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Rehabilitation Needs Assessment in Persons Following Spinal Cord Injury in Disaster Settings: Lessons Learnt in 2015 Nepal Earthquakes

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Abstract

Objective: To report on the use of a 'triage' clinical tool for rehabilitation decision-making process and outcomes in an acute disaster setting- the Nepal earthquake (EQ); and the lessons learnt.

Participants and Setting: Consecutive EQ victims with a spinal cord injury (SCI) (n=101) admitted to a Nepalese sub-acute medical facility.

Intervention: An accredited WHO Foreign Medical Team (FMT) from the Royal Melbourne Hospital was deployed to assist with priorities identified by the host institution: develop triage processes for clinical outcomes, identify barriers and train local healthcare professionals.

Results: The triage tool was clinically useful in identifying patients requiring immediate and urgent rehabilitation intervention for a range of disabilities. Mean age was 34.4 ± 15.1 years and female (53.5%) admitted 2-10 days following injury. Over two-thirds had SCI (78%) with common clinical issues: pain (74%), bladder (73%) and bowel dysfunction (58%), and pressure ulcers (33.3%). Participants reported symptoms consistent with post-traumatic stress. The 'triaging' and disability management plans were well received by staff, as patients were stream-lined for step-down facilities; during this process barriers were identified for future action.

Conclusion: A collaborative interdisciplinary approach using the triage tool improved clinical outcomes in the disaster-setting. Long-term planning should include early rehabilitation, community-based programs, accreditation, partnerships, and inclusion of persons with disability.

Keywords: Spinal cord injury; Rehabilitation; Earthquake; Disability, Disaster response; Foreign Medical Teams; Health outcome

Introduction

Nepal, a Himalayan nation (area of 147,181km2) in South Asia has over 27.8 million inhabitants [1]. It ranks in the 'low' income group with gross national income per capita (2013) of US$2260, placing it 145th on the World Bank Human Development Index [2]. Only 18% of Nepalese people live in urban areas, and an estimated 24% of the total population live below the poverty line of less than $1 per day [1]. The median age of the population is 20.1 years with a life expectancy of only 66.2 years [1]. The literacy rate among adults aged 15 years and above is 65.9% (2011) [3].

A 7.8-magnitude earthquake erupted in Nepal on 25th of April 2015 (11:56 am local time), with the epicentre approximately 80km northwest of the capital, Kathmandu. This was followed by continuous aftershocks with two earthquakes over 6.1 magnitudes. Three weeks later, on 12 May the country was struck again by a 7.3 magnitude tremor with epicentre near Mount Everest (76km northeast of Kathmandu), causing further deaths, injuries and destruction in the affected area. As of 22nd May 2015, the Ministry of Health and Population (MoHP) confirmed: greater than 5.6 million people affected by the earthquake, 2.8 million displaced, 8,633 deaths, 103,686 injured and more than one million homes destroyed nationwide [4]. Subsequent tremors and aftershocks (>1200 recorded) triggered fresh landslides and avalanches, making the combined disaster the deadliest in the country's history. The mounds of rubble and debris created by the disaster impeded life-saving operations and access to affected areas, mainly the remote mountainous regions. The natural disaster affected 35 districts, of which 14 were severely damaged (80% of houses severely damaged) [4]. An estimated 1100 health facilities were damaged in the earthquake (456 completely, 690 partially destroyed), predominantly village health-posts which supply basic medicines and other routine services in remote communities, outside the Kathmandu valley [4]. The forthcoming monsoon further threatened the country's fragile transportation network, and the ongoing aid effort and rebuilding, while access to medical care remained a big challenge.

A total of 128 Foreign Medical Teams (FMTs) from 38 different countries were officially deployed in Nepal along with 47 National Medical Teams, based on expertise and capabilities [5]. This deployment was jointly coordinated by the Nepalese MoHP, the Health Emergency Operation Centre (HEOC) and the WHO Disaster-Management Committee. The MoHP reported 4.2 million people needed urgent health services and basic humanitarian assistance. As of 29 May, there were an estimated 200-300 patients with spinal cord injuries (SCI), and 40-60 amputees [6]. The need for rehabilitation care of injured persons was highlighted and as of current update there has been request for rehabilitation of over 250 severely injured persons from Kathmandu valley alone [5]. Currently, few facilities specialize in SCI rehabilitation in the Kathmandu valley, while others are transitional care centres.

