV fentanyl was 5 ug/kg/hour
- 1055 administrations in patients > 5 y/o
- Mean dose was 1.1 ug/kg; mean total dose 3.0 ug/kg
- Post-fentanyl hypotension in 4.9% of patients; the hypotension was new in 2.7% of patients
- Pre and post fentanyl O2 saturation were both 98%

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- No hypoxemia in 522 doses in non-intubated pts
- “Fentanyl is an ideal agent for prehospital analgesia due to its short-acting nature and safety profile. Since its first uses in the 1980s, multiple studies have demonstrated the safety of fentanyl in this environment.”
- “It is recognized that other agents, such as ketamine, may be advantageous in patients with potential hemodynamic compromise.”
- Conclusion: “These findings strongly support the continued use of intravenous fentanyl by appropriately trained providers in the prehospital setting.”

ASA, Ibuprofen, and Mild TBI - Fabbri - J Neurol Neurosurg Psych 2011

- 14,288 trauma patients with mild TBI
- Outcome: traumatic lesion on CT within 7 days
- OR of intracranial lesion 2.7 on multivariate analysis for patients on antiplatelet agents (ASA, ibuprofen)
- Patients on clopidogrel (Plavix) was excluded
- Conclusion: “Pre-injury antiplatelet therapy significantly increases the risk of intracranial lesions in subjects after mild head MHI.”

CRASH-2: Timing of TXA Dosing – Lancet 2011

- Subgroup analysis of 20,211 trauma patients based on time of administration of TXA
- Looked at effects of timing of TXA administration
- Considered only deaths due to bleeding (1063 deaths out of 3076 deaths overall)
- Risk of death due to bleeding was significantly reduced (5.3% vs 7.7%) if TXA was given within 1 hour of injury. At 1-3 hrs after injury, also significant decrease (4.8 vs 6.1%)
- Cochrane Review 2011: “The review concluded that tranexamic acid safely reduces mortality in bleeding trauma patients without increasing the risk of adverse events.”
- Conclusion: “Our results strongly endorse the importance of early administration of tranexamic acid in bleeding trauma patients and suggest that trauma systems should be configured to facilitate this recommendation.”

Antibiotics in TCCC

LTC Clint Murray

LTC Murray reviewed current recommendations on antibiotic use in trauma patients from various countries and organizations and antibiotic use in selected military campaigns. TCCC currently recommends a single dose of oral moxifloxacin for all open combat wounds, or cefotetan or ertapenem IV/IM if the casualty is unable to take oral therapy (e.g., shock, unconsciousness, penetrating torso injury).

The available human data on the timing of antibiotic administration after injury comprises a variety of clinical settings and antibiotic choices which are hard to compare. This data is inconclusive. Animal data suggests that fewer infections will occur if

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antibiotics are given earlier (within one hour) rather than later (more than six hours after injury), except in cases where there is a massive organism load.

Prior to the establishment of the Ranger Prehospital Trauma Registry, reports on the timing of antibiotics and surgery were:

- often limited to primarily extremity injuries
- often did not address point-of-injury antibiotics
- often did not examine parenteral versus oral antibiotics for absorption in polytrauma patients
- often did not examine the impact of “stacking” antibiotics through the successive levels of care.

The 75th Ranger Regiment systematically collected data pertaining to the management of combat-related injuries by first responders, including the delivery of point-of-injury (TCCC) antimicrobials. The electronic medical records from casualties occurring between March 2003 to March 2010 were examined for infections (excluding urine/respiratory samples) and colonization with multi-drug resistant (MDR) organisms within 30 days of injury at level III, IV, and V facilities.

