



Responding to Crisis: Surgeons as Leaders in Disaster Response

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I was extremely honored to be selected by the American College of Surgeons Committee on Trauma (ACS COT) to deliver the 2016 Scudder Oration on Trauma. Dr Charles Locke Scudder provided outstanding and innovative leadership during the formative years of the ACS, and a foundation for its COT.¹ On a personal level, it is a privilege for me to honor Dr Scudder, who was also a well-known Surgeon-in-Chief at Massachusetts General Hospital in Boston and leader of the New England surgical community in the early 1900s. His life and exemplary surgical career have been a model for generations of young surgeons.

Sharing our surgical expertise with the world's most vulnerable populations during humanitarian crises is a responsibility as well as a privilege. During the past century, surgeons have played a significant and ever-expanding role in responding to complex disasters throughout the world. Multidisciplinary surgeons are uniquely qualified to participate in all aspects of disaster medical response, not just operative management.

The demands of disaster relief have changed significantly during the last few decades, both in the spectrum of threats, the scope of medical care, and the field of operations. Before that, wars and natural disasters were the most frequent mass casualty incidents requiring civilian surgical teams. Increasingly, surgeons are responding to man-made disasters, both non-intentional (technological accidents) and intentional (terrorism).²

I would like to highlight some of the notable contributions of surgical teams responding to past and present humanitarian crises. Lessons learned from these disasters will be important for surgeons responding to complex disasters in the future, often in remote regions of the world (Fig. 1).

SURGEONS' RESPONSE TO PAST DISASTERS

Military and civilian surgeons have a rich history of responding to medical needs during wartime, which has

continued to the present time. In World War 1, the fledging ACS and its founder, Franklin H Martin, MD, played a major role in organizing the nation's surgeons to aid in the war effort (Fig. 2).³ In 1915, American civilian surgical teams were deployed to France more than 2 years before the arrival of any US combat troops. One of the first civilian surgical units in World War 1 was stationed at the Ambulance Americaine Hospital in France under the leadership of George Crile and Harvey Cushing.^{3,4} The surgical unit created an institutional model for wartime training of surgical personnel and demonstrated a newfound appreciation of the necessity for medical preparedness in wartime.

In World War 2, the War Department again asked academic institutions to organize surgical units that could be mobilized for active duty (Fig. 3). Well-known leaders of the ACS who were among the individuals volunteering for duty included Dr Claude Welch (ACS President 1973 to 1974) and Dr Edward Churchill (author of the book *Surgeons to Soldiers*).^{3,4} The novel use in World War 2 of ancillary surgical teams that could be rapidly mobilized and sent to installations in need of additional surgical staff has become a model for contemporary civilian disaster medical response.

Valuable lessons in the care of traumatic injuries have also evolved from the response by surgeons to man-made disasters other than war. On December 6, 1917 in Halifax, Canada, an explosion of a munitions ship (SS Mont-Blanc) occurred after a collision with a Norwegian ship in Halifax Harbor. This was the largest man-made explosion to date, until the Hiroshima bomb, resulting in 2,000 fatalities and more than 9,000 casualties. Teams of surgeons from many of the Boston hospitals provided most of the immediate relief from outside Halifax. Dr William Ladd, a young physician from Boston City Hospital, was so moved by the tragedy and the death of more than 500 children that he subsequently devoted all his energy to the care of children and the establishment of pediatric surgery as a specialty.⁵ For the last 100 years, Halifax has presented Boston with a giant Christmas tree as a remembrance of their help during the tragedy.

The Coconut Grove Night Club Fire occurred in Boston in 1942. Four hundred and ninety-two individuals died and hundreds sustained severe burn injuries. The

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Figure 1. Haiti earthquake (2010). (Courtesy of Dr Briggs.)

disaster came at a unique time in the history of burn care and resulted in significant advances in the resuscitation and surgical care of burn victims.

ROLE OF SURGEONS IN TODAY'S DISASTERS

Disaster surgical care, called “crisis management care” (Institute of Medicine), requires a fundamental change in the approach to the care of victims.^{6,7} Crisis management care is minimally—not maximally—acceptable, surgical care in the acute phase of the disaster because of the large number of victims. The goal of surgical disaster response is “the greatest good for the greatest number of patients.” This is in contrast to the goal of conventional surgical care, which is “the greatest good for the individual patient.”

Similar to the “ABCs” of trauma care, disaster response includes the following basic elements that are similar in all disasters^{7,8}:

1. Search and rescue (first priority)
2. Triage (second priority)
3. Definitive surgical care (third priority)
4. Evacuation (fourth priority)

Rapid assessment by experienced disaster responders will determine which of these elements are needed in the acute phase of the disaster to augment local capabilities. Surgeons are uniquely qualified to participate in all 4 areas because of their expertise in rapid decision making, triage, resuscitation, damage-control surgery, and critical care.

Search and rescue

Many countries have developed specialized search and rescue teams, such as the Urban Search and Rescue Teams in the US. Surgeons are important members of search and rescue teams and participate in rescue (extrication), field amputations, and initial stabilization of victims trapped in confined spaces, many with significant crush injuries.

