Baghdad to Boston (or Austin?): Translating Military Combat Casualty Care Lessons From 15 Years of War to the Civilian Sector

James J. Geracci, MD
COL(Ret.), US Army
“The opinions or assertions contained herein are the private views of the author.”
Legacy of Battlefield Medical Innovation

**World War I**
- IV fluids
- Blood transfusions
- Motorized ambulances
- Topical antiseptics

**World War II**
- Whole blood/plasma available
- Specialty-specific surgical groups
- Antibiotics
- Fixed wing aero-medical evacuation

**Korean Conflict**
- Improved fluid resuscitation
- Forward surgical capability
- Helicopters for patient evac/transport
- Primary repair/grafts for vascular injury

**Vietnam**
- Improved use of helicopters
- Improved laboratory support
- Portable radiology equipment
- Mechanical ventilators in theater

**Desert Shield/Storm**
- Forward burn care
- Intercontinental aeromedical transport of burn patients
- Critical Care Air Transport (CCAT)

**OEF / OIF**
- Military trauma system/registry
- Damage control resuscitation
- Tactical Combat Casualty Care (TC3)
- TQs/Individual First Aid Kits (IFAK)
- Understanding preventable death

Care of the Wounded in Vietnam

Robert M. Hardaway, M.D.
Current State of Casualty Care System

After 15 years of war, what have we learned?
Standard of Care
When the War Began?
Preventable Deaths: The Eastridge Study

Death on the Battlefield
Implications for Prevention, Training, and Medical Care

White House
Office of Science and Technology Policy
September 4, 2012

Brian Eastridge
COL, MC, USA
Trauma Consultant
US Army Surgeon General

• 4,596 U.S. deaths
• 87% of deaths were pre-hospital
• 24% of pre-hospital deaths potentially preventable
Where Are Soldiers Dying? Where Can We Save the Most Lives?

Prevention


What is the Cause of Death?

Hemorrhage (n=888) - 91%

Airway Obstruction (n=77) - 7.9%

Tension Pneumothorax (n=11) - 1.1%

Extremity [119/888] = 13.5%
Junctional [171/888] = 19.2%
Truncal [598/888] = 67.3%

**Paradigm Shift and Primary Focus**

*If...* “[88%] of combat casualty deaths occur on the battlefield before the casualty ever reaches a medical treatment facility” – Bellamy, 1984


*If...* [After 30 years] “87.3% of all injury mortality [still] occur in the pre-MTF environment” – Eastridge, 2012


*Then...* Performance improvement directed toward primary prevention (TTPs); secondary prevention (PPE); pre-MTF care (Personnel, Training, Equipment); and Tactical Evacuation (MEDEVAC and CASEVAC Personnel, Training, Equipment) have the best opportunity to reduce preventable death on the battlefield
“Eliminating Preventable Death on the Battlefield”

- U.S. military potentially preventable pre-hospital deaths = 25%
- Success was achieved with a command-directed Casualty Response Program: 1) All Rangers and Docs trained in TCCC; 2) Battlefield care was reliably documented; and 3) Casualty care scenarios and documentation included in unit battle drills.

Current Standard of Care?

Evidence-based Trauma Care

Tactical Combat Casualty Care

Documentation
Current Standard of Care?

Far Forward Blood Products

Intranasal Ketamine

TQs

Combat Gauze

TXA
Advances at the pre-hospital end of the trauma continuum have had the most significant impact on reducing preventable combat deaths.
Cumulative Monthly Average: %KIA, %DOW, CFR, MISS
Nov 2003 – Present

Produced by the Joint Trauma System, Data Source: DoDTR v.3.2 data extracted is supplemented by data provided by DMDC Statistical Analysis Division & US Pentagon OSD
What is the Cause of Death?

- Hemorrhage: 91% (n=888)
- Airway Obstruction: 7.9% (n=77)
- Tension Pneumothorax: 1.1% (n=11)
- Extremity: 13.5% (119/888)
- Junctional: 19.2% (171/888)
- Truncal: 67.3% (598/888)

What Does the Future Hold?

Research on the Edge:
USAMRMC and the Combat Casualty Care Research Program

In modern warfare, casualty care providers face challenges rarely seen in civilian populations.

For more than 200 years, the Army’s efforts to protect soldiers from emerging health threats have resulted in significant advances in medicine. George Washington's Continental Army was protected against smallpox in 1777, using a procedure for future mass immunizations. stock image, N/A Water used proved mosriqo
What Does the Future Hold?
Relevance to the Civilian Sector?