In general, the Nepalese MoHP and general medical community (with the FMTs) coped well with the challenges presented by the earthquake. However, consistent with previous reports from earlier earthquakes (Haiti, Pakistan, China) [7-12], various gaps in disaster management processes and patient care were identified at both ground and management level. The aim of this report is to describe the use of a rehabilitation triage tool by the Australian FMT for patients following the Nepal earthquake, and to highlight lessons learnt to improve SCI care in future disaster settings. This effort was part of a much larger initiative of the WHO, to support the MoHP and set-up systems of care to stream-line clinical care for the EQ survivors and disaster management, and improve collaboration with various NGO's and community partners.

Methods

Setting

An Australian rehabilitation FMT from the Royal Melbourne Hospital (RMH) was deployed to a 40-bed Nepalese sub-acute medical facility on the 8th of May 2015, after the major earthquake on 25th April 2015. This clinical deployment was approved by the MoHP, the ISPRM, the RMH as well as the local facility. The local facility, a not-for-profit centre, is located in the outskirts of Kathmandu, and offers a range of rehabilitation services to patients (disproportionately from the poorer sections of Nepalese society), including vocational retraining. At the time of the EQ disaster, there were no Nepalese rehabilitation physicians working in Nepal. The only Nepali rehabilitation trainee (RD-author) (currently training in Bangladesh) was recalled to assist the disaster victims. The FMT worked with him, rehabilitation consultant from Bangladesh and the local nursing and allied health staff at the facility.

Procedure

The FMT underwent a full accreditation process by the WHO and the MoHP Nepal prior to deployment. The mission was to conduct a disability 'needs' assessment, assist in patient triage, care and outcomes for earthquake victims, and provide education and training to local staff for additional capacity. The FMT submitted daily surveillance reports and an exit report to both the MoHP and WHO rehabilitation sub-cluster as mandated; in addition, they attended the FMT Coordination meetings at MoHP, where possible.

Over an 8-day period, the 7 member-FMT (3 rehabilitation physicians, 2 nurses, 1 physiotherapist, 1 orthotist) conducted daily ward rounds with Nepalese rehabilitation staff. The FMT assumed a facilitator role in conducting daily triage and teaching clinical rounds and consensus case conference meetings with local staff. With interdisciplinary clinical input, a needs analysis was performed on day 1, which identified the need to triage all patients at the facility to streamline care and discharge planning processes. A field tool was designed and approved by local staff to plan patient clinical management and further care.

Data collection

All patients admitted to the centre after the earthquakes were assessed. All data was collected by the RMH team and the Chief Nepali Physician (RD), prospectively during the ward rounds by the treating FMT. All clinical and process-related information was shared with the local clinicians on the ward rounds for treatment plans, and feedback was incorporated. SCI was diagnosed on clinical presentation and available imaging, and documented by the neurosurgeon, spinal surgeon, or rehabilitation medicine specialist. The American Spinal Injury Association Impairment Scale (AIS) [13] was used to classify the severity of SCI.

On the third day of the RMH FMT deployment, the second 7.3 magnitude earthquake was experienced while clinical ward rounds were being conducted. The FMT was then involved in a 'new' disaster management plan, and assisted in the evacuation and care of the SCI patients, moving them into makeshift tents outside, until the hospital building was inspected and considered safe by MoHP.

Results

The RMH mission was a small part of the overall WHO effort. Unexpectedly, the RMH FMT witnessed a crisis situation, a 'disaster within a disaster' with the second earthquake creating additional challenges given the limited resources and staff at the centre. The facility was initially resourced for only 40 patients but had over 85 new patients admitted after the first earthquake, while another 20 awaited transport the day of the second earthquake. There was, however, strong leadership of coordinating and government bodies, such as MoHP, Nepal Health and Research Council (NHRC) and the WHO. The FMT team attended the briefings given by the FMT Coordination Committee, led by the Secretary of NHRC, a WHO representative, and representatives from the Nepalese Army and Police. Based on the 'needs' assessment and interactive feedback from the management staff, physicians and other health professionals, various activities at the medical facility were prioritised, and are described below.