Of 405 casualties in the sample, 113 (28%) received antibiotics at the point of injury. There were 28 (7%) infections - 26 wound infections, 1 blood, and 1 cerebrospinal fluid. The organisms involved were:

- Polymicrobial (21%)
- Acinetobacter baumannii (68%)
- Klebsiella pneumoniae (ESBL+) (14%)
- Pseudomonas aeruginosa (11%)
- Escherichia coli (ESBL+) (7%)
- Enterobacter cloacae (ESBL+) (11%)
- Clostridium non-perfringens species (7%)
- Enterococcus faecalis (4%)
- Serratia species (4%)

Analysis of the data showed no evidence of decreased infections but also no evidence of increased colonization or infection with MDR pathogens among those who received point-of-injury antibiotics as recommended in TCCC guidelines.

LTC Murray offered the following points for consideration on the topic of Point of Injury antibiotics:

- Only about 1/3 of casualties had documentation of point-of-injury antibiotics. Is this a training issue? A documentation issue? Are medics withholding antibiotics for some reason?
- Though this study has limitations that must be kept in mind, the data do not show a positive or negative impact on infection by giving single doses of a broad-spectrum antibiotic at the point of injury.
- The majority of infections were caused by nosocomial organisms.
- We still do not have good data on the timing of antibiotics and surgery.

Limitations of this study included the small number of casualties, the

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retrospective study design, the lack of information of evacuation times, and the reliance on AHLTA data for the incidence of infection.

There is a clear need to continue to address issues of documentation, training, and compliance with TCCC guidelines. Early wound irrigation and surgical debridement of devitalized tissue were also emphasized as important measures to prevent wound infection. In the ensuing discussion, it was noted that there was no explanation available for why some casualties got antibiotics and some did not. Was there a medic selection based on anticipated delays to evacuation or very dirty wounds? Or was antibiotic administration random?

No change to the current TCCC Guidelines in regards to point of injury antibiotic administration was proposed by CoTCCC members at this time.

TCCC Equipment Issues

Major Brandi Ritter

The Defense Medical Materiel Program Office (DMMPO) is exercising proactive oversight on issues such as counterfeit medical gear (tourniquets), vendor substitutions to medical materials (unintentional variation), manufacturing quality assurance failures, and purchasing outside approved DOD lanes.

Pyng FAST-X sternal IO device update: Patient movement while applying this device may cause the device to be incorrectly inserted if the device is positioned at the wrong angle. The manufacturer has performed a root analysis and redesigned the insertion mechanism. Current plan is to retest the device on living subjects as opposed to cadavers, and then resubmit for FDA clearance.

DMMPO is investigating a possible new counterfeit tourniquet with fake national stock numbers that has shown up in troop medical clinics and in M-17 bags. DMMPO is trying to track down the source.

Three cases have been identified where tibial EZ-IO needles were used at a humeral site. This is a training issue.

H & H cricothyroidotomy sets may be shipped with tubes that are curved around the hemostat inside the package. The tube is pinched during vacuum packaging, predisposing the tube to kink when it is inserted. In response to this, the company narrowed the cause down to a certain lot of tubes and has changed its packaging techniques. The company also replaced all of the kits purchased when the questionable tubes were included in the kit and the problem was reported.

The next issues of Feedback to the Field will address appropriate application of pelvic stabilizers and humeral intraosseous devices. This report is classified For Official Use Only, so recipients must be careful to handle the it properly.

With regard to the TCCC equipment overview Red/Green charts, further progress has been made in updating Individual First Aid Kits and medical kits. The Combat Pill Pack continues to be a significant issue.

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PHTLS TCCC Update

Mr. Mark Lueder

New TCCC sites have been added and more are on the calendar for the near future. There are currently 17 active training sites. The instructor cadre is growing as well. Mr. Lueder noted that there is an increasing demand for a “civilianized” version of TCCC.

He also noted that tourniquets and Combat Gauze were added to Chicago area Emergency Medical Systems approximately 9 months ago and are gaining acceptance among providers. Seven of the eleven EMS systems in Chicago now have both.

JTTS TACEVAC Overview

LTC Bob Mabry/MAJ Rich Morton

LTC Mabry has just returned from a three-month deployment to Afghanistan as the Director of Evacuation Care for the Joint Theater Trauma System (JTTS). He presented a synopsis of how tactical evacuation (TACEVAC) is managed in theater as well as descriptive data on transport volume and the characteristics of the medical and surgical problems of the casualties being transported.

