

The Experiences of a Surgical Response Team in Haiti

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On Tuesday afternoon, January 12, 2010, a 7.0-magnitude earthquake occurred in downtown Port-au-Prince, Haiti. This was a particularly devastating prospect for a developing nation already struggling for the normalcy of civil society. The Haitian population lacks a stable government, and the nation's infrastructure and building structures are far below the standards of developed nations. A staggering 80% of the population lives below the poverty line. Soon after the earthquake struck, the news media showed images of the devastation. Both the scope of destruction and the lack of adequate medical facilities were horrific. One could not help but ask, "How could this happen in this day and age?"

The next morning, January 13, Dr. David L. Helfet began to assemble a surgical response team to aid in relief efforts. Multiple medical relief organizations were contacted, including Partners in Health (PIH), a relief organization involved in Haiti outreach for over 2 decades. We understood that PIH would have intricate knowledge of the needs in Port-au-Prince and be able to place our team where it would be most effective.

The initial response team (Figure 1) consisted of 3 attending orthopedic surgeons, 3 orthopedic trauma fellows, 2 anesthesiologists, 1 nurse practitioner, 2 nurses, and 2 scrub technicians. Donated supplies included (but were not limited to) 100 self-contained large and small Synthes external fixator kits, 4 power drivers, saw blades, operating room soft goods, instruments, antibiotics, and regional anesthesia supplies. There were also specialized fracture care sets that would later be deemed unnecessary because the hospital conditions were incompatible with their use. Supplies were donated

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from both private industry (Synthes) and our own institutions: the Hospital for Special Surgery (HSS) and New York Presbyterian Hospital.

On Friday morning, January 15, the team gathered outside HSS for one last inventory check and boarded a shuttle bus headed for Teterboro Airport in New Jersey, where we were to board a private airplane (also graciously donated by Synthes) for air transportation to Port-au-Prince. It became evident that our haste



Figure 1. The initial surgical relief team consisted of David L. Helfet, MD, Dean G. Lorch, MD, Daniel Chan, MD, Patricia Donohue, NP, Douglas Green, MD, Kethy Marie Jules-Elysee, MD, Neil MacIntyre, MD, Ronald Perez, RN, and Louise Strickland, RN (joining the team later were Devon M. Jeffcoat, MD, and Florian Huber, MD).



Figure 2. Upon arrival in Port-au-Prince, Haiti, the supplies and the team were transported by United Nations vans.



Figure 3. The hospital grounds adjacent to L'Hôpital de la Communauté Haïtienne upon arrival. The hospital building was beyond capacity. Patients were triaged and awaiting surgical care.

would be in vain. The Port-au-Prince airport was now being run by the US military and all flights in and out were tightly controlled. Our landing clearance, which had been received well in advance of the flight, was suddenly retracted, and we were rerouted to the Dominican Republic. We waited there 36 hours before receiving new landing clearance in Port-au-Prince (Figure 2).

CONDITIONS IN THE FIELD

The first thing our team noticed was a pervasive odor, a putrid stench that emanated from the city. It first became obvious as we deplaned, but the mixture of jet fuel and exhaust initially lessened its impact. We soon found that this odor permeated all corners of the city. People at the airport wore masks to no avail. A group from PIH greeted us at the airport and acted as our guides. We then loaded our caravan and a United Nations (UN) convoy took our team and gear to the Hospital General. To our shock the situation on the ground was far worse than we could ever have imagined. Along every roadside people were sleeping on sidewalks, piles of rubble, and sewer drains. They were too scared to go into the remains of their homes for fear of another aftershock. Dead bodies were visible on every street corner along with children playing in the street. The only light present was that from our headlights and from candles people had placed in their makeshift shelters made with broken pieces of wood and plastic tarps. Many of these same supplies were used to manage fractures prior to our arrival.

The first hospital we visited was Hospital General. According to our guide from PIH, this was the most advanced institution in the city. Our experience was far from this description. The wards and operating rooms were condemned, so amputations were being performed on picnic tables using hacksaws and local anesthetic. The lack of electricity was not lost on the locals. One family member was spotted climbing an electrical tower in order to reattach wires with his bare hands. After a long discussion with the doctors and nurses at the



Figure 4. The reception area of the hospital was transformed into a makeshift ward with all patient care provided by family members.