- Military burden: ~ 6,850 military service member deaths. 1,680 (20-25%) potentially survivable injuries.
- Civilian burden: 147,790 US trauma deaths (2014). 30,000 (20%) may have been preventable with optimal care.
- Threats from active shooter, mass casualty incidents, and everyday trauma

Traumatic injury accounts for nearly half of all deaths for Americans under 46 years of age and cost the nation $670B in 2013.
Wartime Advances in Trauma Care Brought Home

• Photo courtesy of Dr. John Holcomb
• Also – Mayo, Tucson, Savannah, New Orleans, Cincinatti, etc – but not everywhere
Tactical Combat Casualty Care in the Civilian Sector

TACTICAL COMBAT CASUALTY CARE:
FROM THE BATTLEFIELDS OF AFGHANISTAN AND IRAQ TO THE STREETS OF AMERICA

Tactical Edge 2012
-Butler and Carmona
Ft. Hood, TX Shootings: Officer Kim Munley

- 12 dead; 31 wounded on 5 Nov 09
- Officer Munley got shooter; shot in both thighs
- Direct pressure and improvised tourniquets used by several physicians unsuccessful at controlling hemorrhage
- Saved by Army 68W medic with a CAT tourniquet applied to left thigh
21 FEB 2013
Encinitas, CA

- Suspect hiding in attic shot a Deputy through a vent with a 12g slug.
- Slug hit above knee shattering bone and causing massive bleeding from femoral artery.
- Deputy Dunford, who had taken a TCCC course 2 months prior, pulled out his recently issued C-A-T TQ and stopped the bleeding.
- ER MD stated that he clearly saved the life of his partner.
Boston Marathon Bombings

• 15 APR 2013
• 3 dead; 264 wounded
• Blast injuries
• Multiple shrapnel wounds
• Traumatic amputations
• First Responders/EMS used improvised TQs
Injured transit police officer went into cardiac arrest following Watertown gunfight

MBTA Transit Police Officer Richard Donohue remains in critical condition at Mt. Auburn hospital

CAMBRIDGE, Mass. — Richard Donohue, the MBTA transit police officer critically wounded in a gun battle with the bombing suspects, had lost nearly all his blood and his heart had stopped from a single gunshot wound that severed three major blood vessels in his right thigh.

- Use of tourniquet at the scene saved officer’s life
• Mother of 3 working in her kitchen
• GSW to the leg from a drive-by shooting with severe bleeding
• Police applied recently-issued CAT TQs
• Bleeding controlled – Mom survived
In response to Sandy Hook shootings
White House-directed working group organized by FBI and American College of Surgeons
Excerpt from findings:

Life threatening injuries in active shooter incidents such as those in Fort Hood, Tucson, and Aurora are similar to those encountered in combat settings. Military experience has shown that the number one cause of preventable death in victims of penetrating trauma is hemorrhage. Tactical Combat Casualty Care (TCCC) programs, when implemented with strong leadership support, have produced dramatic reductions in preventable death. Recognizing that active shooter incidents can occur in any community, the Hartford Consensus encourages the use of existing techniques and equipment, validated by over a decade of well-documented clinical evidence.
Does Trauma Care in the United States Reflect a True “Learning Health System”?

Components of a continuously learning health system articulated by IOM (2013) report Best Care at Lower Cost.

Components of a continuously learning trauma care system:

- Leadership-instilled culture of learning
- Coordinated PI and research to generate evidence-based best trauma care practices
- Timely dissemination of knowledge
- Systems for ensuring an expert trauma care workforce
- Transparency and incentives aligned for quality trauma care
- Aligned authority and accountability for trauma system leadership
- Patient-centered trauma care

Patient centeredness is the core of a learning trauma care system.
Past as Precedent: Informing our Future

Conflict: WWII Korea Vietnam OEF/OIF The Next War

Combat Medical Capability, Emphasis, and Experience

Inter-war period

Reasons:
- Loss of leader emphasis
- Impact of fiscal constraints
- Impact of garrison mentality
- Loss of institutional experience

Our (Joint) Challenge: Mitigate the Dip
- Maintain lessons learned to preserve gains made in survivability rates
- Maintain leadership emphasis on medical capabilities and incorporation in unit training

The price for the “arrogance of the present” is paid for in blood in the future…

TF Smith (Medical)

CPT Edwin Overholt, MC, BN Surgeon/ PLT LDR

1LT Raymond Adams, MSC, Asst BN Surg

SGT Ezra Burke NCOIC/PLT SGT
Current Standard of Care?

Far Forward Blood Products

Intranasal Ketamine

TQs

Combat Gauze

TXA
So Is This Really New?

Each stretcher bearer, each officer, each man if possible, should know how to fix a garrot. The use of the garrot has been much criticized, but if it causes the loss of a limb it may save a life. Many men die unnecessarily from hemorrhage on the battlefield and at the ambulance.

