

## VIEWPOINT

# A National Trauma Care System to Achieve Zero Preventable Deaths After Injury

## Recommendations From a National Academies of Sciences, Engineering, and Medicine Report

**Donald M. Berwick, MD, MPP**

Institute for Healthcare Improvement, Cambridge, Massachusetts.

**Autumn S. Downey, PhD**

National Academies of Sciences, Engineering, and Medicine, Washington, DC.

**Elizabeth A. Cornett**

National Academies of Sciences, Engineering, and Medicine, Washington, DC.

Since antiquity, with respect to advancing the care of the injured, “war has been a very efficient schoolmaster.”<sup>1</sup> Innovation in trauma care has once again accelerated, spurred by the significant burden of injury from more than a decade of war in Afghanistan and Iraq.

During those recent wars, the percentage of wounded service members who died of their injuries reached the lowest point in recorded wartime history—9.3% in Afghanistan and Iraq compared with 23% during the Vietnam War.<sup>2</sup> Effective bleeding-control measures, improved resuscitation techniques, and aggressive neurocritical care interventions are among many advances that saved lives on the battlefield that otherwise would have been lost. For example, an estimated 1000 to 2000 lives were saved by widespread use of tourniquets.<sup>3</sup>

Military medical forces did not begin the recent wars with these capabilities. These interventions developed in response to the urgency from increasing numbers of US service members who died of potentially survivable

However, questions have arisen as to how the military’s learning trauma system can be improved, sustained, and expanded across the US Department of Defense. In addition, there are questions about how thoroughly and rapidly wartime trauma lessons learned can be applied in the civilian sector, where the need, if not the sense of urgency, is at least as great. In Afghanistan and Iraq, approximately 6850 service member lives have been lost over the last 15 years.<sup>6</sup> In the United States there are nearly 150 000 deaths from trauma each year, and injury is the third leading cause of death, accounting for more years of life lost than any other cause.<sup>7</sup>

A new report from the National Academies of Sciences, Engineering, and Medicine,<sup>8</sup> of which the former Institute of Medicine is now part, clarifies the components of a learning health system necessary to ensure continuous improvement in military and civilian trauma care. The report also provides recommendations on how lessons from the military’s experiences in Afghanistan and Iraq can be sustained and built on for future combat operations and translated more effectively into the civilian care system.

The report concludes that military and civilian trauma systems are inextricably linked, even if leaders sometimes seem unaware of that. It asserts that continued progress in trauma care capability and learning capacity will require better conduits for the continuous and seamless exchange of knowledge between the 2 sectors. Military and civilian trauma care and learning will be optimized together, or not at all.

The committee recommends that a national strategy and a joint military-civilian approach for improving trauma care be developed to ensure the delivery of optimal trauma care to save the lives of Americans injured both within the United States and on the battlefield. To guide such an approach, the committee identified strengths and gaps in progress in the military and civilian sectors, using the following elements of a learning trauma care system as a diagnostic lens.

### Elements of a Learning Trauma Care System Leadership and a Culture of Learning

A learning health system must be stewarded by leadership committed to nurturing a culture of continuous learning and improvement. Diffusion of responsibility in both military and civilian trauma care has permitted unwarranted variation in practice and suboptimal patient

The nation should and, with proper leadership, can do better for the soldiers, sailors, airmen, and marines it sends into harm’s way.

injuries.<sup>4</sup> That urgency was inconsistent with reliance on slow and costly clinical trials to inform improvements in trauma care practices. It drove the Military Health System and its nascent Joint Trauma System to embrace, instead, a culture of continuous performance improvement and a more agile approach to advancing combat casualty care.

The Military Health System calls this pragmatic, more rapid model for learning “focused empiricism.” Focused empiricism is aligned with the characteristics of a learning health system articulated in the 2012 Institute of Medicine report *Best Care at Lower Cost*.<sup>5</sup> For example, the Joint Trauma System digitally captures and routinely uses patient care data from its registry to identify trends and answer clinical questions, enabling care practices to evolve incrementally based on the best available evidence until higher-quality data can be generated. In effect, military medicine put the learning health system framework into practice before the Institute of Medicine described it.

#### Corresponding

**Author:** Donald M. Berwick, MD, MPP, Institute for Healthcare Improvement, Editorial Affairs, 20 University Rd, Seventh Floor, Cambridge, MA 02138 ([donberwick@gmail.com](mailto:donberwick@gmail.com)).

outcomes. Nearly 1000 service members died of potentially survivable injuries in Afghanistan and Iraq,<sup>4</sup> and 20 to 30 times that number of US trauma deaths each year may be preventable.<sup>9</sup> Given these challenges and the high stakes for the nation in the face of foreign and domestic threats, the White House should lead the integration of military and civilian trauma care to establish a national trauma care system. Such a system should unite military and civilian trauma care leaders around a common, core aim established at the highest level in the nation; namely, to achieve zero preventable deaths after injury and minimize trauma-related disability. The White House should direct both the US Department of Health and Human Services and the US Department of Defense to organize to pursue that aim.

#### Digital Capture of the Trauma Patient Care Experience

Military and civilian trauma systems should collect and share common data spanning the entire continuum of care, including prehospital trauma care and long-term outcomes.

