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Hosted by NHTSA's Office of EMS

WELCOME



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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

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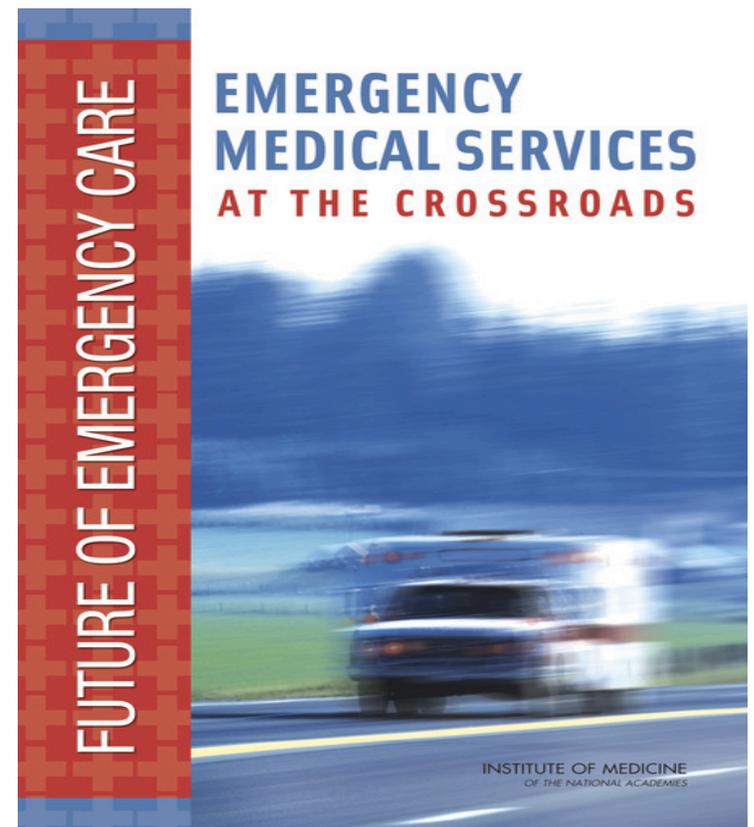
Why does EMS Need Evidence-Based Guidelines for Prehospital Care?



- Peter Taillac, MD, FACEP
- Clinical Professor
- University of Utah Division of Emergency Medicine
- Utah State EMS Medical Director

Institute of Medicine

- 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



Todd Rasmussen, MD FACS

Colonel USAF MC

Director US Combat Casualty Care Research Program

Fort Detrick, Maryland

Military Experience

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Special Review

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

Understanding Combat Casualty Care Statistics

John B. Holcomb, MD, Lynn G. Stansbury, MD, Howard R. Champion, FRCS, Charles Wade, PhD, and Ronald F. Bellamy, MD

