SIGN Response to Natural Disasters

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Summary: Each disaster causes different types of injuries. Orthopaedic surgeons who respond should have equipment that is compatible with the facilities available and suitable to treat the injuries. Provisions, including training for long-term patient care, should be made before leaving the disaster area. All care should be taken under the leadership of host orthopaedic surgeons.

Key Words: disaster—SIGN—natural disaster—relief—tsunami—earthquake.

Earthquakes in the Pacific Ring of Fire have accounted for the majority of disasters in the past 10 years. This section will describe 3 of these disasters. Each disaster caused a different spectrum of injuries because of forces from the earthquake, the construction materials of the buildings, and climate. Surgical Implant Generation Network (SIGN) programs are still functioning in hospitals serving the people in the area of these 3 disasters.

THE 2004 TSUNAMI—BANDA ACEH, INDONESIA

The tsunami occurred on December 26, 2004 causing a huge area of destruction in Banda Aceh, Indonesia. As far as one could see, no upright structures remained in the areas nearest to the sea. Only the foundations were visible for miles (Fig. 1). Photos of missing family members covered airport walls (Fig. 2).

Crumpled cars littered the road from the airport to the Banda Aceh General Hospital. Cars were crushed on all sides as if repeatedly rolled over by a giant force (Fig. 3). We learned later that this damage occurred when the tsunami roared through the town. The lifeless passengers were often still in the cars. We passed a large ship which had been propelled 3 miles inland by the tidal wave and left to rest next to the largest hotel located in the center of town.

Indonesian flags marked the buildings which had not yet been searched for bodies. Rescue workers wondered how anyone could have survived the massive forces generated by the tsunami. How could anyone with a fractured femur or tibia have survived? Later many patients who had washed up on shore and been treated by bonesetters presented at the hospital with nonunions and malunions of the long bones. Figure 4 shows a large ship that has been propelled to the center of town by the tsunami.

The SIGN team slept on the floor of an Indonesian army barracks. The Indonesian army and the insurgents had been fighting a long time. This disaster created the impetus for settlement of their dispute.

During the first visit we treated mostly soft tissue wounds in a Danish mobile unit. This was a self-contained unit that included a compressor, water supply, operating room, and even a ward. The main hospital had been severely damaged. When we arrived a few weeks after the event, 6 inches of mud still covered the floor of Dr. Azharuddin’s office (Fig. 5).

At a meeting called to discuss strategic planning, one country proclaimed that they would build a new hospital. Others made similar generous claims to help the people of Banda Aceh. There is no new hospital today in Banda Aceh, but the older one is functional. A number of individuals who showed up on their own and did whatever was necessary were...
invaluable. One retired doctor organized a system to deliver laboratory specimens. The only orthopaedic surgeon in Banda Aceh was Dr. Azharuddin. His destroyed home and a water-logged pile of his orthopaedic books were reminders of a better past (Fig. 6). The hospital was nonfunctioning and so Dr. Azharuddin traveled to meet the SIGN team in Jakarta where he learned the SIGN technique. When he returned to Banda Aceh the Indonesia Orthopaedic Association sent residents to train with him and assist with patient care. The operating rooms and wards are now functional as he continues to do SIGN surgery. He has reduced and stabilized many fractured femur and tibias that washed up during the tsunami and were treated initially by bonesetters. He taught the SIGN technique to the residents who returned to their hospitals and started SIGN programs. He has done 221 sign surgeries with good results.

THE 2005 GREAT PAKISTAN EARTHQUAKE

At 9 AM on October 8, 2005 an earthquake shook the Kashmir region. Children were in school; many perished as the walls of the school collapsed around them. The building walls were made of rocks which cause many catastrophic injuries as the walls collapsed allowing the roof to fall on those inside. Row after row of homes around the epicenter of the earthquake were demolished. This earthquake was approximately 50 miles from the Ayub Medical Center and Gilani Hospital in Abbottabad. The mountain road connecting the epicenter and these hospitals was 50 miles of unpaved road (Figs. 7–9). Can you imagine the pain that each patient with a comminuted femur fracture felt over each bump during this ride down the mountain in the back of a truck? Unheated tents surrounded each hospital. These unheated tents soon filled with patients in agonizing pain, homeless and distraught because many family members were missing.

