

COMMENTARY

Physical Medicine and Rehabilitation: Critical Role in Disaster Response

James E. Gosney Jr, MD, MPH

The emerging, critical role of the medical specialty of physical medicine and rehabilitation (PM&R), also known as *physiatry*, in disaster response deserves notice in this global forum dedicated to integrating relevant medical specialty perspectives into disaster medicine and public health preparedness. *Trauma rehabilitation*, the rehabilitation of injuries associated with physical trauma, focuses on early rehabilitation interventions of injuries including traumatic brain injury, spinal cord injury (SCI), traumatic amputations, peripheral nerve injuries, multiple musculoskeletal trauma, and burns.¹ This commentary characterizes the role of PM&R during the response stage of several recent large-scale natural disasters including Hurricane Katrina, the 2005 Kashmir earthquake, the 2008 Sichuan earthquake and the 2010 Haiti earthquake. Relevant, significant disaster recovery and preparedness efforts are included as well.²

Hurricane Katrina, one of the deadliest and the most costly natural disaster in US history, made landfall along the Gulf Coast on August 29, 2005, resulting in catastrophic flooding and the forced evacuation of nearly 373 000 area residents.³ Many remaining residents sought emergency shelter in the Louisiana Superdome and the New Orleans Ernest N. Morial Convention Center, and because of a rapid decline in living conditions there were bused to the Reliant Park megashelter in Houston, where more than 11 000 people were treated in the “Katrina Clinic” during a 2-week period.⁴ Hamilton et al provide a detailed description of the clinic design, its operations, and supporting emergency command structure during the course of “Operation Dome Shelter” operations.³

Physiatrists evaluated and treated a range of musculoskeletal, dermatological, metabolic, and cardiovascular complaints in the Katrina Clinic; neurological diagnoses including subacute stroke and chronic spinal cord injuries were also managed. Care shifted from initial, immediate medical issues to chronic PM&R conditions including mobility deficits, wound care, catheterization, and pain pump refills.⁵ Chiou-Tan et al elaborated on the PM&R conditions that were treated at the Katrina Clinic via a retrospective chart analysis that showed 239 patients with 292 PM&R conditions.⁴ The most frequent PM&R conditions by diagnostic category were swollen feet and legs, leg pain and cramps, headache, and neck and back pain; the majority of the musculoskeletal arm, leg, and trunk diagnoses were described as pains, strains, sprains, pulls, and tendinitis/fasciitis, a pattern of injuries that is consistent with enduring stressful body postures and limited mobility for extended periods before arrival.

PM&R patient data and lessons learned from the Katrina Clinic informed forecasting of necessary durable medical equipment, consumable supplies, and specific medications, as well as creating staffing ratios and on-call schedules that included medical rehabilitation professionals.⁴ Katrina Clinic experience also demonstrated the critical need for PM&R to ensure that evacuation and transportation protocols and sheltering options for the disabled population are comprehensively addressed in municipal disaster planning. These preparedness points are highlighted in the recent American Academy of Physical Medicine and Rehabilitation comments on the draft National Disaster Recovery Framework.⁶

Since Hurricane Katrina, catastrophic earthquakes have demonstrated a pattern of injury characterized by severe skull/traumatic brain injury, SCI, pelvis and extremity fractures, traumatic amputation with associated nerve injury and related internal injuries, and burn/inhalation injuries. Survival depends on rapid retrieval, triage, and transportation of survivors to a trauma center for definitive surgical care.⁷

Long-term morbidity can be significantly reduced by the performance of early rehabilitation interventions by the rehabilitation traumatologist (ie, physiatrist as part of the intensive acute care team initially and then as head of the multidisciplinary medical rehabilitation team once the patient has transferred to the appropriate, specialized inpatient rehabilitation unit). Many earthquake survivors have multiple, severe impairments requiring comprehensive and protracted rehabilitation to achieve optimal physical functioning and reintegration into postdisaster society.

Indeed, experience from the 2005 Kashmir earthquake in which 79 000 people were killed and 106 000 were injured showed that the involvement of physiatrists in the management of SCI during the disaster response resulted in improved outcomes and reduced morbidity.⁸ Despite the lack of spinal trauma evacuation protocols and only 1 tertiary care rehabilitation institute in Pakistan, the many patients with SCI were successfully managed overall due to effective helicopter evacuation, rapid establishment of temporary spinal units, and augmentation by international SCI rehabilitation teams.^{9,10}

