A reproducible strategy to solve problems

Lenworth Jacobs, MD, MPH, FACS

T o understand where the Eastern Association for the Surgery of Trauma is today, it is important to return to the origins of this dynamic organization. In the 1970s and early 1980s, the nation had returned from the Vietnam conflict and military surgeons, especially those who had been were drafted to go to Vietnam were very interested in returning to their private practices. Academic departments needed to return to general surgery, teaching, and research. In fact, the National Institute of Health funding was heavily biased to nontrauma research. The result of these forces was that there was minimal interest in trauma and trauma-related issues

However, there were major problems in delivering trauma care, which required innovative solutions. In the mid-1970s, the Federal Emergency Medical Services (EMS) legislation was passed, which created a universal access number, 911 and laid the framework for a modern National Emergency Medical System. There were dramatic advances in the prehospital arena. Emergency medical technicians (EMTs) and emergency medical paramedics (EMTPs) were created and certified. Ambulances in which modern trauma care could be conducted were designed and implemented. Trauma centers were designated. Trauma systems, which looked at issues from resuscitation to rehabilitation were put into place. Emergency departments now had 24-hour availability of radiographic imaging, including CT scans and bedside ultrasound. Dedicated trauma operating rooms, which could manage the most severely injured trauma patients, were implemented.

THE PROBLEM

The young surgeons responsible for the day-to-day management of these issues that were dramatically improving trauma care had difficulty in finding a credible forum for presenting and discussing these new ideas and solutions.

The American Association for the Surgery of Trauma, a major trauma organization, had a restricted membership, and the criteria for membership tended to select surgeons who were senior and further along in their academic careers. The problem was that young surgeons had no formal voice in promoting solutions to the problems, which they faced on a daily basis.

DOI: 10.1097/TA.00000000003568

J Trauma Acute Care Surg Volume 93, Number 1

THE SOLUTION

The solution was to create a platform and a credible organization for young surgeons where they could present their clinical, academic, and administrative problems along with their innovative solutions. An organization that was dedicated to trauma problems and solutions and that was specifically for young surgeons and their colleagues needed to be established and implemented. The idea for the Eastern Association for the Surgery of Trauma (EAST) was developed by four young surgeons, Howard Champion, Burt Harris, Lenworth Jacobs, and Kimball Maull. This group was rapidly expanded to include Raymond Alexander, Andrew Burgess, Thomas Gennarelli, Norman McSwain, Michael Rhodes, and C. William Schwab. This group became the founding board members of EAST.^{1–3}

Eastern Association for the Surgery of Trauma was dedicated to facilitating young trauma surgeons' representation on the national trauma agenda and promoting their ascendancy in both clinical, educational, research, and administrative arenas. The bylaws were designed to maintain the governance and direction of the organization in the hands of young people who were younger than 50 years.

The selection process for articles, which were presented at the annual meeting, was rigorous and included a written article and written peer review of the article prior to the completion of the meeting. Articles were then eligible for publication in the Journal of Trauma in a very short timeframe usually about 6 months. The meeting was also designed to be family friendly so that young surgeons could have an academically sound meeting and their young families could also participate in developing friendships in a warm climate.³

DEVELOPING A REPRODUCIBLE STRATEGY TO SOLVE PROBLEMS

In reflecting on the origins of EAST and the processes, which were developed and implemented more than three decades ago, it was clear that there was a reproducible strategy to identifying and solving significant problems. It is useful to reflect on a number of significant challenges that have been identified and dealt with over the decades. I would like to focus on a few of these challenges. First, establishing an advanced life support (ALS) system to manage severely injured and critically ill patients for a city and an air-medical system for a State. Second, developing the Advanced Trauma Operative Management (ATOM) course in response to the decreasing ability of trauma surgeons to perform open operations for severe trauma. Finally, implementing the Stop the Bleed national initiative to decrease mobility and mortality from severe bleeding.

Submitted: January 21, 2022, Accepted: January 30, 2022, Published online: February 11, 2022.

From the Department of Surgery, University of Connecticut, School of Medicine, Mansfield, CT.

The author declares no conflict of interest.

