Tactical Combat Casualty Care: Leadership Lessons Learned

THOR 2016

Frank Butler, MD

20 June 2016

THOR
North Sea Morning Dip

Disclaimers

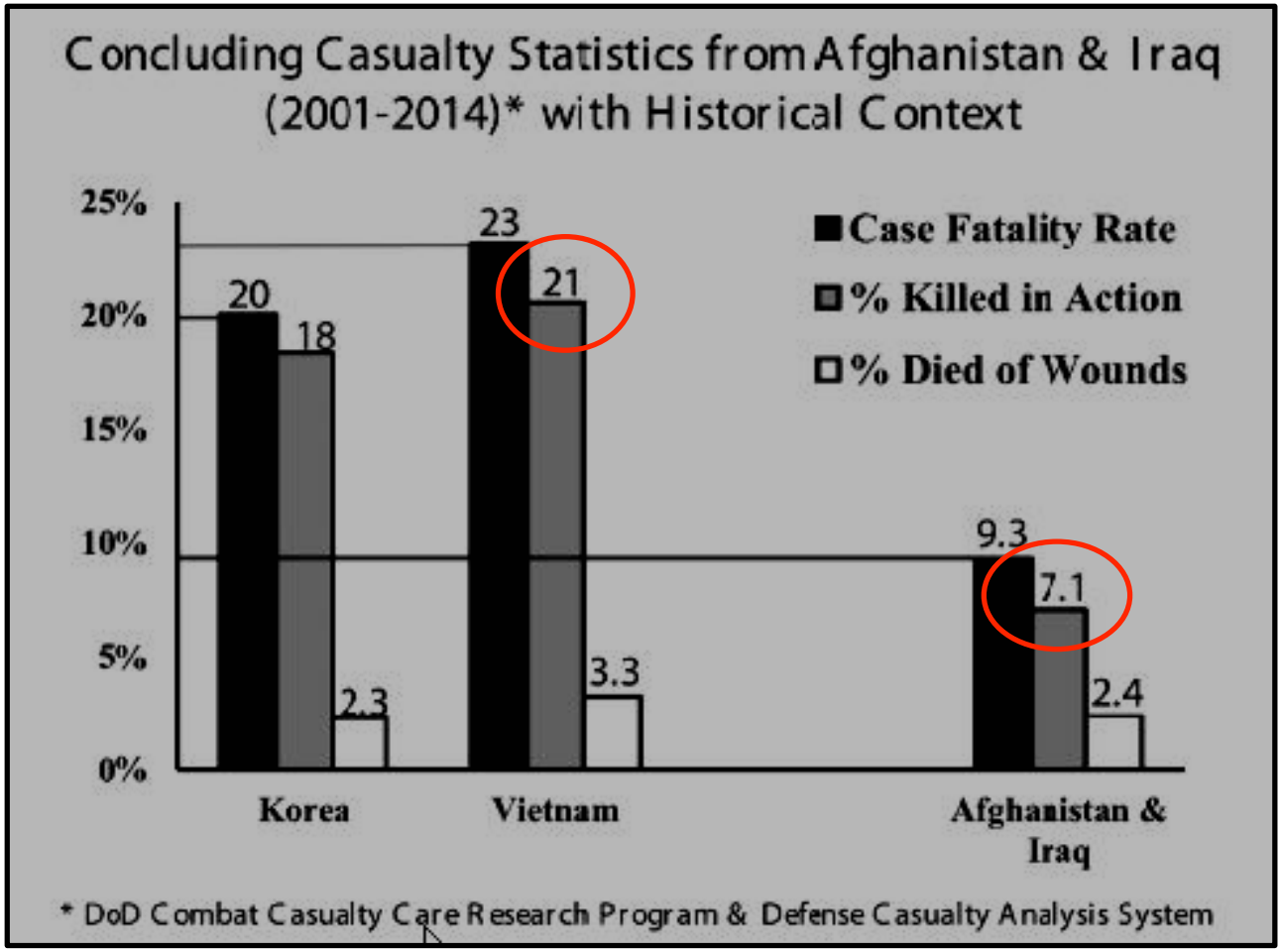
"The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting the views of the Departments of the Army, Air Force, Navy or the Department of Defense."