J Trauma 2006;60:397-401

“...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)**

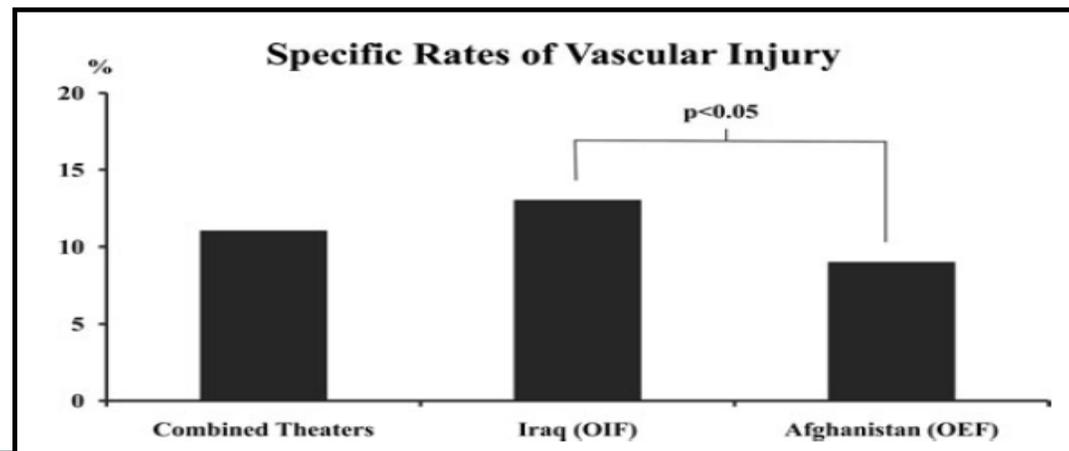
Epidemiologic Research

ORIGINAL STUDY

The Epidemiology of Vascular Injury in the Wars in Iraq and Afghanistan

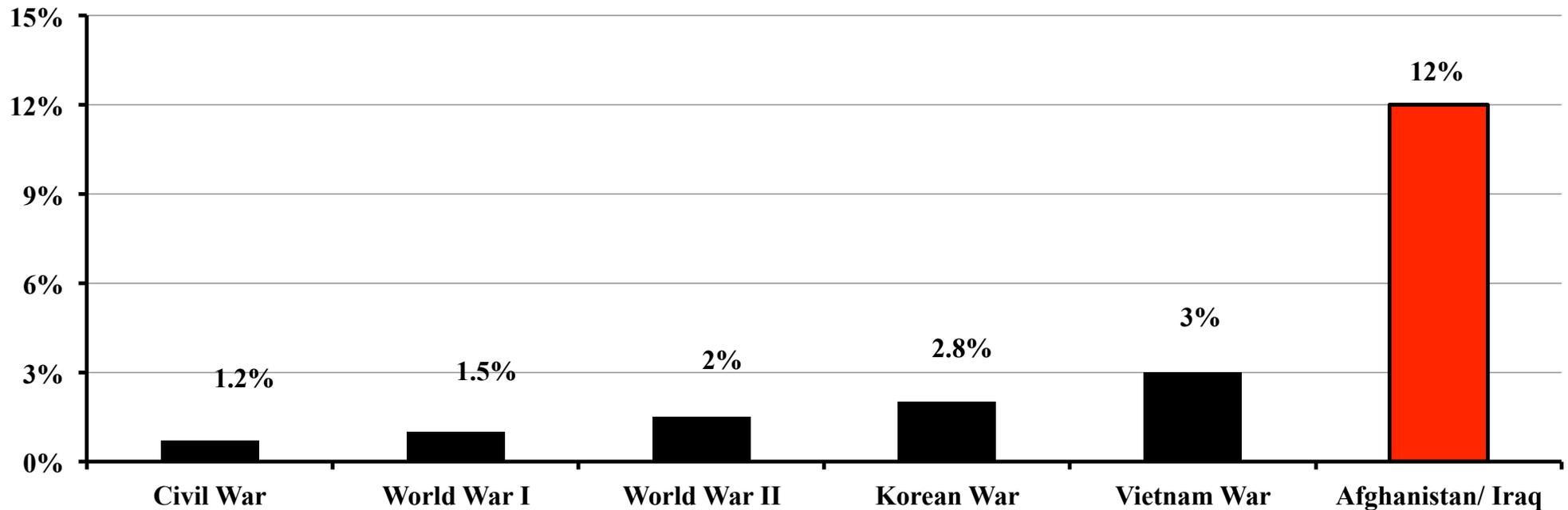
Joseph M. White, MD, Adam Stannard, MRCST*, Gabriel E. Burkhardt, MD*, Brian J. Eastridge, MD*, Lorne H. Blackbourne, MD*, and Todd E. Rasmussen, MD*‡*

Ann Surg 2011;53(6):1184-9



Epidemiologic Research

Rate of Wartime Vascular Injury



*White JM, et al. Ann Surg 2011;253:1184.
Stannard A, et al. Br J Surg 2011;98:228.*

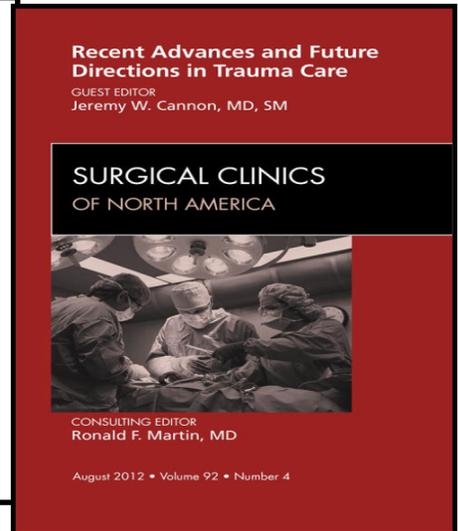
Epidemiologic Research

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,*}



Noncompressible torso hemorrhage (NCTH)

