

Committee on Tactical Combat Casualty Care Meeting Minutes 3-4 November 2009

Loew's Hotel
Denver, CO

Attendance:

CoTCCC Members

Dr. Brad Bennett	USUHS	_____
Dr. Jim Bagian	VA	_____
Dr. Dave Callaway	OMI	_____
Dr. Howard Champion	USUHS	_____
COL Jim Czarnik	JSOC	_____
Mr. William Donovan	75 th Ranger Regiment	_____
COL Warner Farr	USSOCOM	_____
COL Stephen Flaherty	WRAMC	_____
Dr. Douglas Freer	RPSC	_____
Dr. John Gandy	USAF (Ret)	_____
Dr. John Holcomb	UT HSC	_____
COL Jonathan Jaffin	OTSG	_____
Dr. Don Jenkins	Mayo Clinic	_____
SOCM Shawn Johnson	NSWG2	_____
CAPT Ken Kelly	Tripler AMC	_____
Dr. Jim Kirkpatrick	DCDD	_____
LTC Russ Kotwal	75 th Ranger Regiment	_____
MSG Harold Montgomery	75 th Ranger Regiment	_____
COL Kevin O'Connor	WHMO	_____
MSG Joseph Paisley	USASOC	_____
Mr. Don Parsons	DCMT	_____
Mr. Gary Pesquera	MARFORCOM	_____
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	_____
Mr. Dominique Greydanus	JTTS	_____

Guests:

COL Greg Beilman	JTTS	_____
CDR Linda Beltra	BUMED	_____
SGM F. Bowling	USASOC	_____
SSG Jake Brown	A11/20 SFG	_____
LCDR Henry Casey	NAMI	_____

Mr. Bill Cauley	DAGEHH	_____
COL George Costanzo	JTTS	_____
Dr. John Croushorn	Compression Works	_____
Ms. Donna Dymon	BUMED	_____
Mr. William Fabbri	FBI	_____
MAJ Colleen Forestier	CANSOFCOM	_____
James Fulton	DMSB	_____
MAJ Rob Hennessy	BAMC	_____
LtCol Boots Hodge	DMSB	_____
Mr. Kevin Joyner	MARCORSYSCOM	_____
LTC Booker King	ISR	_____
HMCS Mike Langley	MARCORSYSCOM	_____
Mr. Lyle Lumsden	State Dept	_____
CAPT Mark Lyles	BUMED	_____
SSG John Maitha	75 th Ranger Regiment	_____
Dr. Perry Malcom	OSD	_____
Dr. Richard Meehan	NASA	_____
Mr. John Miles	FMTB	_____
COL Karen O'Brien	TRADOC	_____
COL Andy Pennardt	USASOC	_____
CAPT Joseph Rappold	NMC Camp Pendleton	_____
COL Gregory Risk	USASOC	_____
MAJ Brandi Ritter	DMSB	_____
Dr. Richard Schwartz	MCG	_____
COL Laura Torres-Reyes	DMSB	_____
HM2 Rashad Waller	MARFORCOM	_____
COL Ian Wedmore	AMC Madigan	_____

Tuesday 3 November - CoTCCC Open Session

Administrative Remarks

Dr. Frank Butler

Dr. Butler reviewed the agenda for the meeting and asked that individuals in the audience disclose any financial interests in the agenda items to be discussed. Upcoming CoTCCC meetings are planned for 9 February in San Antonio and 20 April in Tampa.

2009 TCCC Award

Dr. Frank Butler

Retired COL John Holcomb was presented with the 2009 TCCC Award. This award is based on a vote of the CoTCCC membership and goes each year to the individual who is felt by the group to have made the most noteworthy contributions to TCCC. Dr. Holcomb was a charter member of the CoTCCC, the Commander of the U.S. Army Institute of Surgical Research, and the Army Surgeon General's Trauma Consultant prior to his retirement. He has served extensively in combat environments, providing surgical support to both Special Operations and conventional forces. His

pioneering work in hemostatic agents and Damage Control Resuscitation has been a major factor in achieving the remarkable improvements in casualty survival noted in Iraq and Afghanistan.

