

Tactical Combat Casualty Care



**Defense Health Board Update
9 March 2009
Frank Butler, MD**



Decision Brief

Proposed Action

ASD/HA endorsement of TCCC to services

- **Service Surgeons General**
 - Basis of combat trauma training
- **Service Line Leadership**
 - Include TCCC overview in entry, mid-level, and senior leadership courses
 - Train all combatants in at least the basic TCCC life-saving skills



Why TCCC?



Civilian Trauma Care Setting

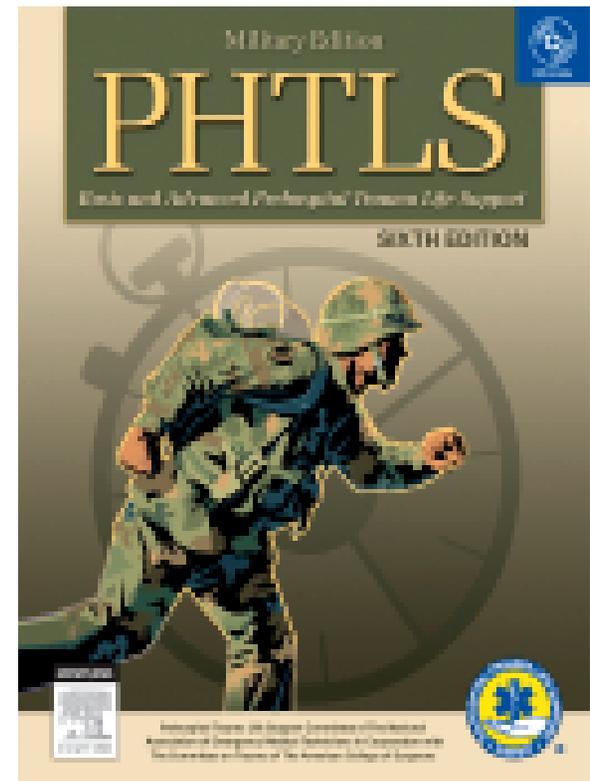
Tactical Trauma Care Setting





TCCC Brief History

- Original paper published 1996
- First used by Navy SEALs and Army Rangers in 1997
- Updates published in PHTLS manual since 1998
- ACS COT and NAEMT endorsement
- Now used throughout the U.S. military
- No defined change procedure





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**
- **Now part of DHB**



CoTCCC Members – Recent and Present

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



Comparison of Statistics for Battle Casualties, 1941-2005

Holcomb et al J Trauma 2006

The U.S. casualty survival rate in the GWOT is the best in our nation's history.

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

Note: CFR is the Case Fatality Rate – the percent of those wounded who die



Why Are We Doing Better?

- Improved Personal Protective Equipment
- **Tactical Combat Casualty Care**
- Faster evacuation time
- Better trained medics

Holcomb, Champion, et al J Trauma 2006



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



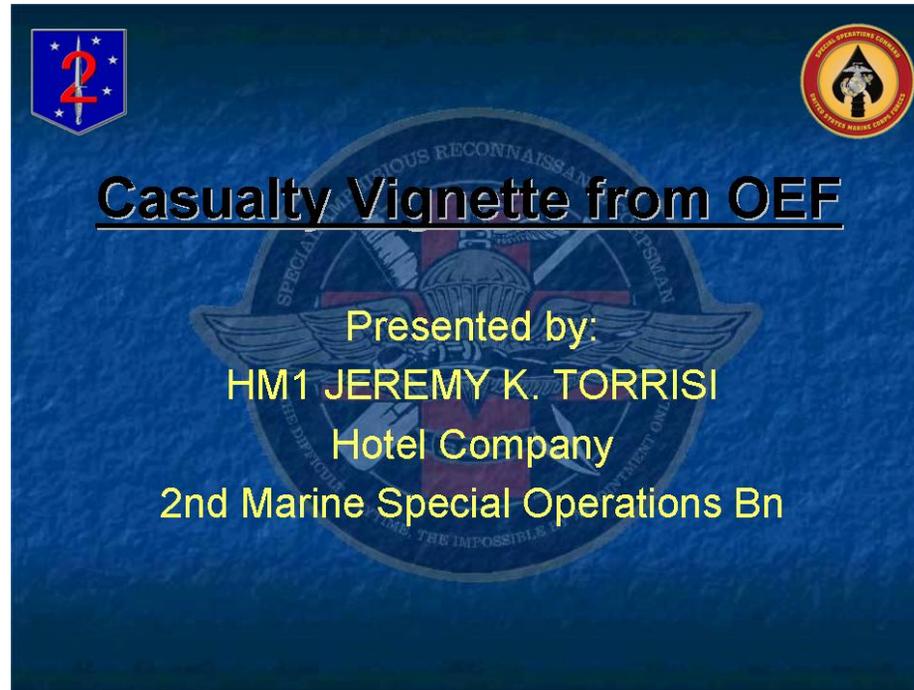
Tourniquets – Kragh et al Annals of Surgery 2009



