



**Tactical Combat Casualty
Care: DHB Update 2008**

**Frank Butler, M.D.
CAPT MC USN (RET)
Chairman
Committee on TCCC
4 Sept 2008**

Civilian Trauma Care Setting



Tactical Trauma Care Setting



Tourniquets in WWII **Wolff AMEDD J April 1945**

“We believe that the strap-and-buckle tourniquet in common use is ineffective in most instances under field conditions...it rarely controls bleeding no matter how tightly applied.”



Vietnam

Over 2500 deaths occurred in Vietnam secondary to hemorrhage from extremity wounds. These casualties had no other injuries.



Vietnam. Medical Evacuation. Marines of Company E, 2nd Battalion, 9th Marines, while under heavy fire with NVAs within the DMZ on Operation Hickory III, are carrying one of their fellow Marines to the H-34. 07/29/1967



Tourniquets in U.S Military Mid-1990s

- Old strap-and-buckle tourniquets still being issued
- Medics and corpsmen being trained in courses where they were taught **not** to use them



SOF Deaths in the GWOT Holcomb, et al

Ann Surg 2007

Factors That Might Have Changed Outcomes (82 Fatalities – 12 Potentially Survivable)

- Hemostatic dressings/direct pressure (2)
- **Tourniquets (3)**
- Faster CASEVAC or IV hemorrhage control (7)
- Surgical airway vs intubation (1)
- Needle thoracostomy (1)
- PRBCs on helos (2)
- Battlefield antibiotics (1)



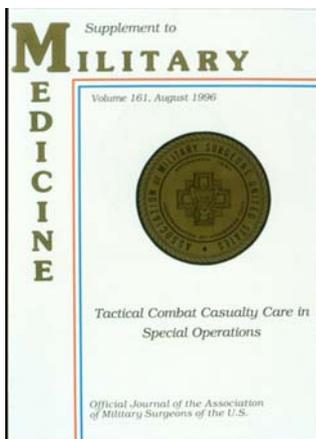
Tourniquets – Beekley et al J Trauma 2008

- 31st CSH in 2004
- 165 casualties with severe extremity trauma
- 67 with prehospital tourniquets; 98 without
- Seven deaths
- **Four of the seven deaths were potentially preventable had an adequate prehospital tourniquet been placed**

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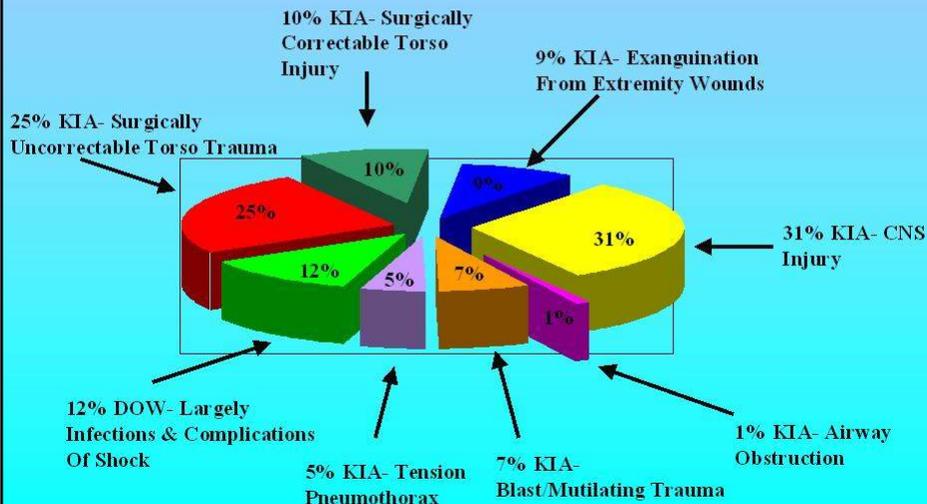
Tactical Combat Casualty Care in Special Operations



Military Medicine Supplement August 1996

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How People Die In Ground Combat (From COL Ron Bellamy)