- ***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

Battlefield Trauma Care: Vietnam

"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

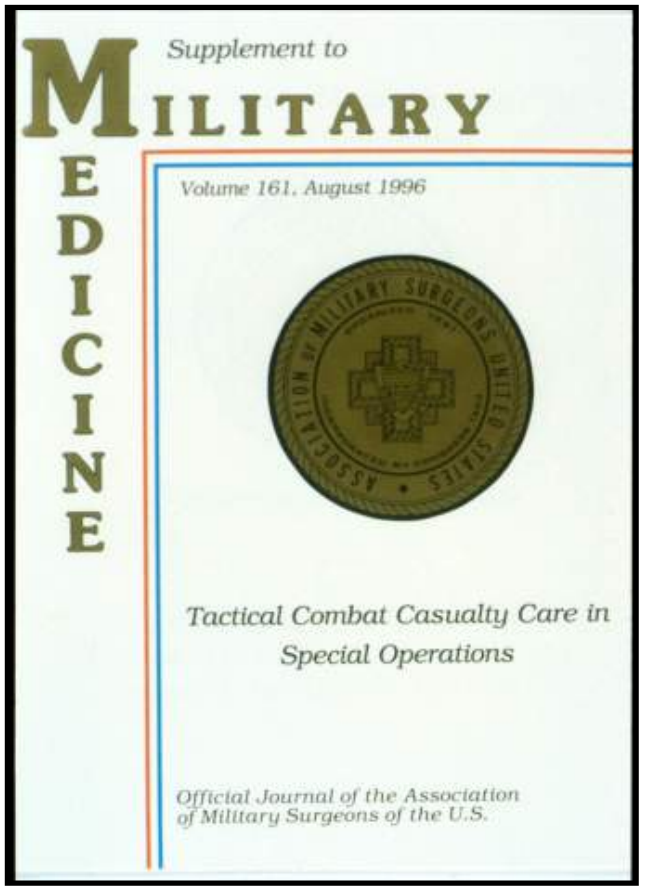
1. Nothing gets a pass just because it's "the way we've always done it."

That would be <u>tradition</u>-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

Tourniquets in TCCC
Mil Med 1996

"*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.

TCCC Lessons Learned

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

1996 TCCC Paper Recommendation #10

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

Historical Note

Lead, Follow, or Get out of the Way—How Bold Young Surgeons Brought Vascular Surgery into Clinical Practice from the Korean War Battlefield

Michael S. Baker, Walnut Creek, California

" 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

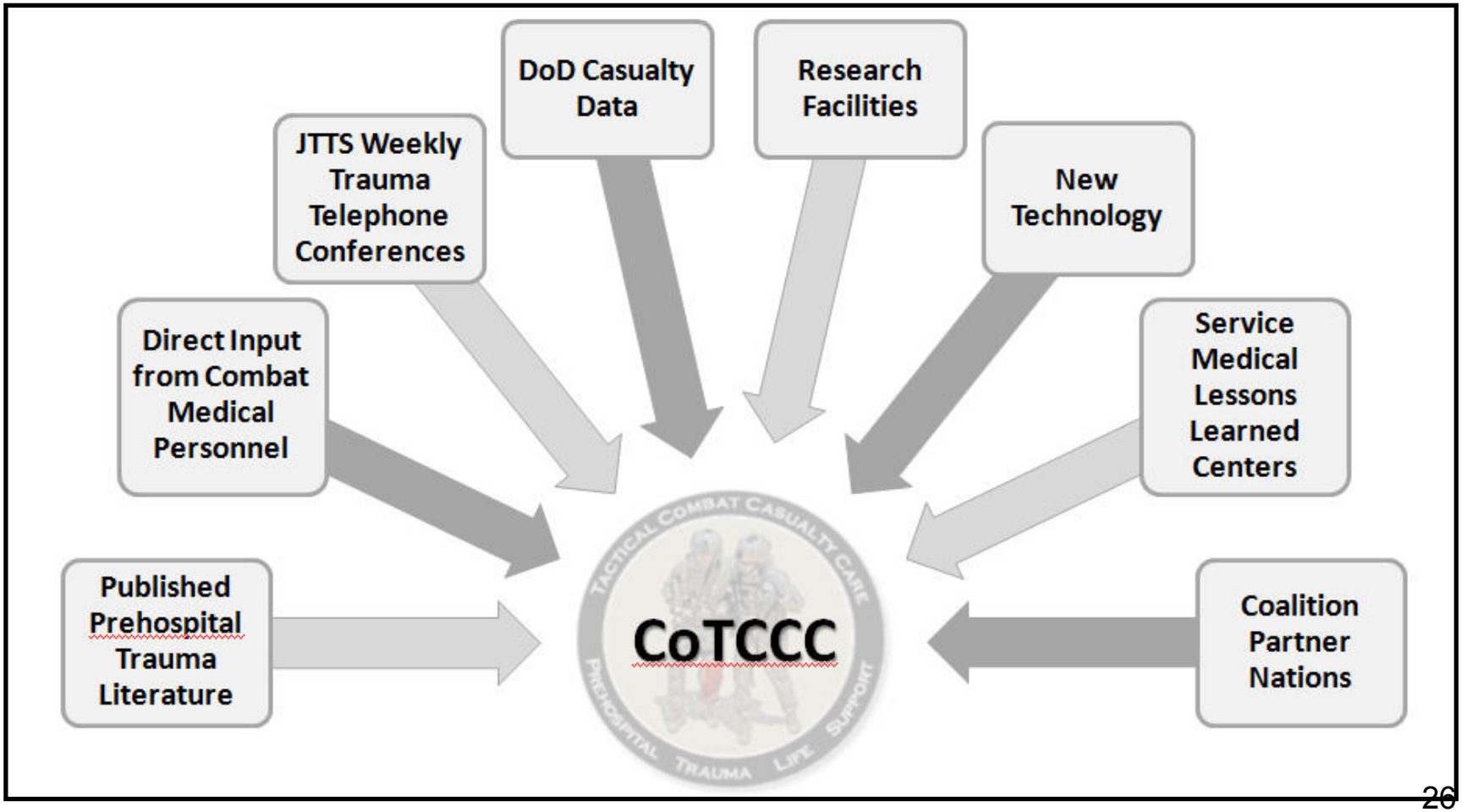
- ***Make informed and definitive decisions***
- ***Then act on them***