This study was presented at the Eastern Association for the Surgery of Trauma, January 13, 2022

Address for reprints: Lenworth Jacobs, MD, MPH, FACS, 37 Belknap Rd, West Hartford, CT 06117; email: lenworthjacobs@gmail.com.

DEVELOPING AN EMERGENCY MEDICAL SYSTEM FOR A CITY AND STATE

In the mid-1970s, EMS were unorganized and not well developed. The city of Boston had a long tradition of delivering excellent medical and surgical care. However, the focus was on delivery of that care after the patient arrived at the hospital. The focus of the city of Boston's services was on law enforcement and fire suppression.

Patients were transported to the hospital in police wagons with police officers who had little or no medical training and minimal medical equipment. In the mid-1970s, Federal EMS legislation was enacted, which established a universal access number 911, training standards for EMTs and EMTPs, and specifications for ambulances. Boston charged the department of health and hospitals to design and implement a modern emergency medical system for the city.

Boston had 17 teaching hospitals and three hypercompetitive medical schools. As director of EMS for the city of Boston and Boston City Hospital, we had to design and implement EMS for the city.

The Vision

The goal was to provide an EMS for Boston, which would be at the same exemplary standard as the medical care provided in the teaching hospitals in the city.

To achieve this vision, the medical establishment of the three universities and 17 teaching hospitals had to be engaged as partners in this mission. A Conference of Boston Teaching Hospitals was established. The Department of Public Health established an EMS division that set training, operational, and equipment standards.

We obtained a grant to train EMTs and EMTPs. We recruited men and women from the city to be a third service known as Boston EMSs. The training expectations were patterned after resident education. Paramedics were expected to evaluate, generate, and communicate diagnostic impressions, which were precise enough to allow a physician on the radio to order life-saving interventions. Severely injured and ill patients were intubated, defibrillated, and given intravenous medications. The results of each case were evaluated and discussed in a peer-reviewed format.

This medical format was easy for traditional hospital physicians to understand and recognize the benefits for patient care that prehospital medical interventions provided. The results of these interventions were presented and discussed at citywide peerreviewed rounds and published in the professional literature.⁴

This process has been sustained for more than four decades. It has been a real benefit to thousands of patients. It is now fully integrated into all the trauma centers and every emergency department. The concept of giving medical direction and having medical control of life-threatening techniques and interventions and immediately delivering the resuscitative medication by ALS prehospital providers is now a medical and public expectation.

The challenge of coordinating an EMS system with a large city police and fire system with completely different organizational and structures was an excellent education for developing a state-wide air medical system for the state of Connecticut.

The Problem

Trauma events, such as motor vehicle and motorcycle crashes occurred on roadways, which were significant distances

from a trauma center, which had the personnel and equipment immediately available at any hour of day or night to respond to these severely injured patients.

The Solution

The goal was to develop an air medical system, which could provide sophisticated ALS care at any time of the day or night and transport the patient to the nearest trauma center.

To successfully implement a statewide trauma system, it was critical to involve all the hospitals in the state, the Department of Public Health, prehospital EMS, law enforcement and fire services, and the public.

The concept required the public, the medical community, the regulatory agencies, the payors and the prehospital community to understand the benefits of having a helicopter with a fully trained ALS crew respond and land at an unsecured landing site, such as a highway, and perform life-saving interventions. The public had to be comfortable with having themselves or their loved ones transported to a hospital far from their local area to receive the best care.^{5,6}

The training of advanced flight practitioners involved seeking partners in surgery, anesthesia, emergency medicine, nursing, respiratory therapy, cardiology, infectious diseases, and OB/GYN. Each group enthusiastically provided cognitive education and skill exposure and training. This required the education and acceptance of the chiefs of each department so that there was a clear understanding of the life-saving importance of having clinical experts providing immediate care at the scene, minutes after a severe life-altering event.

The same process of evaluating and critiquing every call in a peer-reviewed forum to maximize educational opportunities was implemented.

To be successful and sustain a new service for decades, there are a number of critical elements, which had to be achieved.

The professional community had to understand the magnitude of the problem and the need for a creative and innovative solution.

The governmental and regulatory agencies had to be fully engaged and involved as this was the practice of medicine by a new group of professionals performing life altering skills and procedures in a difficult autonomous environment.

