Tactical Combat Casualty Care: Leadership Lessons Learned

THOR 2016

Frank Butler, MD
20 June 2016
THOR
North Sea Morning Dip
“The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting the views of the Departments of the Army, Air Force, Navy or the Department of Defense.”

- No financial interests in items discussed
Thanks!

- Committee on TCCC
- Joint Trauma System
- USAISR
- DHA MEDLOG
- UK colleagues
- LTG Nadja West
- MG (Ret) Les Berger
- RADM (ret) Michael Baker
- COL (Ret) Russ Kotwal
- COL Brian Eastridge
- COL (Ret) John Holcomb
- CAPT (Ret) Steve Giebner
- MSG (Ret) Harold Montgomery
- CAPT (Ret) Doug Freer
- Lt Col (Ret) John Gandy
- Dr. Rich Carmona
- LTC (P) Bob Mabry
- Dr. Lenworth Jacobs
- Col (Ret) Warren Dorlac
- SGM F Bowling
- LTC Ethan Miles
- Dr. Bijan Kheirabadi
- Dr. Alex Eastman
- Dr. Howard Champion
- Lt Gen (ret) Doug Robb
Better Prehospital Care = Decreased KIAs

2016 IOM Report
“All seem uncertain regarding the best method to implement factual knowledge to the man most in need, the front line trooper… citing our ineptness in the field of self-help and first aid …..”little if any improvement has been made in this phase of treatment of combat wounds in the past 100 years.”

CAPT J.S. Maughon
Mil Med 1970
Battlefield Trauma Care: 1992

- Based on trauma courses NOT developed for combat
- Medics, corpsmen, PJs taught NOT to use tourniquets
- No hemostatic dressings
- Large volume crystalloid fluid resuscitation for shock
- 2 large bore IVs on all casualties with significant trauma
- Civil War-vintage technology for analgesia (IM morphine)
- No focus on prevention of trauma-related coagulopathy
- No tactical context for care rendered
- Special Ops Medics – venous cutdowns if trouble starting an IV
- Heavy emphasis on endotracheal intubation for prehospital airway management
Tourniquets Reconsidered –
The Primary Driver for TCCC

- ATLS 1992: Tourniquets strongly discouraged
- Fear of ischemic damage to limbs - BUT
- Exsanguination from extremity hemorrhage was the #1 cause of preventable death in Vietnam - AND
- Tourniquets can control extremity hemorrhage
- Used routinely during orthopedic surgery and limbs are not lost there as a result
- Also – even if you had to choose between death and losing a leg....
- Bottom line: The “No Tourniquet” rule was NOT evidence-based and was NOT logic based.
Pulling the Thread

Other Aspects of Care in 1992 that Needed Review

- Tactical context in battlefield trauma care
- Fluid resuscitation and IV access
- Battlefield analgesia
- Prevention of coagulopathy
- Spinal precautions
- Battlefield CPR
- Treatment of tension pneumothorax
- Battlefield antibiotics

- Undertaken as a Naval Special Warfare Biomedical R +D project
TCCC Lessons Learned

1. Nothing gets a pass just because it’s “the way we’ve always done it.”

That would be tradition-based medicine.
Tactical Combat Casualty Care (TCCC): A Different Approach

- Battlefield trauma care research effort – Special Operations and USUHS: 1993-1996
- Reviewed most recent trauma care literature
- Combat environment and mission considered
- Combat medic training and equipment considered
- Project included input from combat medics, corpsmen, and pararescuemen (PJs)
- **Evidence-based** – INCLUDING requiring evidence for current practice at that time
- **Goal** – To prevent ALL preventable deaths
Tactical Combat Casualty Care in Special Operations

Military Medicine Supplement
August 1996

Evidence-based trauma care guidelines customized for use on the battlefield
“It is very important, however, to stop major bleeding as quickly as possible since injury to a major vessel may result in the very rapid onset of hypovolemic shock..... Ischemic damage to the limb is rare if the tourniquet is left in place less than an hour and tourniquets are often left in place for several hours during surgical procedures. In the face of massive extremity hemorrhage, in any event, it is better to accept the small risk of ischemic damage to the limb than to lose a casualty to exsanguination....The need for immediate access to a tourniquet in such situations makes it clear that all SOF operators on combat missions should have a suitable tourniquet readily available at a standard location on their battle gear and be trained in its use.”
2. It doesn’t matter how good the plan is – If nobody’s using it.
TCCC Senior DoD Leader Briefings: 1996-1997

