WELCOME
PreHospital Evidence-Based Guidelines

- Pain management for trauma
- Control of pediatric seizures
- Helicopter transport of injured patients
Evidence-Based Prehospital Guideline for External Hemorrhage Control: American College of Surgeons Committee on Trauma
Why does EMS Need Evidence-Based Guidelines for Prehospital Care?

- Peter Taillac, MD, FACEP
- Clinical Professor
- University of Utah Division of Emergency Medicine
- Utah State EMS Medical Director
In 2006, the Institute of Medicine called for the development of evidence-based prehospital care protocols.
Evidence-Based Guidelines

FICEMS Strategic Plan Objective:

Support the development, implementation, and evaluation of evidence-based guidelines (EBGs) according to the National Prehospital EBG Model Process
Why do we need prehospital EBGs?

• Best possible patient care
• Minimize care variability
• Patient safety
• Decreased Liability
• Improve prehospital research
• Enhance performance improvement
Current State of Protocols

• Care provided according to agency protocols and standing orders

• Who makes up the prehospital protocols that you currently use?
  • State EMS Office
  • Regional Committees
  • Your medical director
Current State of EMS Protocols

• Are your protocols up-to-date?
• Do they reflect the current best evidence or are they based on:
  • the old protocols
  • Your medical director’s opinion/training/habits/preferences
Problems with EBGs

• Evidence

• Implementation

• Review & Update
Current Prehospital EBGs

- Pediatric seizure management
- Pain control in trauma
- Helicopter EMS utilization
- External hemorrhage control
- Pediatric respiratory distress (not yet published but publically available)
- More in the pipeline…
Richard Hunt, M.D., FACEP

Director for Medical Preparedness Policy
National Security Council Staff
The White House
Military Experience

"...if efforts are successful, the current war will be the first from which detailed analyses of epidemiology, severity of injury, trauma care and outcomes can be used to, guide research resources for CCC."
Military Experience

• Department of Defense Trauma Registry is the largest repository of injury & injury management information in history

• Information entered concurrent or near-concurrent on all injured US service personnel who arrive at treatment facility in Afghanistan or Iraq to be treated

• For the majority of the wars studies on wounding patterns and survival were based on this registry (then called the Joint Theater Trauma Registry or JTTR)
The Epidemiology of Vascular Injury in the Wars in Iraq and Afghanistan

Joseph M. White, MD*, Adam Stannard, MRCS*,†, Gabriel E. Burkhardt, MD*, Brian J. Eatridge, MD*, Lorne H. Blackbourne, MD*, and Todd E. Rasmussen, MD*†

Epidemiologic Research

Rate of Wartime Vascular Injury

# Epidemiologic Research

## Noncompressible Torso Hemorrhage

A Review with Contemporary Definitions and Management Strategies

*Surg Clin N Am 92 (2012) 843–858*

Jonathan J. Morrison, MB, ChB, MRCS\(^a,b\),
Todd E. Rasmussen, MD\(^b,c,d,*\)

<table>
<thead>
<tr>
<th>Noncompressible torso hemorrhage (NCTH)</th>
<th>Hemodynamic/Procedural Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anatomic Criteria</strong></td>
<td></td>
</tr>
<tr>
<td>1. Thoracic cavity (including lung)</td>
<td></td>
</tr>
<tr>
<td>2. Solid organ injury (\geq) grade 4 (liver, kidney, spleen)</td>
<td>Hemorrhagic shock(^a); or need for immediate operation</td>
</tr>
<tr>
<td>3. Named axial torso vessel</td>
<td></td>
</tr>
<tr>
<td>4. Pelvic fracture with ring disruption</td>
<td></td>
</tr>
</tbody>
</table>
Military Experience

• Although highly valuable in discerning information on the prevalence of certain injury patterns & the commonality & effectiveness of injury management strategies, this method of study had major limitation....

• For example, from this type of study the survival of US service personnel was widely touted as 95-98%

• Sounds pretty good, what’s wrong with that?
Military Experience

• In studying only those who made it to a surgical hospital, epidemiologic studies using DoDTR (JTTR) studied only this

• But what about this?

• In other words what is happening (what is cause of mortality) in patients who didn’t survive to be treated?
Hidden Burden of Mortality

• True burden of mortality from combat injury not recognized until epidemiologic study included medical examiner’s office (AFME)

• Cause of death in those who did not survive to be treated at deployed surgical facility
Hidden Burden of Mortality

- Cause of death in those not surviving to treatment

Epidemiologic Study

Death on the battlefield (2001–2011): Implications for the future of combat casualty care

Brian J. Eastridge, MD, Robert L. Mabry, MD, Peter Seguin, MD, Joyce Cantrell, MD, Terrill Tops, MD, Paul Uribe, MD, Olga Mallett, Tamara Zubko, Lynne Oetjen-Gerdes, Todd E. Rasmussen, MD, Frank K. Butler, MD, Russell S. Kotwal, MD, John B. Holcomb, MD, Charles Wade, PhD, Howard Champion, MD, Mimi Lawnick, Leon Moores, MD, and Lorne H. Blackbourne, MD

J Trauma Acute Care Surg 2012;73(Suppl1):S431-S437

• Second and larger study of causes of death on the battlefield partnering with medical examiner’s office (AFME)
Epidemiologic Study

![Graph showing the comparison between Nonsurvivable and Potentially Survivable cases with 3,040 and 976 respectively.]