(Note that in the following discussions, Medical Evacuation (MEDEVAC) refers to Red Cross-marked dedicated air ambulances without offensive weaponry. Casualty evacuation (CASEVAC) refers to casualty evacuation accomplished by tactical aircraft without Red Crosses but with offensive weaponry and armor. CASEVAC aircraft are typically not dedicated medical assets. Tactical Evacuation (TACEVAC) includes both MEDEVAC and CASEVAC.)

Casualties who are critically injured at the point of wounding need critical care during transport from the point of wounding to the role II or role III facility in order to arrive there with an optimized chance for survival. The military does not staff or train to this mission like civilian EMS systems do. LTC Mabry presented data from a manuscript recently submitted for publication which documents that advancing the level of medical provider from EMT-Basic to critical-care flight paramedic (CCFP) reduced mortality by 50% in one area of operations in Afghanistan.

There are major issues that need to be addressed in the training, equipping, and deployment of TACEVAC medical teams. An initiative to staff TACEVAC platforms in theater with personnel trained to the CCFP level has been approved by OTSG. Standardized protocols for TACEVAC care are lacking and there is no formal EMS-trained oversight of the TACEVAC system in theater. TACEVAC unit physicians often have limited training and experience in trauma care.

MAJ Morton added that, prior to recent efforts, there were up to 16 systems for documentation of TACEVAC care present in theater among the US and its allies. In collaboration with the medics from the various forces, the TCCC card was modified to become the NATO Evacuation Document which was designed to be completed within 60 seconds and to supplement the information provided by the ground combat medical provider on the Tactical Combat Casualty Care Casualty card (DA form 7656). The NATO Evacuation Document has been computerized for easy inclusion into electronic medical records. It has also been validated in the field, and is now being used by NATO

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medics on evacuation platforms in theater. Data describing TACEVAC care can be captured by trauma registries using this document.

Some of the points that emerged from the ensuing discussion included:

- 1) Dr. Steve Flaherty remarked that the aviation community has been resistant to efforts to modify TACEVAC care in the past. Dr. Flaherty also pointed out that Flight Surgeons may not be aware of the specifics of the TACEVAC Care that their medics are providing;
- 2) SFC George Hildebrandt noted that the Aeromedicine Proponency is located in Fort Rucker, AL;
- 3) LTC Mabry noted that documentation is the key: “You can’t fix anything that you can’t measure.”
- 4) MAJ Morton added that the TACEVAC system organization needed to be specifically addressed in any recommendations on this issue made by the CoTCCC.
- 5) LTC Mabry also added that TCCC and EMS system issues need to be added to the service Flight Surgeon courses.

MERT TACEVAC Overview

Lt Col Rob Russell

The U.K. Medical Emergency Response Team (MERT) was initiated in 2006 in Helmand Province because of very long TACEVAC times in that area of operations. In essence, U.K. forces took the resuscitation room to the casualty. A typical MERT is staffed with a physician (emergency medicine or anesthesia), an emergency medicine nurse, and two paramedics. This staff provides the casualty with four pairs of experienced hands and extra medical decision-making capabilities as well as advanced airway management (including mechanical ventilation and oxygen), thoracotomy and/or thoracostomy, intraosseous access, splinting (including pelvic), spinal immobilization, hypothermia prevention, and resuscitation with packed red blood cells (PRBCs) and thawed plasma during the TACEVAC flight.

Though the MERT can deploy on a Merlin helicopter, the preferred platform is the Chinook CH-47. The MERT is usually accompanied by a four-man protective force who also assist with casualty care while in flight. The nurses serving with MERTs are highly experienced in emergency medicine. They act as the link with the aircrew, wearing the communications gear.

The Chinook can accommodate eight stretchers and 20 walking wounded. Medical gear is stowed in three modular packages; one is kept on the helicopter, the second kit is kept immediately available, and the third is kept in storage. The MERT can relocate to a new airframe in less than 10 min.

