Committee on Tactical Combat Casualty Care
Meeting Minutes 9-10 February 2010

Grand Hyatt Hotel
San Antonio, TX

Attendance:

CoTCCC Members

Dr. Frank Anders	USAR
CMDCM Chris Angstead	MARFORPAC
Dr. Jim Bagian	VA
Dr. Brad Bennett	USUHS
COL Lorne Blackbourne	USAISR
COL Paul Cordts	WAMC
SFC Mike Davila	USASOC
COL Tom Deal	USSOCOM
Col Warren Dorlac	USAF
COL Brian Eastridge	JTTS
COL Warner Farr	SOCCENT
COL Steve Flaherty	WRAMC
COL Jonathan Jaffin	OTSG
CAPT Ken Kelly	Tripler AMC
Dr. Jim Kirkpatrick	DCDD
LTC (P) Russ Kotwal	75th Ranger Regiment
MAJ Bob Mabry	DCMT
MSG Harold Montgomery	75th Ranger Regiment
Dr. Mel Otten	Univ Cincinnati
Mr. Don Parsons	DCMT
Dr. Peter Rhee	Univ Arizona
HMCM Eric Sine	JSOMTC
Mr. Rick Strayer	JSOMTC
CAPT Jeff Timby	NMCP

CoTCCC and Defense Health Board Staff

Dr. Frank Butler	CoTCCC
Ms. Danielle Davis	CoTCCC
CDR Ed Feeks	DHB
Dr. Steve Giebner	CoTCCC
Mr. Dominique Greydanus	JTTS
Ms. Olivera Jovanovic	DHB

Guests

CAPT Roland Arellano	FMTB East
COL Kao Bin Chou	75th Ranger Regiment
CPT Andy Fisher	75th Ranger Regiment
CAPT Scott Flinn	SWMI
Dr. Keith Gates	UTHSCH
LTC Bob Gerhardt	USAISR

Mr. Bob Hinger	JFCOM
CDR Chris Hults	DMRTI
Mr. Kevin Joyner	MARCORSYSCOM
COL John Kragh	USAISR
HMCS Mike Langley	MARCORSYSCOM
Major Julio Lairet	USAISR
Mr. Lyle Lumsden	State Dept
SSG John Maitha	75th Ranger Regiment
Dr. Perry Malcolm	OSD
LTC Paul Mayer	DCMT
LCDR Anne McKeague	NAMRU San Antonio
Mr. John Miles	FMTB East
COL Andy Pennardt	USASOC
CPT Jason Penrod	USAR
SGT Bryan Rippee	75th Ranger Regiment
MAJ Brandi Ritter	DMMPO
MSG (Ret) Sam Rodriguez	Center for Army Lessons Learned
Major Erin Savage	Canadian Forces
SSG Emmett Sparktes	USAR
SFC Jeremy Williamson	75th Ranger Regiment
Mr. Scott Williams	USSOCOM

Tuesday 9 February
CoTCCC Public Session

Administrative Remarks **Dr. Frank Butler**

Dr. Butler 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 20 April in Tampa. The Chairman introduced new members of the CoTCCC:

Command Master Chief Chris Angstead (MARFORPAC)
Colonel Tom Deal (USSOCOM)
Colonel Warren Dorlac (USAF)

Defense Health Board Remarks **CDR Ed Feeks**

The transition of personnel throughout the DoD occasioned by the new administration is not yet complete. A new Assistant Secretary of Defense for Health Affairs has not yet been nominated. This has impacted the function of the DHB, primarily through delays in reappointing members of DHB subcommittees. The Trauma and Injury Subcommittee and the CoTCCC are among the few subgroups within the DHB to have been reappointed at this time.

TCCC Special Award **Dr. Frank Butler**

A CoTCCC Special Award was presented to SFC Jeremy Williamson. SFC Williamson is retiring from the 75th Ranger Regiment after a distinguished career in the Army. He is the medic shown in the TCCC logo and was awarded a plaque acknowledging this and thanking him for his distinguished career as a Ranger medic. The Rangers have long been leaders in the development and implementation of TCCC and SFC Williamson has been a major contributor to that effort.