Triage

Triage is often the most important and psychologically most difficult mission of disaster medical response. Demand for resources always exceeds the supply of resources in disasters. Triage in disasters is based on 3 parameters: severity of injuries, likelihood of survival, and available resources. Surgeons are frequently assigned the role of Triage Officer in disasters because of their knowledge of the medical consequences of various injuries (eg burns, blast, and crush injuries) and the ability to make rapid decisions about priorities for surgical care.

Definitive surgical care

Today’s surgical disaster teams are based on clinical capabilities, not titles (eg trauma surgery, critical care, pediatric

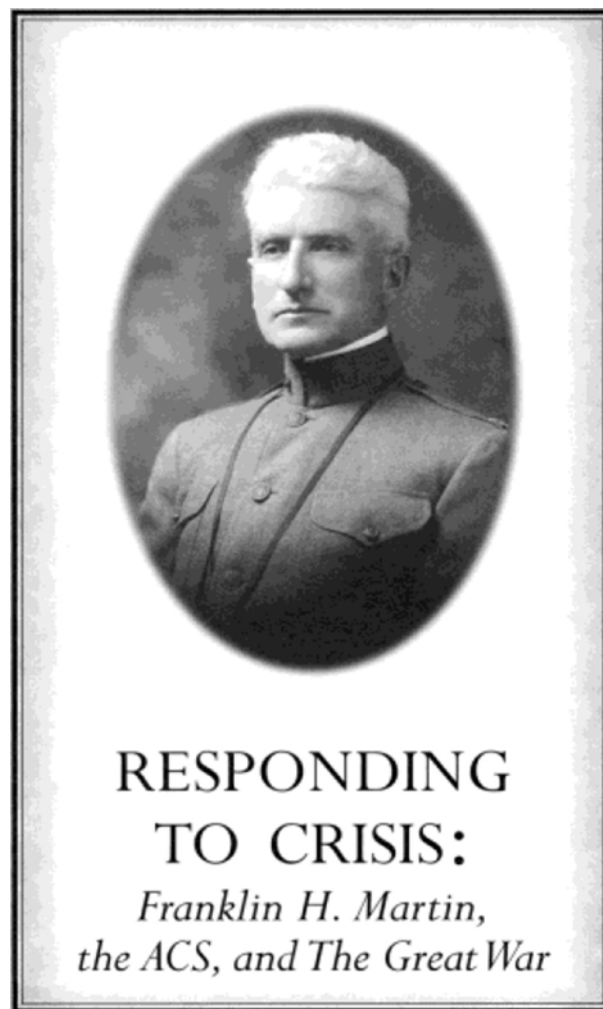


Figure 2. Franklin H Martin, MD, American College of Surgeons founder during World War 1.



Figure 3. Civilian surgical team (University of Pennsylvania) during World War 1.

surgery, orthopaedic surgery, and other surgical specialties) (Fig. 4). Damage-control surgery (eg control of hemorrhage and contamination) is an important part of crisis management care for all surgical specialties participating in the care of disaster victims (Fig. 5).^{7,8}

Disaster surgery always includes non-disaster (often neglected) surgical care as well as emergency surgical care, especially in international disaster relief. Surgeons must often make difficult practical and ethical decisions about the level of surgical care rendered in disasters, especially in austere environments with limited resources.⁷⁻⁹ Surgical procedures in disasters will make a difference if they are relatively simple, cost-effective, curative, and sustainable in the host country.



Figure 4. Child with crush injury to head, Haiti earthquake (2010).



Figure 5. Damage-control surgery, Haiti (2010). (Courtesy of Dr Briggs.)

Mobile field hospitals, designed to provide the full-spectrum of surgical care, including operative care, are frequently used in disasters, particularly in resource-limited environments (Fig. 6).

Evacuation

Surgeons with expertise in critical care are valuable assets in the evacuation of disaster victims to fixed or mobile hospital facilities. The numbers of victims needing evacuation can be significant in today's complex disasters, especially in austere environments.

PARTNERSHIPS IN DISASTER RESPONSE

Partnerships in disaster response are critical to meet the complex needs in today's humanitarian crises and must



Figure 6. US mobile field hospital, Haiti (2010). (Courtesy of Dr Briggs, with permission from Dr Lawler for use of his photograph.)

be developed in advance of the disaster. Civilian surgeons have participated in a number of successful partnerships with military organizations, government agencies, hospital units, and non-profit organizations.

Government partnerships

The National Disaster Medical System, under the auspices of the Department of Health and Human Services, is an integral part of the congressionally mandated Federal Disaster Plan for the US. Surgeons participate in this initiative as part of 2 entities: Disaster Medical Assistance Teams and International Medical Surgical Response Teams.