TCCC Special Award

Dr. Frank Butler

The CoTCCC marked the recent retirement of CAPT Doug Freer with a TCCC Special Award. CAPT Freer was the Commanding Officer of the Naval Operational Medicine Institute and was instrumental in that command providing the first home for the CoTCCC. He also spearheaded the effort to have the CoTCCC receive long-term support from Navy Medicine beginning in 2003. He merits the title inscribed on the award: “ The CoTCCC’s First Commanding Officer.” He has remained an integral part of the committee’s activities throughout its 8-year history.

Combat Medic Presentation

SSG Jake Brown

This meeting’s Combat Medic presentation was given by SSG Jake Brown. He deployed to Afghanistan with the 20th Special Forces Group in 2008. His Special Forces unit was operating near a suspected Taliban stronghold (altitude 6500 ft) when one of the team members sustained a gunshot wound to the buttocks with an exit wound at the hip. The casualty was quickly moved to cover and the external hemorrhage was managed with Celox and direct pressure. Bleeding was slowed but not completely stopped. The casualty was alert when evaluated, but his blood pressure was 92 systolic and his heart rate was 130. SSG Brown elected to give him 500 ccs of Hespan and he was allowed to take PO fluids. He was also treated with 10 mg of morphine IV and 25 mg of promethazine. Hypothermia prevention was instituted. The casualty was transported to an aid station by vehicle under intense small arms fire. Treatment was noted to be difficult in the loud and very cramped space within the vehicle. At the aid station, the casualty was given a gram of Rocephin, 10 more mg of morphine, and supplemental oxygen via non-rebreather mask. The TCCC casualty card was filled out. His vital signs prior to evacuation were HR 90, BP 130/88, RR 20, and O2 sat 99%. The elapsed time from injury to evacuation was 90 minutes.

SSG Brown’s comments, observations, and lessons learned included: 1) he used Hespan instead of Hextend because that was what was available; 2) it was difficult to communicate while the casualty was being loaded onto the helicopter - “Can’t talk under rotor blades;” 3) there should be more training for SF units with hemostatic agents; 4) the unit was told not to use QuikClot; they had HemCon, but he had not trained on it prior to deployment; 5) TCCC training for non-medical operators is critical; 6) there was a significant increase in blood pressure with Hespan and SSG Brown questioned whether Lactated Ringer’s would have been a better choice for this casualty.

Far Forward Combat Casualty Care in OEF

CDR Jim Hancock

CDR Jim Hancock from Naval Hospital Camp Lejeune presented his experiences from his time deployed to Afghanistan with Marine Task Force 2/7. He had 11 hours notice for an 11-month deployment. His unit provided medical support for 10 Army Forward Operating Bases (FOBs). His comment regarding the Taliban forces was that “These guys like to fight and they’re good at it.” The typical evacuation time for casualties in his area of operations was 3 to 4 hours. He emphasized the need for an advanced trauma care capability to be located in close proximity to forward units engaging the enemy. His unit’s approach to meeting this need was to fabricate a Mobile Trauma Bay using a storage unit mounted on a 7-ton truck. His trauma team (half of a Shock Trauma Platoon) equipped it with advanced trauma care equipment and positioned it at locations where they could receive casualties very close to the point of wounding. This concept was successful in Afghanistan and has been briefed to both the medical and the line leadership of the Marine Corps. The Marines have now built and fielded 9 of these Mobile Trauma Bays in a very short period of time. He also stressed the need for tactical awareness to be incorporated into battlefield trauma care, noting that one of his corpsmen was wounded trying to care for a casualty before hostile fire had been adequately suppressed.

CDR Hancock’s comments, observations, and lessons learned included: 1) make sure that your stretchers fit into your evacuation helicopters; 2) IEDs are currently the primary weapon used by the Taliban and these attacks produce an average of 3 patients; 3) the “Golden Hour” is a myth – many patients cannot wait that long for life-saving interventions; 4) medical providers – including physicians - supporting Marine Corps units in far-forward settings must be prepared to defend themselves and their casualties; 5) the Taliban likes to target aid stations; 6) he successfully used a video laryngoscope to obtain a very difficult airway in a casualty shot in the neck; 7) evacuation of casualties in Afghanistan is more difficult and prolonged than in Iraq; 8) for this reason, far-forward advanced medical care as exemplified by the Mobile Trauma Bay concept is critical to obtaining the best outcomes for our casualties; and 9) Navy corpsmen deployed in support of Marine Corps combat operations need to have an increased emphasis on trauma training.