Anatomic Criteria

1. Thoracic cavity (including lung)
2. Solid organ injury \geq grade 4 (liver, kidney, spleen)
3. Named axial torso vessel
4. Pelvic fracture with ring disruption

Hemodynamic/Procedural Criteria

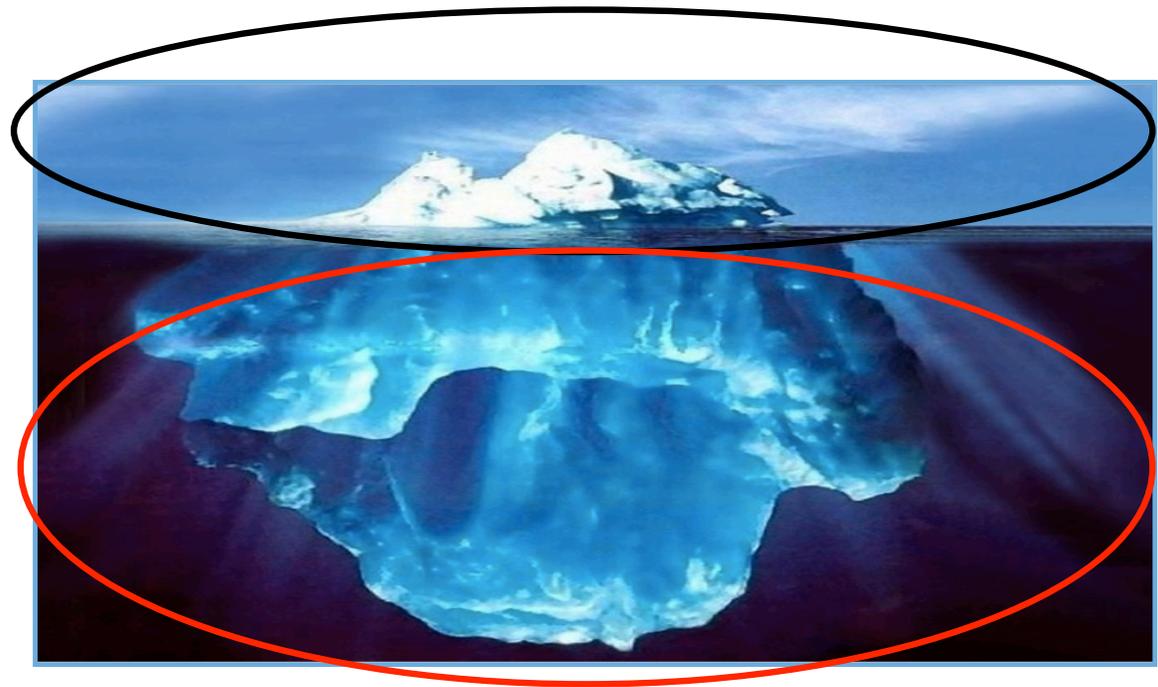
Hemorrhagic shock^a; or need for immediate operation