Three Principle of TCCC

- **Treat the casualty**
- **Prevent additional casualties**
- **Complete the mission**

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Phases of Care in TCCC

- **Care Under Fire**
- **Tactical Field Care**
- **Tactical Evacuation Care**





TCCC Guidelines 1996

- **Tourniquets**
- **Aggressive needle thoracostomy**
- **Nasopharyngeal airways**
- **Surgical airways for maxillofacial trauma**
- **Tactically appropriate fluid resuscitation**
- **Battlefield antibiotics**
- **Improved battlefield analgesia**
- **Combine good tactics and good medicine**
- **Scenario-based training**
- **Combat medic input to guidelines**

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Committee on Tactical Combat Casualty Care

- **Funded by USSOCOM in 2001**
- **First sponsored by BUMED at Naval Operational Medicine Institute (NOMI)**
- **Members from all services and civilian sector**
- **Trauma Surgery, EM, Critical Care, operational physicians; medical educators; combat medics, corpsmen, and PJs**

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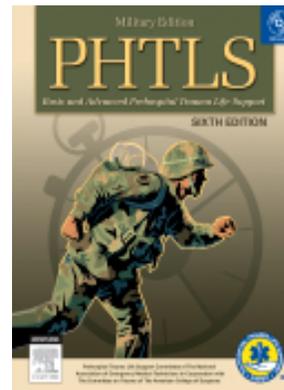
CoTCCC Members – Recent and Present

- U.S. Surgeon General
- Chairman – ACS Committee on Trauma
- 5 members of the ACS Committee on Trauma
- Trauma consultants for Army and Air Force Surgeons General
- 2 Command Surgeons, U.S. Special Operations Command (USSOCOM)
- Senior Enlisted Medical Advisor, USSOCOM
- Command Surgeon for the Army Rangers
- Senior Medic for the Army Rangers
- 5 Trauma Directors for Level 1 Trauma Centers¹⁵



TCCC Updates 2003 and 2006

- HemCon and QuikClot
- Intraosseous infusion devices
- Combat Pill Pack
- Hypotensive resuscitation
with Hextend
- Moxifloxacin
- Hypothermia prevention
- Management of wounded hostile
combatants



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TCCC in the DOD

- SEALs and Rangers 1997
- Unit-based initiatives in Army and USMC – ongoing since 1997
- Army 91W School 2000
- USSOCOM 2005
- USAF PJ School 2005
- USMC ALMAR 2 Aug 06
- Coast Guard 221752Z Nov 2006
- BUMED 111622 Dec 2006

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CoTCCC (3)

- FY 03 – FY 06 funding from BUMED
- FY07 and FY08 - additional funding from Army Surgeon General
- Fall 07 – NMSC question: “Should CoTCCC be repositioned at a joint and/or higher location?”
- ASD/HA and JCS J4 brief - Oct 07
- 3 March 08 – CoTCCC relocated

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TCCC Realignment 28 March 2008

**From the Naval Operational Medicine
Institute**

To the Defense Health Board

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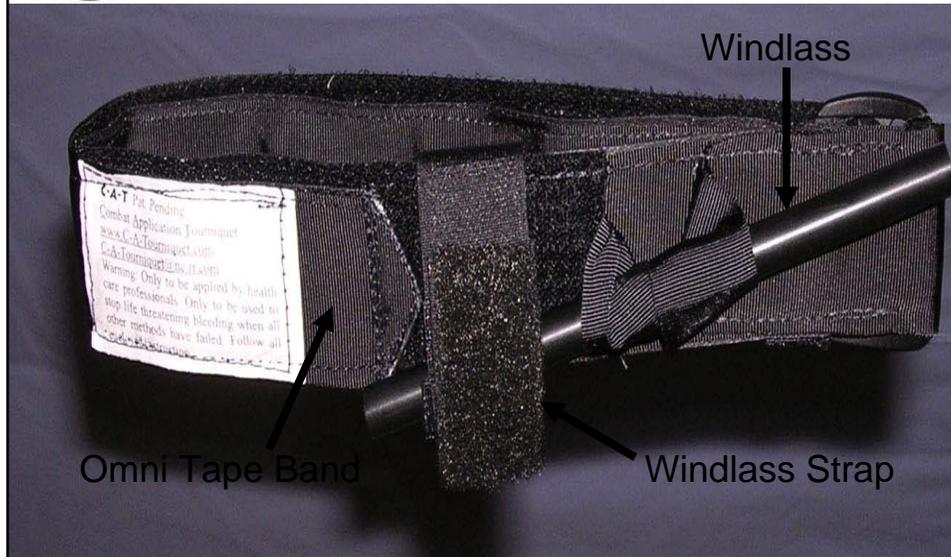
Tourniquets