Development of a triage tool

A user-friendly one-page structured clinical rehabilitation triage tool was developed on the first day of deployment (available from the Authors) with input from the local medical and therapy staff. The triage tool was used to identify patients who needed urgent and/or specific rehabilitation intervention, for ease of patient processing, for planning treatment and possible discharge from the facility. The triage tool included: patient demographics, a list of relevant disabilities (physical status, pain, continence), usual interventions, and psychosocial elements, e.g. discharge destination (step-down, home, community- based rehabilitation [CBR]). The tool was used in 101 consecutive patients admitted to the centre after the two earthquakes. The tool was well received by the staff, who found it helpful for their routine clinical practice. A decision was made to use it in the longer term, with minor adjustments to suit local needs. Unfortunately, many

patients identified as not having SCI (who could have been discharged into the community) had no homes to return to after the earthquake, and were to be housed in temporary step-down facilities set up by the MoHP.

Clinical triage tool audit

The demographics and clinical characteristics of consecutive inpatients are provided in Table 1. The mean age of participants (n=101) was 34.4 years (±15.1 years), range 11 to 86 years. Over half were female (53.5%), and many were blue collar workers (and students). Over two-thirds had SCI, while 19 patients (18.8%) had spinal fractures without SCI. More than two-thirds (n=74, 73.3%) had bladder problems and over half (58%) had bowel issues. Pressure ulcers were identified in one-third of all patients (33.3%). All participants reported some form of psychological trauma, which included severe anxiety, fear, or sleep disturbance, all symptoms consistent with post-traumatic stress disorder (PTSD). Three-quarters of the sample reported some degree of pain (n=75), one-quarter (25.7%) had neuropathic pain. The mean pain score on Visual Analogue Scale (VAS, 0=no pain to 10=extreme pain) was 3.8 ± 2.7 (ranging from 0 - 10) (Table 1).

Variables	n (%) [unless stated other wise]
Age years (Mean ± SD, range)	34.4 ± 15.1 (11 - 86)
Female	54 (53.5)
SCI	79 (78.2)
Spinal fracture without SCI	19 (18.8)
Other fractures/injuries	3 (3.0)
Comorbidities	23 (22.8)
Psychological trauma[#]	101 (100)
Physical disability (Paralysis)	59 (58.4)
Bladder issues	74 (73.3)
IDC	72 (71.3)
Intermittent catheter	3 (3.0)
UTI (lab evidence)	2 (2.0)
Fluid balance chart documentation	3 (3.0)
Bowel issues	
Constipation	57 (56.4)
Overflow with retention	2 (2.0)
Pressure ulcers (Grade I – IV)[*]	34 (33.7)
Positioning and alignment	81 (80.2)
Turning protocol	74 (73.3)
Pressure mattress	1 (1.0)
Daily skin inspection	78 (77.2)
Pressure area dressings	30 (29.7)
Pain VAS score (0-10) [Mean ± SD, range]	3.8 ± 2.7 (0 - 10)
Neuropathic	26 (25.7)
Musculoskeletal	24 (23.8)
Mixed	25 (24.8)
Discharge plan	
Rehabilitation	83 (82.2)
Step-down[**]	9 (8.9)
Home destroyed	92 (91.1)

Table 1: Socio-demographic and clinical characteristics of the participants (n=101). IDC=Indwelling catheter; n=Total Number; SCI=Spinal Cord Injury; SD=Standard Deviation; UTI=Urinary Tract Infection. [#]Psychological trauma includes severe anxiety, fear, sleep disturbance. [*]Recommended strategies for skin care. [**]Step-down=care facility funded by the MoHP in the community.