At present, MERT members train individually and not as a team. Team training is recognized as an unmet need at present. The present staggered turnover among MERT personnel has advantages and disadvantages.

Does the MERT make a difference? Lt Col Russell noted that the MERT is only one part of the chain of care. If the care provided in Care Under Fire and Tactical Field Care on the one end, and in the hospital emergency department on the other end, is not

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good, then the MERT may make no difference in outcome for the casualty. In Afghanistan at present, mean time for transport from point of wounding to handover in the emergency department for the MERT is 40 minutes. As of this briefing date, MERTs have transported 1,721 casualties. Procedures performed during transport include 281 advanced analgesia/anesthetics, 96 ET tubes, 7 surgical airways, and 21 chest procedures.

Data on outcomes at this point is mostly anecdotal. However, the advanced medical care provided by the MERT far forward has contributed an increased number of unexpected survivors in severely injured casualties, especially those with head injuries.

Points made during the discussion:

- LTC Mabry noted that rapid sequence intubation is not typically available on the battlefield except in USMC Shock/Trauma platoons and that this capability may reduce the need for surgical airways;

- Dr. Bennett asked about success rates for surgical airways by provider type. No specific data was available on this question.

- MSG Kyle Sims asked about the number of casualties with surgical airways already done at the time of MERT arrival and noted that if a casualty really needed a surgical airway, he would usually need to have it done before the MERT arrived. The answer was that some casualties did have surgical airways done prior to MERT arrival, but that specific data was not available on this point.

MATTERS Study

Major Joe Dubose

Major Joe Dubose is an Air Force trauma surgeon working at the Baltimore Shock Trauma Center. He discussed the Military Application of Tranexamic Acid in Traumatic Emergency and Resuscitative Surgery (MATTERS) study. Tranexamic acid (TXA) is an anti-fibrinolytic; that is, it prevents clots from breaking down once formed. Treatment with TXA is associated with a reduction in all-cause mortality if given within the first three hours after injury per the subgroup analysis of the CRASH-2 study. It is used routinely by the British in Operation Enduring Freedom, usually given with the first shock pack in the emergency department at Bastion. The MATTERS study is a tri-service, joint UK–US retrospective examination of the benefits of TXA administration in trauma patients admitted to Bastion from January 2009 to December 2010. The study examined both 24-hour and 28-day mortality. 896 casualties were enrolled – 293 received TXA and 603 did not.

Findings from this study include:

- TXA administration is associated with a trend in reduction in blood product use for massive transfusion patients;

- TXA administration is associated with an improved all-cause mortality at 28 days: 16.4% vs 23.2%, $p = 0.018$;

- In patients receiving massive transfusions (≥ 10 units of PRBCs), improvement in 28-day mortality is greater: 13.6% vs 27.6%, $p = 0.003$;

- TXA administration was an independent predictor of survival in this study: odds ratio 0.08 (0.02 – 0.42), $p = 0.003$.

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CASEVAC in the Marine Corps

CDR Bill Padgett

Casualty evacuation (CASEVAC), described as the transport of injured Marines from the point of injury to definitive medical care, is consistently listed as a Marine Corps requirement throughout various doctrinal publications and policies. The Marine Corps operates as a task organized force constructed from Marine Air Ground Task Force (MAGTF) components to achieve the appropriate capabilities in order to execute the assigned mission requirements. CASEVAC requirements and capabilities for the mission at hand are defined and assigned during the planning process. There is not a dedicated CASEVAC capability in the Marine Corps, however the capability is put in place during mission planning by designating personnel and equipment for the requirements identified. The Medical Officer of the Marine Corps does not own medical personnel or equipment, but as a supporting office to the line commanders who own the personnel and equipment, champions CASEVAC policy, processes and resources as part of the Expeditionary Force Development System which converts operational capability gaps or concepts to fielded capabilities that support Marine Corps strategy.

CASEVAC medical kits have been developed. The TCCC guidelines are incorporated in CASEVAC training processes and TCCC material recommendations are considered as part of the continuous CASEVAC equipment reviews.