- DoD Biomedical R+D Review
  - MG Les Berger – then Joint Staff Surgeon
- Senior Military Medical Advisory Committee
  - ASDHA/Service SGs/Joint Staff Surgeon
- Joint Staff Vision 2010 Futures Meeting
- Defense Medical Oversight Committee
  - 4-Star Service Deputy Chiefs of Staff
- USSOCOM Commander

• Summary: Generally good reception BUT
  - no plan of action
TCCC Medical Conference Briefings: 1996-1997

- AMSUS
- Military Health System conference
- Special Operations Medical Association
- US Armed Forces Academy of Family Medicine
- Wilderness Medical Society

**Summary:**

- Again – generally positive reception
- Some pushback on tourniquets

**BUT** - still no action plan
Now What?

WRT saving lives on the battlefield –
At this point, TCCC was exactly nowhere.
3. If What You’re Doing is Not Working - Do Something Else.

Next step: a unit-based approach
TCCC Unit Level Briefings: 1996-1997

- Naval Special Warfare Command
- 75th Ranger Regiment
- Army Special Missions Unit
- PJ Medical Advisory Board Leaders

Summary: Good reception - in-depth discussions - TCCC Guidelines implemented at the levels briefed.

- Line Commanders made TCCC happen
- BUT – you won’t get line commander buy-in unless unit docs, PAs, and medical NCOs agree
TCCC Lessons Learned

4. The Committee on TCCC and the TCCC Working Group

Now that we’ve got TCCC going – Have to keep it going
10. The Assistant Secretary of Defense for Health Affairs should establish a standing panel tasked with the development and periodic review of battlefield trauma care guidelines. This panel should monitor new developments in the field of prehospital trauma care and incorporate them into updated guidelines which are appropriate for the tactical battlefield environment.
Committee on Tactical Combat Casualty Care (CoTCCC)

- First funded by USSOCOM in 2001-2002 at the Naval Operational Medicine Institute (NOMI)
- Later sponsored by Navy and Army Surgeons General and the U.S. Army Institute of Surgical Research
- 42 members - all services
- Trauma Surgeons, EM and Critical Care physicians; operational physicians and PAs; medical educators; combat medics, corpsmen, and PJs
- 100% deployed experience in 2016
- Relocated to the Defense Health Board in 2007 at the direction of ASD/HA
- Moved to the Joint Trauma System in 2013
“When the war on the Korean Peninsula, erupted in June 1950, the policy of the Army Medical department was to ligate all arterial injuries unless a simple transverse or end-to-end anastomosis could be performed, and repair was “contrary to policy and orders.” Despite pressure and threats of “courts martial for vascular repairs” from the senior military medicine leaders......the young surgeons, mostly draftees and reservists, resisted rigid doctrine and orders to desist, and in the face of threatened punishment, were committed to do the right thing, and ultimately went on to change military medicine and vascular surgery.”

Ann Vasc Surg 2016
Lead, Follow, or Get out of the Way

Sometimes the CoTCCC has led; sometimes we have followed; but we’ve never just gotten out of the way.”

COL Kevin O’Connor
Former Army SMU Surgeon
Physician to the Vice President

- Make informed and definitive decisions
- Then act on them
TCCC Lessons Learned

5. Maintain an Active Search for Good Ideas – Wherever They Can Be Found – and Process Them As Though Lives Depended on It

Because, indeed – they do.
Changes to the TCCC Guidelines

CoTCCC

- DoD Casualty Data
- Research Facilities
- New Technology
- Service Medical Lessons Learned Centers
- Coalition Partner Nations
- Published Prehospital Trauma Literature
- Direct Input from Combat Medical Personnel
- JTTS Weekly Trauma Telephone Conferences

Slide: COL (ret) Russ Kotwal
Intraosseous Devices: Direct Medic Input

- SFC Rob Miller – CoTCCC Meeting 2002
- Places an IO device on the table
- “Why aren’t we using these things?”
- CoTCCC agreed – despite minimal use in prehospital trauma care at the time
- Now used universally in the US Military
"First get your facts; then you can distort them at your leisure."