The triage tool findings were assessed every day after the ward round and discussed with the local clinical staff. All patients were grouped according to the major categories of triage: immediate mobilisation and/or rehabilitation, step-down, CBR, discharge home or unsuitable for rehabilitation. Of the 101 patients evaluated, only 9 were categorised as ready to be transferred to a step-down facility funded by the MoHP in the community; 83 required immediate rehabilitation (including mobilisation), with the remainder categorised as able to be discharged home upon recovery from their wounds and/or depending on their post-discharge living circumstances. The team also applied the reverse triage process [14] where possible by providing more attention to the most seriously injured patients, in order to utilise staff and scarce resources more appropriately.

Characteristics of SCI

Of the 79 participants with SCI, the majority (n=38.48%) had lumbar injuries, followed by thoracic level injuries (48%). Six participants had injuries at two different spinal levels. Almost one-third of the participants (n=26.33%) were classified as AIS A, while 23% were AIS B and 18% AIS C. One participant sustained a central cord syndrome, and one had a cauda equina injury (Table 2).

AIS*	SCI location					
	C1-C8	T1-T12	L1-L5	Below S1	Mixed	Total n (%)
A	4	7	11		4	26 (32.9)
B	2	7	8		1	18 (22.8)
C	2	3	9			14 (17.7)
D		7	5			12 (15.2)
E		1	5		1	7 (8.9)
CCS	1					1 (1.3)
CES				1		1 (1.3)
Total n (%)	9 (11.54)	25 (31.6)	38 (48.1)	1 (1.3)	6 (7.6)	79 (100)

[*]American Spinal Injury Association Impairment Scale (AIS) [13]:

A: Complete. No sensory or motor function is preserved in the sacral segments S4-S5.

B: Sensory incomplete. Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5 (light touch, pin prick at S4-S5 or deep anal pressure), AND no motor function is preserved more than three levels below the motor level on either side of the body.

C: Motor incomplete. Motor function is preserved below the neurological level and more than half of key muscle functions below the single neurological level of injury (NLI) have a muscle grade less than 3.

D: Motor incomplete. Motor function is preserved below the neurological level and at least half of key muscle functions below the NLI have a muscle grade of 3 or greater.

E: normal.

Table 2: SCI level and AIS classification* of the participants (n=79). CCS: Central Cord sSyndrome; CES: Cauda Equina Syndrome; n: Total number; SCI: Spinal Cord Injury.

Clinical need and staff education

The RMH FMT integrated with 3 local staff teams (each had two physicians, one PT, one OT and two nurses). All teams conducted daily ward rounds and patient assessment, followed by 1-2 hours case-conference discussion to plan treatment. Further, the RMH FMT team conducted education and training on different issues, such as: fracture management/bracing; fracture classification; preventative care and SCI disability management; pain management; spasticity care; mobilisation program/precautions; management of contractures and complications of immobility; patient-centred care concepts; concurrent closed head injury (if relevant); diet, falls, pressure care and wound and psychological management.

Access to pain medications (especially agents for neuropathic pain), urinary catheters, intravenous lines, special pressure care dressings and antibiotics was challenging. Electricity cuts further limited usable sterilization equipment for wound management, suture removal etc. Materials and tools to fashion orthoses and spinal braces was particularly challenging in the setting. The FMT and local orthotists used available tools to adjust bracing. Pathology and imaging results for many SCI were limited or unavailable, as the facility was in a sub-acute setting and did not have these facilities on site. Many patients had no or limited post-surgical notes or precautions. There was limited ability to request neurosurgical or orthopaedic surgical advice, as acute hospitals at the time were overflowing with patients arriving with acute injuries from the earthquakes.

Despite these barriers, the RMH FMT recognised the local centre as a well-designed, spacious facility with dedicated clinical staff. The centre has partnerships with community organisations and strong fund-raising and advocacy programs. The RMH FMT conducted a leadership workshop for clinical staff on issues such as: team building; capacity building; rehabilitation processes and organisation; triage and prognosis; general ward set-up; models of care; systems of management of referrals; medical documentation and record keeping; patient-centred care and the need for evidence-based practice in SCI.