Combat Medic Presentation **SGT Bryan Rippee**

SGT Rippee is from the 75th Ranger Regiment and presented a combat casualty scenario from OEF. He was part of a forty-man Special Operations assault force that was taking fire as they approached an objective that contained a number of known Taliban members. During the firefight, a member of the patrol detonated a pressure plate improvised explosive device (IED). The internal medical support consisted of one medical officer and two Special Operations combat medics. The unit suffered seven casualties after detonation of the IED. The individual who triggered the device had catastrophic injuries and died immediately. The other six casualties survived. Hostile fire continued throughout the casualty management described below.

One casualty had a gunshot wound to the right upper quadrant and was treated with an oral transmucosal fentanyl lozenge (OTFC), Invanz, and hypothermia prevention. A second had a traumatic right lower extremity amputation just below the knee and was treated with a CAT tourniquet, OTFC, and Dilaudid. A third casualty had a depressed skull fracture, shrapnel wounds to the chest, and near-drowning from being thrown into a nearby creek from the blast. He was treated with intubation, an occlusive chest dressing, several needle decompressions of the chest, and Versed. A fourth casualty had maxillofacial trauma and a fractured hand. He was managed by placing him in the "sit-up and lean forward" position to keep his airway open and by administering OTFC. The other two casualties had less severe injuries. They also received OTFC for their pain.

SGT Rippee's observations, comments, and lessons learned included: 1) Talon litters were very effective in transporting the litter patients; 2) the evacuation team ran out of litters and was forced to improvise - an assault ladder was found to be an effective substitute; 3) when used properly, the improved Hypothermia Prevention and Management Kit (HPMK) was not affected by the rotor blast of a CH-47 - a significant improvement from the last generation of HPMK; 4) a quick muster is a vital part of casualty management – in this case it enabled the missing assaulter to be located rapidly and rescued from the nearby creek; 5) the King LT is a practical and convenient airway adjunct on occasion, but did not work well for the near-drowning casualty; 6) the casualty with the traumatic amputation was found to be shivering at the Casualty Collection Point, despite having a warming blanket; 7) non-medical First Responders trained in TCCC proved to be invaluable to the successful management of this casualty situation; and 8) there are still problems with adherence in some of the commercially available chest seals.

For his outstanding and heroic actions in this casualty scenario, SGT Rippee was selected as the 2009 U.S. Army Special Operations Command Medic of the Year.

USAISR Fluid Resuscitation Conference **COL Lorne Blackbourne**

This conference was sponsored by the U.S. Army Institute of Surgical Research on January 8-9 in Dallas to look at two questions with respect to prehospital fluid resuscitation for combat casualties:

1) Are we currently doing as well as we could be in this area?
2) What new developments in fluid resuscitation are on the horizon?

The conference speakers addressed fluids in three broad categories: 1) FDA-approved resuscitation fluids; 2) oxygen-carrying fluids; and 3) procoagulants. Speakers reviewed the available data and latest research in each of these areas.

It was noted at the conference that there have been relatively few advances in prehospital fluid resuscitation in the last decade. There is currently a lack of reliable data coming in from the battlefield on the success of the current TCCC fluid resuscitation protocol that calls for a hypotensive resuscitation with Hextend approach. Major points from the conference were:

- there was little support from the conference attendees for the large-volume crystalloid prehospital resuscitation strategies that are used by many civilian Emergency Medical Systems;
- there was no finding from the group that TCCC should consider modifying its current fluid resuscitation protocol at this point in time;
- the number one research priority for the DoD in the area of prehospital fluid resuscitation should be reconstituted dried plasma because of its sustained increase in intravascular volume, clotting factors, and buffering effect. Dried plasma is not FDA-approved at present.

USAISR LSI Research Project **Major Julio Lairet**

This research project is designed to gather data on life-saving interventions (LSIs) performed by first responders in the prehospital combat setting. Major Lairet reviewed the purpose, staffing, scope, and methodology being used in this project. In short, investigators at Level II and III facilities note which casualties have had LSIs (such as surgical airways and needle chest decompressions) performed prehospital and gather information and outcomes related to the LSIs. The project is growing in terms of collection sites and information collected. Data from one hundred and thirty-one casualty treatment records has been collected in theater to date. The research team has set a goal of 1000 records by summer's end.