The International Medical Surgical Response Teams are regional disaster teams affiliated with academic trauma centers in Boston (Massachusetts General Hospital), Miami (Ryder Trauma Center), and Seattle (Harborview Medical Center) and include “federalized” multidisciplinary surgeons from throughout the country. The teams have a deployable, rapid-assembly field hospital and include the capacity for initial stabilization, operative interventions, critical care, and evacuation. The teams’ logistical cache contains flexible and mobile equipment, including ventilators, monitors, ultrasound machines, blood, and pharmaceuticals. The International Medical Surgical Response Teams have deployed to both national and international disasters.^{2,9,10}

Civilian surgeons played a significant role in the US Government’s deployment of the International Medical Surgical Response Teams to the devastating Bam, Iran earthquake in 2003, which occurred in a mountainous, austere region of Iran. The entire city of Bam was destroyed and more than 40,000 individuals died and 10,000 were injured. Thirty-four search and rescue teams (27 countries) and 15 international field hospitals (US included) responded to the earthquake (Fig. 7).¹⁰

The Haiti earthquake in 2010 was a devastating disaster, and surgeons from throughout the world provided surge capacity and mobile field hospitals to care for more than 300,000 injured victims.^{9,11} US Field Hospital, staffed by the International Medical Surgical Response Teams and Disaster Medical Assistance Teams, treated 3,000 patients during 6 weeks and performed 300 operations (conscious sedation and general anesthesia). Fifty percent of cases were general surgery and 50% were orthopaedic surgery. Multidisciplinary surgeons were critical in meeting the diverse disaster needs, such as earthquake injuries, traumatic injuries, critical care, pediatrics, obstetrics, and evacuation of victims to outside medical facilities. Endemic diseases, such as neonatal and adult tetanus, meningococcal meningitis, tuberculosis, HIV, and malaria presented unique challenges in the austere environment of Haiti.



Figure 7. Earthquake in Bam, Iran (2003). (Courtesy of Dr Briggs.)

Military partnerships

US Navy hospital ships

Multidisciplinary civilian surgeons provided “surge capacity” to the US Navy hospital ships in both the Indonesia tsunami (US Naval Ship Mercy) and the Haiti earthquake (US Naval Ship Comfort). Due to the high mortality from the tsunami, many of the surgical procedures on the ship dealt with neglected surgical conditions, as Banda Aceh was a conflict zone before the tsunami, with limited medical care. This was in contrast to the surgical care provided on the US Naval Ship Comfort after the Haiti earthquake, which focused mainly on the surgical treatment of significant crush injuries from the earthquake (Fig. 8).

Senior Visiting Surgeons Program

The Senior Visiting Surgeons Program at the Landstuhl Regional Medical Center in Germany provided civilian surgical surge capacity during the wars in Afghanistan and Iraq from 2005 to 2012. This initiative was developed and implemented by the American Association for the Surgery of Trauma in conjunction with the ACS COT to build military-civilian interaction in trauma care and research. One hundred and ninety-two surgeons from the American Association for the Surgery of Trauma and Society for Vascular Surgery participated in the program.^{12,13}

AMERICAN COLLEGE OF SURGEONS PARTNERSHIP

The American College of Surgeons, under Operation Giving Back, is assuming a leadership role in disaster surgery preparedness and response initiatives. Operation Giving Back, through its website, provides coordination



Figure 8. US Naval Ship Comfort, Haiti (2010). (Courtesy of the US Navy.)

of requests by organizations needing surgeons for disaster response. Additionally, in collaboration with the American Association for the Surgery of Trauma, a disaster registry based on functional capacities has been developed to better define surgeon's capabilities (acute care surgery, trauma surgery, and critical care) for disaster response.

PARTNERSHIPS WITH INTERNATIONAL ORGANIZATIONS

In 2016, WHO began the process of developing and launching emergency medical teams as a critical component of the global health workforce concept, including surgical capacity. The initiative involves government and nonprofit organizations and works in conjunction with, and at the request of, WHO's regional partnerships, such as the Pan American Health Organization.¹⁴

A FINAL TRIBUTE

In a disaster everyone is our neighbor regardless of political, ethnic, cultural, or geographic constraints. Today's multidisciplinary surgeons are continuing a century-old tradition of



Figure 9. Turkey earthquake (1998). (Courtesy of Dr Briggs.)

excellence in responding to humanitarian crises, both at home and in remote regions of the world (Fig. 9).

It is difficult to adequately thank all of the individuals who have worked with me over the years, sharing their surgical expertise during complex disasters. A debt of gratitude is owed to the "home teams," the surgical colleagues at our institutions who covered for us when our disaster teams deployed to humanitarian crises throughout the world. Thanks to all my fellow surgeons who deployed with me on 24 hours' notice to disasters in remote regions of the world, not knowing what challenges in surgical care awaited them.

I also owe a tremendous debt to mentors in my career, including Dr Robert Freeark (Loyola), Dr Donald Trunkey (San Francisco), Dr David Richardson (Louisville), Dr Leslie Ottinger (Massachusetts General Hospital), and Dr Andrew Warshaw (Massachusetts General Hospital), who helped me develop the surgical expertise needed to make a difference in today's complex disasters.

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