Identified gaps for action

Nepal faces various challenges in the long-term management of earthquake survivors. The healthcare focus for disaster management was primarily on acute care; rehabilitation services and community care were less prioritised. The SCI survivors are a vulnerable population requiring long-term planning for service delivery and rehabilitation. Early aggressive rehabilitation and preventative care in SCI has the potential to minimize complications such as pressure ulcers, constipation etc. Based on FMT experiences and feedback from participants in different workshops, the gaps and challenges identified were presented to the WHO Rehabilitation Sub-cluster (in the Daily Surveillance and Exit Reports), the MoHP and presented to the Director (and a board member) of the Nepalese facility on the 14th of May 2015. These included:

- Lack of access to timely neurosurgical advice regarding mobilisation following spinal surgery.
- Lack of beds (patients accommodated in corridors, even prior to 13th May earthquake).
- Lack of continuous electrical supply (e.g., for autoclaving).
- Lack of procedural training for volunteers and carers.
- Lack of emergency packs in case of evacuation.
- Lack of medical equipment such as glucometers, urine dipsticks, dressings etc.
- Limited imaging (MRI, CT, X Rays) and laboratory tests.
- **Orthotics/prosthetics** - tools needed for adjustments; no prefabricated devices.
- Limited materials (adequate supplies of gloves, dressings, tweezers, staple removers, torches etc.).
- Limited number of appropriate wheelchairs and cushions for seating, pillows and cushions for positioning patients in bed.
- Lack of pressure mattresses for patients with pressure ulcers.
- Very limited access to medical records or information on procedures performed on the spine following surgery.
- Limited information on surgical post-operative precautions or on wound management.
- Limited painkillers (especially for neuropathic pain), anticoagulants etc.
- Limited awareness of evidence-based practice.
- Limited psychological support.

Discussion

This is the first narrative report presenting a 'snapshot' of the on-ground experience of an FMT assessing and managing SCI patients during and after the major earthquakes in Nepal. Overall, the RMH FMT deployment was productive in providing assistance and management of SCI survivors. The FMT was able to improve clinical disability planning and patient management, educate/train staff and strengthen rehabilitation services. The team developed a one-page structured triage tool and used it for 101 SCI earthquake victims admitted to the facility during their deployment. The triage tool was well received by the clinical staff and assisted in patient flow and management.

Major earthquakes are devastating and associated with high death rates and mass casualties with many traumatic injuries. The earthquakes in Nepal resulted in significant loss of life and long-term disability from severe injuries, including SCI. They created a large socioeconomic burden with major economic loss and long-term negative consequences on human development, infrastructure and the environment. Despite focus on acute care in such settings, the importance of early rehabilitation focusing on prevention of complications in SCI patients cannot be over-emphasized. The importance and role of rehabilitation services during and after a natural disaster are discussed elsewhere [9,15-20]. There is consensus

amongst disaster management experts that medical rehabilitation should be initiated in the emergency response phase, and continued in the community over the longer-term to restore function and enhance participation of survivors [15,16,18].

Reports from previous humanitarian catastrophes suggest that, despite high quality care provided by FMTs in such situations, deployment of FMTs is not based on situational needs, with significant variation in capacities, clinical competencies and professional ethics [21]. Lack of coordination, systems for monitoring, and common terminologies, definitions and frameworks hindered evidence to guide future deployments and improvement of this system [22,23].

There was a strong consensus in the post-Haiti earthquake PAHO/WHO meeting in Cuba (December 2011), for the need for international standards, greater accountability, more stringent oversight, better coordination, and improved reporting [22]. A resolution recommending "a flexible mechanism for registration and accreditation of rapid-response FMTs with the goal of improving quality of medical response in coordination with WHO" was passed in 2012 [21]. Following this, recommendations from a technical expert group from the cuba meeting a FMT working group (FMT-WG) was created to oversee mechanisms for "complementarity" of FMTs, enhance their role and to coordinate their different services before deployment and on arrival [21,22]. A classification system for FMTs based on capabilities, professional standards and outline for the various processes for FMTs, such as on-site coordination/registration with national authorities and mechanisms for authorising arriving teams, has since been developed [21].

