

# Battlefield Trauma Care Proposed RDT&E Priorities



Defense Health Board  
25 June 2012



## Battlefield Trauma Care: Then

“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, or two percent of the 2600.”

*CAPT J.S. Maughon  
Mil Med 1970*

2



## Battlefield Trauma Care: Then

“One orthopedic surgeon expressed his opinion... felt that the release of tourniquets, either purposely or inadvertently, or their improper application initially, had definitely contributed to exsanguination in some cases. Others discussed airway control or bandage application. Regardless 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*

3



## Battlefield Trauma Care: Then (2001)

- Medics taught NOT to use tourniquets
- No hemostatic agents
- Large volume crystalloid fluid resuscitation for shock
- 2 large bore IVs on all casualties with significant trauma
- Civil War-vintage medication for battlefield analgesia (IM morphine)
- No focus on prevention of trauma-related coagulopathy
- No tactical context for care rendered
- Aggressive spinal immobilization for all neck and back trauma – including penetrating

4



## Battlefield Trauma Care: Now

- Phased care in TCCC
- Aggressive use of tourniquets
- Combat Gauze as hemostatic agent
- Aggressive needle thoracostomy
- Sit up and lean forward airway positioning
- Surgical airways for maxillofacial trauma
- Hypotensive resuscitation with Hextend
- IVs only when needed/IO access if required
- OTFC, IV morphine, and ketamine for battlefield analgesia
- Hypothermia prevention; avoid NSAIDs
- Battlefield antibiotics
- Tranexamic acid
- Combat Ready Clamp



## Evidence-Based Battlefield Trauma Care

- **Requires evidence!**
- **It does not matter how good the answers are if the questions are wrong.**
- **Need the right studies with the proper research design**



## Battlefield Trauma Care RDT&E Priorities

\* **New Recommendations in red text**

### Non-Compressible Hemorrhage Control

- Follow-Up Tranexamic Acid Studies
- **Critical Plasma Components for Treatment of Non-Compressible Hemorrhage (with supporting studies)**

7



## The Combat IV



- **Iconic battlefield Intervention**
- **Water for Blood: A Bad Trade**
- **STOP THE BLEEDING!**



## Battlefield Trauma Care RDT&E Priorities

### Tactical Damage Control and Hypotensive Resuscitation Studies

- **French** and German Freeze-Dried Plasma Experience
- Prospective Studies Using FDA-Approved Plasma Alone as the Prehospital Resuscitation Fluid in Patients with Non-Compressible Hemorrhage
- Medical Emergency Response Team 1:1 Packed Red Blood Cells:Plasma Experience
- **FDA-approved U.S. Manufactured FDP Product**
- **Oxygen-Carrying Resuscitation Fluids**

9



## Battlefield Trauma Care RDT&E Priorities

**Whole Blood Substitute for Resuscitation  
from Hemorrhagic Shock**

10



## Battlefield Trauma Care RDT&E Priorities

### Improved Battlefield Analgesia

- Opioid Analgesia and Mortality Studies
- Combat Trauma Analgesia and PTSD
- Transdermal Lidocaine for Combat Injuries

11



## Battlefield Trauma Care RDT&E Priorities

### Prehospital Care Documentation and Databasing

- Unit-Based Prehospital Trauma Registries
- Voice-Activated Medical Recording Devices

12



## Battlefield Trauma Care RDT&E Priorities

### TCCC Training Technology and Methods

- Enhanced Electronic TCCC Training
- Improved TCCC Training Metrics
- **Optimized Training Methods for Essential TCCC Skills**
- **Optimized Simulation Devices for Essential TCCC Skills**

13



## Battlefield Trauma Care RDT&E Priorities

**Junctional Pressure Devices  
(with supporting studies)**



**Abdominal Aortic Tourniquet  
(with supporting studies)**



14



## Battlefield Trauma Care RDT&E Priorities

Use and Outcomes Analysis for Individual  
Elements of TCCC

15



## Battlefield Trauma Care RDT&E Priorities

### Combat Casualty Care Monitoring

- Monitor-Driven Prehospital Fluid Resuscitation
- Tissue Oxygenation Monitoring in Combat Casualties
- End-Tidal CO<sub>2</sub> or Non-invasive PaCO<sub>2</sub> Monitors (with supporting studies) for Casualties Requiring Advanced Airways
- Monitors with Trend Lines for Prehospital Care Documentation (with supporting studies)