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

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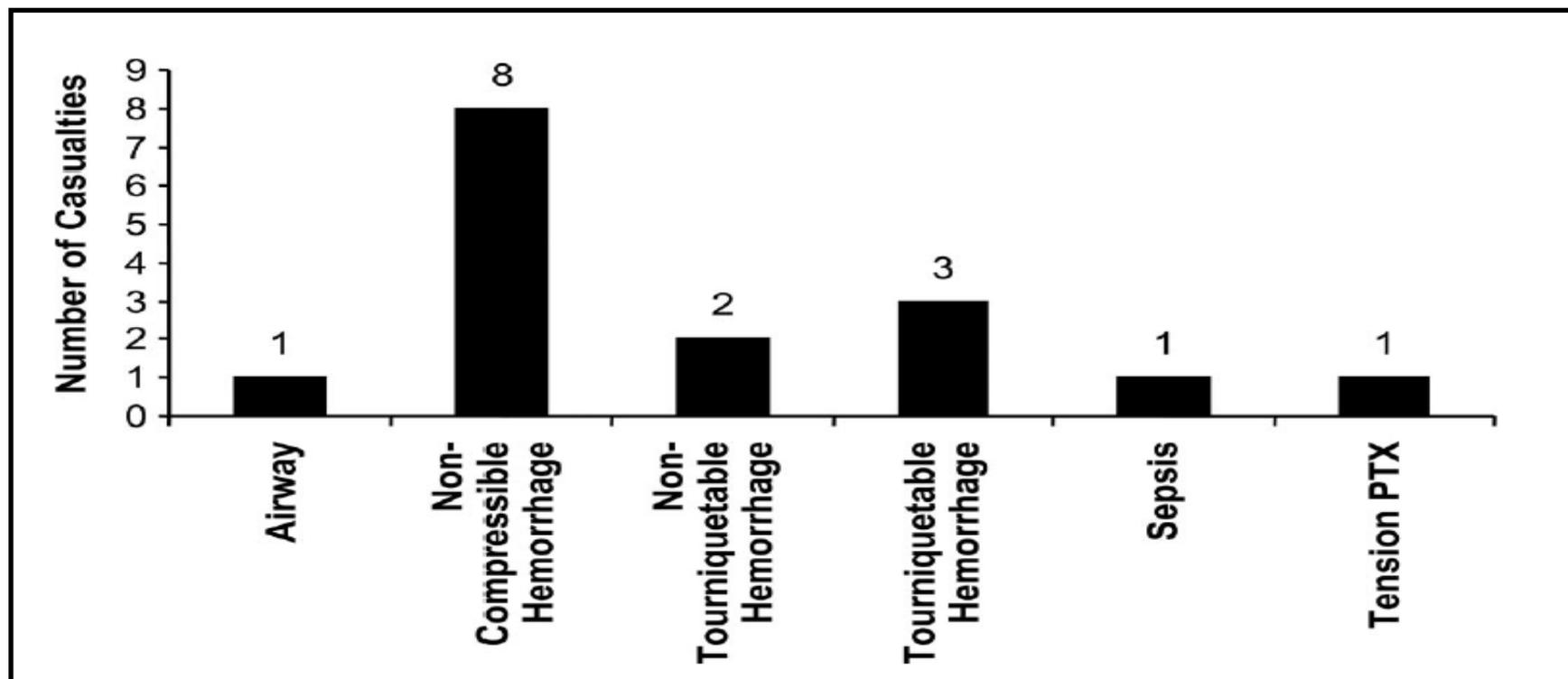
Causes of Death in U.S. Special Operations Forces in the Global War on Terrorism 2001–2004

John B. Holcomb, MD, Neil R. McMullin, MD,* Lisa Pearce, 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||*

Annals of surgery 245, no. 6 (2007): 986.

- 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



Annals of surgery 245, no. 6 (2007): 986.