The problem was compounded when practicing in New England as the geographic proximity of the States means that medicine was practiced in multiple states by the air medical providers. This meant that reciprocity for medical practice had to be explained to, and approval obtained from the appropriate medical licensing authorities in each state.

It was critical to understand the financial implications of a multistate air medical service as they are very expensive systems to operate. The hospitals and the insurance entities both private and governmental, had to understand and agree to the medical benefits that accrue to implementing the service. Payment mechanisms needed to be established in advance so the service would sustain itself for decades.

LifeStar, the Air Medical Service that originated at Hartford Hospital, has transported in excess of 38,000 severely injured or ill patients during the past 35 years.

THE ATOM COURSE

The conventional surgical wisdom from military conflicts was that all penetrating injuries to the abdomen and neck needed

© 2022 Wolters Kluwer Health, Inc. All rights reserved.

e6

to be explored. The result of this philosophy was that surgical trainees became very skilled in performing exploratory laparotomies.

At Boston City Hospital, surgeons frequently performed multiple laparotomies is in a single night. Occasionally, a stab wound to the liver would have spontaneously stopped bleeding by the time the laparotomy was performed resulting in a nontherapeutic exploration. The advent of more sophisticated imagery, such as CAT scans, reduced the need for an exploratory laparotomy to identify if there was an injury to a solid organ in the abdomen. Diagnostic precision was rapidly augmented by contrast enhanced CAT scans and angioembolism, which allowed for the identification and control of bleeding vessels with nonoperative management. These changes were beneficial to the patients as they were spared a negative or an unnecessary laparotomy.

It became obvious that the number of trauma operations that were being performed by senior surgical residents were dramatically decreasing.^{7–13} The issue of the problem and solution of decreasing operative skills is extensively discussed in the 2021 Scudder Oration.¹⁴

The Problem

Trauma patients with penetrating injuries to both solid organ and viscera within the abdominal cavity required the presence of surgeons who were expert in open exploration of the abdomen. Patients with severe hemorrhagic blunt trauma who required emergent operative intervention in a suburban or rural environment needed to have surgeons who were competent to explore and repair or resect the injured organ.

The Solution

The aviation industry had recognized the importance of using high fidelity simulation to train pilots and assure their competence in being able to recognize and manage all types of hazards that could occur during a flight. This dramatically enhanced aviation safety. It also standardized the approach to pilot training.

A similar concept of practicing surgery in a simulated nonhuman environment to assure competence to safely perform the procedure on an injured patient in the operating room was the solution.

ATOM DEVELOPMENT AND STANDARDIZATION

Injuries to the stomach, duodenum, small bowel, pancreas, spleen, liver, kidney, bladder and ureter along with injuries to the diaphragm, inferior vena cava and heart were created in a 50-kg swine. The procedures were performed in a fully monitored and anesthetized swine with the same instruments that were used in the trauma operating room. Each animal had an anesthesiologist and a scrub nurse. These procedures created an atmosphere, which was exactly the same as that which occurred in the hospital trauma operating room.

A methodology was developed, which assured that each procedure was performed and evaluated the same way. A video of each injury was reviewed by the instructor prior to beginning the course. This process assured that the injuries were created in exactly the same manner. This standardized process of creating the injury assured that each student surgeon had the same injury with the same degree of difficulty for every case. The instructor evaluated and assured that the student successfully completed each of the steps to provide an ATOM certificate of competence. The rigorous evaluation process provided objective evaluation of each student and each site. This process created a national and international standard for the course.

TESTING AND EVALUATING THE ATOM COURSE

Twenty senior experience trauma surgeons, many of whom were on the committee on trauma, evaluated the inaugural ATOM course.¹⁵

There was a uniform agreement that a senior or chief surgery resident or any board-certified surgeon should be able to manage all of the operative injuries successfully.