USMC CASEVAC providers are typically Fleet Marine Force (FMF) corpsmen with at least TCCC training in addition to unit specific CASEVAC training on the platform to be utilized. Many will have EMT-Basic training as part of their corpsman duties and patient contact hours are typically battalion aid station sick-call experiences. Trauma rotations and formal operational emergency medical skills training have been used depending on CASEVAC mission requirements identified. A General Medical Officer (GMO) or Flight Surgeon will typically provide oversight and ongoing training of the corpsmen involved in the CASEVAC missions.

The Marine Corps has an internal CASEVAC capability utilizing designated personnel and equipment that supports its expeditionary mission. As part of the mission planning process, the Marine Corps considers joint casualty evacuation capabilities that can augment the Marine Corps and free Marine Corps resources to focus combat power on the mission objective. In the mature Afghanistan theater, the Army Dust-off, Air Force Pedro, and British MERT have significantly increased the medical capabilities of the CASEVAC missions with dedicated assets that in turn release Marine Corps equipment and personnel back to the fight at hand.

The characteristics of some of the airframes used in the Marine Corps were discussed. The CH-46 Sea Knight is armed, has a limited range (160 nm) and is small, being able to carry only 15 litter or 22 ambulatory casualties. Its speed is 140 kts. The CH-46s are being replaced by the MV-22s. The MV-22 Osprey is also small, carrying 12 litter casualties or 24 ambulatory casualties, but its speed of 305 kts and range of 879 nm make it a unique armed asset. The CH-53 is also armed and can carry 24 litter casualties or 37 ambulatory casualties. Its speed is 195 kts and its range is 540 nm, but this platform is hard to get designated for CASEVAC in that it is very capable and usually designated for other purposes. The UH-1 Huey is small and thus limited in its use as a CASEVAC platform when multiple injuries can be expected.

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In the discussion, the following points were made:

- SFC Hildebrandt noted that JP 4-02 says that the Army has primary responsibility for CASEVAC;
- Mr. Parsons noted that Army evacuation units are commanded by evacuation pilot MSC officers and noted that the unit's battalion flight surgeons are typically post-intern flight surgeons. He questioned where the unit medical direction comes from under this arrangement;
- LTC Mabry noted that the USMC STP platoons and FRSSs are often co-located far forward and are a remarkable capability. He went on to add that MG Rubenstein has approved CCFP as the new standard for flight medics in the Army. He added that seeing actual trauma patients is a critical part of preparing individuals to manage trauma on the battlefield.

U.S. Army TACEVAC Overview

SFC George Hildebrandt

SFC Hildebrandt spoke on the Army TACEVAC capability. He noted that the Army has the propensity for tactical aeromedical evacuation. The primary focus within this community is on the evacuation airframes. He noted that there are 15 aircraft per evacuation company.

MEDEVAC in the 82nd Airborne Division

CAPT Carl Kusbit

CPT Kusbit is a Critical Care Flight Nurse. He briefed the committee on the critical care capabilities of MEDEVAC teams in the 82nd Airborne Division. The Division now has 17 critical care nurses in theater. Their Critical Care Flight Skills Course was established while he was in theater and provides three weeks of training for medics, physicians, nurses, and Physician Assistants. This is followed by hands-on scenarios in flight at the end of the course on the HH-60 Blackhawk, clinical experience at Womack Army Hospital, and hopefully soon, Cape Fear Valley Hospital.

The 82nd Airborne uses HH-60 airframes for their missions, which are typically MTF to MTF transfers, but also may include evacuation from the point of injury. MEDEVAC crews in the 82nd are usually comprised of a physician or nurse plus a medic and provide advanced critical care life support including advanced airway support (RSI, intubation, and ventilator management), advanced pharmacology (analgesia/sedation/vasopressors/beta-blockers/thrombolytics), blood products, pediatric advanced life support, emergency obstetric care, management of elevated intracranial pressure, and emergency care for working dogs.

