Air Force Disaster Response: Haiti Experience

Joseph J. Stuart, MD,[1] and Drew C. Johnson, DO[2]

After the devastating earthquake in Haiti, the United States Air Force deployed multiple medical units as part of the disaster response. Air Force Special Operations Command medical teams provided initial medical response and assisted in the organization of medical assets. A small portable expeditionary aeromedical rapid response team with the assistance of a mobile aeromedical staging facility team stabilized patients for flight and coordinated air evacuation to the United States. An expeditionary medical support hospital was set up and assisted in patient movement to and from the USNS Comfort *hospital ship. These units were able to adapt to the unique circumstances in Haiti and provide great patient care. The lessons learned from these experiences may help the United States better respond to future disasters.* (Journal of Surgical Orthopaedic Advances 20(1):62–66, 2011)

Key words: Air Force, disaster, earthquake, Haiti, military, response, trauma

The magnitude 7 earthquake of January 12, 2010 and subsequent aftershocks devastated the country of Haiti and its capital of Port-au-Prince. The Haitian government estimated that over 200,000 people were killed, 300,000 were injured, and 1 million were made homeless (1). Much of the country's medical infrastructure was destroyed and what remained was quickly overwhelmed. This devastation led to one of the greatest humanitarian responses in history. Under the direction of the United States Military Southern Command (SOUTHCOM) and in support of the United States Agency for International Development (USAID), the military mission termed "Operation Unified Response" included multiple U.S. Air Force medical assets to provide humanitarian assistance and disaster relief. These units were required to adapt to unique and changing circumstances while providing medical care and compassion to the people of Haiti. Interaction and communication with other U.S. government and military units, foreign military forces, nongovernmental organizations (NGOs), and local physicians and representatives from the Haitian health care system were imperative to provide the best care possible. This article describes the role of these U.S. Air Force medical units in the disaster response, the roles of the orthopedic surgeons in these units, and the lessons learned from these experiences.

From [1]Department of Orthopaedic Surgery and [2]Department of Emergency Medicine, Michael O'Callaghan Federal Hospital, Nellis Air Force Base, NV. Address correspondence to: Joseph J. Stuart, MD, Department of Orthopaedic Surgery, Michael O'Callaghan Federal Hospital, 4700 N. Las Vegas Boulevard, Las Vegas, NV 89191; e-mail: Joseph.stuart@nellis.af.mil.

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Air Force, the Department of Defense, or the U.S. Government.

Received for publication December 23, 2010; accepted for publication December 23, 2010.

For information on prices and availability of reprints call 410-494-4994 X232.

1548-825X/11/2001-0062$22.00/0

Air Force Special Operations Command Medical Response

Air Force Special Operations Command (AFSOC) sent rapidly deployable assets into Haiti within 24 hours of the earthquake. In addition to medical teams, they had teams specialized in search and rescue, weather observation, communications, and airfield management, among others. Combat controllers were able to take command and control of flight operations and had the airport ready for landing aircraft within 30 minutes of arrival (2). Although there was some media scrutiny of aircraft prioritization, these Air Force specialists were crucial in providing capabilities necessary for further influx of relief assistance, establishing a supply and logistics network, and setting up air evacuation of patients requiring higher levels of care.

The special operations medical assets were composed of special operations surgical teams, special operations critical care evacuation teams, and special operations forces medical elements. These self-sufficient units provide rapidly deployable surgical and critical care with most of the physicians, nurses, and technicians having deployed in combat operations. Special operations surgical teams provided the first military surgical capabilities in the country. Three orthopedic surgeons were sent as part of these teams, which also consisted of general surgeons, anesthesia providers, emergency physicians, nurses, and surgical technicians. They were capable of performing "damage control" procedures and stabilizing patients for transport. They utilized existing structures, when safe,

and also used tents for patient care areas. They had basic surgical instrumentation, external fixation sets, and splinting materials for fracture stabilization.

