

# Spinal Cord Injury Management and Rehabilitation: Highlights and Shortcomings From the 2005 Earthquake in Pakistan

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Recent natural disasters have highlighted the lack of planning for rehabilitation and disability management in emergencies. A review of our experience with spinal cord injury (SCI) after the Pakistan earthquake of 2005, plus a review of other literature about SCI after natural disasters, shows that large numbers of people will incur SCIs in such disasters. The epidemiology of SCI after earthquakes has not been well studied and may vary with location, severity of the disaster, available resources, the expertise of the health care providers, and cultural issues. A lack of preparedness means that evacuation protocols, clinician training, dedicated acute management and rehabilitation facilities, specialist equipment, and supplies are not in place. The dearth of rehabilitation medicine specialists in developing regions further complicates the issue, as does the lack of national spinal cord registries. In our 3 makeshift SCI units, however, which are staffed by specialists and residents in rehabilitation medicine, there were no deaths, few complications, and a successful discharge for most patients. Technical concerns include air evacuation, early spinal fixation, aggressive management to optimize bowel and bladder care, and provision of appropriate skin care. Discharge planning requires substantial external support because SCI victims must often return to devastated communities and face changed vocational and social possibilities. Successful rehabilitation of victims of the Pakistan earthquake has important implications. The experience suggests that dedicated SCI centers are essential after a natural disaster. Furthermore, government and aid agency disaster planners are advised to consult with rehabilitation specialists experienced in SCI medicine in planning for the inevitable large number of people who will have disabilities after a natural disaster.

**Key Words:** Disasters; Earthquakes; Pakistan; Rehabilitation; Spinal cord injuries; Trauma.

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**N**ATURAL DISASTERS FOLLOW no rules. All have the potential for devastating social, medical, and public health consequences. Earthquakes can cause mass casualties, widespread property destruction, and disruption of essential community services.<sup>1</sup> They often affect regions of the world that have limited resources with which to respond to mass casualties.

On October 8, 2005, at 8:52 AM PST, an earthquake measuring 7.6 on the Richter scale occurred in northern areas of Pakistan and India. It was the most devastating and debilitating natural disaster in Pakistan's history. More than 73,000 people were killed and 126,000 were injured.<sup>2</sup>

This article focuses on the lessons learned from, and the shortcomings in, the management and rehabilitation of large number of patients with spinal cord injury (SCI) in Pakistan after that earthquake.

SCI is among the most devastating conditions known to mankind. In Pakistan, the chronically disabled are generally disrespected and rarely function as useful members of society, a fact that presented an additional challenge in managing the hundreds of traumatic SCI patients after the earthquake. Because there is no SCI registry in Pakistan, an accurate assessment of the number of people who sustained an SCI cannot be made, but estimates are that it was between 650 and 750.<sup>3-5</sup>

In general, Pakistan—and its medical community in particular—coped very well with the challenges presented by the calamity, but mistakes were made and shortcomings exposed.<sup>5-8</sup> It is therefore appropriate to appraise our management of the SCI victims to improve systems and processes and be better prepared for future disasters. Some of the authors had first hand experience in the rehabilitation of SCI patients in different hospitals in the twin cities of Islamabad and Rawalpindi in the months after the earthquake. We also had interaction with physicians and other health professionals who were involved in the evacuation and acute management of SCI patients.

## EVACUATION EFFORTS

### Lack of Spinal Trauma Evacuation Protocols

Spinal trauma is a surgical emergency that requires specialized care in the initial immobilization and transport of a patient. Movement of the spinal column must be restricted to avoid creating neurologic injuries additional to those produced by the inciting trauma.<sup>9</sup> Unfortunately, after the earthquake, there was usually little such care taken in transporting patients with a suspected or diagnosed SCI.

In the Western world, the spinal board is an established means of extrication and efficient transport in the prehospital phase of trauma management.<sup>10</sup> The boards, however, were rarely used in the aftermath of the Pakistan earthquake. In evacuating patients by road, all types of vehicles—from private

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cars to buses and trucks—were used; they are totally unsuitable for transporting SCI patients. These circumstances inadvertently resulted in worsening neurologic and vertebral damage and, in many instances, resulted in an incomplete SCI becoming a complete SCI. One patient gave the following description of his experience:

When the earthquake happened, I was struck on my back by the falling debris and had a severe backache when rescued from the rubble. I walked to the Neelum stadium and waited for my turn to be rescued. When the pain became unbearable I (laid) down. I still remember when people lifted me from my feet and arms to put me in the helicopter. I could hear my back snap and suddenly I was numb from the waist down and couldn't move my lower limbs. They told me, after 3 days in Rawalpindi, that I had a broken back.

Sadly, the majority of the health care providers involved in the search, rescue, and evacuation efforts were totally unaware of the concept of log rolling and the correct immobilization techniques for transporting the injured who had suspected or actual SCI.