A Flight Medic's Experience in OEF **SSG Emmett Spraktes**

SSG Spraktes is a Flight Medic for the California Highway Patrol and also for 2nd Plt., C Co., 1/168th MEDEVAC (CA National Guard). He presented a casualty scenario in which he cared for three combat casualties.

A 16-man Army dismounted patrol was ambushed near Asadabad in eastern Afghanistan. The unit was taking small-arms and RPG fire and sustained 3 casualties. One had a gunshot wound to the abdomen and was hypotensive and tachycardic with altered mental status by the time SSG Spraktes arrived and was lowered down to the scene on a hoist under enemy fire. He initiated treatment and then helped to hoist the

critical casualty back into the dustoff helicopter while he remained on the ground with the other two casualties (one with a grazing gunshot wound to the right hip, the other with a possible right ankle fracture.) All 3 casualties survived.

SSG Spraktes' observations, comments and lessons learned included: 1) anticipate a significant shock when someone on the ground first touches the hoist hook on a helicopter; 2) flight medics must be able to perform hoist rescue procedures; 3) MEDEVAC pilots need to be highly skilled and able to fly under very demanding conditions; and 4) flight medics need to be trained to a higher level than they currently are – his recommendation was EMT-Paramedic.

TACEVAC Care Issues **CW2 Jason Penrod**

CW2 Penrod is a MEDEVAC pilot who was also assigned to 2nd Plt., C Co., 1/168th MEDEVAC in Afghanistan. He stated that what the U.S. military does currently in theater in terms of aeromedical evacuation skills and equipment (from point of wounding to level II or III) is below the U. S. civilian standard, which calls for a minimum of a flight paramedic level of training. In his experience, when the DoD is able to deploy in-flight medical personnel who are civilian flight medics, with equipment in the platform commensurate with their skills, the quality of care rendered during TACEVAC improves significantly. He stressed that highly skilled providers are needed from the point of wounding throughout the continuum of care.

CW2 Penrod made the following additional points: 1) documentation of TACEVAC care in Afghanistan has been poor, but is improving; 2) Reserve and National Guard flight medics often have very little interaction with the flight surgeons who are supposed to oversee their professional development; 3) DoD standards for flight medics should be raised to those in the civilian sector to ensure that casualties are well-cared for during MEDVAC and CASEVAC; 4) military flight surgeons who oversee flight medics often have minimal training and experience in trauma; 5) there is a formal process improvement effort in the civilian sector for in-flight care but none in the military for MEDEVAC and CASEVAC care; 6) there is a lack of standardized care protocols for in-flight care in the military as compared to the civilian sector; and 7) the Commission on Accreditation of Medical Transport Services (CAMTS) is the civilian EMS parallel to JCAHO and needs to have a counterpart in the DoD.

The following additional comments were made by meeting attendees:

- Col Dorlac: There are large disparities in flight medics' training and capabilities. This is one of the biggest problems that we have in theater at present.
- COL Farr: All SOF medics are trained to an EMT-P equivalent level; he doesn't like turning casualties over to someone trained only to an EMT-B level for transport after care has been initiated by SOF medics.
- Dr. Gates: Suggested assigning ICU nurses and respiratory therapists to dustoff crews in addition to EMT-Ps.
- Dr. Butler: Civilian paramedic courses may not reflect contemporary battlefield trauma care concepts, particularly in the area of prehospital hemorrhage control.
- MSG Montgomery: Career progression is a problem for 68W medics (including flight medics) – there is an expectation that senior individuals will assume an admin/leadership role.

Mr. Parsons: 68W medics may never see an actual trauma patient until they are in combat. Paramedics have to do ride-alongs in ambulances as part of initial and sustainment training.

Dr. Otten: Have to consider MEDEVAC and CASEVAC from the point of injury differently from casualties being transferred from one treatment facility to another. A physician and a nurse are needed for interfacility transfer. Transfer care is different from TCCC TACEVAC care.

Col Dorlac: It is difficult for Forward Surgical Teams to provide personnel to cover transfers; they are already often doing split operations in Afghanistan.

LTC Kotwal: A career experience that is heavily focused on operational nursing issues such as en-route care may be promotion-limiting.

TCCC Update **Dr. Frank Butler**

A MARADMIN message was recently published which directed implementation of the 2008-2009 changes to the TCCC Guidelines throughout the Marine Corps. It also directs TCCC training for individual Marine combatants.