Vincent
April 1918
So Is This Really New?

1800’s
So Is This Really New?
So Is This Really New?

MG Carl W. Hughes, 1954
FIGURE 4-5 Funding sources for military medical research, 2013.
NOTE: CSI = Congressional Special Interest; DHP = Defense Health Program.
SOURCE: Data from Rasmussen, 2015.
Civilian Sector Challenges

• Authority and accountability for civilian trauma care capabilities are fragmented and vary from location to location, resulting in a patchwork of systems for trauma care in which mortality varies twofold between the best and worst trauma centers in the nation.

• There is no federal civilian health lead for trauma care (including prehospital, in-hospital, and post-acute care) to support a learning health system for trauma care, despite past recommendations that such a lead agency be established.
Civilian Sector Challenges

There are over 50,000 AUTONOMOUS EMS, Fire + Rescue, and Law Enforcement Agencies in the U.S.
Civilian Trauma Research

- Preventable trauma death is **public health crisis** of monumental proportions
- Despite significant societal burden, **civilian investment (#27)** in trauma research is not commensurate
San Diego 911 dispatcher's medical instructions questioned

BY: Emily Valdez
POSTED: 11:10 PM, Jan 13, 2015
UPDATED: 10:17 PM, Jan 14, 2015
Rabaya was a bystander who tried to save a stranger’s life Monday afternoon. The unidentified man was hit by a motorcycle while walking across Palm Avenue in Egger Highlands.

The man's leg was severed, but he was talking and awake.

"I put the belt around his leg and stopped the bleeding," said Rabaya.

Rabaya said he has first aid training from his time in the Navy. He knew he had to stop the bleeding.
EMS - Removed TQ Causes Fatality in San Diego

Dispatcher: OK. All right, so they put a tourniquet on his leg?

Caller: Um, no, a belt ... they wrapped a belt around because his leg is chopped off.

Dispatcher: OK, we need to take that belt off. We don't want to tourniquet it.

Caller: Take the belt off, she said, take it off.
“San Diego Fire-Rescue Department has become aware of an issue during an emergency call at 11:21 a.m. on January 12 in Imperial Beach. (San Diego’s Fire Dispatch Center dispatches for Imperial Beach and other cities). This call involved a pedestrian and a motorcyclist in which the pedestrian sustained multiple injuries, including a severed leg. After being transported to the hospital, the pedestrian did not survive his injuries.”
Not New Issues...But Our New Reality: Analysis Paralysis

FIGURE 4-4 Timeline of assessments relevant to civilian trauma research.
Relevance: How Many Preventable Deaths are OK?

- Military burden: ~ 6,850 military service member deaths. 1,680 (20-25%) potentially survivable injuries.
- Civilian burden: 147,790 US trauma deaths (2014). 30,000 (20%) may have been preventable with optimal care.
- Threats from active shooter, mass casualty incidents, and everyday trauma.

Traumatic injury accounts for nearly half of all deaths for Americans under 46 years of age and cost the nation $670B in 2013.
Las Vegas Concert Shooting

The New York Times

After the Las Vegas Shooting, Concertgoers Became Medics

Bystanders carried a wounded woman at the Tropicana Hotel after the mass shooting.

CHASE STEVENS / LAS VEGAS REVIEW-JOURNAL, VIA ASSOCIATED PRESS

By SHERI FINK

OCTOBER 15, 2017
The Vision:

“Military and civilian trauma care will be optimized together, or not at all.”

“Where you are injured should not determine if you live or die”
The Aim:

- **The aim:** Achieving **zero preventable deaths** after injury and minimizing trauma-related disability
- **The role of leadership**
  - National-level leadership
  - Military leadership
  - Civilian sector leadership
- **An integrated military–civilian framework** for learning to advance trauma care
  - Improving the collection and use of data
  - **Collaborative research** in a supportive regulatory environment
  - Systems and incentives for improving prehospital trauma care
  - Developing expertise
  - **Organized civilian trauma system** positioned to assimilate wartime lessons and serve as a repository and incubator for innovation during interwar period.
Systems and Incentives for Improving Prehospital Care

- The greatest opportunity to save lives after injury is in the prehospital setting.
- Prehospital care is not currently linked to health care delivery reform efforts.
- Variable standards of care, a paucity of universal protocols and current reimbursement practices for civilian EMS (i.e., pay-for-transport) are major impediments to the seamless integration of prehospital care into the trauma care continuum.
Way Ahead
So What?
So What?
So What?
So What?
Why Am I Passionate About Getting It Right?
Questions?

James J. Geracci, MD

james.geracci@gmail.com
(512) 350-1930 (mobile)