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

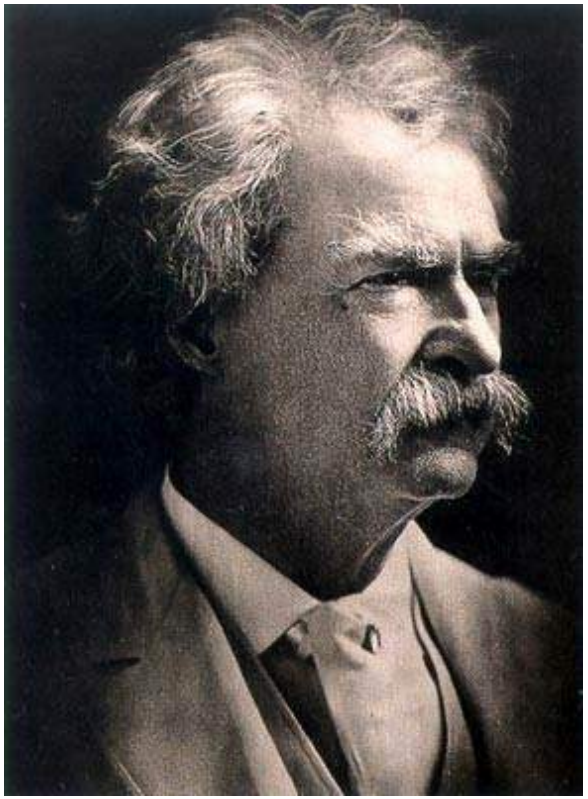


Slide: COL (ret) Russ Kotwal

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

TCCC Literature Review



"First get your facts; then you can distort them at your leisure."