The Evidence



Combat Application Tourniquet

6515-01-521-7976



Other Tourniquets

- SOF Tactical Tourniquet
- Emergency Military Tourniquet





SEAL Casualty Scenario Afghanistan – March 2003

- Toyota truck struck by RPG
- 3 casualties
- 1 with abdominal wounds - KIA
- 2 with severe lower extremity bleeding
- Tourniquets placed
- both survived



Tourniquets Tarpey 2005

"Tourniquets played a decisive role in quickly and effectively stopping hemorrhage under fire and keeping a number of soldiers with serious extremity wounds involving arterial bleeding alive until they could eventually undergo emergent surgery at the Forward Surgical Team."

AMEDD Journal 2005



Tourniquets Tarpey

"Given the intense conditions under which our medics treated casualties, it would have been absolutely impossible for them to have attempted to hold pressure over wounds while continuing to fight and treat other wounded."

AMEDD Journal 2005

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Tourniquets Lakstein 2003

- Israeli battlefield experience
- 91 tourniquet applications
- 94% success on arms
- 71% success on legs
- Complications: 5 cases of peripheral neuropathy noted
- "Strap and windlass" type superior to latex tourniquets

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Tourniquets – Kragh et al J Trauma 2008



- Combat Support Hospital in Baghdad
- 232 patients with tourniquets on 309 limbs
- Best were EMT (92%) and CAT (79%)
- No amputations from tourniquet use
- Approximately 3% transient nerve palsies

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The Way Ahead

- Implement TCCC into all service medic training NOW. Develop and implement for training requirement for physicians also
- Implement training for every soldier on CTM frequently – every soldier must be a “combat lifesaver” or we give victory to the enemy
- Seek outside assistance for training
 - TCCC 90 days from deployment will come train you
 - Multiple training courses available commercially for every skill level – some are free of charge



TCCC: Success in Combat 3rd Infantry Division

“The adoption and implementation of the principles of TCCC by the medical platoon of TF 1-15 IN in OIF 1 resulted in **overwhelming success**. Over 25 days of continuous combat with 32 friendly casualties, many of them serious, we had 0 KIAs and 0 Died From Wounds, while simultaneously caring for a significant number of Iraqi civilian and military casualties.”

CPT Michael Tarpey
Battalion Surgeon 1-15 IN
AMEDD Journal 2005

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TCCC: First Responder Feedback

- Madigan Army Medical Center TCCC training
- Training included classroom, scenarios, simulators, Live Tissue Training in lab and field
- 1317 combat medics deploying to OIF/OEF
- 140 medics polled after their return from one-year deployment in Iraq
- **99% indicated that the principles taught in the TCCC course helped with the management of injured casualties during their deployment**

*Sohn
Journal Surg Res 2006*

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TCCC: Success in Combat 101st Infantry Division

- **“By teaching and using these ideas, the 101st has accumulated one of the highest casualty survival rates in combat of any Army unit.”**
- “General Cody was so impressed with the TCCC course that he decided to expand the training from a single test schoolhouse to an Army-wide program.”