As noted in the minutes from the November 2009 meeting, Joint Theater Trauma Service records had identified three recent casualties in which prehospital surgical airways were performed incorrectly. Additional feedback from one of the casualty's unit medical officer revealed that the surgical airway was performed at night, during an engagement, by a former 18-D medic who worked under the supervision of a wounded unit medic. The casualty had a shattered jaw from a gunshot wound to his face and was combative. Landmarks on the casualty's neck were difficult to identify due to soft tissue swelling. Though the procedure had complications, the cricothyroidotomy did provide a definitive airway and the casualty survived - the lesson being that an evaluation on the success or failure of a medical intervention performed on the battlefield must include a clear understanding of the tactical context.

The new TCCC curriculum presentation entitled "Direct from the Battlefield" (TCCC lessons learned) will be updated on an ongoing basis by the Chairman based on key points noted in the JTTS Trauma Telecons and other information flowing from theater. The current version of this presentation will be reviewed by CoTCCC members in tomorrow's internal session.

The DHB Core Board was briefed on the TCCC guideline changes pertaining to burn care on 13 November 2009. They wanted to see how the burn changes fit into the other TCCC guidelines and to have more time to consider the proposed change. This issue will be revisited at their next meeting on 1 March. After the briefing on the CoTCCC's recommended battlefield trauma care research priorities, the DHB requested an inclusive brief on the DoD medical research program.

The National Association of EMTs is proceeding with its TCCC training program. The first course will be taught at the Defense Medical Readiness Training Institute next month.

The Marine Corps is currently considering replacing the TK4 tourniquet in its Individual First Aid Kit (IFAK) with either the CAT or the SOFT-T tourniquet.

In the recent mass casualty shooting at Fort Hood, Officer Kim Munley's life was saved by a 68W Army medic. She was wounded in both thighs, and was showing signs

of shock despite the attempts of bystanders (including physicians) to control the hemorrhage with direct pressure and improvised tourniquets. The medic had a Combat Application Tourniquet (CAT) with him and applied it to Officer Munley's leg, successfully controlling the hemorrhage.

There have been reports from theater of CATs breaking when used. Investigation revealed that counterfeit CATs have been showing up on the battlefield. Ordering CATs through the DOD supply system by the assigned NSN (6515-01-521-7976) instead of by description should eliminate this problem.

Injured globes are still sometimes not being shielded by first responders. Tactical eyewear can be used for this purpose if there is no eye shield in the IFAK. Routine use of tactical eyewear also needs more emphasis.

There were reports at the January USAISR Fluid Resuscitation Conference that the TCCC hypotensive resuscitation with Hextend protocol is often not being used by medics in the field. Assuming that this is true, the question becomes "why not?" Do the medics not have Hextend in their kits? Is there just not enough time to start IVs in the field? Are they following recommendations from other trauma courses to continue to use a large-volume crystalloid approach to prehospital fluid resuscitation? As noted previously in the minutes, there was no recommendation to change the current TCCC fluid resuscitation guidelines from the conference. In a recent study by Proctor at the University of Miami, Hextend was used per TCCC guidelines for initial resuscitation of trauma patients in the Emergency Department with enough success that Ryder Trauma Center has now made it the standard of care for initial resuscitation. No coagulopathy was seen with Hextend use so long as the maximum infused volume was 1000cc, as called for by the TCCC Guidelines.

A recent article in the New England Journal of medicine reported an association between early treatment of pain with morphine in combat casualties and a reduced incidence of PTSD. In this study, the IV morphine was given in the Emergency Department. This finding reinforces the importance of early and effective battlefield analgesia and raises the question of why IV morphine or OTFC is not being used at the point of injury or during transport to the medical treatment facility.

A greater incidence of spinal injury is being seen in TCCC as the use of IEDs with greater explosive power becomes more prevalent. In the period from July - December 2009, there were 119 casualties with blunt force spinal fractures. Many of these individuals had multiple fractures of the spinal column. Fourteen of the casualties also had spinal cord injuries with neurological deficits. The information available does not reveal whether the spinal cord injuries occurred at the time of wounding or during subsequent treatment and transport.