TCCC Update

Dr. Frank Butler

A Defense Health Board (DHB) memo on the impact of TCCC in reducing preventable deaths in combat casualties was signed out on 6 August 2009. It notes that studies have reported that approximately 20% of fatalities in Iraq and Afghanistan were potentially preventable. (Holcomb 2007, Kelly 2008) Two Special Operations units that have trained all of their combatants in TCCC since the start of the current conflicts have recently reported that their units have had no preventable deaths despite being heavily

engaged in combat operations since 2001. Recommendations in the 6 August DHB memo include:

- TCCC training for all deploying combatants
- TCCC training for all deploying medical department personnel
- TCCC overview training for combat leaders
- Document TCCC care on the TCCC Casualty Card
- Incorporate first responder care information into trauma registries for process improvement
- Establish a Combat Evaluation Program at the U.S. Army Institute of Surgical Research in order to evaluate the effectiveness of currently recommended life-saving interventions in TCCC.

This DHB memo was subsequently highlighted as the feature article in USA Today on 14 September 2009.

There have been numerous requests for TCCC training from allied nations and tactical law enforcement units that the military has been unable to support. The Prehospital Trauma Life Support (PHTLS) organization will soon add TCCC to the list of courses that they are able to offer. Dr. Steve Giebner has been coordinating with MAJ Bob Mabry and Mr. Don Parsons at the Army Department of Combat Medic Training in San Antonio to arrange a TCCC instructor course for the PHTLS National Faculty. The course will be taught on 1-2 December 2009. PHTLS-sponsored TCCC courses will provide a certification card bearing the logos of the American College of Surgeons Committee on Trauma, the National Association of EMTs, and PHTLS as well as the TCCC logo. Instructors and provider certification records will be maintained in registries at the PHTLS office.

Long evacuation delays may result in a high incidence of wound infections for combat casualties (Mabry 2000). Previous reports have noted that this incidence is much reduced with antibiotics given shortly after the time of wounding (Tarpey 2005, Westmoreland 2004) Another study has just been published that noted a 40% infection rate in casualties with combat wounds not treated with systemic antibiotics in comparison to a 7% infection rate in those casualties who did receive antibiotics. (Gerhardt 2009)

COL John Kragh has recently published another tourniquet paper in the Journal of Emergency Medicine. His case series now includes 499 casualties from Iraq with tourniquets on 651 limbs. Overall survival was 87%, but the survival rate was only 4% if the tourniquets were applied after shock was present. There was a 1.5% incidence of peripheral neuropathies, and no limbs were lost as a result of tourniquet ischemia. COL Kragh noted that 10 casualties died from extremity hemorrhage without prehospital tourniquets being used.

The TCCC Casualty Card has now been designated as Department of the Army Form 7656, thanks largely to the efforts of LTC Larry France from OTSG and his

working group. The first large order of these forms (approximately 70,000) will be delivered soon and supplied to deploying Army units.

The American College of Surgeons conducted a panel session on 14 October at their Clinical Congress in Chicago to discuss the Management of War Wounded. The session was co-chaired by Col Jay Johannigman and COL Lorne Blackbourne. The session reviewed the entire continuum of care in the Joint Theater Trauma System (JTTS). Dr. A. Brent Eastman gave the Scudder Oration on trauma at the Congress and congratulated the military on the remarkable success of the JTTS in optimizing trauma care for service members injured in Iraq and Afghanistan. A presentation on TCCC was provided to review the care currently being provided to casualties in the prehospital phase of care.

An e-mail from COL Warren Dorlac, Deployed Director of the JTTS, on 24 September 2009 reported that there had recently been complications noted on 3 prehospital surgical airways done in Iraq. One went through the center of the thyroid cartilage and injured one of the vocal cords. All 3 casualties survived their wounds. The lack of additional detail on these occurrences emphasizes the need to have better documentation of prehospital trauma care so that the indications for these procedures, the tactical circumstances in which they were done, the other airway interventions that were attempted, the training in surgical airways provided to the individuals who performed the airways, etc can be reviewed and process improvements performed as indicated.