*J Trauma Acute Care Surg* 2012;73(Suppl1):S431-S437
Epidemiologic Study

- Of those with potentially survivable injuries
Mitigating Preventable Death

Survival With Emergency Tourniquet Use to Stop Bleeding in Major Limb Trauma

COL John F. Kragh, Jr., MC, USA,* Thomas J. Walters, PhD,* David G. Baer, PhD,* LTC Charles J. Fox, MC, USA; Charles E. Wade, PhD,* Jose Salinas, PhD,* and COL John B. Holcomb, MC, USA*

Ann Surg 2009;249:1

Emergency Military Tourniquet (EMT™)

Combat Application Tourniquet (C-A-T®)
Mitigating Preventable Death

**Review Article**

Battlefield trauma care then and now: A decade of Tactical Combat Casualty Care

Frank K. Butler, Jr., MD, CAPT, MC, USN (Ret) and Lorne H. Blackbourne, MD, COL, MC, USA


- All US combat medics, corpsmen and pararescuemen are taught battlefield care techniques based on TCCC guidelines
- Pre-Hospital Trauma Life Support (PHTLS)
Mitigating Preventable Death

Reduced KIA (5.7%) & DOW (4.1%) rates

No preventable deaths

Non-medical personnel

Conclusions: A command-directed casualty response system that trains all personnel in Tactical Combat Casualty Care and receives continuous feedback from prehospital trauma registry data facilitated Tactical Combat Casualty Care performance improvements centered on clinical outcomes that resulted in unprecedented reduction of killed-in-action deaths, casualties who died of wounds, and preventable combat death. This data-driven approach is the model for improving prehospital trauma care and casualty outcomes on the battlefield and has considerable implications for civilian trauma systems.

Implications of Combat Casualty Care for Mass Casualty Events

Violence from explosives and firearms results in mass casualty events in which the injured have multiple penetrating and soft tissue injuries. Events such as those in Boston, Massachusetts; Newtown, Connecticut; and Aurora, Colorado, as well as those in other locations, such as Europe and the Middle East, demonstrate that civilian trauma may at times resemble that seen in a combat setting. As the civilian sector prepares for and responds to these casualty scenarios, research and trauma practices that have emerged from the wars in Afghanistan and Iraq provide a valuable foundation for responding to civilian mass casualty events. Several lessons learned by the US military were implemented during the response to the bombings in Boston in April of this year.

Military research has found that approximately 25% of persons who die as a result of explosive or gunshot wounds have potentially survivable wounds.1 These individuals have injuries that are not immediately or necessarily lethal and have a chance to survive if appropriate care is rendered in a timely fashion. The military has learned that implementation of evidence-based, clinical practice guidelines can reduce potentially preventable death.2 Certain aspects of these lessons also apply to multiple casualty scenarios in civilian settings.

Care During Transport
Evacuation is the next step in the continuum. Findings from military research have shown improved survival associated with the use of more advanced en route care capability. Mabry et al3 demonstrated a 66% reduction in mortality among patients evacuated by critical care flight paramedic teams (16 deaths among 202 patients) compared with casualties transported by basic emergency medical technicians (71 deaths among 469 patients). The survival benefit was attributed to higher levels of training and experience among flight paramedics. Morrison et al4 extended these observations in a study of injured military personnel evacuated by the United Kingdom’s physician-led platform (aircraft or airframe used to transport patients) referred to as the medical emergency response team-extended (MERT-E). In this report, there was a 33% reduction in mortality in the
Translation to Civilian Trauma

Emergency tourniquets, war lessons saved lives in Boston
Janice Lloyd, USA TODAY 2:05 p.m. EDT April 18, 2013
Translation to Civilian Trauma

Return of the Tourniquet: What we learned from war saved lives in Boston
Lydia DePillis
April 17, 2013

From Baghdad to Boston: War Lessons on Amputations Help Blast Victims Walk Again
Tara Haelle, April 16th, 2013
Translation to Civilian Trauma

Improving Survival from Active Shooter Events: The Hartford Consensus Committee to Create National Policy to Enhance Survivability From Mass Casualty Shooting Events
Hartford, CT April 2, 2013
Jacobs L., McSwain N., Rotondo M., Wade D., Fabbri W., Eastman A, Butler F., Sinclair J.
Translation to Civilian Trauma

An analysis of prehospital deaths: Who can we save?