The ATOM course improved their ability to identify and repair traumatic injuries. Their knowledge and confidence in the surgical repair of injuries was improved, and it was an effective teaching strategy for surgical education of operative management.^{16,17}

The ATOM textbook with multiple Committee on Trauma trauma surgeon authors described how they would deal with specific clinical injuries and how they would perform the operative skills.¹⁸

Partners for International Development of the ATOM Course

The ATOM course fulfilled the objective of increasing the ability of surgical trainees and surgeons in practice to gain experience in the management of penetrating trauma to the abdomen and chest. Multiple sites in the United States and Canada were implemented followed by international ATOM training sites in Ghana in Africa, in Qatar and Saudi Arabia in the Middle East, São Paulo, Brazil in South America, and multiple other countries in Europe and Japan

ATOM LESSONS LEARNED: A CONTINUING IMPLEMENTATION STRATEGY

Problem Identification

The loss of a surgeon's technical ability to explore an abdomen to manage severe hemorrhagic or visceral injuries resulted in severe consequences for patients who are injured in both civilian and military environments.

Solution and Implementation

The vision was to develop a training course, which could teach operative surgical techniques in 1 day and assure an increase in confidence and competence of the surgical trainee. The ATOM course fulfilled this objective.

Engaging Partners

It was necessary to engage professional educators, surgeons, anesthesiologists, veterinarians, audiovisual experts, and industry partners who could create a nonhuman educational surgical operating environment.

The course had to be evaluated by expert trauma surgeons who could verify that the procedures were safe and consistent with the surgical management of injuries that any surgeon would encounter in an emergency trauma practice and be expected to successfully repair.

© 2022 Wolters Kluwer Health, Inc. All rights reserved.

Evaluation and Dissemination

The course was rigorously evaluated to measure the enhanced confidence and competence of each trainee to successfully perform each of the operative procedures. The results of these evaluations were published widely. The ATOM course has now trained more than 5600 surgeons in 34 sites in the United States and 16 countries throughout the world.

STOP THE BLEED: A Response to Severe Hemorrhage

The tragic shooting of 20 elementary school children in Newtown Connecticut in December 2012 followed by the bombing at the Boston Marathon 6 months later, sharply focused the issue of morbidity and mortality from severe bleeding and the need for immediate hemorrhage control.

These two events generated a call to action to improve survivability from mass casualty events. The American College of Surgeons (ACS) Board of Regents established a Joint Committee to Create a National Policy to Enhance Survivability from Intentional Mass Casualty and Active Shooter Events.

There was a major response from the senior leadership of the federal government, the private sector, and the public resulting in the President of the United States and the National Security Council (NSC) being supportive of a national solution to save the lives of people with severe bleeding.

The joint committee sought representation from prehospital responders, including law enforcement, fire services, and EMS. These representatives needed to have the authority to present the necessary operational changes to their organizations so that a national plan could be implemented.

The committee was comprised of representatives from the ACS, NSC, White House, Department of Defense, Department of Homeland Security, Federal Bureau of Investigation, American College of Emergency Physicians, Prehospital Trauma Life Support organization, Tactical Combat Casualty (TCCC) support organization, The International Association of Fire Chiefs, The National Association of Chiefs of Police and the 17th Surgeon General of the United States.

The committee was convened on April 2, 2013, in Hartford Connecticut, to generate policies that would enhance survival of the victims of mass-casualty events.

The conference relied upon data and evidence from existing military and recent civilian experiences and was sensitive to the multiple agencies that played a role in responding to mass-casualty events. The meeting was known as the Hartford Consensus Conference and produced four concept papers.¹⁹ The origins, development, and implementation of the Stop the Bleed program were outlined in the 2021 Scudder Oration¹⁴

Role of Prehospital Scene Responders

It was critical to clearly identify the roles and responsibilities of the responding agencies. Law-enforcement was usually the first responder to the scene. Their role was to secure the scene and stop any further injuries from occurring from either an active shooter or other ongoing explosive events. They were also tasked to secure the scene for legal purposes, as it was a crime scene.

Emergency medical service responders either from EMS or from the fire department were summoned to the scene to manage any injuries. There was a desire to shield the non-law enforcement responders from potential injuries from an ongoing event. The result of these policies was that the medical response was frequently delayed. Law enforcement was not tasked or trained to intervene medically. If a patient was severely injured or profusely bleeding, their management would be delayed with resultant morbidity and mortality from severe hemorrhage.