TCCC Equipment Overview **Major Brandi Ritter**

Major Ritter presented an analysis by the Defense Medical Materiel Program Office (DMMPO) of the trauma care equipment contained in service IFAKs and combat medical sets. There are significant differences between the various equipment sets and many do not have key TCCC-recommended items. The most complete equipment sets are those issued to Special Operations medics and combatants, although none of the

kits had all the recommended items. These lists will be reformatted to focus more sharply on critical equipment items and re-presented at the next meeting.

TCCC Equipment Demonstration **MSG Harold Montgomery**

MSG Montgomery and a team of Ranger medics demonstrated the Ranger TCCC equipment sets for the group.

TCCC in Naval Surface Forces **CAPT Scott Flinn**

CAPT Flinn reviewed several casualty scenarios that have occurred in the past on surface vessels. On the USS Stark (missile strike in 1987), there were 37 fatalities and 35 wounded. On the Samuel B. Roberts (mine explosion in 1988), there were 29 wounded, 10 seriously. On the Cole (suicide bomb in the port of Aden in 2000), there were 17 deaths and 37 wounded. In major casualty events aboard ships, there will be a different epidemiology of wounding than is seen in ground combat. Penetrating trauma, blast, blunt force trauma, crush injury, fire, smoke inhalation, and drowning may all play a role as causes of injury and death. Despite mass casualties, the first priority is to save the ship. There may also be men and women overboard who require rescue.

CAPT Flinn reviewed current TCCC training and equipment policies for surface forces. There is a 3-day TCCC training course that is taught to Surface Warfare and USMC Independent Duty Corpsmen. Training in burns, smoke inhalation, and blast injury is added to the standard TCCC curriculum. There is also now shipboard training for all hands in basic TCCC lifesaving skills. The 2008 Naval Surface Forces Authorized Medical Allowance List (AMAL) review added necessary TCCC equipment to ships' AMALs. This equipment is preplaced in various locations throughout the ship, since fire, flooding, and structural damage may render some areas on the ship inaccessible in a casualty scenario.

Management of Suspected Spinal Injury in TCCC **Dr. Keith Gates**

The primary concern in the management of casualties with possible spinal injury is prevention of subsequent injury to the spinal cord itself with the secondary neurological deficits that may ensue.

Pathologic movement of the injured bony skeleton of the spinal column and/or the associated soft tissue structures produces the potential for catastrophic spinal cord injury. (Hadley 2002) Spinal immobilization (SI) can reduce movement of the unstable spine and is routinely undertaken in trauma victims suspected of having unstable spinal injuries to reduce the likelihood of their sustaining neurological deficits. Spinal injury occurs by the two major mechanisms of blunt and penetrating trauma. The American College of Surgeons Advanced Trauma Life Support curriculum does not differentiate between penetrating and blunt trauma in its treatment protocol.

Spinal immobilization is time consuming, however, and requires multiple individuals to perform properly. While widely utilized and taught, the effect of spinal immobilization on mortality and neurologic injury in trauma patients is uncertain. A recent Cochrane review of 4453 papers potentially related to this topic found no

randomized, controlled trials to validate the use of spinal immobilization or to document its success in improving outcomes. (Kwan 2001) While not supported by Class I or Class II evidence, SI is based on sound anatomical and mechanical considerations and is supported by many years of clinical experience in trauma management. The basic principles of SI have not changed substantially since their inception and require a c-collar, a long spine board, straps or tape, and a head restraint device. The first step is to provide manual in-line stabilization immediately. If the neck is not in the neutral position, an attempt should be made to achieve alignment. If the patient is awake and co-operative, he or she should actively move their neck into line. If unconscious or unable to co-operate, this is done passively. If there is any pain, neurological deterioration, or resistance to movement, the procedure should be abandoned and the neck splinted in the current position.