16



## Battlefield Trauma Care RDT&E Priorities

### Hemostatic Dressing Studies

- Comparison Testing of Celox Gauze, Combat Gauze, CitoGauze, and **MRDH**
- **Multiple Fragmentation Wound Hemostatic Agent with Supporting Studies**
- **Hemostatic Dressings for Large Battlefield Soft Tissue Injuries with Supporting Studies**
- **Negative Pressure Hemostatic Dressing System with Supporting Studies**
- **Hemostatic Strategies and Agents for Coagulopathic Casualties**

17



## Battlefield Trauma Care RDT&E Priorities

**Comparison Testing of New Tourniquets**

18



## Battlefield Trauma Care RDT&E Priorities

### Battlefield Airway Management

- Improved Surgical Airway Technology
- Improved Surgical Airway Training Methods
- Optimized Airway Devices for Trauma

19



## Battlefield Trauma Care RDT&E Priorities

### Preventable Death Analyses in Combat Fatalities

- Clinicopathological Review of Every U.S. Combat fatality in Iraq and Afghanistan
- Preventable Death Analyses from Combat Units

20



## **Battlefield Trauma Care RDT&E Priorities**

### **Optimal Management of Traumatic Brain Injury in TCCC**

- **Strategies for Lowering Intracranial Pressure during Prehospital Care**
- **Optimal Fluid Resuscitation for Casualties with TBI and Shock**

21



## **Battlefield Trauma Care RDT&E Priorities**

**Impact of TACEVAC Provider Level and  
Skill Sets on Survival**

**Hypothermia Prevention Equipment  
Comparative Studies**

22



# Battlefield Trauma Care RDT&E Priorities

## Combat Medic/Corpsman/PJ Combat TCCC Equipment Evaluations

23

28. The chest seal(s) I used was/were effective at sealing the sucking chest wound (Note: Only rate items you used and leave rating blank for items not used)

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Rating Average	Response Count
Halo	0.0% (0)	0.0% (0)	2.6% (1)	23.1% (9)	<b>74.4%</b> (29)	4.72	39
Hyfin	1.7% (1)	3.4% (2)	5.1% (3)	<b>45.8%</b> (27)	44.1% (26)	4.27	59
H+H	20.0% (1)	20.0% (1)	0.0% (0)	20.0% (1)	<b>40.0%</b> (2)	3.40	5
Asherman	17.0% (16)	<b>29.8%</b> (28)	17.0% (16)	28.7% (27)	7.4% (7)	2.80	94
Bolin	5.6% (3)	9.3% (5)	16.7% (9)	<b>40.7%</b> (22)	27.8% (15)	3.76	54
Other (List in comment box)	0.0% (0)	3.8% (1)	19.2% (5)	34.6% (9)	<b>42.3%</b> (11)	4.15	26
Comments: (Ease of use, adhesion, specific problems, performance in cold/heat/rain/sand, etc.) Specify items in your comments.							87



# Battlefield Trauma Care RDT&E Priorities

## Focused Analysis of Specific TCCC Interventions

### An Analysis of Battlefield Cricothyrotomy in Iraq and Afghanistan

Robert L Mabry, MD; Alan Frankfurt, MD



### 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**

79



# Battlefield Trauma Care RDT&E Priorities

## Veres Needle for Needle Thoracostomy



## Improved Tactical Suction Devices With Supporting Studies

26



## **Battlefield Trauma Care RDT&E Priorities**

**Spinal Cord Protection for Casualties with  
Suspected Spinal Injury in Tactical Settings**

**Enhanced Pelvic Protection in Personal  
Protective Equipment**

27



## **Battlefield Trauma Care RDT&E Priorities**

**Comparative Chest Seal Studies**

**Medic Resiliency Studies**

28



## **Battlefield Trauma Care RDT&E Priorities**

**Prehospital Strategies to Lower the  
Incidence of Extremity Osteomyelitis**

**The Effect of Gender on Survival in  
Combat Casualties**

29



## **Battlefield Trauma Care RDT&E Priorities**

**TCCC Curriculum Translations for  
Partner Nations**

**Field Handheld Diagnostic Imaging  
Capabilities**

30



## Battlefield Trauma Care RDT&E Priorities

- Recommended by CoTCCC
- Unanimously recommended for approval with modifications by the Trauma and Injury Subcommittee on 2 May 2012
- *The past decade of war has seen unprecedented advances in battlefield trauma care. Military medical RDT&E has been key to these advances. It is essential to preserve the momentum during the peace interval.*

31



## Questions?



32