Recent JTTS weekly trauma telecons have highlighted several opportunities to improve in the prehospital phase of care: 1) the increasing incidence of IED attacks with multiple casualties suffering spinal fractures requires a re-look at the training provided to First Responders about the tactical movement of casualties with blunt trauma and suspected spinal injury; 2) second tourniquets should be applied without delay if the first tourniquet does not rapidly succeed in controlling hemorrhage and eliminating the distal pulse; 3) tourniquets need to be applied before the onset of shock; and 4) several recent casualty events have highlighted the need to apply rigid eye shields immediately to protect the globe in cases of known or suspected penetrating eye trauma. In order to emphasize these and future lessons learned that are emerging from the battlefield, a new presentation on this topic will be added to the TCCC curriculum.

An e-mail forwarded from the Defense Medical Standardization Board discussed the following incident:

- "During live tissue training yesterday, we noted that 3 patients failed to perfuse large wedges of lung tissue as evidenced by lack of green coloration after intravenous administration of green dye while the heart was still beating.
- I am concerned this may be evidence of pulmonary embolization after an earlier procedure where Celox (a granular hemostatic) is used to control

an exsanguinating femoral hemorrhage. The majority of the lung turned dark green along with the gut, the heart and all other organs, but there was a well-defined wedge of lung tissue that remained completely pink. The animals were caprines. The wedges were sized from 2x2x5cm to 3x4x8cm. We have performed this lab dozens of times, but do not recall seeing this in the lung. We may have simply not noted it before.

- The wound where we use the Celox involves exposure and incision of the medial saphenous artery and vein, proximal caudal artery and vein, and medial circumflex femoral artery and vein. The 3 attending veterinarians could not offer an alternative explanation for this. There was no atelectasis or evidence of pulmonary edema in these patients, but neither of those conditions would have prevented the circulatory system from carrying green dye to the capillaries of the alveoli in such a focal distribution.
- Since Woundstat was prohibited after animal studies and anecdotal/case study evidence presented with pulmonary emboli, this suggests a similar effect.
- This email is just to point out an observation which may impact outcomes on casualties."

This episode adds another bit of information to the discussion regarding whether there is a significant risk of embolic and thrombotic complications from the use of granular hemostatic agents.

TRADOC TCCC Initiatives

COL Karen O'Brien

COL Karen O'Brien, the TRADOC Surgeon, provided an update on the recent initiatives undertaken by the Army Training and Doctrine Command in their combat trauma training programs. The focus is on avoiding preventable deaths. There have been two significant TCCC-related accomplishments in recent months: 1) the removal of IV training from the Combat Lifesaver (CLS) curriculum for the reasons outlined in the recent paper on this topic by MAJ Bob Mabry; and 2) an overview of TCCC will be added to the training course for Army combat leaders, both officer and enlisted. Removing IV skills from the CLS curriculum is anticipated to be controversial with the line, but with the proper communication to combat leaders, they will understand that the emphasis of TCCC needs to be on the skills that have the highest likelihood of saving lives combat – tourniquets, hemostatic agents, needle decompression, tactical casualty movement, improved evacuation procedures, and scenario-based training. Training in hypothermia prevention has also received additional emphasis in CLS training.

COL O'Brien also noted that TRADOC will be working to bring about a cultural change in managing individuals involved in blast events. All individuals who are within 50 meters of a blast, who are mounted in a vehicle struck by an IED blast, or who are in

a structure in which a blast occurs must be evaluated by a medic to include a MACE evaluation.

Operational Medicine Research: Thinking Out of the Box **CAPT Mark Lyles**

“When one truly understands the question, the answer is easy.”

Albert Einstein

CAPT Lyles, the Deputy Chief for Medical R+D at BUMED, reviewed a number of research efforts designed to support the warfighter, including:

- 1) a forward deployable dental dressing designed to provide temporary repair for dental emergencies;
- 2) metallic salts of fluoride for antimicrobial therapy;
- 3) new testing kits for rapid typing and screening of fresh whole blood;
- 4) topical treatments for cutaneous leishmaniasis;
- 5) a 3-D cranial imaging pre-injury data base;
- 6) nanoparticle encapsulated antibiotics for infection prevention;
- 7) metal-ceramic hybrid technologies for prosthetics;
- 8) artificial bone development;
- 9) adipose harvesting and storage for wound repair;
- 10) infrared visors for medical diagnosis;
- 11) new technologies for diagnosing internal bleeding and TBI;
- 12) enhanced night-vision devices; and
- 13) the Dragoon ultra-lite for use in transporting casualties from the battlefield.