Tactical trauma care has traditionally focused on penetrating trauma as the prevalent mechanism of injury based on historical wounding data from armed conflicts. Because penetrating trauma has a very low incidence of spinal cord injury resulting from casualty movement, trauma management guidelines developed for the tactical environment have had a primary emphasis on moving the casualty to cover rapidly to avoid further injury from hostile fire. (Butler 1996) Studies have noted that most victims of penetrating trauma to the neck suffer cord injury from the initial mechanism and rarely from subsequent manipulation. (Arishita 1989) For penetrating trauma, prehospital SI has not been found to be beneficial and may actually complicate care. (Brown 2009) A recent paper by Haut found that for penetrating trauma patients, prehospital SI was associated with twice the mortality seen in non-immobilized patients. (Haut 2010) The tactical provider must always consider the tactical context and the safety of both provider and casualty. SI as it is typically done in the civilian prehospital sector is time-consuming; it can delay movement of the casualty to a location of relative safety and cause both provider and casualty to be exposed to hostile fire for a longer period of time to accomplish an intervention whose benefit has not been documented.

For these reasons, spinal precautions have not been not been heavily emphasized previously in the Tactical Combat Casualty Care Guidelines, although the need for spinal precautions in blunt trauma casualties is part of the TCCC training curriculum. Due to the increasing number of IED attacks being seen in Iraq and Afghanistan, however, blunt trauma is becoming more common as a mechanism of combat injury. Significant numbers of vertebral fractures, especially of the thoracic spine, are being reported. (JTTS – unpublished data) The recent development and deployment of mine-resistant vehicles has resulted in a corresponding increase in the charge size and explosive force of the enemy's IEDs in an attempt to defeat the protective features of the new vehicles. Of all admitted casualties from OIF (n = 2404) and OEF (n = 2136) for July 2008 through June 2009, fully one third (39% in OIF and 35% in OEF) entailed mechanisms of injury that included a significant blunt trauma component. (JTTS – unpublished data) The primary blast component of roadside and under-carriage IEDs is not the most significant factor in injury causation. (Champion 2009) It is rather the very high G-forces and resultant high-magnitude compressive and flexion forces on the spine that produce the spinal injuries.

These new injury pattern developments require a reassessment of spinal protection guidelines on the battlefield. It has been argued in the civilian literature that

considerable force is required to fracture the spine at the initial impact and that any subsequent movements of the spine are unlikely to cause further damage. (Kwan 2001, Hauswald 1998) Considering the unique mechanism and pattern of injuries being seen on the current battlefield, however, it is possible that the potential for iatrogenic cord damage could be reduced with the implementation of some basic, tactically-appropriate spinal precautions. These techniques must be developed taking into account such factors as incoming hostile fire, limited space, weight considerations, evacuation times, and rescuer manpower resources.

As noted previously in the minutes, in the period from July - December 2009, there were 119 casualties whose injuries included blunt force spinal fractures, many of whom had fractures at multiple levels of the spinal column. Fourteen of these casualties also had spinal cord injuries. Information on whether or not any of these spinal cord injuries were sustained during point-of-wounding care or subsequent transport of the casualty to a Level II or Level III treatment facility is not currently available.

Since the last CoTCCC meeting, which included a discussion of this issue, there has been a 3-month effort by an ad-hoc working group led by Drs. Gates, Holcomb, Jenkins, and Otten on this topic. The group developed a modified spinal protection technique, called Spinal Motion Restriction (SMR) that could be used in tactical settings in lieu of civilian-based protocols and techniques. SMR would make use of the casualty's own Individual Body Armor (IBA) to help protect the injured thoracic spine. The following changes to the TCCC Guidelines were proposed:

Care Under Fire: (new text in red)

3. Direct casualty to move to cover and apply self-aid if able. If casualty requires assistance, move him to cover. If mechanism of injury included blunt trauma (such as riding in a vehicle which was struck by an Improvised Explosive Device), minimize spinal movement while extricating him from the vehicle and moving him to cover. The casualty should be moved along his long spinal axis if at all possible while attempting to stabilize the head and neck.

Tactical Field Care and TACEVAC Care

Insert new #2: Use Spinal Motion Restriction techniques as defined below for casualties whose mechanism of injury included blunt trauma IF: a) they are unconscious; b) they are conscious and have midline cervical spine tenderness or midline back pain; or 3) they are conscious but demonstrate neurologic injury such as inability to move their arms and/or legs, sensory deficits, or paresthesias. For these casualties, leave the Individual Body Armor in place and secure to protect the thoracic spine. The cervical spine may be protected by using a cervical stabilization device in conjunction with the casualty's Individual Body Armor or by an additional first responder holding the casualty's head to maintain alignment with the back. Long or short spine boards should be used in addition to these measures when available.