CPT Kusbit noted that the 82nd is in agreement with the TACEVAC innovations proposed by LTC Mabry.

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TACEVAC in the 160th SOAR

CPT Kyle Faudree/SFC John Dobbins

The 160th Special Operations Aviation Regiment (SOAR) trains Special Operations Combat Medics to be Special Operations Aviation Medics in its Special Operations Aviation Medic Indoctrination Course. Its Medical Officers can also take this course. CPT Faudree reviewed the topics of instruction within the course. There is a strong focus on TCCC: “What you guys write drives our program.” This program of instruction and subsequent pipeline training includes airborne training, SOCM, SERE-C school, fastroping, water survival, a non-trauma module, and leads ultimately to the Flight Paramedic–Certified credential which is now required of medics to be Fully Mission Qualified. CPT Faudree noted that the SOAR has a 90% pass rate on the NREMT-P exam.

CPT Faudree and SFC Dobbins reviewed the contents of standardized medical kits used by SOAR TACEVAC crews (Individual Medical Kit, Assault Aid Bag, MARCH Belt, Gen III TACEVAC Panel, PEERS Case), and the airframes they fly on (the MH-47G Chinook, the MH-60 Blackhawk, and the AH-6 Little Bird). These aircraft are all armed and capable of defending themselves on evacuation missions. The MH-47G is large and provides good accessibility to the casualties, thus facilitating care enroute. It is the primary airframe used in Afghanistan because of its ability to operate in higher altitude terrains. The Blackhawk has been used more in Iraq. Hypothermia is a problem in the Blackhawk because it is a doors-open airframe. The Little Birds are rarely used for anything medical.

The 160th SOAR participates in the annual Special Operations Command Medical Multilateral Exercise, a medically-focused, beginning-to-end mission training exercise held every summer at Ft. Campbell, KY. This exercise includes realistic medical scenarios and live tissue training.

In the discussion period, Mr. Parsons asked if the SOAR carries blood on TACEVAC missions. The answer was “not usually” and that the medics receive little training in this area. There is also often a lack of availability of blood products for their missions. Col Dorlac asked if they carried a ventilator. CPT Faudree responded that they use the SAVe device for this purpose and that it has worked well. (The Simplified Automated Ventilator is a lightweight device that delivers a standardized tidal volume of 600ccs at a rate of 10 breaths per minute.)

TACEVAC Care Discussion

Group

In the discussion that followed the presentations above, the following TACEVAC recommendations were outlined:

1. Develop a U.S. Advanced TACEVAC Care Capability
 - Structured after the successful MERT model insofar as possible
 - Emergency Medicine or Critical Care physician-led team
 - Modular team and equipment
 - Use most capable platform available (CH-47/CH-53/CV-22)
 - Routine blood and plasma in 1:1 ratio

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- Advanced airway capability
 - IV medications: morphine, ketamine, TXA, etc
 - Use this capability when possible for the most critical casualties
 - Enables a tiered response when needed
 - Field in the near term on a limited basis as a pilot effort
 - Field where feasible and where a high probability of critical casualties exists
 - Good documentation of outcomes
 - Compare the outcomes with this platform to other TACEVAC models, with appropriate subgroup analysis based on injury severity
 - Use this analysis as the basis to consider system-wide changes
2. Optimize TACEVAC response times
- SecDef-directed 60-minute max
 - Faster transport to optimal care is lifesaving for critical casualties
 - Plan for optimized response time
 - Especially critical in Immature theaters
3. Hostile Fire CASEVAC Option
- Armed, armored aircraft with no Red Crosses
 - Modular medical packages for tactical aircraft of opportunity
 - Should be identified in planning phases
 - Supplement to dedicated MEDEVAC platforms
 - Avoids evacuation delays due to ground fire
 - Concept used with success in Special Operations TF planning 2003
4. In-flight care providers that meet or exceed the civilian standard:
- Critical care trained flight paramedic, or
 - Critical care trained flight nurse, or
 - Critical-care capable flight-trained physician.
 - Critical-care capable flight-trained PAs also an option
- * At least 2 of the above providers per platform when transporting critical casualties
- * At least 1 of the above providers per critical casualty
5. Routine availability of PRBCs and plasma on TACEVAC platforms for critical casualties
- Use hypotensive resuscitation with Hextend if no blood is available
 - Limit the amount of crystalloid infused
6. Pre-deployment trauma experience for TACEVAC providers in air evacuation units
- TCCC training and
 - Ongoing ICU/trauma experience and/or
 - Service Trauma Training Centers and/or
 - Other trauma rotations to provide ongoing trauma patient contact.
 - Use a metric? (as per CCATTs – Critical Care Air Transport Teams)