- Cause of death in those not surviving to treatment

Epidemiologic Study

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ORIGINAL ARTICLE

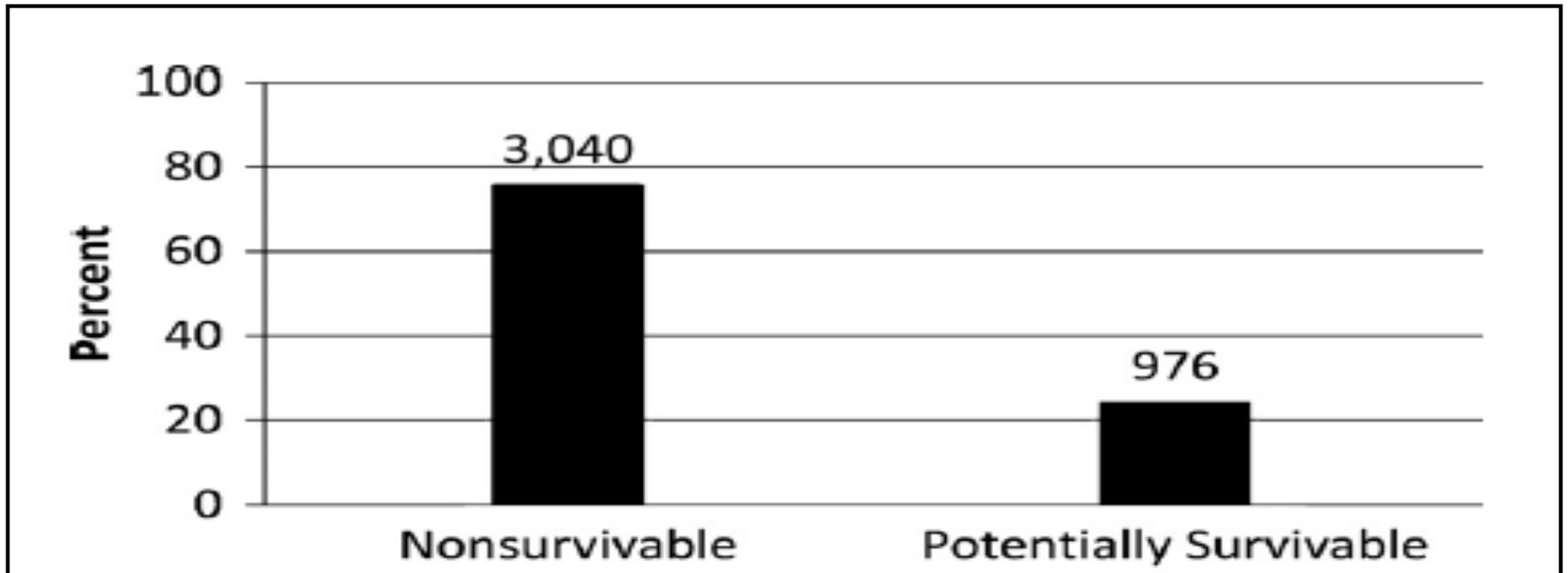
Death on the battlefield (2001–2011): Implications for the future of combat casualty care

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

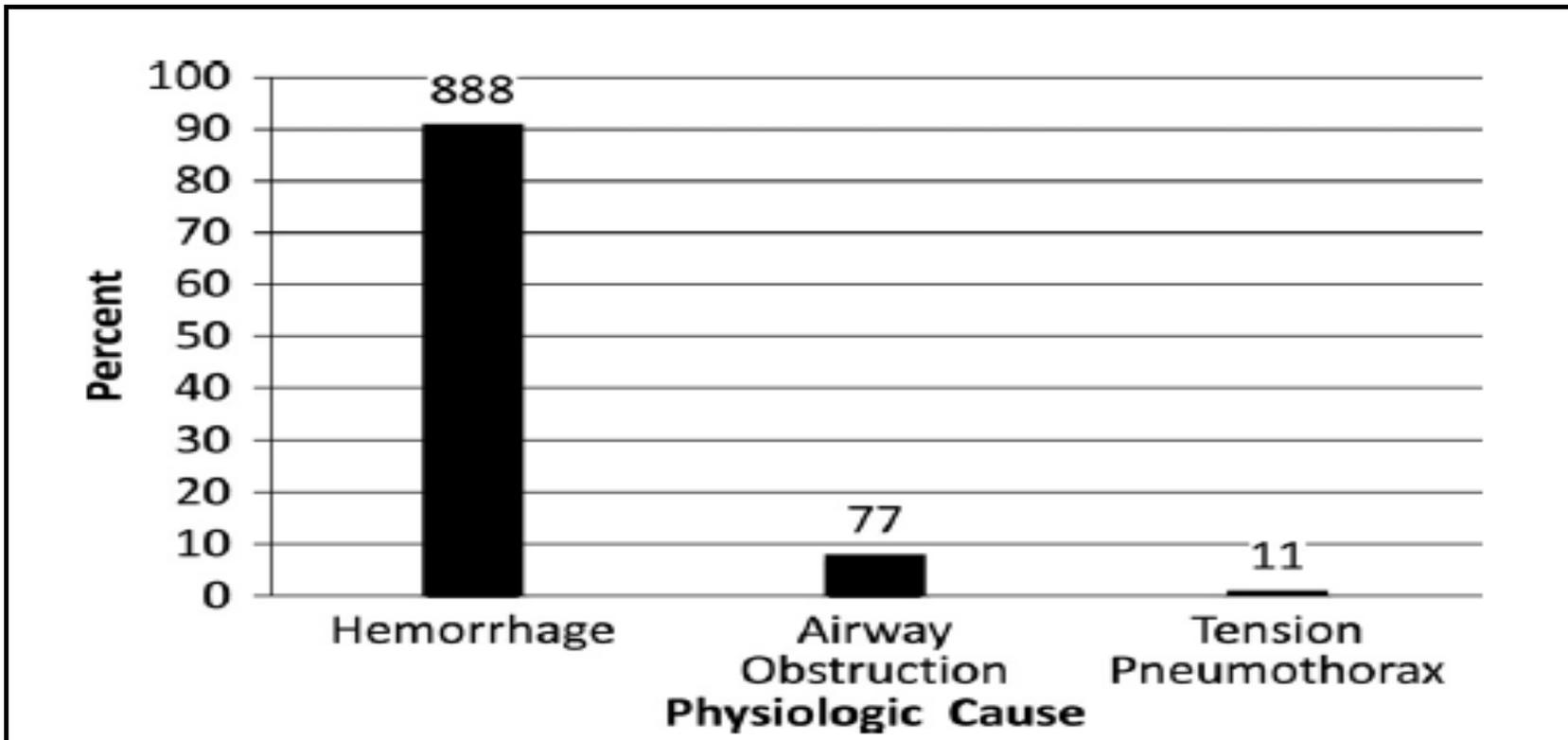
- **Second and larger study of causes of death on the battlefield partnering with medical examiner's office (AFME)**