Biting cold nipped constantly through their bodies. The Ayub Medical Center hospital, badly damaged by the earthquake had been declared unsafe so the SIGN team operated in a nuclear medicine building until the hospital was cleared for surgery.
Most patients had posttraumatic stress syndrome. After-shocks lasted for days, so people were afraid to go into any building. Sometimes operations were interrupted when the aftershocks or “jerks” occurred causing rapid exits of the operating room staff and patients. An estimated 10,000 patients were seen in the first 10 days. Teams of surgeons came through but many had no tools or facilities with which to work so they were not well used.

A SIGN team from Faisalabad, Pakistan brought their SIGN equipment with them and worked in the hospital for a few days immediately after the earthquake. Surgeons from the Ayub hospital wanted to continue using SIGN after this team left. A call was placed to SIGN which set into place immediate mobilization. Arrangements were made to obtain a quick visa in Toronto from the Pakistan Embassy.

The United States SIGN team was met at the airport in Islamabad by a Pakistani student and taken by car to Abbottabad. The student was a member of a student committee who triaged all donations, visiting personnel, and organized the rescue missions by helicopters. They set up in a small room in the medical center and worked efficiently although they had no previous disaster training. Their efficiency and dedication were exemplary.

After checking into a local hotel, the team was immediately put to work using the SIGN system to stabilize fractured femurs and tibias. The local surgeons soon learned the technique and became proficient within a few days (Fig. 10). The weather was very cold, the patients were in pain, and the resultant muscle contractions caused extreme fixed telescoping of the fractures. Reductions could not be done manually. The engineers at SIGN were consulted and designed and manufactured a distracter to ratchet these fractures out to length. This was completed within 3 weeks and taken back to Pakistan where it worked very well.

Dr. Shah, former professor at the Ayub Medical Center in Abbottabad, had a private hospital which he immediately dedicated to treating the victims of the earthquake (Fig 11). His hospital was poor, yet the operating room was very clean. He invited the SIGN team to visit his hospital. He wanted the SIGN system for his patients. SIGN agreed to donate instruments and implants to his hospital for 3 months. Fortuitously the SIGN program manager from Dhaka, Bangladesh was assigned to work in Abbottabad for 3 months. Dr. Richard Gosselin also assisted in his hospital. Dr. Shah must be one of the top surgeons in the world.

His reports on the SIGN surgical database show excellent correction and healing of malunion, nonunion and fractures treated with plates that failed. He has done 1100 SIGN surger-
ies since his first surgery 4.2 years ago. Many have been in external fixation for a long time. He almost always manages to get a good result. He travels monthly to treat the increasing number of injuries in nearby Peshawar where one refugee camp is now home to 1 million people. He trained surgeons from 2 hospitals who then started SIGN programs in Peshawar, Pakistan just across the border from Afghanistan.

2006 CENTRAL JAVA EARTHQUAKE, INDONESIA

The injuries sustained from this earthquake were different than Pakistan because the building structures were lighter and the weather warmer but the injuries were of equal severity (Fig. 12). A group of orthopaedic residents and staff surgeons from Jakarta assessed the potential needs in surrounding hospitals for patients suitable for SIGN surgery. Each night they sterilized instruments in this hospital. The next day the SIGN team operated on these patients. They became skilled SIGN surgeons in a short span of time (Fig. 13).

FUTURE PREPARATIONS

Equipments commonly needed should be stored and ready for immediate mobilization. The equipments should be applicable for the wounds encountered and easy to use. Many teams of doctors are roaming around ready to work, but they do not have the equipments nor the operating rooms available to work. Teams that have all the equipments necessary for surgery, including the structure would be very valuable. The surgeons from Lahore, Pakistan traveled to the epicenter of the earthquake in Mussaferabad and operated out of a railroad car. This served as a base for a hospital which was later constructed in this area. Trained personnel who are willing to depart on short notice should be listed by a coordinating agency.

Surgeons with experience treating different injuries should be first responders and assist with the protocols for treatment of the victims. These often involve soft tissue injuries which are first treated with external fixators. Later, more definitive fixation is needed. Finally, surgeons skilled in reconstruction such as bone transport should be called in. This could be coordinated by an international agency so politics is not a detriment. The most important aspect is that we work with the local surgeons.