### Air Evacuation of Casualties

The choice of evacuation mode in SCI depends on the patient's condition and local settings.<sup>11</sup> After an earthquake, helicopter transport is the preferred method for evacuating casualties and supplying medical resources.<sup>12,13</sup> The use of helicopters can significantly reduce transportation times, especially when ground ambulances are hindered by impassable roads.<sup>14</sup>

The earthquake struck remote communities that are nearly inaccessible even in the best of times. With the existing roads destroyed, only air transportation was possible. A helicopter rescue operation was launched immediately after the earthquake and served as both a supply lifeline and as a means to evacuate survivors. The airlift capabilities in Pakistan were vastly inadequate; therefore, international help was sought. The response was generous and immediate. Of the many Pakistani and international helicopters available, only 2 to 3 were air ambulances with medically trained aircrews. Once placed on the helicopters, patients often were crowded together, stretched out on the floor, to utilize every inch of space.

The overriding priority was to triage and evacuate as many casualties as possible during daylight because only a few aircraft were equipped to fly at night. In a time of chaos, with an overwhelming number of injured, the rescue operation successfully evacuated thousands of casualties from the disaster zone directly to tertiary care hospitals in the twin cities, where they had early access to specialty medical and surgical services. This may have contributed to the low mortality of SCI patients.

### Unique Epidemiology of SCI

There is little in the literature about the epidemiology of SCI as a result of earthquakes; however, its epidemiology in this earthquake has been recently reported.<sup>15</sup> Important highlights are: (1) the ratio of males to females injured was of 1:1.3; (2) the mean age of the injured was 28 years, with 16.5% of all injured being less than 18 years old; (3) paraplegia was the dominant level of SCI (89%), with no cases of complete tetraplegia reported; (4) air evacuation (83%) and spinal fixations (75%) in a large number of patients; and (5) there were no deaths among the SCI patients who were cared for by teams of rehabilitation specialists. These findings are in contrast to the typical epidemiology of traumatic SCI.<sup>15-19</sup>

## INITIAL TREATMENT EFFORTS

### Lack of an SCI Registry

Because Pakistan had no national SCI registry when the earthquake occurred, there is no accurate assessment of the exact number of people who sustained an SCI. In fact, very little is known about the epidemiology of SCI in Pakistan before the earthquake because only 3 studies have been published.<sup>16,20,21</sup> The attempt by the National Data Registration Authority to document SCI in the initial post-earthquake period was a fair effort, but it had some major flaws. These included the following: (1) data collection was done by data entry operators rather than by health professionals; (2) instead of documenting injury level and degree of completeness, the only information entered was "spinal trauma, back trauma, SCI," thus making an accurate analysis difficult; (3) some patients who were bed bound and unable to move their lower limbs because of bilateral pelvic fractures or severe blunt muscular trauma to the back were also mistakenly included in the SCI database; and (4) the survey was carried out in the first few weeks after the earthquake within a specific time period. It is possible that patients with SCI who reported late were not included in this database. Also, SCI patients who died before the survey would not have been included.

### Lack of Spinal Units and Rehabilitation Specialists

Spinal units were established in the West as early as World War II; these units were dedicated to the treatment and rehabilitation of SCI patients in order to manage their needs in a comprehensive manner.<sup>22</sup> Unfortunately, this was never a priority for governments, health bureaucrats, or health professionals in Pakistan. The emphasis has been on surgical interventions after SCI and on giving advice about exercises at home after discharge from treatment. At the time of the earthquake, apart from the Armed Forces Institute of Rehabilitation Medicine (AFIRM), no other hospital in the twin cities had an SCI rehabilitation unit. Although neurosurgical departments were already established in nearly all the major teaching hospitals, dedicated spinal units using a multidisciplinary approach to rehabilitation were not. The paraplegia center at Hayatabad, Peshawar, is making commendable efforts to address this; however, the center's main focus is on physical therapy (PT), and has not had the involvement of rehabilitation medicine specialists.

The situation described above had important implications because SCI patients had to be cared for in makeshift paraplegia centers. At the Melody Rehabilitation Center and Paraplegic Center, District Headquarters Hospital (DHQ), many SCI patients were placed on charpoys (traditional beds of woven twine), which are totally unsuited for SCI patients (fig 1). Also, they were mobilized after spinal fixation without spinal braces. This resulted in many avoidable complications. The Agha Khan University trauma team from Karachi noted that paraplegic patients were the most neglected of all patients injured in the earthquake.<sup>8</sup>

At the time of the earthquake, there were few qualified neurosurgeons and spinal surgeons in Pakistan, but rehabilitation medicine specialists were even less common. In a country of 160 million people, the number of fellowships in physical medicine and rehabilitation was less than 20. The majority of patients with SCI were taken to hospitals in the twin cities, however, initially there was not 1 rehabilitation specialist in these hospitals who could facilitate SCI rehabilitation. Medical officers and house officers were in charge of paraplegia centers

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