The lack of clarity as to who was in charge and the order of implementing the various responsibilities led to organizational confusion and had the potential to have a negative effect on the timing and care rendered to an injured victim.²⁰

Collaboration with the Military

The Assistant Secretary of Defense, Dr. Jonathan Woodson; the 17th Surgeon General, Dr. Rich Carmona; Dr. Frank Butler, Chairman of the Committee on TCCC and a Captain in the U.S. Navy SEALs, and Dr. John Holcomb, a surgeon veteran of multiple conflicts and a member of the TCCC were members of the Hartford Consensus. A joint agreement previously signed by David Hoyt, MD, ACS Executive Director and Jonathan Woodson, MD, Assistant Secretary of Defense, facilitated the collaboration between the ACS and the Department of Defense.

They proposed using the organizational philosophy of the military command structure, which was already in place in combat.^{21–23} Each individual soldier was trained and equipped with a bleeding control kit that included a tourniquet, and they were expected to immediately respond to a severely injured soldier.²⁴ It was clear that there were a number of lessons to be learned and incorporated into the civilian response to severe bleeding.²⁵

Civilian Governmental and Law Enforcement Response

The Department of Homeland Security, the Federal Emergency Management Agency, the US Fire Administration, and the Federal Bureau of Investigation were members of the Hartford Consensus and gave guidance as to how to incorporate hemorrhage control into law enforcement agencies while maintaining scene security and preservation of evidence at the scene.²⁶

The NSC and the White House convened a series of meetings with more than 50 governmental and private sector organizations representing organized medicine, EMSs, fire rescue, law enforcement, organized nursing, and other responders to provide information and seek input on the most effective way to educate and empower the public to become immediate responders to stop severe bleeding.

Vice President Biden, now President Biden, endorsed the Hartford Consensus, stating the report "called for every person to take responsibility for learning the basics of how to respond to uncontrolled bleeding and to put those lessons into use when circumstances placed them in a position to help." The report had the potential to maximize survivability for victims of mass casualty situations and had the potential to increase the resilience and readiness of a nation to respond to these threats.²⁷

Presidential Directive

President Barack Obama recognized the importance of engaging the public in this initiative. He created a Presidential Directive and set a target of 180 days for the development and delivery of a National Preparedness goal to identify the core

Jacobs

capabilities necessary for preparedness, and a national preparedness system to guide activities, which would enable the nation to achieve an inter-agency implementation plan for completing the National Preparedness goal.²⁸

The presidential directive also included integrating a national planning framework covering all levels of government, private and nonprofit sectors, and the public to build and sustain the capabilities outlined in the National Preparedness goal.

The presidential directive facilitated the ACS's interest in providing leadership and education in implementing a National Stop the Bleed program.

Engaging the Leadership of the ACS

The leadership of the ACS enthusiastically endorsed the Stop the Bleed initiative. 29,30

The Committee on Trauma together with the National Association of Emergency Medical Technicians and the TCCC committee under the leadership of Peter Pons, MD, and Norman McSwain, MD, developed the Bleeding Control Course for the public to learn how to use pressure to control severe bleeding, and to apply a tourniquet.^{31–34}

At the 2015 ACS Clinical Congress in Washington, DC, the leadership of the College participated in the B-Con course and received certification.

Of the 341 surgeons participating in the training, 93.7% thought that teaching the public how to control bleeding should be a priority, 93.1% thought the training was appropriate for the public, and 93.8% believed that training the public should be made a priority of the ACS. The EAST provided similar training at its Scientific Assembly in January 2017.³⁵

Evaluating the Public's Desire to Become Immediate Responders

The average member of the public had no knowledge of anatomy and had probably never encountered severe bleeding. They would also be asked to intervene in a difficult and usually chaotic situation. This could be from an inadvertent laceration from a chainsaw or a kitchen knife, but it could also be from a violent shooting or explosive event. They might be in proximity to a location with the potential for ongoing violence and danger.^{36,37}

A national poll assessed the public's response to the idea of being trained to stop severe bleeding. Of the 1,051 people surveyed, 98% said they were very likely or somewhat likely to stop bleeding if a family member was injured; 92% said they would get involved despite not knowing the person. These data demonstrated that the public was willing to be trained and were fully prepared to become involved as Immediate Responders to stop severe bleeding.^{38,39}

Communication Strategy to Engage and Educate the Public

A communication and marketing strategy to promote Stop the Bleed was implemented to inform and engage the public. The NSC and the government created a logo to represent "Stop the Bleed." Philanthropic support from a corporate member of the Hartford Consensus, Johnson and Johnson, was obtained to develop the national Stop the Bleed promotional campaign. The cast of CBS prime-time show, Code Black, provided a public service announcement (PSA) which played on CBS affiliate stations across the United States, and was viewed by millions. These initiatives were very effective in conveying the Stop the Bleed message to the general public.