Mark Twain
TCCC Journal Watch

TCCC Article Abstracts:
Monthly focused PUBMED search of prehospital trauma literature

TCCC Distro List
- TCCC Change Notices
- TCCC Article Abstracts
- TCCC Info Items

* To be added to the list:
danielle.m.davis.civ@mail.mil

Tactical Combat Casualty Care
Journal Article Abstracts

Committee on Tactical Combat Casualty Care
August 2015
“Three Things I Would Change in TCCC” Talks

- Surg CAPT Steve Bree – February 2016
- Top recommendation – add pelvic binders
- TCCC Working Group agreed
- Proposed change on pelvic binders pending
  – Col Stacy Shackelford
TCCC Lessons Learned

6. Make Needed Course Corrections Quickly as Additional Evidence and Experience Is Gained

A continuously learning battlefield trauma care system.
Prehospital fluid resuscitation for patients in shock per ATLS – 2 liters of LR or NS wide open
Crystalloids vs Colloids: Intravascular Staying Power

- Give 1000cc LR
- Wait one hour
- Only 200cc of infused volume of LR is still in the intravascular space

Rainey et al
The Pharmacologic Approach to
The Critically Ill Patient. 1988
For fluid resuscitation in traumatic hemorrhagic shock: "there is almost universal agreement that colloid containing fluids act more efficiently than crystalloid fluids to restore hemodynamic stability."

*Falk et al. Critical Care Clinics 1992*

"When rapid expansion of the intravascular volume is desired, colloids are the clear choice".

*Marino; The ICU Book*
Prospective RCT; community consent obtained
Aggressive early crystalloid resuscitation vs resuscitation delayed until after repair of vascular injury
Penetrating torso trauma; systolic BP < 90 mmHg
Early n = 309; Delayed n = 289
Volume: Early = 2,478 mL; Delayed = 375 mL
Survival: Early = 62%; Delayed = 70% (p=0.04)
Fluid Resuscitation in TCCC: 1996

- IVs and fluid resuscitation delayed until Tactical Field Care
- **No** IV fluids for casualties not in shock
- **No** IV fluids for casualties in shock resulting from uncontrolled hemorrhage
- For casualties in shock as a result of hemorrhage that is now controlled - 1000 cc of Hespan initially
- Limit Hespan to 1500 cc or less
Mogadishu: The Tactical Medicine Lessons Learned

Special Operations Medical Association
8 December 1999
Clear consensus among the panel members that a casualty with mental status changes due to shock must be fluid resuscitated.

Panel members stressed the importance of not trying to aggressively administer IV fluids with the goal of achieving "normal" blood pressure in casualties with penetrating injuries of the chest or abdomen.

"Titrate to mentation”

Evidence of benefit not strong.
Joint MRMC – ONR
Fluid Resuscitation Conferences

• Held in 2001-2002
• Co-chairs: COL John Holcomb and Dr. Howard Champion
6. Fluid Resuscitation

- Assess for hemorrhagic shock; altered mental status (in the absence of head injury) and weak or absent peripheral pulses are the best field indicators of shock.

a. If not in shock:
   - No IV fluids necessary
   - PO fluids permissible if conscious and can swallow
6. Fluid Resuscitation
b. If in shock:
   - Hextend, 500ml IV bolus
   - Repeat once after 30 minutes if still in shock.
   - No more than 1000ml of Hextend
Fluid Resuscitation from Hemorrhagic Shock: 2014

“The historic role of crystalloid and colloid solutions in trauma resuscitation represents the triumph of hope and wishful thinking over physiology and experience.”

LTC Andre Cap
J Trauma, 2015

There is an increasing awareness that fluid resuscitation for casualties in hemorrhagic shock is best accomplished with fluid that is identical to that lost by the casualty - whole blood.
TCCC Fluid Resuscitation fm Hemorrhagic Shock: 2014

Updated Fluid Resuscitation Plan

Order of precedence for fluid resuscitation of casualties in hemorrhagic shock

1. Whole blood
2. 1:1:1 plasma:RBCs:platelets
3. 1:1 plasma and RBCs
4. (tie) Plasma (liquid, thawed, dried) or RBCs alone
8. Hextend
9. (tie) Lactated Ringers or Plasma-Lyte A

Butler et al – JSOM 2014
Forrest Gump on Normal Saline

I AM NOT A SMART MAN

BUT TOO MUCH SALINE SEEMS LIKE A BAD IDEA IN PENETRATING TRAUMA

Slide: Dr. Marty Schreiber
TCCC Lessons Learned

7. TCCC Change Approval Methodology Evolution

*Improved due diligence*
TCCC Change Process Methodology - Then

- Need for change identified
- Discussed at a CoTCCC meeting
- Change finalized at the meeting
- Vote
- Change published in meeting minutes
- Changes in PHTLS Text published at 3-4 year intervals
- Later – Defense Health Board briefs/memos
TCCC Change Process Methodology - Now

- Need for change identified
- Sponsor identified
- Change paper written
- Author review
- TCCC Working Group review
- Collect feedback and distribute updated version
- Teleconference or meeting discussion - or both
- Finalize proposed change
- Vote – 2/3 supermajority still required
- If approved - paper written and published
• All TCCC change papers are now published in the Journal of Special Ops Medicine
• Searchable in PUBMED
8. Strategic Messaging – Must “Inform and Inspire “

Change doesn’t “just happen” – It is inspired to happen.
“The goal is to inform and inspire decision makers around the country to effect this vision by establishing appropriate metrics, applying these metrics, and using this information to motivate decision makers.”

