

# A roadmap to life after the worst injuries, in times of war and peace

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The wars in Iraq and Afghanistan have produced a horrific type of medical trauma known as the "dismounted complex blast injury" (DCBI). Caused when an improvised explosive device detonates beneath a soldier patrolling on foot, DCBIs often lead to the loss of both legs and at least one arm, cause severe damage to the abdomen and pelvic area, and result in catastrophic bleeding. Experts estimate dozens of members of the armed forces suffered these types of injuries during the conflicts that have marked the past 15 years. Previously, these injuries were considered deadly, but today, training for soldiers includes advanced first aid techniques - such as the application of tourniquets and infusion of blood products - that can allow many soldiers with DCBIs to survive long enough to reach surgical care.

Details of how to manage DCBIs, and in many cases stabilize these critically injured patients and restore many normal functions, are published in the *Journal of the American College of Surgeons*. The authors, comprised of military surgeons and led by Jeremy W. Cannon, MD, SM, FACS, an associate professor of Surgery at the Perelman School of Medicine at the University of Pennsylvania, say the lessons learned will not only save lives on the battlefield in the future but also in civilian trauma centers today.

"These invaluable lessons must now be preserved for application in future conflicts and even in some cases of severe trauma seen in industrial accidents, crush injuries, and terrorist attacks like the Boston Marathon bombing," said Cannon, who is also a former U.S. Air Force

trauma surgeon and a member of the U.S. Air Force Reserve.

"Combining experts from multiple fields - such as trauma, orthopedics, urology, and plastic surgery - has enabled substantial recovery for many of these critically injured soldiers, but the lessons learned can help trauma physicians both in the military and civilian worlds, guiding them in how to properly manage these devastating wounds and, ultimately, saving lives."

The transference of advanced surgery skills from military to civilian hospitals has a history dating to the dawn of modern medicine—the ancient Greek physician Hippocrates famously said that "War is the only proper school for a surgeon." In that spirit, the National Academies of Sciences, Engineering and Medicine issued a report last June calling for the integration of military and civilian medical trauma education, training and research, with the goal of completely eliminating all preventable trauma deaths across the country.

The review from Cannon and colleagues addresses the initial management of DCBIs, including massive blood transfusions, advanced resuscitation techniques, and assessment of the extensive injuries. It follows with discussions of the major medical issues that then have to be addressed: the stabilization of the fractured pelvis, the cleaning of wounds and cutting back of excessively damaged soft tissue, the treatment of severe colorectal, genital, and urinary/bladder injuries, and the prevention of potentially lethal bacterial and fungal infections.

The discussion also covers the management of common long-term complications such as heterotopic ossification, in which solid masses of bone begin growing inappropriately within soft tissues near blast injury sites, and the formation of blood clots in the extremities and lungs, which occurs at a high rate in DCBI survivors.

In the long run, better methods for stopping internal bleeding, more

advanced regenerative, transplant and prosthetics technologies, and new drugs to prevent complications such as heterotopic ossification, are hoped to further improve care for DCBI patients. In the meantime, disseminating the lessons already learned by military surgeons will bring medicine closer to the National Academies' goal of eliminating preventable deaths from [injury](#)— "a lofty but eminently achievable objective," Cannon said.

Provided by Perelman School of Medicine at the University of Pennsylvania

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