The ACS worked with Hartford Insurance Company to implement a public facing website, "StoptheBleed.org."

The program used PSAs in stadiums, sports arenas, and electronic media, such as television and social media, to expand the message of stopping bleeding to a national public audience.

Availability and Location of Bleeding Control Equipment

It was essential that the Immediate Responder had access to bleeding control equipment that could be readily available in any location. The kits should contain a pair of gloves, a tourniquet, a hemostatic dressing, and an easy-to-understand instruction guide. These kits should be placed beside automatic external defibrillators in public places, such as stadiums, hospitals, convention centers, airports, churches, and anywhere that large numbers of people would have the potential to be severely injured. They also should be available in cars, boats, or camping equipment.

Engaging the Congress and State Regulatory Agencies

The ACS was asked to train members of the Congress and the Senate in bleeding control. Numerous members of Congress and their staff attended a number of training sessions and became strong advocates for the Stop the Bleed program.

A number of states recognized the importance of training school-teachers and students in bleeding control. The state of Texas passed a law HB 496 in 2019, which required every school district to develop a protocol for bleeding control. It stated that bleeding control kits must be easily available, and the school system should provide bleeding control training. Most importantly, a trained responder providing care in good faith was immune from civil liability. The State of Tennessee passed House Bill 212 in 2021, which authorized Tennessee schools to place Stop the Bleed kits in schools and train staff members.

Medical schools recognized the importance of training medical students in controlling bleeding. The Netter School of Medicine at Quinnipiac University in Connecticut instituted a program which not only involved medical students in Stop the Bleed training but required that all medical students be certified in Stop the Bleed and be competent in bleeding control prior to graduation^{40,41}

The State of Georgia's Trauma Commission implemented a plan to train law-enforcement personnel and equip airports and churches with kits to stop bleeding.

The Occupational Safety and Health Administration (OSHA) provided a guidance document for the workplace, which stated that an employer must ensure bleeding control be available in 3 minutes to 4 minutes. A person must be trained to render first aid and have adequate supplies available.

Implementation of the Stop the Bleed Course

The course has been implemented in all 50 states and 133 countries. There are more than 99,000 instructors. More than

111,000 classes have been given and 1.8 million people have been trained and certified by the ACS as Immediate Responders in stopping severe bleeding.^{42,43}

Stop the Bleed Lessons Learned

Implementation strategies include the following: the identification of major societal problems like Active Shooter incidents and Intentional Mass-Casualty events, which are of great concern to the government, the private sector, and the public; engaging a coalition of experts from different domains to generate a solution; identifying partners in the White House, NSC, and the leadership of multiple governmental agencies, private sector organizations, surgical leaders, and the public; designing and implementing a communication strategy that engaged governmental decision makers, private sector organizations, and the public; publishing the progress of the Stop the Bleed initiative in peer-reviewed and mass-communication media.

CONCLUSION

The concept of identifying significant problems that affect the society, developing thoughtful solutions and then engaging partners from multiple domains that can facilitate implementing the solution, is reproducible. Organizations such as the Eastern Association for the Surgery of Trauma has had a major impact in shaping the national trauma agenda and providing a forum for young professionals to develop, discuss and implement solutions in a logical way to solve problems.