Mark Twain

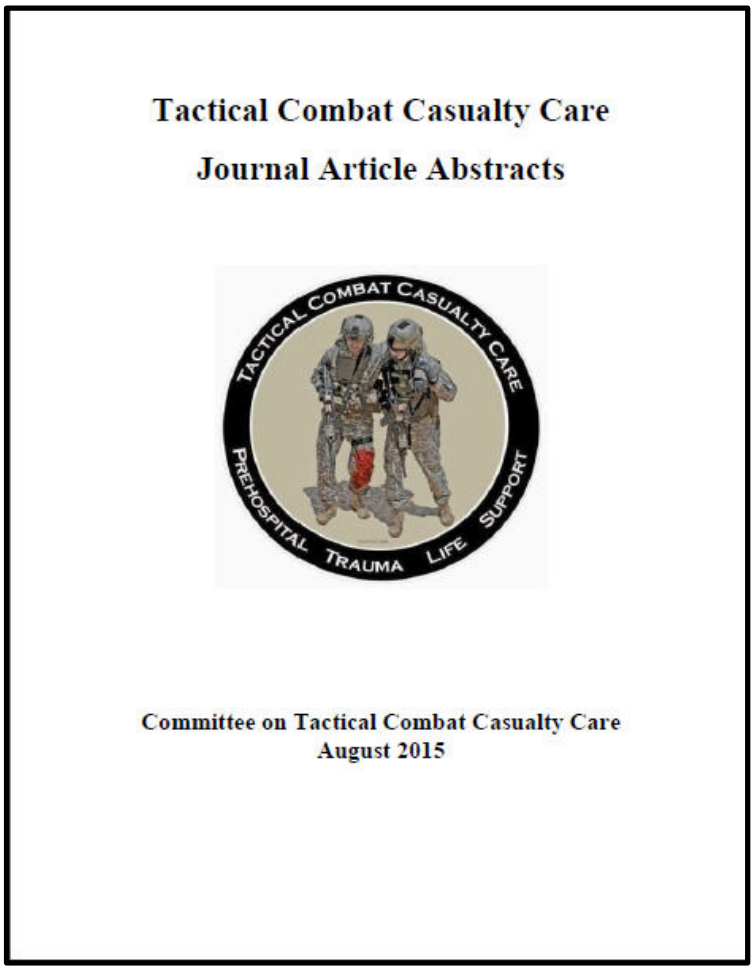
TCCC Journal Watch

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: 1992

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

Crystalloids vs Colloids

- **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

The New England
Journal of Medicine

Volume 331 OCTOBER 27, 1994 Number 17

IMMEDIATE VERSUS DELAYED FLUID RESUSCITATION FOR HYPOTENSIVE PATIENTS WITH PENETRATING TORSO INJURIES

WILLIAM H. BICKELL, M.D., MATTHEW J. WALL, JR., M.D., PAUL E. PEPE, M.D., R. RUSSELL MARTIN, M.D., VICTORIA F. GINGER, M.S.N., MARY K. ALLEN, B.A., AND KENNETH L. MATTOX, M.D.