- **Ibn Sina Hospital, Baghdad, 2006**
- **Tourniquets are saving lives on the battlefield**
- **31 lives saved in this study by applying tourniquets prehospital rather than in the ED**
- **Author estimates 2000 lives saved with tourniquets in this conflict (Extrapolation provided to MRMC)**



MARSOC Casualty Scenario 2008



- 15 casualties
- 4 tourniquets applied
- 3 lives saved
- 4th casualty died from chest wound



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



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



CoTCCC: 25-Meter Targets

- **2008/2009 updates to the guidelines**
- **TCCC Curriculum – Update Feb 09**
 - Now out and soon available on the internet
 - MHS website
 - USAISR website
 - DMRTI website
 - PHTLS website
- **Seventh Edition PHTLS Manual Input**



TCCC

New Guidelines 2008/9



No Hemostatics in Care Under Fire



TCCC

New Guidelines 2008/9



New Tourniquet Guidelines



New Tourniquet Guidelines

- Use a CoTCCC-recommended tourniquet
- Apply over the uniform in Care Under Fire – move to skin in Tactical Field Care
- Use for all traumatic amputations
- Tighten to eliminate distal pulse
- Use second tourniquet just proximal to the first if needed
- Expose and mark clearly the time of application





TCCC

New Guidelines 2008/9



New Hemostatic Agent



New Hemostatic Agent – Combat Gauze

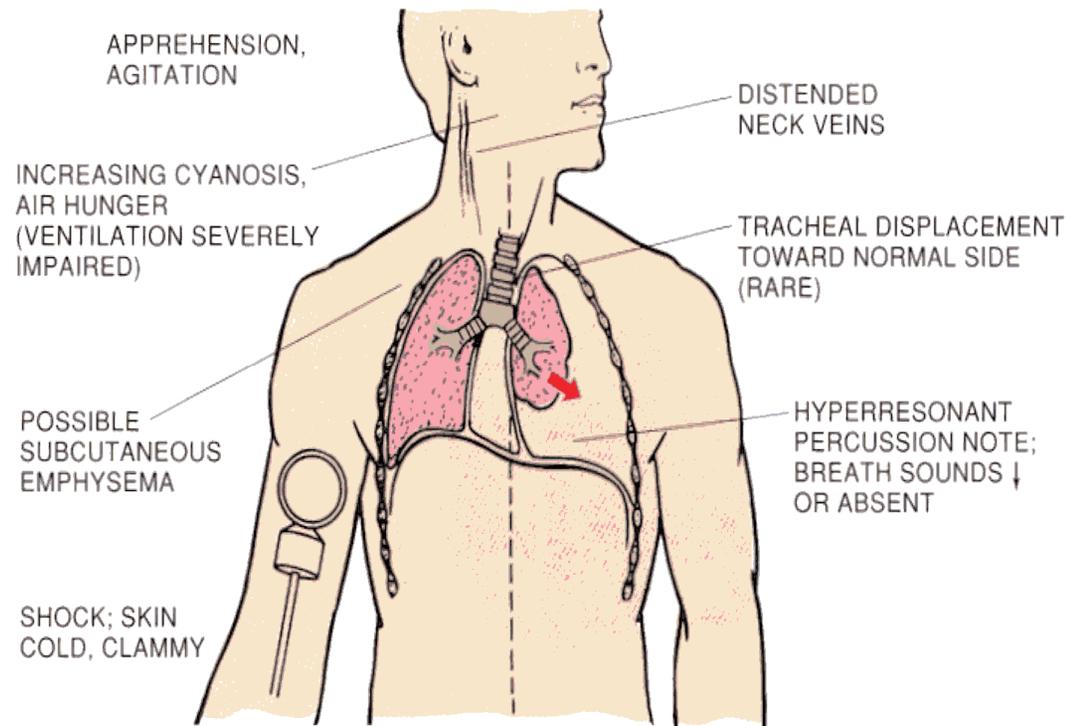
- Shown in lab studies to be more effective than the previous agents
- Both Army (USAISR) and Navy (NMRC) studies confirmed
- Medic preference for gauze agent and safety concerns with WoundStat