James S. Davis, MD, Shevonne S. Satahoo, MD, Frank K. Butler, MD, Harrison Dermer, Daniel Naranjo, MD, Katherina Julien, Robert M. Van Haren, MD, MSPH, Nicholas Namias, MD, MBA, Lorne H. Blackbourne, MD, and Carl I. Schulman, MD, PhD, MSPH, Miami, Florida

More than 1 in 5 civilian trauma deaths had potentially survivable injuries – chest injuries & death from hemorrhage were predominate & suggest targets for future research & implementation of novel prehospital interventions…
Conclusions

• Study of the large burden of injury during the wars in Afghanistan and Iraq has defined causes of mortality from penetrating injury (explosive & gunshot wounds)

• Those who survive to be treated at a hospital have greater than 90% survival; but a percentage (20-30%) of deaths at the scene may be preventable with guidelines that advocate for sensible medical measures (i.e. stop bleeding) in combination with tactical considerations

• By instituting such guidelines & protocols, the military is reducing potentially preventable death; elements of this experience stand to save lives in civilian setting
EBG: External Hemorrhage Control in the Prehospital Setting

Purpose
To develop an evidence-based guideline for civilian prehospital management of external hemorrhage using a systematic literature review and the GRADE methodology.
EBG Guideline Development
EBG Guideline Development

• Expert Panel April 2013
• Define key systematic literature review
• Expert panel discuss literature review and apply GRADE methodology
• Manuscript drafted and submitted to Prehospital Emergency Care
Expert Panel

- Michael J. Betzner, MD
  - Flight service director
- Eileen M. Bulger, MD
  - Chair ACS-COT EMS Committee
- Frank Butler, MD
  - US military physician
- Drew Dawson & Cathy Gotschall
  - NHTSA Office of EMS
- Mary Fallat, MD
  - Pediatric Surgery
- Jay Johannigman, MD
  - US military physician
- Christopher Kahn
  - Local EMS medical director
- Eddy Lang, MD
  - GRADE methodology expert
  - Emergency physician
- Norman McSwain, MD
  - Trauma surgeon, ACS-COT
- Jeffrey Salamone, MD, NREMT
  - Trauma surgeon
- Karen Schoelless, MD & David Snyder, PhD
  - ECRI Institute
- Nels Sanddal, PhD
  - ACS-COT
- Peter Taillac, MD
  - Utah EMS Medical Director
- Lynn White
  - EMS researcher
- Det. Scott Harding, NREMT-P
  - Paramedic
What is the GRADE methodology?

- Grading of Recommendations Assessment, Development and Evaluation methodology

- Consistent with the National Prehospital Evidence-based Guideline model approved by FICEMS and the National EMS Advisory Council
Systematic Literature Review

- Inclusion: studies of traumatic hemorrhage treated by EMS personnel in the prehospital setting with tourniquets and/or hemostatic dressings currently available on the US market.
- Animal studies also reviewed for hemostatic agents
- Meta-analysis performed when feasible
- 1,598 citations reviewed
  - 27 clinical studies met inclusion criteria
  - 38 animal model studies also reviewed
- Available at www.ems.gov
Summary of Recommendations

• We recommend the use of tourniquets in the prehospital setting for the control of significant extremity hemorrhage if direct pressure is ineffective or impractical.
  • Strong Recommendation
  • Moderate quality of evidence, upgraded based on large effect size
Additional Recommendations: Tourniquets

- Commercially produced windlass, pneumatic, or ratcheting devices
- Not recommended: narrow, elastic, or bungee-type devices
- Improvised tourniquets only if commercial device unavailable
- Tourniquet release only at definitive care
Additional Recommendations

• Topical Hemostatic Agents
  • In combination with direct pressure
  • Gauze format that supports wound packing.
  • Only products determined effective

• Junctional Hemorrhage Device
Recommendations for Implementation & Training

• Clinical Guidelines & Training
• Proper wound packing and pressure application techniques.
• Include all prehospital personnel, including emergency medical responders
Prehospital External Hemorrhage Control Protocol

Apply direct pressure/pressure dressing to injury

Direct pressure effective (hemorrhage controlled)
Direct pressure ineffective or impractical (hemorrhage not controlled)

Wound amenable to tourniquet placement (e.g. extremity injury)
Wound not amenable to tourniquet placement (e.g. junctional injury)

Apply a tourniquet*
Apply a topical hemostatic agent with direct pressure#

*Use of a tourniquet should be performed by trained personnel only.

#Direct pressure should be continued until definitive hemostasis is achieved.

###Notes:
- Always consider the patient’s overall medical condition and the environment before applying tourniquets.
- Tourniquets should only be used when other methods of hemorrhage control have failed or are impractical.
- Properly trained personnel should apply and remove tourniquets.
- Direct pressure should be applied for at least 5 minutes and then reassessed for hemostasis before removal.
- Monitor the patient closely for signs of hypotension and restore invasive monitoring if available.
Implementation of Tourniquets in an EMS Agency

Scott Youngquist, MD, MS
Medical Director
Salt Lake City Fire Department
LET'S HEAR YOUR QUESTIONS & COMMENTS