REFERENCES

- Champion HR, Maull KI, Jacobs LM, Harris BH. A brief history of the founding of the Eastern Association for the Surgery of trauma. *J Trauma Acute Care Surg.* 73(2):308–313.
- Rotondo MF, Esposito TJ, Reilly PM, Barie PS, Meredith JW, Eddy VA, et al. The Position of the Eastern Association for the Surgery of Trauma on the Future of Trauma surgery. *J Trauma*. 2005;59(1):77–79.
- Jacobs LM. Eastern Association for the Surgery of Trauma 1991: Presidential Address. J Trauma. 1991;31(7):978–998.
- Jacobs LM, Ramp JM, Bray JM. An Emergency Medical System approach to Disaster Planning. J Trauma. 1979;19(3):157–162.
- Gabram SG, Jacobs LM, Schwartz RJ, Stohler SA, et al. Airway intubation in injured patients at the scene of an accident. *Conn Med.* 1989;53:633.
- Boyd CR, Corse KM, Campbell RC. Emergency interhospital transportation of the major trauma patient: Air versus ground. J Trauma. 1989;29:789.
- Engelhardt S, Hoyt D, Coimbra R, Fortlage D, Holbrook T, et al. The 15 year evolution of an urban trauma center: what does the future hold for the trauma surgeon? *J Trauma*. 2001;51:633–637; discussion 637-8.
- Fakhry SM, Watts DD, Michetti C, Hunt JP; EAST Multi-Institutional Blunt Hollow Viscous Injury Research Group. The resident experience on trauma: declining surgical opportunities and career incentives? Analysis of data from a large multi-institutional study. *J Trauma*. 2003;54:1–7; discussion 7-8.
- Bulinski P, Bachulis B, Naylor DF Jr, Kam D, Carey M, Dean RE, et al. The changing face of trauma management and its impact on surgical resident training. *J Trauma*. 2003;54:161–163.
- Hawkins ML, Wynn JJ, Schmacht DC, et al. Non-operative management of liver and/or splenic interest: effect on resident surgical experience. *Am Surg.* 1998;64:552–556.
- Lukan JK, Carrillo EH, Franklin GA, Spain DA, Miller FB, Richardson JD, et al. Impact of recent trends of non-invasive trauma evaluation and nonoperative management in surgical resident education. *J Trauma*. 2001;50: 1015–1019.
- Scherer LA, Battistella FD. Trauma and emergency surgery: an evolutionary direction for trauma surgeons. J Trauma. 2004;56:7–12.