References:

1. Andriacchi T, Schultz A, Belytschko T, Galante J. A model for studies of mechanical interactions between the human spine and rib cage. J Biomech 1974;7:497-507
2. Arishita GI, Vayer JS, Bellamy RF. Cervical spine immobilization of penetrating neck wounds in a hostile environment. J Trauma 1989; 29: 332-337
3. Ben-Galim P, Dreiangel N, Mattox K, et al: Extrication collars can result in abnormal separation between vertebrae in the presence of a dissociative injury. J Trauma 2010; In press
4. Bohlman HH. Treatment of fractures and dislocations of the thoracic and lumbar spine. J Bone Joint Surg [Am] 1985;67-A:165-169
5. Brown JB, Bankey PE, Sangosanya AT, Cheng JD, Stassen NA, Gestring ML. Prehospital spinal immobilization does not appear to be beneficial and may complicate care following gunshot injury to the torso. J Trauma 2009;67:774-8
6. Butler FK, Hagmann J, and Butler EG. Tactical Combat Casualty Care in Special Operations. Milit Med 1996;161; Supplement
7. Champion H, Holcomb J, Young L: Injuries from explosions: physics, biophysics, pathology, and required research focus. J Trauma 2009;66:1468-1477
8. Domeier RM, Swor RA, Evans RW, Hancock JB, Fales W, Krohmer J, Frederiksen SM, Rivera-Rivera EJ, Schork MA. Multicenter prospective validation of prehospital clinical spinal clearance criteria. J Trauma 2002;53:744-50.
9. Domeier RM. National Association of EMS Physicians: indications for prehospital spinal immobilization. Prehosp Emerg Care 1999;3:251–253.
10. Hadley MN. Cervical Spine Immobilization before admission to the hospital. Neurosurgery 2002;50:S7-S17
11. Hauswald M, Ong G, Tandberg D, Omar Z: Out-of hospital spinal immobilization – its effect on neurologic injury. Acad Emerg Med 1998;5:215-219
12. Haut ER, Kalish BT, Efron DT, et al: Spinal immobilization in penetrating trauma: more harm than good? J Trauma 2010;68:115-120
13. Hoffman JR, Mower WR, Wolfson AB, Todd KH, Zucker MI: Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma: National Emergency X-Ray Utilization Study Group. NEJM 2000;343:94-99
14. Kwan I, Bunn F, Roberts I: Spinal Immobilization for Trauma Patients. Cochrane Database System Review 2001
15. Myers LA, Russi CS, Hankins DG, Berns KS, Zietlow SP.Efficacy and compliance of a prehospital spinal immobilization guideline. Int J Emerg Med 2009;2:13-7. Epub 2009 Feb 14.
16. Vaillancourt C, Steill IG, Beaudoin T: The Out-of-Hospital validation of the Canadian C-spine rule by paramedics. Ann Emerg Med 2009;54:663-671

Spinal Trauma in TCCC **LTC Bob Gerhardt**

LTC Gerhardt presented a pilot study done at USAISR that looked at the effects of the presence of IBA and kevlar helmets on spinal alignment in the supine position. Extension of the cervical spine is seen when the casualty is in the supine position if the IBA is in place, but the helmet is removed. He suggested that it may be best to leave

the helmet on if IBA is left in place to help maintain spinal alignment. Additional studies of the mechanics involved are planned.

Discussion of Proposed Change on Spinal Precautions **Group**

The following additional points were made during the ensuing discussion on changing the approach to spinal precautions in TCCC:

- There are often numerous pouches and other items attached onto the back of the IBA and this battlefield configuration would be likely to produce more even neck extension for a casualty in the supine position than was seen the pilot study described by LTC Gerhardt above.
- IBA is typically removed during the initial examination of the casualty, and would have to be put back on in order to be used to provide SMR. This would require additional manipulation of the casualty.
- There is insufficient data at present to indicate that SMR is protective. It might even be harmful in some circumstances.
- To date, there are no reports at hand of spinal cord injury being sustained between the point of wounding and arrival at the first medical treatment facility.
- The increased incidence of spinal injury in theater may be an indicator of success in preventing death of the occupants from blast and penetrating trauma when Mine Resistant Ambush Protected (MRAP) vehicles are attacked with IEDs on the battlefield.