TCCC

New Guidelines 2008/9



Management of Tension Pneumothorax²¹



Tension Pneumothorax

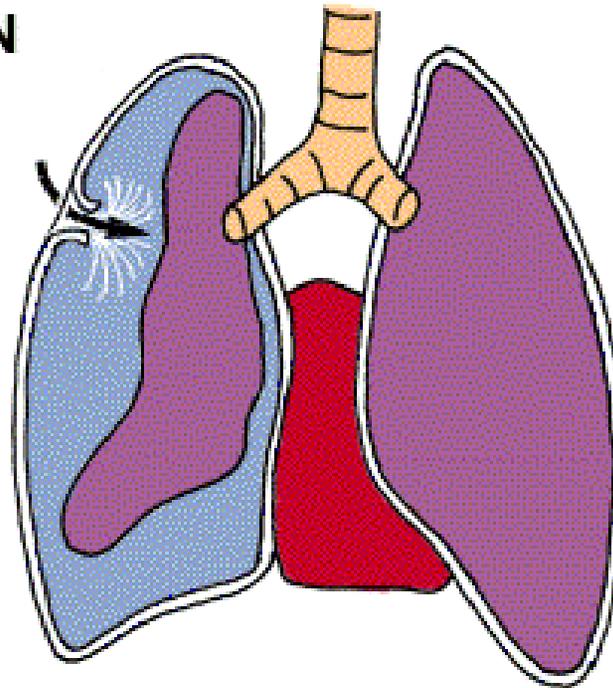
- **Torso trauma**
- **Progressive respiratory distress**
- **Use a 14 gauge, 3.25 inch needle**
- **Do not enter the chest medial to the nipple line**
- **Do not aim the needle towards the heart**



TCCC

New Guidelines 2008/9

OPEN



Management of Sucking Chest Wounds²³



Open Pneumothorax “Sucking Chest Wound”