Epidemiologic Study



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

Epidemiologic Study



- Of those with potentially survivable injuries

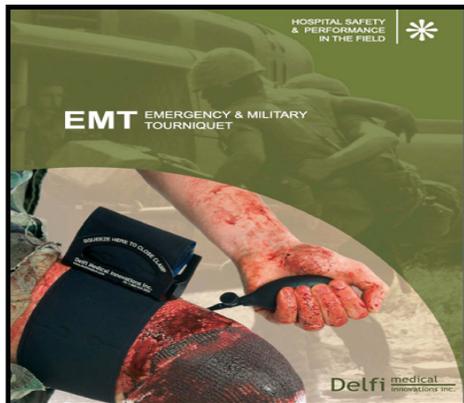
Mitigating Preventable Death

FEATURE

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

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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

J Trauma Acute Care Surg 2012;73(6 Suppl5):S395-S402

- 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

ORIGINAL ARTICLE

ONLINE FIRST

Eliminating Preventable Death on the Battlefield

Russ S. Kotwal, MD, MPH; Harold R. Montgomery, NREMT; Bari M. Kotwal, MS; Howard R. Champion, FRCS; Frank K. Butler Jr, MD; Robert L. Mabry, MD; Jeffrey S. Cain, MD; Lorne H. Blackbourne, MD; Kathy K. Mechler, MS, RN; John B. Holcomb, MD

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.

- Reduced KIA (5.7%) & DOW (4.1%) rates
- No preventable deaths
- Non-medical personnel

Arch Surg. Published online August 15, 2011.
doi:10.1001/archsurg.2011.213

Does it Translate to the Public?

VIEWPOINT

Implications of Combat Casualty Care for Mass Casualty Events

Eric A. Elster, MD
Norman M. Rich
Department of Surgery,
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University of the Health
Sciences, Bethesda,
Maryland, and Naval
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Sam Houston, Texas.

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.

JAMA 2013;310(5):475



dence of preventable death. Moreover, none of the regiment's 32 fatalities died of preventable causes during the out-of-hospital phase of care. The critical elements of the protocol include early control of hemorrhage using tourniquets for extremity bleeding and hemostatic dressings for bleeding not amenable to tourniquets.