An AFSOC medical team initially responded to the U.S. Embassy to aid in processing and treating American citizens and preparing them for transport. The team at the embassy worked in austere conditions setting up makeshift operating areas and operating tables among the rubble. Another AFSOC team set up operations at the airport in support of air evacuation efforts to stabilize patients with more severe injuries that were indicated for care in the United States. They worked in coordination with Air Force critical care air transport teams (CCATT) to stabilize and prepare these patients for flight. As medical resources in Haiti and around the embassy improved, the AFSOC teams were consolidated at the airport. With an overwhelming number of injured patients, these teams managed limited resources and adapted to austere conditions while treating and stabilizing hundreds of patients during their initial response. Working with the Haitian government as well as other government organizations and NGOs, they helped coordinate the initial medical response to the disaster. They performed medical site surveys to assess available medical assets. AFSOC medical teams also assisted in establishing casualty evacuation and patient movement within the country and coordinated with U.S. naval air platforms when they became available. After the USNS *Comfort* hospital ship arrived, one of the AFSOC orthopedic surgeons was sent to the *Comfort* to assist with the large volume of orthopedic patients. As other Air Force medical units came into Haiti, the AFSOC medical units were replaced and returned to their home base and usual missions. The unit at the embassy treated a total of 362 patients. AFSOC surgeons at the embassy performed 14 major surgeries, including nine amputations, and delivered one baby. The teams surveyed 16 hospitals, directed medical triage of more than 8000 American citizens, and evacuated 167 patients (2). The foundation and structure that the AFSOC teams had established proved vital for the remainder of the Air Force medical teams as well as the overall humanitarian response.

Small Portable Expeditionary Aeromedical Rapid Response Team

A small portable expeditionary aeromedical rapid response (SPEARR) team was mobilized from Eglin Air Force Base, Florida. The members of the team were put on alert 48 to 72 hours following the earthquake and were eventually mobilized and arrived in Port-au-Prince on January 23rd. The typical role of a SPEARR team is to support a patient population of 500 for 5 to 7 days of initial medical response. The team is meant to be rapidly deployable and mobile with only one pallet of equipment. Most surgical equipment is carried in backpacks, and a team typically has one treatment tent, two living tents, and one generator (Fig. 1). The team is composed of 10 members: an orthopedic surgeon, general surgeon, anesthesia provider, emergency medicine physician, operating room nurse, public health/preventive medicine officer, aerospace medicine specialist, critical care nurse, internal medicine physician, and cardiopulmonary technician. For the Haiti mission, the team was augmented with a biomedical officer and a public health technician. The team is equipped to provide critical care for up to 10 patients with a maximum of three mechanically ventilated patients (3). In addition to surgical supplies for resuscitative procedures, the orthopedic surgeon carries external fixators and some splinting materials.

The SPEARR team replaced the AFSOC team at the airport and took control of their medical operations. As the SPEARR team arrived, the injuries had evolved and many had received initial stabilization by other medical treatment groups. The usual mission of the SPEARR team, which is to provide initial resuscitative and stabilization procedures, was no longer as relevant. The team also did not have the facilities or personnel to provide prolonged holding capabilities. For these reasons, the SPEARR team continued the air evacuation mission. Team members were also tasked to provide emergent surgical capabilities for possible airport accidents. The SPEARR team worked with a 13-member Air Force mobile aeromedical staging facility (MASF) team that consisted of two primary care physicians as well as a team of nurses, administrators, and medical and administrative technicians. The MASF team arrived in Haiti on January 20th and provided medical care and holding capabilities as well as logistical and administrative support of the air evacuation mission. The SPEARR team would triage and evaluate patients who were identified for air transport to the United States by other treatment facilities. These patients were then brought to the SPEARR team tent where they were further triaged and stabilized for air transport. More stable patients were taken to the MASF tents where they received further care, while the more critical patients or ventilated patients remained in the SPEARR tent for continued intensive care until the aircraft and CCATT teams arrived.

The SPEARR team evacuated 498 patients over approximately 2 months and provided intensive care for 23 of them. Although they did not perform any surgeries at the surgical site at the airport, the general surgeon and the orthopedic surgeon volunteered at local NGO hospitals and performed approximately 10 total surgeries. The orthopedic surgeon also intermittently supplemented the surgical staff on the USNS *Comfort.* The initial SPEARR team was replaced by another team in mid-March, which

FIGURE 1 Tent used by the AFSOC and SPEARR teams at Toussaint Louverture International Airport, Port-au-Prince, Haiti.

had an orthopedic physician's assistant instead of an orthopedic surgeon. The replacement team ended their assignment in June as the U.S. military ended their disaster response.

Expeditionary Medical Support

The Expeditionary Medical Support (EMEDS) is a rapidly deployable system that can provide initial resuscitation and stabilization, primary care, dental services, force health protection, and aeromedical evacuation of indicated casualties. EMEDS is typically designed to only provide essential care, but in the cases of humanitarian and combined force missions some reconstructive surgeries and rehabilitative services are possible. The EMEDS +10, the unit deployed to Haiti, is simply a 10-bed tent hospital. It is intended to treat an at-risk population of 3000 to 5000 people and can provide medical and dental care for up to 7 days in an austere environment without resupply. This six- to seven-tent hospital typically provides emergency/trauma care, surgical capabilities, critical care, primary care, preventive and aerospace medicine, public health, a 10-bed ward, a three-bed critical care unit, laboratory services, pharmacy, plain-film x-rays, dental services, administrative support, as well as logistics and communications elements (4). The EMEDS +10 sent to Haiti also had augmentation teams for mental health, women's health, and pediatrics. The EMEDS ultimately had a 78-member team including additional personnel and two extra tents (to comprise an eight-tent hospital, which was able to expand to a 20-bed ward).