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- Primary focus of deployment work-up for designated TACEVAC personnel
 - Medic skills sustainment on Commander's USR (unit status report)
7. Standardized Protocols for TACEVAC care
- Outlined in TACEVAC section of TCCC Guidelines
 - Evidence-based
 - Reviewed quarterly
 - Modified as necessary
 - Should be the theater standard for evacuation care
8. Oversight of TACEVAC Care in Theater
- Qualified EMS medical direction oversight in theater
 - Prehospital cell part of the deployed JTS team
 - Prehospital cell as part of JTS home structure
9. Improve Documentation of TACEVAC Care
- TCCC card from ground medic
 - NATO card for flight portion
 - Reliable entry into Joint Theater Trauma Registry (JTTR) and Electronic Medical Record
 - Enhanced prehospital data fields in the JTTR
 - Integrate with unit-based Prehospital Trauma Registry
 - Integrate with Armed Forces Medical Examiner's office data
 - Flight care documentation on Commander's USR (unit status report)
10. Physician oversight in TACEVAC units
- Medical officer should be trained and experienced in trauma care
 - Should be trained in TCCC
 - Trauma skills sustainment on Commander's USR (unit status report)
11. Standardized TACEVAC capability
- Should be a joint requirement
 - Not all services need to provide
 - But casualties from all services should receive the same quality of care
12. Process Improvement
- Flight reviews of TACEVAC care should be part of JTTS QA
 - Depends on documentation
 - A lack of prehospital data should be a trigger for follow-up

Summary

All necessary steps should be taken to implement the above recommendations in the near term to ensure that our combat casualties receive a consistent level of care during TACEVAC that meets or exceeds the civilian standard. All of the above recommendations were approved by the CoTCCC.

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Wednesday 6 April CoTCCC Internal Administrative Session

Administrative Remarks

Dr. Frank Butler

The CoTCCC will meet next in Portland, Oregon on August 2nd and 3rd. At the November meeting, the Committee will host a 10th anniversary dinner. The Army-Navy Club in Arlington is a potential site. Invited guests will include past Committee members and selected VIPs who have been involved with TCCC. The hotel for the November meeting is yet to be determined.

Reappointment letters for members of the Committee were signed by the Secretary of Defense last Thursday.

Fiscal Year 11 operational monies for the CoTCCC arrived at the U. S. Army Institute of Surgical Research last Wednesday.

The Membership and Bylaws Subcommittee considered nominations to fill a vacant medic seat on the CoTCCC. The Subcommittee recommended HMC Jeremy Torrisi to fill this seat.

TCCC Equipment Evaluations: The Navy Operational Medicine Institute Lessons Learned Center (NOMLLC) has reviewed this project and is interested in participating. They can initiate right away. The evaluations will be considered directed After Action Reports (AARs). NOMLLC has strong USMC connections and can offer an online version of the evaluation. This will be the plan for going forward on this project.

Combat Medic Presentation Review

Group

With respect to HMC Torrisi's presentation, the following points were brought up: 1) A discussion of the use of interpreters will be included in the next version of the Mission Planning chapter and the Tactical Field Care chapter. Interpreters must understand medical questions, and scenarios should be rehearsed with interpreters; 2) using taped boots for C-spine immobilization has been a long-standing field-expedient measure. It will be added to the Tactical Field Care chapter; 3) this motor vehicle accident scenario emphasizes the need to address blunt trauma as well as penetrating trauma in training for combat medical personnel.