OTFC: QA of the Battlefield Experience **COL Ian Wedmore**

COL Ian Wedmore is the Army Surgeon General’s Consultant on Emergency Medicine. He has been collecting case reports of the off-label use of oral transmucosal fentanyl citrate (OTFC) to manage pain on the battlefield for the purposes of a Quality Assurance review of this practice. 200 uses of OTFC were identified through a request for information. Uses largely came from Special Operations forces. The pain relief reported by the medics was a decrease from 8 pre-use to 3 post-use. The most common dose used was 800ug (116 uses) and 1600ug (47 uses). Side effects reported were nausea (22), pruritus (3), drowsiness (2), and oxygen desaturation (2). One of the patients who desaturated received 3200ug of fentanyl and 20 mg of morphine IV. The other had significant lung injury from an IED blast. Overall, 93% of casualties got effective pain relief from OTFC. It was noted during the discussion that most of the conventional forces do not field this medication. This information is provided as part of an ongoing quality assurance review, is protected as such, and should not be released outside of that use.

Abdominal Aortic Tourniquet

Dr. Richard Schwartz

Dr. Richard Schwartz, the Chair of Emergency Medicine at the Medical College of Georgia, presented his Abdominal Aortic Tourniquet. He disclosed that he has a financial interest in the device. The device is an inflatable wedge-shaped bladder applied over the abdomen that occludes the aorta just above the bifurcation. It has been demonstrated to be effective at stopping bleeding in a 60-minute swine model of bleeding that entails a combined femoral artery and vein injury. Blood flow returned after deflation of the device. The next step in testing will be a hypotensive porcine model with a 6 mm femoral arteriotomy. The device is a prototype and has not yet received 510(K) approval from the FDA. The device, when approved, may offer an alternate way to manage external hemorrhage in groin injuries.

Burn Care in TCCC

LTC Booker King

LTC Booker King from the USAISR Burn Center presented an overview of the management of burns. He noted that 5-20% of combat casualties at present have injuries that include burns. He also noted that burn care has advanced to a level such that the current mortality for casualties with 80% Total Body Surface Area (TBSA) burns is approximately 50% in active duty service members. LTC King emphasized that one should approach these casualties as “trauma patients with burns, not vice versa.” Burns are rarely fatal in first few hours after injury and it is important not to let the presence of burns interfere with the delivery of life-saving interventions for other potentially fatal injuries. Over 800 burn casualties from Iraq and Afghanistan have been treated at the ISR Burn Center. There have been several survivors with burns greater than 85% TBSA. There is a Burn Flight Team available on call at the ISR to help transport severely injured casualties to the Burn Center.

Immediate management of burns includes doing the right thing tactically, safely removing the casualty from the burning vehicle or structure, stopping the burning process, and addressing life-threatening conditions. Airway and breathing issues for casualties with burns, especially facial burns, include the possibility of inhalation injury with a need for early airway intervention and possible exposure to carbon monoxide and other toxic fumes. The casualties may benefit from supplemental oxygen. Standard TCCC care is then followed by a calculation of the TBSA of the burns using the Rule of 9s. Individuals with 20% or more TBSA burns should receive fluid resuscitation according to the new ISR Rule of Tens.

Burns in TCCC Discussion

Dr. Frank Butler

The following recommendations on burn care were proposed as additions to the TCCC Guidelines:

Care Under Fire

5. Casualties should be extricated from burning vehicles or buildings and moved to places of relative safety. Do what is necessary to stop the burning process.

Tactical Field Care

15. Burns

- a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early surgical airway for respiratory distress or oxygen desaturation.
- b. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines.
- c. Cover the burn area with dry, sterile dressings. For extensive burns (>20%), consider placing the casualty in the Blizzard Survival Blanket in the Hypothermia Prevention Kit in order to both cover the burned areas and prevent hypothermia.
- d. Fluid resuscitation (USAISR Rule of Ten)
 - If burns are greater than 20% of Total Body Surface Area, fluid resuscitation should be initiated as soon as IV/IO access is established. Resuscitation should be initiated with Lactated Ringer's, normal saline, or Hextend. If Hextend is used, no more than 1000 ml should be given, followed by Lactated Ringer's or normal saline as needed.
 - Initial IV/IO fluid rate is calculated as %TBSA x 10cc/hr for adults weighing 40-80 kg.
 - For every 10 kg ABOVE 80 kg, increase initial rate by 100 ml/hr.
 - If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock. Administer IV/IO fluids per the TCCC Guidelines in Section 6.
- e. Analgesia in accordance with the TCCC Guidelines in Section 12 may be administered to treat burn pain.
- f. Prehospital antibiotic therapy is not indicated solely for burns, but antibiotics should be given per the TCCC guidelines in Section 14 if indicated to prevent infection in penetrating wounds.
- g. All TCCC interventions can be performed on or through burned skin in a burn casualty.