The surgical capability of the EMEDS is provided by a five-member mobile field surgical team (MFST). This team is comprised of a general surgeon, orthopedic surgeon, anesthesiologist or nurse anesthetist, emergency medicine physician, and operating room nurse and is capable of performing 10 major surgeries or 20 nonoperative resuscitations in 48 to 72 hours. Within the EMEDS, the operating theater has 100 square feet of tent space, one operating table, and operating room lights. The EMEDS is well equipped surgically for a mobile unit with anesthesia machines, electrocautery, vital signs monitoring equipment, portable suction, and sterile instruments. Supplies also include sterile gowns, gloves, drapes, and dressing supplies. The facility has a large sterilizer with water reclaimer unit in addition to a tabletop steam sterilizer (4). In contrast to the tent used by the AFSOC and SPEARR teams, the EMEDS tent had a more advanced ventilation system. In response to this disaster, additional instrumentation to the standard EMEDS +10 package was included. Surgical instrumentation included major and minor surgical trays as well as thoracotomy, vascular, craniotomy, intestinal, and anorectal trays. Orthopedic instrumentation included a basic ortho set, K-wire/Steinmann pin set, amputation tray, hand and foot set, external fixators, small and large fragment implants, and battery-powered drills and saws. A variety of splinting and casting materials were also available.

The surgical team (MFST) from Nellis, Air Force Base, Nevada, was activated on January 15th, 3 days after the earthquake. This team departed Las Vegas on January 18th for Travis Air Force Base, California, where they met up with the majority of the EMEDS team, who had also started preparations for this deployment. The EMEDS pallets sat on an aircraft waiting for orders to depart. The unit departed Travis Air Force Base and arrived at Port-au-Prince on January 24th. The pediatric and women's health augmentation teams from Lackland Air Force Base, Texas, integrated with the team at the Port-au-Prince airport. On arrival in Haiti, everyone began work assisting the existing teams at the airport. On January 25th, the majority of the EMEDs team went to Terminal Varreux, a private industrial seaport and landfill, while the surgical team remained an extra day at the airport to continue to assist the teams there (Fig. 2). A Georgia disaster medical assistance team (DMAT) was established at the Terminal Varreux site and was providing patient care and assisting the Navy in patient movement to the USNS *Comfort*. Shortly after arrival, the orthopedic surgeon was reassigned to the USNS *Comfort* to assist in the treatment of the many orthopedic patients aboard the ship. Once the EMEDS pallets arrived at the site, construction of the tent facility began. Security was provided by the Navy, while Navy and Air Force specialists provided communications. The day after their arrival, the EMEDS team took over the role of the DMAT team performing triage and intermediate care of patients bound for the USNS *Comfort* as well as emergency care for other disaster victims not sent to the

FIGURE 2 EMEDS hospital at Terminal Varreux, Haiti.

USNS *Comfort*. They also assisted in the disposition of patients coming off the comfort and provided inpatient care for many patients awaiting long-term care placement or those who required further care and observation before final disposition. A member of the Haitian health ministry worked closely with the unit to help coordinate patient movement and arranged further medical care and follow-up for patients with NGO clinics, hospitals, and other local facilities. Interpreters from the military, public health service, and Red Cross, assigned to the EMEDS unit as well as other military and civilian treatment facilities, were invaluable in facilitating interaction and communication with the patients. They also educated the providers about the Haitian culture and their views of health care.

The providers and EMEDS leadership were required to communicate closely with other treatment facilities in the country and become familiar with their capabilities and resources. They became familiar with the logistics of patient movement within the country and worked together with local doctors, foreign militaries, NGOs, and all branches of the U.S. military. As the mission continued, outreach programs were established where providers would hand out supplies and see patients at orphanages and outside clinics such as the Real Hope for Haiti Clinic. The nurse anesthetist, operating room nurse, and operating room technician from the EMEDS also spent short stints on the *Comfort* assisting with their surgical role. The EMEDS unit treated more than 2500 patients with over 150 inpatient admissions and aided in the movement of more than 500 patients from the USNS *Comfort.* They performed 12 cases in the operating room, most being irrigation and debridement and/or dressing changes of patients who required further wound care before final disposition. The orthopedic surgeon and the general surgeon assigned to the EMEDS left Haiti on February 18th and the rest of the EMEDS departed on March 19, 2010.