Wednesday 10 February 2010
CoTCCC Internal Administrative Session

Administrative Remarks **Dr. Frank Butler**

The next meeting will be held 20-21 April 2010 at the Tampa Embassy Suites (Convention Center) in Tampa, FL.

The August meeting date was undecided at the time of the meeting but has since been determined to be 10-11 August 2010 at the Loew's Hotel in Denver.

Members present were asked to disclose any financial interests in the day's agenda items. None were declared.

Travel arrangements have continued to be a problem, with several individuals (both planned speakers and members) unable to make the meeting due to travel issues. The CoTCCC staff is working with the DHB staff to improve the travel process.

Proxies for the vote to follow were reviewed. Several members were unable to travel to San Antonio at the last moment due to severe snow storms across the country, obligations in Haiti, and the travel funding issues noted above.

Annual DHB Ethics Training **Mr. Paul Bley**

Mr. Bley is general counsel for the DHB. He conducted this training via conference call. Pertinent ethics regulations and directives were reviewed. Standards for ethical conduct by Special Government Employees and related information can also be found at the following websites: www.usoge.gov, www.osc.gov.hatchact.htm, and www.osc.gov/wbdisc.htm .

Special Government Employees on the CoTCCC can contact Mr. Bley with specific questions at 703-681-6012 or Paul.Bley@tma.osd.mil.

Preliminary Data - Ranger Prehospital Trauma Registry **LTC Russ Kotwal**

LTC (P) Russ Kotwal from the 75th Ranger Regiment presented data and observations that have been developed from his ongoing analysis of the Ranger Prehospital Trauma Registry. Among his comments, findings, and observations were:

- An analysis of entrance and exit wound sites in KIAs and DOWs in the current conflicts was presented. A review of the mechanisms of injury (IEDs, GSWs, etc) for the Ranger casualties was also presented.
- LTC Kotwal and MSG Montgomery believe that the current helmets are good for ballistic protection, but poor for blast and blunt trauma protection.
- Their registry now contains 130 instances of OTFC use in Ranger casualties. Their experience using OTFC as outlined in the TCCC guidelines is good. As a narcotic, OTFC is easier to control programmatically than morphine in that it is harder to disguise inappropriate use.
- The fatality rate was high among casualties who needed airway interventions.
- The Ranger PHTR is a command-directed line initiative, not a medical function. It does not feed into any other database, though such information sharing has proposed and is currently being discussed.

Discussion and Vote of Proposed Change on Spinal Precautions **Group**

The CoTCCC returned to the discussion of the proposed changes to the TCCC Guidelines pertaining to Spinal Motion Restriction (SMR) that were begun yesterday. The major points made during the previous discussion were reviewed. After further discussion, a vote on the proposed change was called.

The votes were 38 against and 3 in favor of the proposed change. (One member was not present.) The proposed change was not approved.

TCCC Lessons Learned Presentation **Dr. Frank Butler**

Dr. Butler reviewed the presentation that is now the final lecture in the TCCC course. It presents trauma care lessons learned from the battlefield along with illustrative cases. Topics include TCCC techniques, procedures, equipment and medications. The slides were presented to the group and a number of modifications were made based on CoTCCC input.

This lecture will be maintained in the TCCC curriculum sections on the Military Health System and Prehospital Trauma Life Support (PHTLS) websites.

New Business **Group**

HMCM Sine recommended that the CoTCCC do an evaluation of commercially available chest seals. There are two possible approaches. One is to outline the desired characteristics for a chest seal and see which of the available chest seals best meets the criteria established. The second option is to conduct comparative testing at USAISR or another research facility to obtain objective data that might help the CoTCCC to make a definitive recommendation about the best chest seal for use in TCCC.

Dr. Giebner provided an update on the status of the CoTCCC input for the Military Version of the Seventh Edition of the PHTLS Manual. All 12 TCCC chapters have been submitted and the editorial process is ongoing. The target publication date is September 2010.

13 April 2010

Frank K. Butler, M.D. Date
CAPT, MC, USN (Ret)
Chairman
Committee on Tactical Combat Casualty Care
Defense Health Board