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 al⁴ 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 al⁵ 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

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Emergency tourniquets, war lessons saved lives in Boston

Janice Lloyd, USA TODAY 2:05 p.m. EDT April 18, 2013

Translation to Civilian Trauma

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THE NEW REPUBLIC

Return of the Tourniquet: What we learned from war saved lives in Boston

Lydia DePillis

April 17, 2013

SCIENTIFIC AMERICAN™



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

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ORIGINAL ARTICLE

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*

J Trauma Acute Care Surg 2014;77:213-218

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 Schoelles, 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?

- **Grad**ing 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

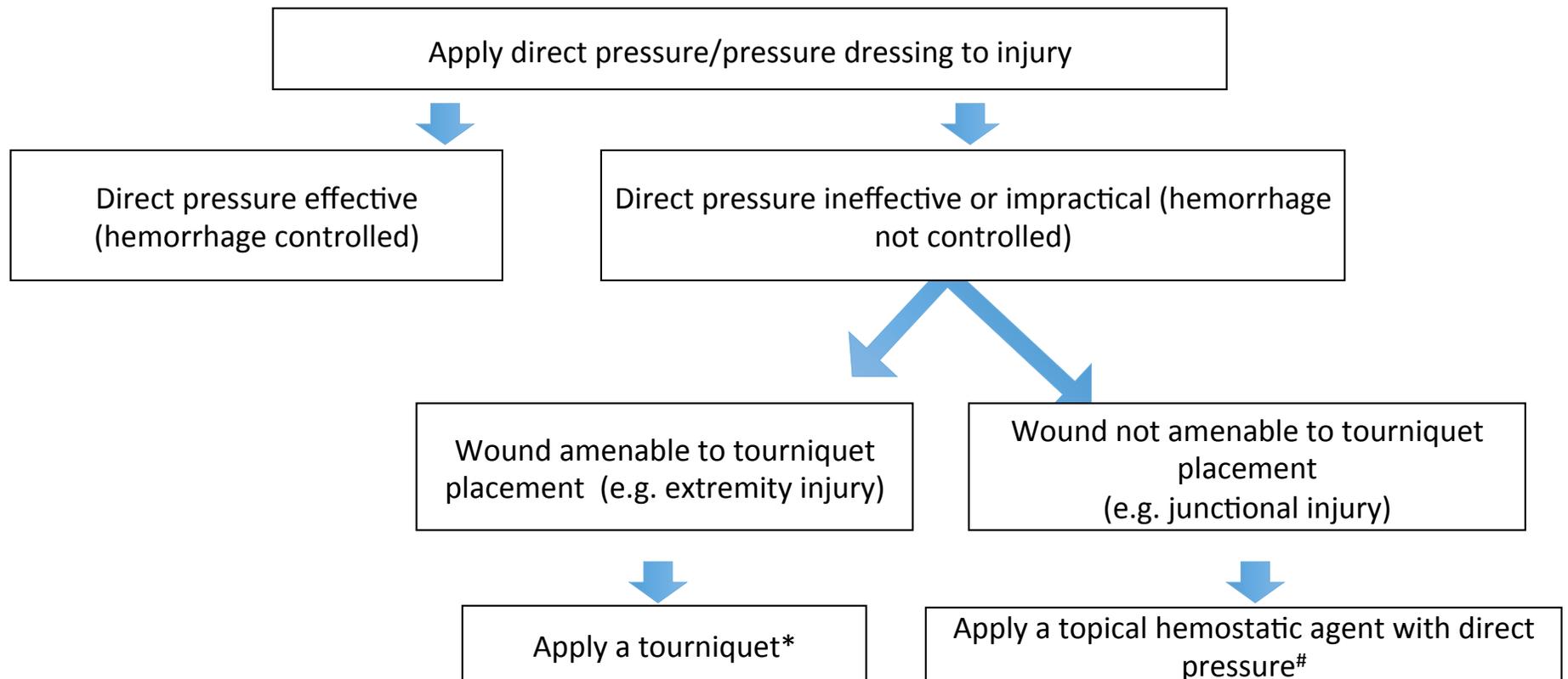
Additional Recommendations

- 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



Implementation of Tourniquets in an EMS Agency



Scott Youngquist, MD, MS

Medical Director
Salt Lake City Fire Department

???

LET'S HEAR YOUR
QUESTIONS & COMMENTS



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