Discussion

The Air Force and other military units have resources that uniquely qualify them for humanitarian responses, such as in Haiti. Although the military platforms are primarily intended for the treatment of battlefield casualties, similar principles allow them to function well in a humanitarian role. The military can provide self-sustained units that can rapidly deploy and provide lifesaving care. The military can also provide transport of these assets to anywhere in the world as well as support the evacuation mission. The learning and experiences from military deployment in support of combat operations, such as triage management, treatment and resuscitation after severe injuries, patient movement, communication, and mass casualties on a smaller scale, also make a responder better prepared for this type of humanitarian mission.

In Haiti it was often commented that the conditions were "like wartime." In some cases this was true. Units were working with limited resources and needed to utilize triage principles to manage their resources. There were terrible injuries that required stabilization and resuscitation. Care was administered in austere conditions, sometimes requiring resourceful solutions. Patients were evacuated to higher levels of care if they were available. Both wartime and humanitarian operations require good relationships with the local community and other resources.

In other ways the humanitarian mission in Haiti differed from modern wartime care. The extreme number of casualties in Haiti presented multiple difficulties. The significant number of injured patients acted to heighten the limitations in resources. In the current military conflicts, patient evacuation is well established and rapid. With few exceptions, patients are evaluated and treated rapidly, in contrast to Haiti, where the number of patients greatly outweighed the initial capacity to provide care. Patients in the wartime theater can be in the United States receiving care within a few days. In Haiti, there were many difficulties finding facilities that could provide complex surgical or postsurgical care to these patients. Most Haitian facilities would have been ill prepared to care for these injuries even before the earthquake. Wartime units have established lines of communications and knowledge of other units in the area. In Haiti it was necessary to establish these lines of communication, and there were understandably times when communication was difficult.

Command and control is more centralized during a military operation when compared to this humanitarian mission. Running a humanitarian response of this scale required the authorization of the host country and the

interaction of leaders from many countries and organizations. Members of the Air Force units that arrived in Haiti 11 to 12 days after the earthquake experienced some frustration as they waited to deploy. It was difficult to see the number of patients and injuries and not be there to begin treating them. Once these units did arrive, other treatment facilities had been established, many of the patients had received initial stabilization, some had perished from wounds, and the remaining injuries had evolved to a more subacute nature. Although the Air Force units could have assumed a larger surgical role if they would have arrived sooner, these units adapted to their assigned missions and integrated into the response efforts. They relocated some of their assets including orthopedic surgeons to the USNS *Comfort*, where skills could best be utilized.

In the initial Haiti response, many units with differing capabilities converged on the country and tried to do their best with the resources they had. There was often poor communication between responder groups and it was inevitable that some resources were inefficiently utilized within and between organizations. Some of the Air Force units had capabilities, including more advanced sterilization equipment, improved operating environments, and additional surgical equipment, as well as personnel and bed space, that were underutilized. A more rapid deployment of these units as well as partnering up with other government organizations or NGOs would likely have resulted in better use of these resources. Although it would be challenging in a multinational response, an overall command and control element could better direct the available resources, assist in patient flow, and better interact with the host nation. It is also necessary to consider the interaction of military units with civilian and other government units in disaster response planning and how the resources and capabilities that the military provides can best be integrated. Opportunities for interaction between military and nonmilitary command elements would help these groups become more familiar with each other's equipment and capabilities and could translate into better integration in a disaster situation.

Overall, the initial response in Haiti saved lives and limbs and was considered successful. It is important that we learn from our successes as well as failures during this operation. Continued reevaluation of medical platforms and capabilities will ensure that the United States has the appropriate resources to respond to future disasters. It is also important to continue to train for these disasters. The Air Force has personnel assigned to dedicated disaster response teams. These teams are prepared for rapid deployment and train together to be prepared for these potential disasters. It is important that different government organizations as well as NGOs communicate, train, and interact with one another to optimize future responses. If a disaster of this magnitude occurs again, hopefully the lessons learned from this experience can help us respond more effectively.

References

1. Haiti death toll up to 230,000. Associated Press. *USA Today*, Feb. 9, 2010.
2. Comer, R. Haiti initial entry force. *Defense Media Network*, July 14, 2010. http://www.defensemedianetwork.com/ stories/haiti-initial-entry-force/ Accessed Sept. 15, 2010.
3. *Air Force Medical Service Concept of Operations for Small Portable Expeditionary Aeromedical Rapid Response Team.* Headquarters United States Air Force, Surgeon General, Bolling AFB, Washington, DC, 2000.
4. *Air Force Tactics, Techniques, and Procedures 3-42.71, Expeditionary Medical Support (EMEDS).* Headquarters United States Air Force, Surgeon General, Bolling AFB, Washington, DC, July 27, 2006. https://kx.afms.af.mil/doctrine