- **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

Altered Mental Status in Uncontrolled Hemorrhage

- **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**

Fluid Resuscitation in TCCC: 2003

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

Fluid Resuscitation in TCCC: 2003

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

Slide: Dr. Marty Schreiber

TCCC Lessons Learned

7. TCCC Change Approval Methodology Evolution

Improved due diligence

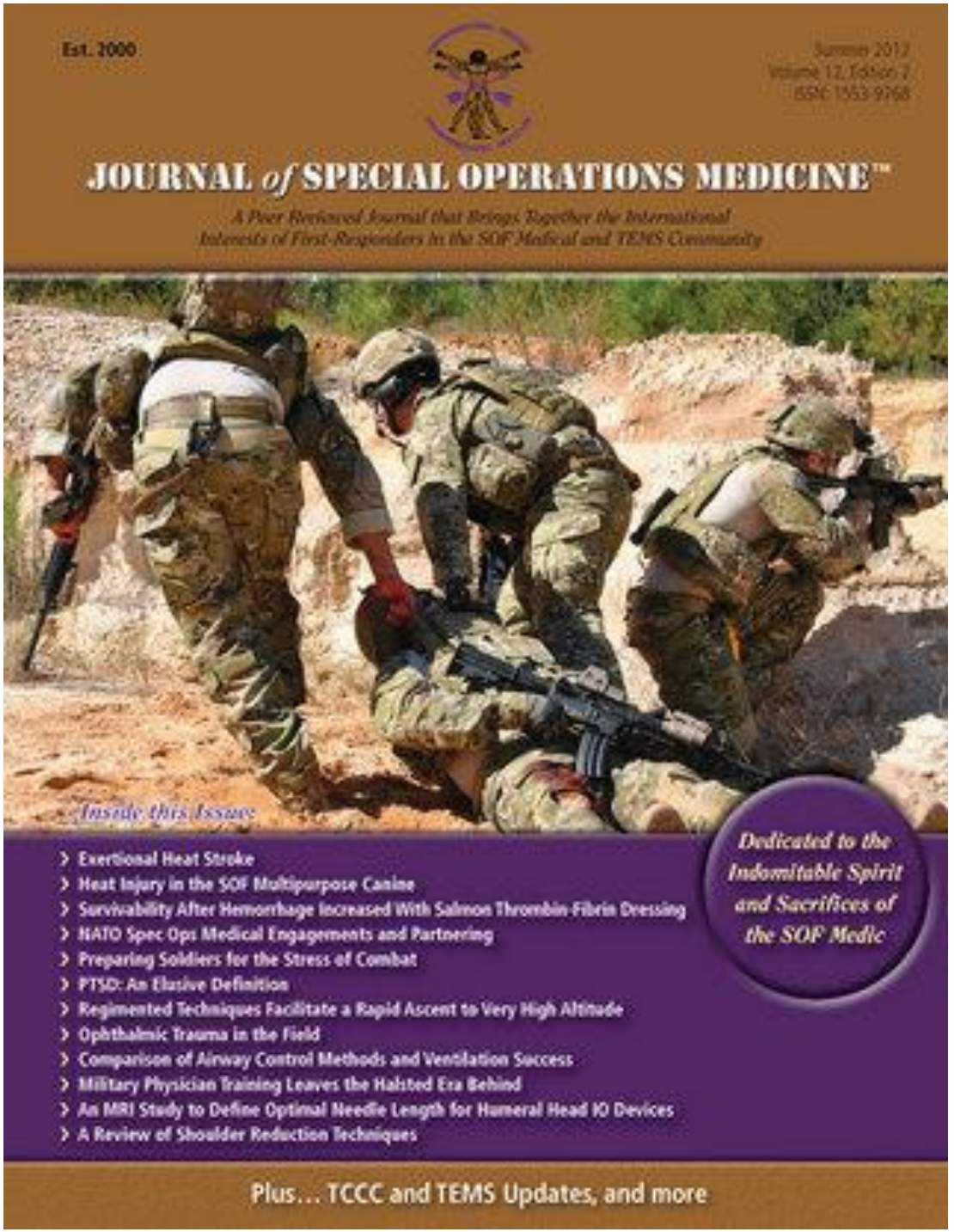
TCCC Change Process Methodology - Then

- 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



TCCC Lessons Learned

8. Strategic Messaging – Must "Inform and Inspire "

Change doesn't "just happen" –
It is inspired to happen.

Inform and Inspire

“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

Holcomb et al
Annals of Surgery 2007

Tourniquets Early in the Iraq and Afghanistan Conflicts

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

<u>The Drivers:</u>

- **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

- Maughon – *Mil Med 1970*: Vietnam
  - 193 of 2,600
  - 7.4% of total combat fatalities
- Kelly – *J Trauma 2008*: OEF + OIF (2003/4 and 2006)
  - 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

Red/Green Charts

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

Leaders don't like to be red.

DEFENSE MEDICAL MATERIEL PROGRAM OFFICE

Service IFAKs April 2010

TCCC Item	USA IFAK	USMC IFAK	USAF IFAK	SOF Operator Kit
Tourniquet		TK-4		
CAT				
SOFT-T				
Nasopharyngeal airway				
Combat Gauze				
Elastic Bandage Pressure				
Chest Seal Dressing				
Rigid Eye Shield				
TCCC Card				

Legend

- In Assemblage
- Not in Assemblage
- Policy to have available when deploying

- **Military Individual First-Aid Kits by Service:**
- **Green = YES for that item; Red = NO for item**

DEFENSE MEDICAL MATERIEL PROGRAM OFFICE

Service IFAKs Nov 2011

TCCC Item	USA IFAK	USMC IFAK	USAF IFAK	SOF Operator Kit
Tourniquet				
CAT				
SOFT-T				
Nasopharyngeal Airway		CAP		
Combat Gauze				
Elastic Pressure Bandage				Funding
Chest Seal Dressing	Field Dressing used with tape		Contracting	Funding
Rigid Eye Shield	Pending Message		Contracting	Funding
TCCC Card	Issued On Deploy	H & H CC	DD Form 1380	Funding

Legend

- In Assemblage
- Not in Assemblage
- Policy to have available when deploying

18 months later – note improvement

Old 75th Ranger Regiment Saying

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.

TCCC Red/Green Chart

	Yes	No
Evidence-Based		
Continually Updated		
Strategic Messaging		
Medical Rapid Fielding Plan		
TCCC Training Standardized and Mandated		
Physician TCCC Training		
DoD-FDA Panel		
TCCC Documentation		
Preventable Death Analyses		

Message from the Army SG – LTG West

Thank You!

Photo – MSG (Ret) Harold "Monty" Montgomery