#### Coordinated Performance Improvement and Research to Generate Evidence-Based Best Trauma Care Practices

To address critical gaps in knowledge of optimal trauma care practices and delivery systems, the United States needs a coordinated trauma research program with defined objectives, a focus on high-priority needs, and a level of resourcing from both military and civilian sectors commensurate with the importance of injury. Without compromising protections of human research participants or patient privacy, regulatory agencies should consider revising research regulations and issuing guidance to ensure that continuous learning approaches, like focused empiricism, are fostered and that critical trauma research and performance improvement activities are not impeded.

#### Timely Dissemination of Trauma Knowledge

Trauma system leaders should establish processes for real-time access to patient-level data from the entire continuum of care and just-in-time access to high-quality knowledge for trauma care teams and those who support them.

#### Transparency and Incentives for Quality Trauma Care

Trauma care practitioners at all levels, including trauma surgeons and other physicians, nurses, technicians, and prehospital care personnel, should have access to data on their performance relative to that of their peers. To facilitate use of those data, appropriate incentives should be put in place to promote the participation of all military and civilian trauma systems in a structured quality improvement process for trauma.

#### Patient-Centered Trauma Care

Given the complexity of traumatic injury and the requirement for multiple patient handoffs, a patient-centered approach is needed in which trauma care is structured holistically around the patient experience and in which patients, families, and communities are proactively engaged in the delivery of that care.

#### Systems for Ensuring an Expert Trauma Care Workforce

In peacetime, the Department of Defense alone cannot possibly maintain the readiness of an expert military trauma care workforce needed to support service members on future battlefields. A joint, integrated network of military and civilian trauma centers should be created as a training platform to prepare and sustain an expert workforce and to promote the translation of best practices between sectors.

#### Conclusions

The progress made by the military's trauma system by applying learning health system principles is remarkable but fragile. Valuable war-time advances and lessons learned are at risk of being lost, and regression and inconsistency do a great disservice to the US Armed Forces service members. In addition, the hundreds of thousands of civilians who have sustained trauma deserve the benefits of care improvements achieved in military medicine. The nation should and, with proper leadership, can do better for the soldiers, sailors, airmen, and marines it sends into harm's way. And every US resident should have the best possible chance for survival and functional recovery after injury. When it comes to trauma care, where people live ought not to determine if they live.

#### ARTICLE INFORMATION

**Published Online:** June 17, 2016.  
doi:10.1001/jama.2016.8524.

**Conflict of Interest Disclosures:** The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

**Funding/Support:** The report described in this Viewpoint was sponsored by the American College of Emergency Physicians, the American College of Surgeons, the National Association of EMS Physicians, the National Association of Emergency Medical Technicians, the Trauma Center Association of America, the US Department of Defense, the US Department of Homeland Security, and the US Department of Transportation.

**Additional Contributions:** Members of the Committee on Military Trauma Care's Learning Health System and its Translation to the Civilian Sector, which wrote the report described in this Viewpoint, were Donald Berwick (chair), Ellen Embrey, Sara Goldkind, Adil Haider, John Holcomb, Brent James, Jorie Klein, Douglas Kupas,

Cato Laurencin, Ellen MacKenzie, David Marcozzi, Joseph McCannon, John Parrish, Rita Redberg, James Robinson, Thomas Scalea, William Schwab, and Philip Spinella.

#### REFERENCES

1. Ireland MW. The achievement of the Army Medical Department in the World War. *JAMA*. 1921; 76(12):763-769.
2. Rasmussen TE, Baer DG, Cap AP, Lein BC. Ahead of the curve: sustained innovation for future combat casualty care. *J Trauma Acute Care Surg*. 2015;79(4 suppl 2):S61-S64.
3. Blackbourne LH, Baer DG, Eastridge BJ, et al. Military medical revolution: prehospital combat casualty care [published corrections appear in *J Trauma Acute Care Surg*. 2013;74(1):347 and 2013;74(2):705]. *J Trauma Acute Care Surg*. 2012;73(6)(suppl 5):S372-S377.
4. Eastridge BJ, Mabry RL, Seguin P, et al. Death on the battlefield (2001-2011): implications for the future of combat casualty care [published correction appears in *J Trauma Acute Care Surg*. 2013;74(2):706]. *J Trauma Acute Care Surg*. 2012;73(6)(suppl 5):S431-S437.
5. Institute of Medicine. *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America*. Washington, DC: National Academies Press; 2013.
6. DCAS (Defense Casualty Analysis System): Conflict Casualties. <https://www.dmdc.osd.mil/dcas/pages/casualties.xhtml>. Accessed June 9, 2016.
7. Rhee P, Joseph B, Pandit V, et al. Increasing trauma deaths in the United States. *Ann Surg*. 2014; 260(1):13-21.
8. National Academies of Sciences, Engineering, and Medicine. *A National Trauma Care System: Integrating Military and Civilian Trauma Systems to Achieve Zero Preventable Deaths After Injury*. Washington, DC: National Academies Press; 2016.
9. Kwon AM, Garbett NC, Kloecker GH. Pooled preventable death rates in trauma patients: meta analysis and systematic review since 1990. *Eur J Trauma Emerg Surg*. 2014;40(3):279-285.