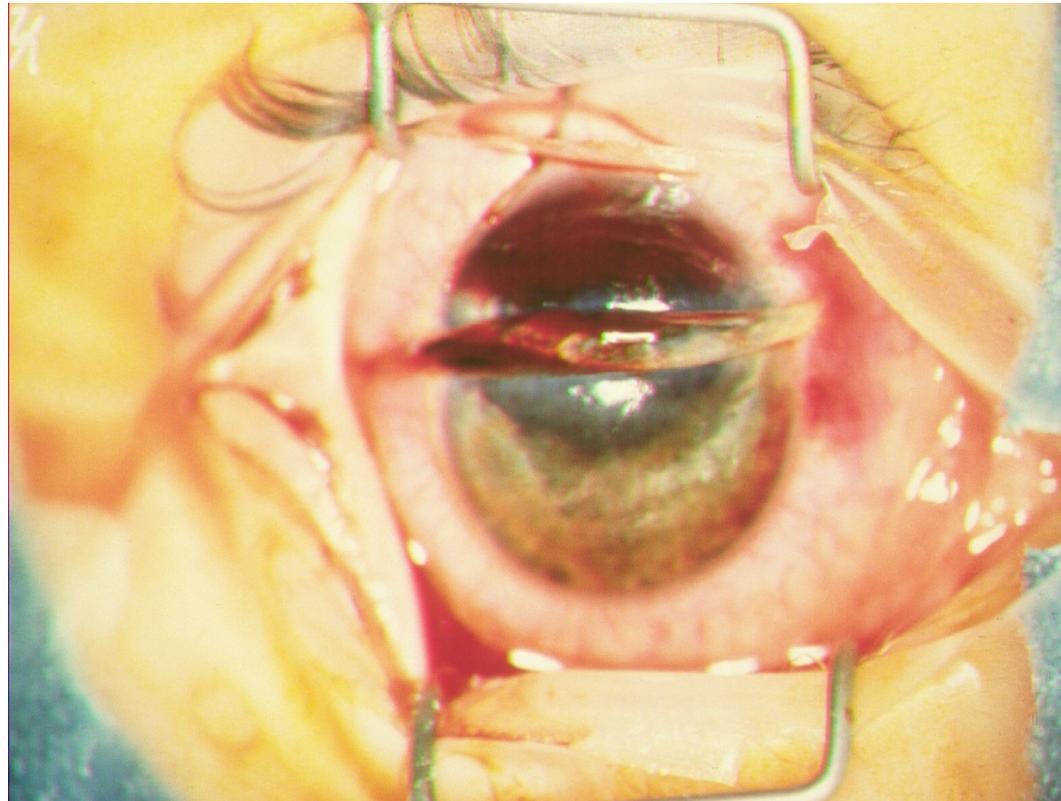
- Immediately apply an occlusive dressing to cover the defect
- No need to construct a three-sided dressing
- Monitor closely for development of a subsequent tension pneumothorax





TCCC

New Guidelines 2008/9



Mgt of Penetrating Eye Injuries



Penetrating Eye Injuries

- **Check vision**
- **Cover eye immediately with a rigid eye shield – NOT a pressure patch**
- **Have casualty take the moxifloxacin in his/her Combat Pill Pack**
- **IV/IM antibiotics if cannot take PO meds**





TCCC

New Guidelines 2008/9



Documentation of Care in TCCC



Documentation

- 30,000+ Wounded in Action in OEF/OIF
- Less than 10% have any form of pre-hospital documentation of care
- In only about 1% of cases is the information adequate

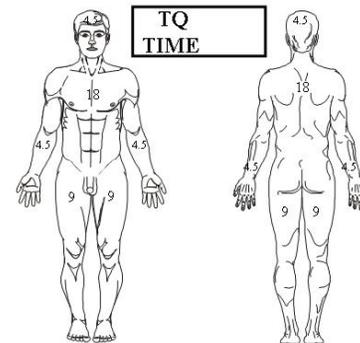
*TCCC First Responder Documentation
Conference 2007*



TCCC Casualty Card

- Designed by Ranger combat medics
- Used in combat since 2002
- Only essential information
- Heavy-duty waterproof or laminated paper
- Hospitals can transcribe into EMR
- Army SG considering

Name/ID: _____
 DTG: _____ ALLERGIES: _____
 Friendly Unknown NBC



A: Intact Adjunct Cric Intubated
B: Chest Seal NeedleD ChestTube
C: TQ Hemostatic Packed PressureDx
 IV IO

FLUIDS: NS / LR 500 1000 1500
 Hextend 500 1000

Other: _____
DRUGS (Type / Dose / Route):
 PAIN
 ABX
 OTHER

GSW BLAST MVA Other

TIME			
AVPU			
PULSE			
RESP			
BP			

Medic's Name _____



TCCC

New Guidelines 2008/9



Change Third Phase of Care to “Tactical Evacuation”



Evacuation Terminology



CASEVAC



MEDEVAC

Both types of evacuation are included in the new term “Tactical Evacuation”



Opportunities for Improvement

- **TCCC training for medical department personnel other than combat medical personnel**
 - Army is the exception – Feb 09 message
- **Better definition of TCCC change implementation process**
- **Combat leaders need to understand combat medicine**
- **All combatants on the battlefield should be trained in the basic TCCC lifesaving skills**
- **Better prehospital care documentation**