Figure 5. The majority of open fractures had been splinted with cardboard, and wounds were dressed with dirty rags.

Hospital General, we determined that our surgical abilities could be better utilized in a place with a functioning operating room and lights.

We returned to our caravan and drove 10 miles through rubble and misery. We finally arrived at L'Hôpital de la Communauté Haïtienne (The Community Hospital of Haiti) in Freres (Figure 3). This institution was considered a "state-of-the-art" facility. We chose it because there was electricity and running water. Upon arrival we found that the hospital was equipped with a single x-ray machine, 3 makeshift operating rooms, and a postanesthesia care unit with 8 beds. The scrub sink consisted of 2 bottles of hand sanitizer. The 2 methods to sterilize equipment were a bucket of Cidex or a dental autoclave, both less than sanitary and not ideal for inserting orthopedic implants.

Once we unpacked, we began working. The term "unpacked" is a misnomer because we really just piled our bags and equipment into a small storage room. This "room" would become our storage center, bedroom, and dining hall.

Our first priority was patient triage. Our nurse practitioner served as our lead triage agent. She and many other nonorthopedic providers shunted more critical



Figure 6. Many patients presented with complex open fractures and fracture dislocations that had not been treated/reduced during the 4 days prior to our arrival as the hospital had very limited staffing or orthopedic specialists. A 24-year-old man presented with this open ankle fracture/dislocation (4 days following the injury).



Figure 7. One patient presented with a right-sided, Arbeitsgemeinschaft für Osteosynthesefragen (AO) type C3 open distal radius fracture 6 days following the injury. Upon removal of a gauze dressing, the soft tissues were unfortunately found to be nonviable, and the open wound was infested with maggots. An amputation was performed to the mid-forearm, above which tissues were found to be viable.

patients to the immediate operating room area. Here the surgeons chose those in most urgent need. We tried to prioritize the treatment of children when possible (Figure 4). This method of triage went on for 65 straight hours.

In our naivety, we prepared to implant intramedullary nails in tibias and femurs and to perform open reduction and internal fixation (ORIF) for most other fractures. This was far from the reality we encountered. Most of our fracture care was for Gustilo-Anderson grade I to grade IIIB open fractures. Many were necrotic as a result of lack of medical care in the acute setting. Fractures were splinted in the field with cardboard, and wounds were dressed with dirty rags (Figure 5). Antibiotics were in short supply, and our choice of agent was dictated by supply at the time. Even in the hospital wards conditions were suboptimal. It was commonplace to see flies on wounds and other patients defecating in buckets next to open fractures.



Figure 8. Many open lower-extremity fractures were also treated through external fixation, including this open femoral shaft fracture.



Figure 9. The presence of multiple fractures/polytrauma was commonly seen, as is often encountered in catastrophic disasters.

We became acutely aware of our limited resources. Patients were transported using wooden doors and old mattresses. Clean used drapes were used as postoperative blankets, and surgical dressings were fashioned from sterile gauze used during the operations.

We were struck by the support that family members showed each other. Mothers would sleep for days next to their children on cardboard boxes. Sons would change their fathers' diapers. Cousins would bring food from miles away. Brothers and sisters would carry their loved ones for miles on heavy wooden doors used as stretchers. One patient had a spine fracture and could not lie flat, so for 5 days his father slept next to him propping him up in order to ease his suffering.

THE NATURE OF SURGERIES PERFORMED

After the initial shock, we came to grips with the limitations set upon us. The Trochanteric Fixation Nail large-fragment and small-fragment sets (Synthes) were set aside, and we continuously charged the reciprocating saws and power drivers. The operating period was 65 hours with

a 4-hour break time because of a generator issue. We were able to perform 81 surgeries on 64 patients (Figures 6-9). Another surgical team using our anesthesiologists and supplies performed 45 additional operations. The 81 operations performed included 20 (25%) amputations, 49 (60%) external fixation/irrigation and débridement (I&D) procedures, 4 (5%) fasciotomies, 5 (6%) massive soft-tissue débridements, and 1 (1%) hand pinning. The specific operations performed were:

- Amputations (20): 2 above-knee amputations, 9 below-knee amputations, 2 arm, 3 forearm, and 4 feet
- External fixators (49): 3 humerus, 1 elbow, 4 radius, 1 pelvis, 1 femoral neck, 13 femur, 22 tibia, and 4 pilon
- Both-bone forearm ORIF (1)
- Massive soft-tissue I&D (5)
- Fasciotomy (4): 1 forearm, 1 leg, and 2 feet
- Hand pinning (1)
- Assistance with a cesarean section (1)

GREATEST CHALLENGES/GREATEST REWARDS

Adjusting to the challenges of operating in a third-world country that had just been devastated by a catastrophic earthquake was a difficult task for our surgical team. The emotional strain was palpable both within our group and within the hospital. As physicians based in the United States, we are accustomed to giving people every state-of-the-art medical resource in order to preserve life and limb. At home, virtually no expense is spared, and almost all possibilities are explored. Now, stationed in Haiti, we had none of the resources to which we had become accustomed. We were without lab work, blood products, electrocardiography machines, code carts, oxygen tanks, and anesthesia machines. We now had to choose whose life was more important. It was very difficult to triage because taking one person first meant someone else would have to wait. In the back of our mind we knew that if they waited they might die. Many of the patients in the hospital did die. Bodies were taken outside and placed by the dumpster. Giant dump trucks would come by and claim the bodies in order to decrease the likelihood of disease from decomposing bodies. It was also difficult to amputate limbs on young and healthy patients. At home we would have given antibiotics and placed a vacuum-assisted closure dressing; 3 days later, the patient would receive a skin graft enabling a restoration of a limb with normal function. Instead, we were forced to amputate arms covered in maggots using a dull hacksaw sterilized in a bucket of Cidex!

With such great emotional hardship comes an equal and opposite emotional reward. This reward is embodied in the smile of a child. The patients and their families would thank us after every operation, even after we amputated limbs. They knew that without surgery their loved ones would die. It was comparable to “Civil War medicine,” and

it was all we could do. In medical school we are taught to be healers—at its core, this is what we were.

WHAT NEEDS TO BE DONE TO MEET FUTURE NEEDS

The acute phase of a natural disaster is a critical time for the intervention of medical expertise, including surgeons. A well-equipped and competent staff along with advanced good logistical planning and personal safety plans is vital to any acute disaster medical relief plan.

First and foremost, an umbrella organization must provide ultimate leadership. Personnel and resources must be dispatched and controlled by a central authority. Proper allocation of scarce resources is vital in emergency situations. Poor planning is a poor excuse for patients not getting proper medical care.

Security is a major concern. A medical team cannot perform proper care if they themselves feel threatened. The US military, UN peacekeeping forces, or an organized security team is vital to keep personnel and supplies safe. The hospital should be secure and a safe work environment is vital. The safety of the supply line is critical; our resupply truck was hijacked somewhere between the airport and our hospital.

There are many groups that have played a role in Haiti and should be involved in the next natural disaster. Nongovernment organizations (NGOs) like PIH and Doctors Without Borders are generally able to move quickly into a disaster zone but lack their own security force and are each a small part of a larger relief effort. Military-associated organizations like International Medical Surgical Response Team (IMSuRT) have the advantage of a predefined plan and a built-in security force. Any such US government/military-supported groups, however, have the disadvantage, as happened in Haiti, that the political ramifications of a rapid US military influx can be seen as a threat to a nation's sovereignty. This can delay their deployment when they are needed most. As was seen in Haiti, patients with open fractures and crush injuries are in the most acute need of lifesaving aid immediately after a natural disaster, and a swift response is needed. A model for the next large-scale disaster response would best integrate the rapid response of NGOs with the large-scale logistical and security support of military-associated organizations. There needs to be a real chain of command—and a “General Patton” in charge!

AUTHORS' DISCLOSURE STATEMENT

Dr. Helfet wishes to note that he is a member of the Board of Directors for Synthes.

The other authors report no actual or potential conflict of interest in relation to this article.