Dr. Richard Carmona
17th Surgeon General of the United States
Hartford Consensus IV
TCCC Strategic Messaging

- Published medical literature
- Briefings for senior leaders
- Presentations at medical conferences
- Joint Trauma System website
- Other websites (MHS – PHTLS – JSOM - SOMA)
- Email distribution list – exponential impact
- PHTLS and other textbooks
- Red/Green Charts
- Participation in relevant working groups
- Response to information requests
- TCCC Mobile – coming soon
- Up To Date – in negotiation
Tourniquet Messaging

Tourniquets in the U.S. Military
2003
Tourniquets: The Magnitude of the Issue

“The striking feature was to see healthy young Americans with a single injury of the distal extremity arrive at the magnificently equipped field hospital, usually within hours, but dead on arrival. In fact there were 193 deaths due to wounds of the upper and lower extremities, …… of the 2600.”

CAPT J.S. Maughon
Mil Med 1970

* Extremity hemorrhage math in Vietnam:
  193 of 2600 = 7.4% x 46,233 fatalities = 3,421
  preventable US deaths from extremity hemorrhage
A Preventable Death: 2003

- RPG explosion
- Bled to death from his right knee wound despite three field-expedient tourniquets
- "A picture is worth 1000 words"
- This one was worth 1000+ lives

Tourniquets Early in the Iraq and Afghanistan Conflicts

- Increased use of tourniquets by both Special Operations and conventional units beginning in 2005

The Drivers:
- Holcomb study: “Causes of SOF Deaths 2001-2004” – highlighted need for TCCC
- USAISR tourniquet study by Walters et al (2005)
- TCCC Transition Initiative begun in 2005

Butler – ACS Bulletin - 2015
Tourniquet Outcomes in TCCC Transition Initiative Report

- **Sixty-seven** successful tourniquet applications identified
- No avoidable loss of limbs due to tourniquet use identified

*Butler, Greydanus, Holcomb*  
*2006 USAISR Report*  
*“TCCC: Combat Evaluation 2005”*
Tourniquets Early in the Iraq and Afghanistan Conflicts

The Drivers:

- USSOCOM TCCC message - March 2005
- USCENTCOM tourniquet and hemostatic agents (HemCon) message – 2005

After these two events, tourniquet use became more and more prevalent among US combat forces.

Butler – ACS Bulletin - 2015
Tourniquets – Kragh et al
Annals of Surgery 2009

• Ibn Sina Hospital, Baghdad, 2006
• Tourniquets are **saving lives** on the battlefield
• **31 lives saved in 6 months** period by the use of prehospital tourniquets
• **No loss of limbs from tourniquet ischemia**
• **Author estimated 1000+ lives saved with TQs**
Eliminating Preventable Death on the Battlefield

- Kotwal et al – Archives of Surgery 2011
- All Rangers and docs trained in TCCC
- U.S. military preventable deaths: 24%
- Ranger preventable death incidence: 3%
Preventable Combat Deaths from Not Using Tourniquets

  - 193 of 2,600
  - 7.4% of total combat fatalities
  - 77 of 982 (in both cohorts of fatalities)
  - 7.8% of total fatalities – no better then Vietnam
- Tourniquets became widely used in 2005-2006
- Eastridge – *J Trauma* 2012: OEF + OIF (to Jun 2011)
  - 119 of 4,596
  - 2.6% of total fatalities – a 67% decrease

*Butler – ACS Bulletin – Hartford Consensus Compendium - 2015*
Red/Green Charts

- Identify key metrics
- Publicize them
- Keep publicizing them until they improve

*Leaders don’t like to be red.*
# Service IFAKs April 2010

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<th>TCCC Item</th>
<th>USA IFAK</th>
<th>USMC IFAK</th>
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- **Military Individual First-Aid Kits by Service:**
- **Green = YES for that item; Red = NO for item**
Service IFAKs Nov 2011

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18 months later – note improvement
9. Lessons Learned aren’t really lessons learned - unless you actually learn them.

COL Russ Kotwal
MSG “Monty” Montgomery
Lessons Learned That We Haven’t Quite Learned - Yet.
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Message from the Army
SG – LTG West

If we do not get this right, it does not matter what else we get right...
Thank You!

Photo – MSG (Ret) Harold “Monty” Montgomery