Tactical Evacuation Care

- Same as TFC, plus
- h. Burn patients are particularly susceptible to hypothermia. Extra emphasis should be placed on barrier heat loss prevention methods and IV fluid warming in this phase.

*** Chairman's Note: the CoTCCC received a request from Col Warren Dorlac, the Deployed Director of the JTTS, to review a proposed protocol on the use of blood products by Air Force pararescuemen during air transport of casualties. The discussions that follow pertain to this request.**

Blood Products in TACEVAC Care

COL Greg Beilman

COL Beilman has recently been the Deployed Director of the JTTS. He pointed out that there is a lack of good data on the benefits of prehospital blood administration. He reviewed 4 papers that address this issue. He noted that blood has been used in far-forward locations in theater, but that use and outcome data is lacking.

COL Beilman noted that the main benefit of prehospital blood transfusion is the salvage of hemorrhagic shock casualties in extremis. Costs include the small risk of transfusion reactions, the blood bank impact (the Israeli Defense Force only used 3.7% of blood they took forward), and the training burden that would need to be imposed to make blood product use feasible in the prehospital phase. He noted that we must determine which casualties are most likely to benefit from prehospital blood and that we must track use and outcomes carefully if the decision is made to go forward with this.

Blood Products in TACEVAC Care

CAPT Joe Rappold

CAPT Rappold recently returned from Afghanistan where he was a trauma surgeon at the Level 3 hospital located at Camp Bastion in Helmand province. CAPT Rappold noted that Helmand is unique in Afghanistan in that there are three very disparate Tactical Evacuation systems in place with three unique levels of training:
UK MERT (Medical Emergency Response Team)
USAF Pararescue Teams
USA Dustoff teams

The trauma system there complies with NATO standards for casualty evacuation (CAT A < 90 min) vice US standard (CAT A < 60 min). CAPT Rappold noted that 15-19% of casualties evacuated to Camp Bastion received blood prehospital. The casualty survival rate is approximately 97% if he or she makes it to Bastion alive, and it is difficult to ascertain from existing data whether or not the blood transfused was a key factor in casualty survival.

CAPT Rappold noted that the MERT is well-trained in blood product administration and has a physician on the team. In contrast, the U.S. CASEVAC and MEDEVAC platforms have limited exposure to blood transfusion practices both in the area of operations (AOR) and at home station. In this context, he posed the question of whether or not the risk of prehospital transfusions was justified and if we might be creating more problems than we are solving. He noted in conclusion that when U.S. and NATO casualties require blood transfusions, they typically require far more than what is carried on MERT missions or what is being proposed to be carried on US platforms. Although he was initially a proponent of this initiative, his ongoing consideration of the data has made him no longer sure it is justified or warranted.

Blood Products in TACEVAC Care

LCDR Henry Casey

Dr. Casey is a former SEAL corpsman who was also trained as an 18-D Special Forces medic. He has made multiple deployments in support of USMC combat operations. He is currently assigned to the Naval Aerospace Medical Institute (NAMI) where he is involved in training Flight Surgeons and flight medics. He noted that the training program at NAMI does not include CASEVAC trauma care. LCDR Casey outlined the training for 8401 corpsmen as follows:

- Army Flight Medic training, FT Rucker
- Paramedic-like training, but no qualification
- No training in blood product administration

Training for Marine Air Wing corpsmen is somewhat different and includes the following elements:

- TCCC
- Operational and Emergency Medical Skills course
- Exposure to buddy transfusion techniques

NAMI does not believe that the benefits of prehospital blood transfusions justify the training and logistic burden that would be entailed in trying to make this intervention available on evacuation platforms. Corpsman training is the most significant obstacle.