Fatalities with Potentially Survivable Wounds

Causes of Death in U.S. Special Operations Forces in the
Global War on Terrorism

2001–2004

John B. Holcomb, MD, Neil R. McMullin, MD,* Lisa Pearse, MD,† Jim Caruso, MD,†
Charles E. Wade, PhD,* Lynne Oetjen-Gerdes, MA,† Howard R. Champion, FRCS,‡
Mimi Lawnick, RN,* Warner Farr, MD,§ Sam Rodriguez, BS,§ and Frank K. Butler, MD||*

17%
(12/82)

rs

The Journal of TRAUMA® Injury, Infection, and Critical Care

**Injury Severity and Causes of Death From Operation Iraqi
Freedom and Operation Enduring Freedom: 2003–2004
Versus 2006**

*Joseph F. Kelly, MD, Amber E. Ritenour, MD, Daniel F. McLaughlin, MD, Karen A. Bagg, MS,
Amy N. Apodaca, MS, Craig T. Mallak, MD, Lisa Pearse, MD, Mary M. Lawnick, RN, BSN,
Howard R. Champion, MD, Charles E. Wade, PhD, and COL John B. Holcomb, MC*

Group 1
19%
(93/486)

Group 2
28%
(139/496)³³



2 Special Operations Units Experience with TCCC

- **Kotwal – TCCC First Responders Conf 9/08**
 - 75th Ranger Regiment
 - 482 casualties – 37 fatalities
- **Pennardt – CoTCCC meeting 2/09**
 - Army Special Forces unit
 - 201 casualties – 12 fatalities
- **Neither unit identified any preventable deaths**
- **Both units train all combatants in TCCC** 34



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Questions?





Backup Slides



Tension Pneumothorax Prehosp Emerg Care 2009

NEEDLE THORACOSTOMY FOR TENSION PNEUMOTHORAX: FAILURE PREDICTED BY CHEST COMPUTED TOMOGRAPHY

Robert L. Stevens, MD, Angel A. Rochester, MD, Jonathan Busko, MD, Thomas Blackwell, MD,
Daniel Schwartz, MD, Anne Argenta, BS, Ronald F. Sing, DO

- 110 patients studied by CT
- Mean chest wall thickness 4.5 cm on right
- Standard 4.4 cm catheter likely to be unsuccessful in 50% of trauma patients



Tension Pneumothorax Prehosp Emerg Care 2009

NEEDLE VERSUS TUBE THORACOSTOMY IN A SWINE MODEL OF TRAUMATIC TENSION HEMOPNEUMOTHORAX

John B. Holcomb, MD, John G. McManus, MD, MCR, S. T. Kerr, MD, Anthony E. Pusateri, PhD

- Swine model of tension pneumothorax – 100% lethal in controls
- Chest tube vs 14-ga needle vs Cook catheter
- 100% survival in both chest tube and needle decompression animals



Tension Pneumothorax Military Medicine 2008

MILITARY MEDICINE, 172, 12:000, 2007

Chest Wall Thickness in Military Personnel: Implications for Needle Thoracentesis in Tension Pneumothorax

Guarantor: COL H. Theodore Harcke, MC USA

Contributors: COL H. Theodore Harcke, MC USA*+§; LCDR Lisa A. Pearse, MC USN‡;
COL Angela D. Levy, MC USA§; John M. Getz, BS‡; CAPT Stephen R. Robinson, MC USN‡

- 100 virtual autopsies
- Mean chest wall thickness was 4.86 cm
- Several NT failures seen at autopsy with 5 cm catheters – predicted success rate 50%
- 8 cm catheter would have reached the pleural space in 99% of subjects



Needle Decompression

J Am Coll Surg 2008

An Evaluation of Tactical Combat Casualty Care Interventions in a Combat Environment

Maj Homer C Tien, MD, MSc, FRCSC, Vincent Jung, Sandro B Rizoli, MD, PhD, FRCSC, FACS,
Maj Sanjay V Acharya, MD, FRCPC, LCdr John C MacDonald, MD, FRCPC

- 134 consecutive trauma patients at Afghanistan MTF
- Seven needle decompression performed
- All seven decompressions performed at least 2 cm medial to MCL – no major complications noted
- Recommended using nipple line as landmark – don't enter the chest medial to this line

Hemostatic Agent Comparison

	QC ACS	HemCon	Celox	WoundStat	Combat Gauze
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