*John Gresham
The Year in Veteran's and Military Medicine 2005-2006*

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Lessons Learned from Modern Military Surgery

Alec C. Beekley, MD*, Benjamin W. Starnes, MD, James A. Sebesta, MD

US Army Medical Corps, Madigan Army Medical Center, 9040 Fitzsimmons Avenue, Fort Lewis, WA 98431, USA

The terrorist attacks of September 11, 2001 on the United States marked the beginning of the "Global War on Terror." The United States military responded with the first massive deployment of troops from all branches of service since the Persian Gulf War of 1991. Unlike that conflict, in which previous casualty estimates far exceeded the actual number of casualties...

- Beekley et al GWOT Lessons Learned paper
- 9 of 19 major items discussed were TCCC



Comparison of Statistics for Battle Casualties, 1941-2005 *Holcomb, et al J Trauma 2006*

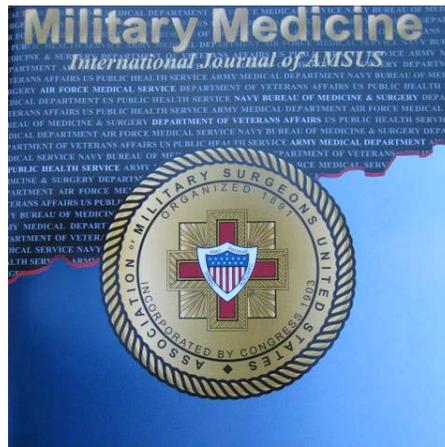
	World War II	Vietnam War	OIF/OEF
% CFR	19.1%	15.8%	9.4%



Why Are We Doing Better?

- Improved PPE
- **Tactical Combat Casualty Care**
- Faster evacuation time
- Better trained medics

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TCCC 2007

- Directed by BUMED
- All of U.S. military using TCCC
- Numerous reports of lives saved
- No conceptual deficiencies identified

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**Dr. Jeff Salomone
ACS COT Prehospital Chair**

“I am writing to offer my congratulations for the recent dramatic advances in prehospital trauma care delivered by the U.S. military. Multiple recent publications have shown that Tactical Combat Casualty Care is saving lives on the battlefield.”

*Letter to ASD Health Affairs
10 June 2008*

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**Mabry and McManus
AMEDD Center and School**

“The new concept of Tactical Combat Casualty Care has revolutionized the management of combat casualties in the prehospital tactical setting.”

*Critical Care Medicine
July 2008*

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TCCC New Guidelines 2008



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Comparison of New Hemostatic Agents with the Currently Deployed Products (HemCon and QuikClot) in a Lethal Model of Extremity Hemorrhage in Swine

Bijan S. Kheirabadi, Michael A. Dubick,
LTC Scot J. Estep, COL John B. Holcomb

TCCC meeting, April 1 2008



US Army Institute of Surgical Research

Hemorrhage Control Testing Hemostatic Agents in Injury Models

Trauma & Resuscitative Medicine Department, NMRC
Silver Spring, MD

Department of Surgery, USUHS
Bethesda, MD



	<i>QC ACS</i>	<i>HemCon</i>	<i>Celox</i>	<i>WoundStat</i>	<i>Combat Gauze</i>
Hemostatic efficacy	+	+	+++	++++	++++
Side effect	None	None	---	---	None
Ready to use	√	√	√	√	√
Training requirement	+	+	+	+++	++
Lightweight and durable	++	+++	+++	++	+++
2 yrs Shelf life	√	√	√	√	√
Stable in extreme condition	√	√	√	√	√
FDA approved	√	√	√	√	√
Biodegradable	No	No	Yes	No	No
Cost (\$)	~30	~75	~ 25	30-35	~25

USAISR



CoTCCC Recommendation April 2008

- **Combat Gauze as the first line hemostatic agent**
- **WoundStat carried as the backup for casualties in whom Combat Gauze has not worked or where a granular agent is felt to be a better option**