Far-Forward Blood Products: A SOF Perspective

COL Greg Risk

COL Greg Risk is a Special Operations physician who for 3 years was the Assistant Dean at the Joint Special Operations Medical Training Center in Fort Bragg, NC. He is also a former 18D Special Forces medic. COL Risk emphasized that Special Operations Forces may have to care for a casualty for 36-48 hours before he reaches definitive care. He is not convinced that that blood products in TACEVAC will benefit the casualty significantly. Factor VIIa is a treatment option that has been associated with

good outcomes when given early (Spinella 2008) and should be considered as an option for the management of hemorrhage.

Crystalloids, which have been used in the past, result in hemodilution of clotting factors and increased acidosis and may increase the risk of fatal hemorrhage. While freeze-dried plasma may eventually be the fluid of choice, COL Risk's choice for the best option at present is buddy transfusions, because you replace what has been lost, to include replenishing O₂ carrying capacity and coagulation factors. "Walking Blood Bank" procedures have been developed that ensure that unit members are all prescreened for viral diseases. The time to obtain and transfuse one unit of fresh whole blood is 40-60 minutes dependent on training. Fresh whole blood replenishes substrate in the coagulation system and augments the effects of Factor VIIa in establishing hemostasis. The "Walking Blood Bank" may be employed when there is a lack of banked and screened blood products in austere environments or during prolonged evacuation. This concept fails if done ad hoc or impromptu – it requires training and sustainment along with preplanned logistics.

Wednesday 4 November - CoTCCC Internal Administrative Session

Admin Issues/TCCC Logo

Dr. Frank Butler

Dr. Butler presented the new TCCC logo, which has been revised by Dr. Cheryl Casey per requests from CoTCCC members at the last meeting. The new logo was accepted by unanimous voice vote and will be incorporated into the TCCC training curricula.

Dr. Butler also discussed the fact that funding for CoTCCC support has not yet been received at the USAISR and is not currently in the Defense Health Board POM. These issues are being worked with the DHB staff.

Case Report

Dr. Frank Butler (for MAJ Bob Mabry)

A brief case study was presented of an individual in a vehicle hit by an improvised explosive device. The casualty suffered a catastrophic injury to the lower abdomen and pelvis, to include transection of the abdominal aorta. He received emergency treatment that included a cricothyroidotomy and a sternal intraosseous infusion. In the postmortem examination, the cricothyroidotomy device was found to be outside the trachea.

Anatomical Injury Severity Scoring

Dr. Howard Champion

Dr. Champion presented his perspective on anatomical injury severity scoring and pointed out that civilian scoring systems are not ideal for military casualties in that they: 1) don't describe combat injury; 2) don't allow for multi-mechanism wounding complexity; 3) are complex to use; and 4) are inadequate for large soft tissue wounds.

The Military Combat Injury Scale (MCIS) was developed to better characterize combat injury. It was developed by experienced military providers and describes severity based on the urgency of treatment within specific time frames and increased risk of death or disability over time. He asked for assistance from the committee members in the review and critique of the efforts on this project to date.

Burn Care in TCCC

Discussion

The burn care recommendations proposed for addition to the TCCC Guidelines were discussed and approved by a 42-0 committee vote. These recommended changes were also approved by the Trauma and Injury Subcommittee of the DHB on 4 November and will be presented to the Core Board of the DHB.

Blood Products in TACEVAC Care

Discussion

Additional discussion was held on the topic of prehospital blood transfusions. Points made during this discussion included:

1) The success of blood product administration in improving the survival of trauma patients is unquestioned and blood product transfusions are the standard of care in both military and civilian trauma care. The additional benefit gained from starting blood products in the prehospital phase has not yet been established in the medical literature, but the group agreed that this therapy may be beneficial in the group of casualties with shock and ongoing truncal bleeding. The equivocal findings of studies on this treatment modality performed in the civilian sector must be evaluated with the understanding that transport times in military prehospital settings are often much longer than transport times in urban civilian settings.

2) There was strong agreement with the protocol's emphasis on controlling all compressible hemorrhage before moving on to fluid resuscitation.

3) Should the transfusion protocol be implemented, prehospital transfusions should be accomplished by individuals trained to the paramedic or Special Operations Advanced Tactical Practitioner level or higher. Administration of blood products by individuals trained to a lower standard was not felt to be advisable.