Courtesy Dr. Bijan Kheirabadi

USAISR



WoundStat Safety Issues

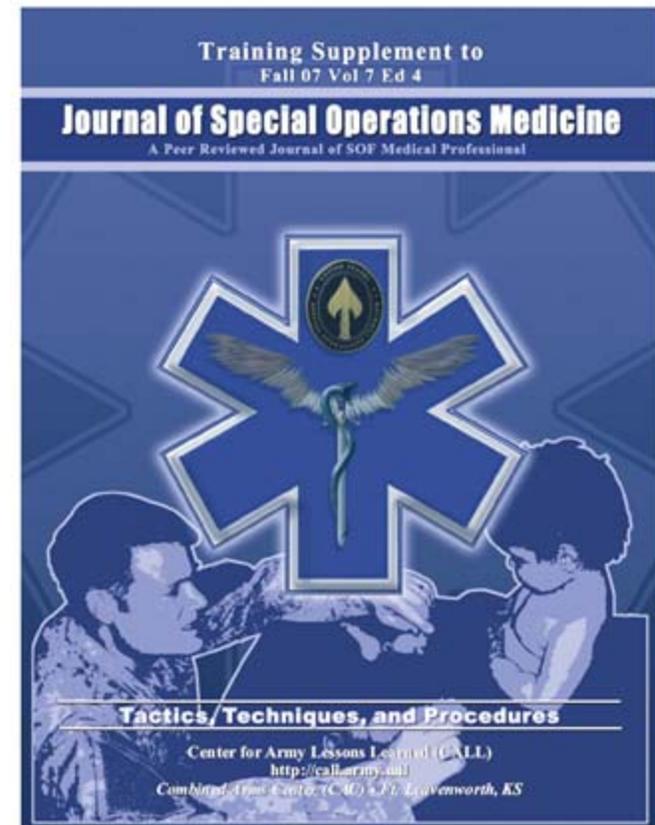
- Dr Bijan Kheirabadi USAISR
- Safety aspects of WoundStat and Combat Gauze
- WoundStat treatment of injured vessels - occlusive thrombi in carotid arteries (7 of 8) and jugular veins (6 of 8)
- WoundStat residues and emboli in the lungs of two animals
- Combat Gauze animals were not observed to have either of these complications





TCCC Casualty Card Current Actions

- DOD/HA asked CoTCCC to review current front line documentation practices
- Review meeting conducted Aug 07 with 60+ medics/corpsman
- Draft TCCC Card initiated
- Published in CALL/JSOM
- Published in new TCCC guidelines and currently under review by component surgeon generals & DOD/HA
- Pending OTSG approval as the directed Army Casualty Card





Current Doctrinal Field Documentation Methods

- **DD 1380 Field Medical Card (wire attachment)**
 - DOD-wide standard and NATO STANAG accepted
 - Difficult to record data on small lines with only ink pen (mostly written out information)
 - Information recorded not necessarily what is needed in patient treatment
- **BMIST (Battlefield Medical Information System – Tactical) Hand-held Units**
 - Not tactically sound, but is good for the field environment
 - Requires charging and has been known to crash
- Other local unit-driven paper products such as SF600, Run Sheets, etc...



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 firefight 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, corpsmen, and PJs 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



TCCC Realignment 28 March 2008

**From the Naval Operational Medicine
Institute**

To the Defense Health Board



DHB Organization



Robert M. Gates
Defense Secretary



David S. C. Chu
Under Secretary of Defense for
Personnel and Readiness

**FACA
Committee
Management
Official**
Mr. Frank M. Wilson



Adam M. Robinson,
Jr.
Navy Surgeon
General
Vice Admiral



James G. Rousebush
Air Force Surgeon General
Lieutenant General



Eric B. Schoomaker
Army Surgeon General
Lieutenant General



Dr. S. Ward Casscells
Assistant Secretary of
Defense
for Health Affairs

**Designated Federal
Official**



Ms. Ellen P. Embrey
Deputy Assistant Secretary of Defense for
Force Health Protection and Readiness and
Director, Deployment Health Support

Operations

Defense Health Board

Support & Administration



DHB Realignment Goal

Top Cover with minimal interference!!!