Potential Changes to the TCCC Guidelines

Group

The following proposed changes to the TCCC Guidelines will be addressed at the next meeting:

- Mr. Don Parsons: Proposed change to the tension pneumothorax decompression procedures to add bilateral needle decompression for a casualty who loses vital signs in the prehospital phase of care.

- MSG Harold Montgomery: Recommendation to add the Combat Ready Clamp™ to the hemorrhage control measures in TCCC.

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- Col Warren Dorlac (with assistance from Major Joe Dubose): Recommendation to add the use of tranexamic acid to the TCCC Guidelines.
- Dr. John Gandy: Recommendation to add the use of ketamine to the TCCC Guidelines.

Proposed DHB Action Memos

Group

The CoTCCC voted to approve the TACEVAC recommendations listed on pages 16 - 18 above.

The group also voted to approve a recommendation that the DoD take all necessary steps to expedite the fielding of a dried plasma product to combat medics and to TACEVAC platforms that are not logistically able to carry PRBCs and thawed plasma.

These recommendations will be reviewed by the Trauma and Injury Subcommittee and then presented to the Core Board of the DHB if approved by the Trauma and Injury Subcommittee.

Air Force Personnel Recovery

Dr. John Gandy/CMSgt Anthony Negron

The Services and the United States Special Operations Command are responsible to prepare forces that are organized, trained, and equipped to perform Personnel Recovery (PR) tasks. CSAR (Combat Search and Rescue) is how the Air Force accomplishes the PR task. Guardian Angel (GA) forces consist of Pararescuemen (PJs), Survival-Evasion-Resistance-Escape (SERE) Specialists, & Combat Rescue Officers (CROs) dedicated to perform CSAR and PR across the full spectrum of military operations. Guardian Angel Recovery Teams consisting of two CROs, 9 PJs, and one SERE Specialist typically execute CSAR and PR missions. The presenters reviewed Air Force GA force structure, missions, manning, and training pipelines.

PJs are NREMT-Ps, not FP-Cs. Beyond that, they have combat medical skills, including RSI and blood product administration. Their training pipeline includes 45 days of pararescue indoctrination, during which about 85% of the students attrite. Additional training includes combat diver, airborne, free-fall parachuting, combat survival, underwater egress, EMT-B, EMT-P, and a pararescue apprenticeship. Medical qualifications include NREMT-P, TCCC (although not identified as a specific course), ACLS, PALS, PHTLS, BATLS, and SOF Advanced Tactical Practitioner for AFSOC PJs. AFSOC PJs also have to do Special Operations Combat Medical Skills Sustainment training every two years. The total number of basic training days is 352 and the initial training takes approximately 18 months.

The lead MAJCOM for PJs in the Air Force is the Air Combat Command and medical protocols are recommended by the PJ Medical Oversight Advisory Board (MOAB). PJ protocols are approved by the ACC Surgeon and are placed in the PJ Procedures Manual.

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Guardian Angel Rescue Teams in Afghanistan are able to administer blood products, have Propaq monitoring, have a standardized drug kit, and an extrication kit. They are the only evacuation asset other than the MERT to carry blood; Guardian Angel assets are located mostly in Bastion.

Recovery Teams have been increasingly tasked in our current theaters with critical care patient transport in MTF-to-MTF transfers, although this is not a traditional PJ mission.

Notes from the discussion:

- LTC Kotwal noted that the PJs need to document care rendered during TACEVAC and that this information needs to be correlated to outcomes;
- LTC Mabry stated that being a CCFPM would be beyond the usual PJ mission and that they have many other qualifications to maintain as Rescue Specialists.
- Dr. Holcomb noted that paramedics are typically more skilled at intubations than critical care nurses.
- MSG Montgomery asked if PJs should be considered to be medics or to be Rescue Specialists. CMSgt Negrón answered that they are more Rescue Specialists.



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

20 July 2011

Date

FKB:sdg