4) Blood component therapy should be undertaken for any casualty who is still in shock after infusion of two 500cc boluses of Hextend if blood components are available. Hextend was noted to decrease mortality by approximately 50% in a recently completed but as yet unpublished study of over 1700 trauma patients at the Ryder Trauma Center in Miami, FL. Hextend use was not found to result in coagulopathies when infusion was

limited to 1000cc or less. The TCCC hypotensive resuscitation with Hextend protocol has now been adopted as the standard of care for initial resuscitation of hemorrhagic shock at Ryder. (Proctor, accepted for publication in the Journal of the American College of Surgeons)

5) The definition of shock for the protocol should be that outlined in the Tactical Evacuation Care section of the TCCC guidelines (altered mental status in the absence of brain injury and/or change in pulse character.)

6) The group recommended that blood product administration be initiated if feasible for any casualty who meets the above criteria and is still enroute to the medical treatment facility. There was felt to be no minimum transport time below which blood product therapy should not be initiated if the above criteria are met. Individuals who continue to have absent radial pulse and/or decreased mental status due to hemorrhagic shock after 1000cc of Hextend have a very high expected mortality and are in need of blood products as soon as possible.

7) Given that the transport container contains 4 units of thawed plasma and 2 units of Packed Red Blood Cells (PRBCs), 2 units of plasma should be given first, followed by the 2 units of PRBCs, followed by the last 2 units of plasma. The rationale for this is that the first priority is to stop the bleeding and that the coagulation factors in the plasma which may assist in hemostasis are more important initially than the additional oxygen-carrying capacity of the two units of PRBCs.

8) The end point of resuscitation should be either return of normal mental status or a palpable radial pulse, or in the presence of TBI, a systolic blood pressure of 90 mmHG. Once the end-point has been attained, resuscitation should be stopped and IV access maintained.

9) The group emphasized the importance of an ongoing process improvement effort on this issue and strongly recommended that all patients receiving blood component therapy in the prehospital phase of care be flagged for review at the weekly Joint Theater Trauma System process improvement teleconferences.

These comments were forwarded to Colonel Dorlac on 6 November 2009.

T-Spine Injuries in Blunt Trauma

Dr. Don Jenkins

The following comments were provided by Dr. Don Jenkins in response to the questions raised about how best to manage blunt trauma casualties with suspected spinal injuries in TCCC:

Spinal Motion Restriction (SMR) is a concept which helps prevent further injury but allows for use of medic intuition, ingenuity, flexibility and judgment while controlling spine mobility during the phases of care. Spinal Immobilization (SI) requires c-collar, back boards, straps, blocks and litters during all phases of care. The concept of SMR is TCCC-friendly; it allows for log rolling of patients and use of techniques and adjuncts to limit motion of the spine during evaluation and treatment to limit further spine injury (similar to the way splints limit injury to limbs) during patient extrication, movement/transport, and evacuation. SMR must be balanced against the need for speed of extrication and ability to move the casualty rapidly into the Tactical Field Care and TACEVAC phases in order to limit further injury to casualty, medic and other

combatants/rescuers. A well-placed SI device takes multiple individuals over 3 minutes to properly apply. SI and SMR have no place in Care Under Fire. An injured combatant is typically wearing their individual body armor (IBA). IBA is an exceptionally stabilizing circumferential 'brace'. Hospitalized patients with known T-spine injury will commonly be fitted with a hard plastic 'clam-shell' or 'tortoise-shell' type brace and then allowed to sit and ambulate. While not identical in 'fit', conceptually, the IBA functions like one of these thoraco-lumbar spine orthotic (TLSO) devices. In an IED blast, vehicle crash/roll-over, or fall from a height, the first-responder/medic performs casualty extraction if needed. IBA should be left in place during vehicle extraction to facilitate SMR. Torso injury evaluation and treatment of chest/abdominal injury should take precedence over SMR. During TFC, following 'body sweep', if T-spine injury is suspected, IBA should be maintained (or, if torso treatment was undertaken, replaced) to facilitate SMR. In the TACEVAC phase, formal SI devices should be available for use where indicated in cases of known or suspected T-spine injury. Again, timeliness of SI application must be weighed against the dangers inherent in transition from tactical to evacuation phases of care.



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Date