Many of these requirements and standards were applied and implemented in the current Nepalese disaster situation. Rehabilitative care had focal attention. However, as in previous disaster responses, more emphasis was on the acute response, saving lives and treating acute injuries. The role of acute rehabilitation and preventative care, especially in SCI, needs to be highlighted. The MoHP and WHO formed a Rehabilitation Sub-cluster for the FMTs, which included the RMH team and others. A requirement was the submission of daily surveillance reports and an exit report with needs assessments, gaps and recommendations to the MoHP.

The rehabilitation sub-cluster identified SCI care as a critical gap, and flagged funding with WHO and MoHP [24]. Recently, on 29th May 2015, the MoHP outlined a 2-year strategic plan for the emergency response and the recovery phase. This feeds directly into the health sector reconstruction, scaling-up of rehabilitation activities following emergencies, and longer-term strengthening of rehabilitation services and links with tertiary, district and grassroots levels. The government has established step-down rehabilitation centres offering nursing and rehabilitation, in and around Kathmandu, with capacity to accommodate over 700 patients [24]. This initiative ensured 100 free step-down beds in various facilities. Further, plans are nearing completion to establish fixed-point centres or step-down facilities in the worst affected districts and meeting with the main trauma centres to refine referral procedures [6]. However, this plan is yet to include comprehensive rehabilitation, preventative care (to minimize complications) and CBR programs for societal integration of SCI survivors. The role of early rehabilitation intervention, preventative strategies to prevent complications in SCI, subacute and community-based rehabilitation programs is critical. This may likely duplicate some assessment processes and compromise care provision to patients over time. The MoHP will need to develop minimum standards for rehabilitation facilities, integrate community-based rehabilitation, establish referral systems for care providers, invest in infrastructure, IT support, documentation and record keeping, and basic data collection to inform further action [17,25].

The Rehabilitation FMT team made various suggestions which need to be considered in future planning and responses to SCI management in disaster settings (Box 1).

Box 1: Lessons learned and the way forward

- More qualified personnel in rehabilitation medicine, nursing and allied health.
- Improved clinical reasoning.
- Improved processes relating to clinical documentation.
- Development of procedures for all process measures from admission to community discharge and longer-term follow-up.
- Development of a referral form and reporting systems for rehabilitation.
- Use of systems and processes for organised delivery of rehabilitation.
- Improved links with acute referrers.
- Expanded community-based rehabilitation through capacity-building.
- Access to capacity building initiatives such as courses, conferences, telemedicine, library, to upskill staff.
- Care-giver training (including PTSD education and support).
- Better communication and improved links with acute hospital referrers and post-discharge follow-up in the community.
- Increased use of information-technology to enhance Continuing Medical Education and promote available services for consumers.
- Increased clinical capacity through organised educational activities e.g. journal club.
- Delivery of evidence-based practice and encourage research.
- Development of Peer Support groups.
- Link with regional organisations, e.g. South Asian Association for Regional Cooperation (SAARC).
- Encouragement of overseas training and mentorship for staff.
- Registration of the Nepalese Rehabilitation Society with the International Society of Physical Rehabilitation Medicine (ISPRM).
- Provision of Key Performance Indicators, Standards of Care & accreditation criteria for Rehabilitation facilities by the MoHP.

Throughout the recent earthquakes, the Nepalese people maintained a positive attitude and a resilient spirit during this difficult time. This report supports the disaster initiatives, coordination and collaborative effort made by the Nepal MoHP and the FMTs. Significant improvements in FMT accreditation during these earthquakes were noted compared with previous Haiti and Pakistan earthquake reports [12,19]. However, much more work is needed to strengthen the disaster relief efforts. In our experience there were specific challenges working with some of the international non-governmental organisations. Efforts should be made for better accountability, use of existing resources, reliable data-sets for analyses in trends in morbidity and disability, and for community re-integration of injured persons. The latter however, was beyond the scope of our mission. The ISPRM can assist the WHO rehabilitation sub-cluster with formal policy on disaster management, advocacy and training, standards for rehabilitation in disaster settings, technical standards, rehabilitation leadership roles in FMTs, requirements for deployment, FMT staffing and configuration, referral and information management, assistive

devices and equipment, data collection, research and surveillance to inform future action. The psychological impact of earthquakes on survivors needs further study.

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