- Austin MT, Diaz JJ Jr, Feurer ID, Miller RS, May AK, Guillamondegui OD, et al. Creating an emergency general surgery service enhances the productivity of trauma surgeons, general surgeons, and the hospital. *J Trauma*. 2005; 58:906–910.
- Jacobs LM. Scudder oration: trauma, education, communication and implementingchange. J Am Coll Surg. 2022;234(5):1–14.
- Jacobs LM, Burns KJ, Kaban JM, Gross RI, Cortes V, Brautigam RT, et al. Development and evaluation of the Advanced Trauma Operative Management course. J Trauma. 2003;55:471–479; discussion 479.
- Jacobs LM, Burns KJ, Luk SS, Marshall TW. Follow up survey of participants attending the Advanced Trauma Operative Management (ATOM) course. *J Trauma*. 2005;58:1140–1143.
- Jacobs LM, Luk SS, Burns K. Advanced Trauma Operative Management course: site and instructor selection and evaluation. *J Am Coll Surg.* 2006;203(5):772–779.
- Jacobs LM, Gross RI, Luk SS, eds. Advanced Trauma Operative Management: surgical strategies for penetrating trauma. Cine-Med, Inc: Woodbury, CT; 2004.
- Jacobs LM, McSwain N, Rotondo M, et al. The Joint Committee to create a National Policy to enhance survivability from intentional mass-casualty and active shooter events. Improving survival from active shooter events: the Hartford Consensus Statement I, II, and III. *Bull Am Coll Surg.* 2013;98(6): 14–16.
- Jacobs LM, Burns KG, McSwain N, Carver W. Initial management of mass casualty incidents due to firearms: improving survival. *Bull Am Coll Surg.* 2013;98(6):10–13.
- Davis JS, Satahoo SS, Butler FK, Dermer H, Naranjo D, Julien K, et al. An analysis of prehospital deaths: who can we save? *J Trauma Acute Care Surg*. 2014;77:213–218.
- Kelley JF, Ritenour AE, McLaughlin DF, Bagg KA, Apodaca AN, Mallak CT, et al. Injury severity and causes of death from Operation Iraqi Freedom and operation Enduring Freedom: 2003–2004 versus 2006. *J Trauma*. 2008;64(Suppl 2):S21–S26; discussion S26-7.
- Butler FK, Hagmann J, Butler EG. Tactical combat casualty care in special operations. *Mil Med.* 1996;161(Suppl):3–16.
- Butler FK. Military history of increasing survival: the U.S. Military experience with tourniquets and hemostatic dressings in the Afghanistan and Iraq conflicts. *Bull Am Coll Surg.* 2015;100(Suppl 1):60–63.
- Holcomb JB, Butler FK, Rhee PA. Hemostatic control devices: tourniquets and hemostatic dressings. *Bull Am Coll Surg.* 2015;100(1 Suppl):66–70.
- Brinsfield KH, Mitchell E. The Department of Homeland Security's role in enhancing and implementing the response to active shooter and intentional mass casualty events. *Bull Am Coll Surg.* 2015;100(Suppl 1):24–26.
- 27. Biden JR. Letter from the Vice President. Bull Am Coll Surg. 2015;100(1 Suppl):9.
- Obama BH. Presidential policy directive: national preparedness. Bull Am Coll Surg. 2015;100(Suppl 1):10–13.
- Warshaw AL. A systematic response to mass trauma: The public, organize first responders, and the American College of Surgeons. *Bull Am Coll Surg.* 2015;100(Suppl 1):14–15.
- Hoyt DB. Increasing survival, enhancing citizen resilience. Bull Am Coll Surg. 2015;100(1 Suppl):8.
- Bulger E, Snyder D, Schoelles K, et al. An evidence-based pre-hospital guideline for external hemorrhage control. American College of Surgeons Committee on Trauma. *Prehosp Emerg Care*. 2014;18(2):163–173.
- Eastman AL. The continuing threat of active shooter and intentional mass casualty events: local law-enforcement and hemorrhage control. *Bull Am Coll Surg.* 2015;100(Suppl 1):56–58.
- McSwain NE. Integrated education of all responders. Bull Am Coll Surg. 2015;100(Suppl 1):78–81.
- Butler FK, Giebner SD, McSwain N, Pons P, eds. Pre-hospital Trauma Life Support Manual. 8th ed, Military version. Burlington, MA: Jones and Bartlett Learning: 2014.
- Jacobs LM, Burns K, Pons P, Gestring M. Initial steps in training the public about bleeding control, surgeon participation and evaluation. *JAm Coll Surg.* 2017;224:1084–1090.
- Moalem J. Bleeding control training: an opportunity for local voluntarism, community engagement, and peer education. *Bull Am Coll Surg.* 2017; 102(6):17.
- Levy MG, Jacobs LM. A call to action to develop programs for bystanders to control severe bleeding. *JAMA Surg.* 2016;151(12):1103–1104.

© 2022 Wolters Kluwer Health, Inc. All rights reserved.

- Jacobs LM, Burns K, Langer G, Kiewiet de Jonge C. The Hartford Consensus: a national survey of the public regarding bleeding control. *J Am Coll* Surg. 2016;222(5):948–955.
- Jacobs LM, Burns K. The Hartford Consensus: survey of the public and healthcare professionals on active shooter events in hospitals. *J Am Coll* Surg. 2017;225(3):435–442.
- Chernock B, Fischer A, Gallagher K, Fridling J. Letters to the editor: it is time to mandate bleeding control training in medical schools. *Bull Am Coll* Surg. 2019;104(2):52–53.
- Fridling J, VannCott C, Violano P, Jacobs LM. Establishing the first Hartford Consensus-Compliant Medical School in the USA. *J Trauma Acute Care* Surg. 2019;86(6):1023–1026.
- Goralnick E, Haider A. Effectiveness of instructional interventions for hemorrhage control for laypersons in public access and tourniquet training study. A randomized clinical trial. *JAMA Surg.* 2018;153(9): 791–799.
- Bulger EM, Gestring ML, Jacobs LM. Optimizing bleeding control training for the public: a national imperative. *JAMA Surg.* 2018;153(9):799.