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Eye Trauma Management



**COTCCC Recommendation
April 2008**



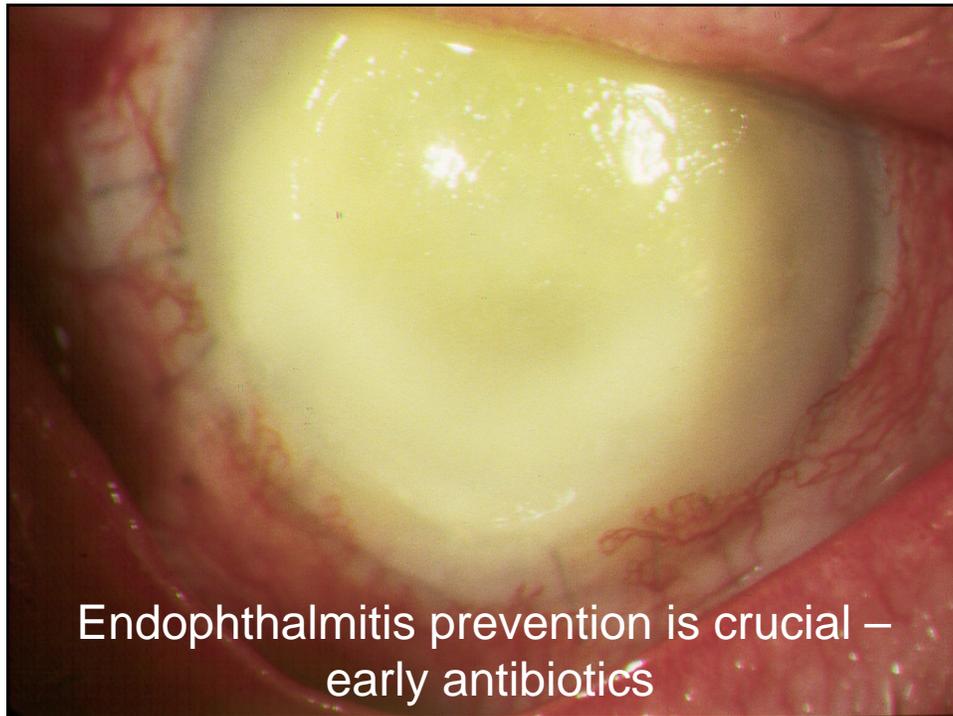
Eye Trauma Management

Tactical Field Care/CASEVAC Care

If a penetrating eye injury is suspected: 1) perform a rapid field test of visual acuity; 2) cover the eye with a rigid eye shield (NOT a pressure patch); and 3) ensure that the 400 mg moxifloxacin tablet in the combat pill pack is taken if possible and that IV/IM antibiotics are given if oral moxifloxacin cannot be taken.

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TCCC New Guidelines July 2008

Tourniquets

- Use a CoTCCC recommended tourniquet
- Use for ALL traumatic amputations
- Check the distal pulse in TFC if the distal extremity is intact
- Tighten first tourniquet or use a second tourniquet just proximal to eliminate distal pulse if present

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TCCC New Guidelines July 2008

Timing of Hemostatic Agent Use

- Recommended use of Combat Gauze and WoundStat moved to Tactical Field Care

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TCCC New Guidelines July 2008

Treatment of Tension Pneumothorax

- Indication: Progressive respiratory distress with known or suspected chest trauma
- Use a 3.25-inch, 14 gauge needle/catheter
- Entry point should not be medial to the nipple line
- Needle should be directed straight posterior – not towards the heart

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TCCC New Guidelines July 2008

Management of Sucking Chest Wounds

- All sucking chest wounds/open pneumothoraces should be treated by immediately covering the defect with an occlusive material
- Monitor the casualty for the possible subsequent development of a tension pneumothorax

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TCCC New Guidelines July 2008

TCCC Phases of Care Terminology

- Third phase of care is now “Tactical Evacuation Care”
- Includes BOTH Casualty Evacuation (CASEVAC) using combatant evac platforms of opportunity AND Medical Evacuation (MEDEVAC) using designated medical assets
- Both are used currently to evacuate casualties from the battlefield

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TCCC New Guidelines July 2008

Documentation of First Responder Care

- The last step in both TFC and TEC is to document the care rendered on the TCCC First Responder Card and forward it with the casualty to the next level of medical care
- The information on the card can then be used to begin the casualty's electronic medical record at the treating facility

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Questions?

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