The 2008 earthquake in Sichuan Province resulted in at least 69 000 casualties, 374 000 injuries, and the displacement of 5 million people.¹¹ At least 10 000 of the most severely injured were urgently transferred to major hospitals in 20 provinces, where early rehabilitation intervention was performed with gen-

erally positive results. However, postdischarge follow-up showed a reversal of functional gains and secondary complications in some SCI survivors due primarily to insufficient long-term, community-based rehabilitation (CBR) resources, according to Dr Jianan Li, vice chairman of the Chinese Association of Rehabilitation Medicine (personal communication, March 11, 2010). Chinese Ministry of Health CBR teams started working with survivors as they returned to their home communities several months after the earthquake amidst overwhelming need. A household survey of injured people from 21 townships in Mizhu conducted from October to December 2008 showed that 88.4% (2021) required physical rehabilitation (Jean Van Wetter, Handicap International [HI] country director, China, personal communication, March 10, 2010).

International rehabilitation assistance has proven the most beneficial in postearthquake recovery because foreign nongovernmental organizations, including HI, are conducting CBR pilot projects whose potential positive impact will be achieved after full implementation. Although the international immediate earthquake response was prompt, effectiveness was limited by the participation of relatively few physiatrists and the language differences. Unfortunately, the rehabilitation needs of many earthquake survivors in Sichuan, especially children and those with SCI, remain critical, with long-term care uncertain, noted Dr Li.

On January 12, 2010, the earthquake in Haiti resulted in an estimated 217 000 casualties, 300 000 injuries, and 511 000 people displaced.¹² Preliminary injury findings based on an assessment of 17 hospitals in the greater Port Au Prince area at 2 weeks after the earthquake indicated that approximately 80% of people presenting to hospitals had orthopaedic injuries, with lower extremity fractures predominating. SCIs constituted 6% of these injuries.¹³ A high prevalence of both primary and secondary amputations was noted; 2000 to 4000 people are estimated to have received amputations.¹⁴ Overwhelmed response team surgeons amputated urgently under austere conditions with minimal local material support.¹⁵ (By comparison, amputation decisions could be delayed in the Kashmir and Sichuan earthquakes because most of the hospitals were still functioning.)

HI and Christian Blind Mission are coleads of the United Nations–World Health Organization/Pan American Health Organization Haiti Health Cluster’s Injury, Rehabilitation and Disability Workgroup (“disability subcluster”), which is responsible for coordinating all of the rehabilitation activities for injured and disabled people in Haiti.^{15–18} The workgroup serves as a forum for coordinating disability-related response efforts through onsite weekly meetings and an online presence.¹⁹ As part of the emergency response from HI, a physiatrist-led group of medical rehabilitation professionals from Healing Hands Haiti (HHH) United States/Canada with experience in Haiti augmented HI’s mobile health teams. The HHH group directed acute rehabilitation interventions; monitored postoperative amputee and SCI

care in area hospitals; provided necessary education to patients, families, and care providers; and trained local health workers in physical rehabilitation techniques.^{20,21} Uncertain discharge plans for these patients, many without homes and families, raised significant concerns about their receiving appropriate wound and residual limb management in the community. An assessment of 30 amputees revealed only 1 patient who was physically qualified for a prosthetic fitting.²² Implementation of a standardized, community-level, prefitting program with appropriate therapy remains a significant challenge. The Injury, Rehabilitation and Disability workgroup and the Prosthetics and Orthotics subgroup are addressing this complicated issue, among others.²³

North American physiatrists are deploying with medical relief nongovernmental organizations, including those that were working in Haiti before the earthquake, such as the HHH International Foundation,²⁴ Project Medishare,²⁵ and Partners in Health.²⁶ The American Academy of Physical Medicine and Rehabilitation recommends volunteering options to its members and also refers them to the American Medical Association/National Disaster Life Support Disaster Volunteer Physician Registry on its Web site.^{27,28} Physiatrists from other countries including France, the Philippines,¹⁵ and Cuba²⁹ are on the ground as well. Several North American physiatrists who work with Haitian rehabilitation service providers are collaboratively developing a plan to meet intermediate and long-term regional needs, as are other resident rehabilitation organizations with a permanent commitment to Haiti.³⁰ North American physiatrists are also providing input into the draft National Plan for Disability and Rehab.³¹

This commentary describes the critical role of PM&R during the response stage of several recent large-scale natural disasters including Hurricane Katrina and the Kashmir, Sichuan Province, and Haitian earthquakes. Haiti has clearly demonstrated physiatrists’ expertise in providing neurological and musculoskeletal short-term and postoperative care and leadership in developing supporting community-level rehabilitation programming and longer-term rehabilitative recovery planning. Increased physiatrist participation during the immediate earthquake response would have further improved triage effectiveness by identifying and managing traumatic injuries that required acute rehabilitation interventions and minimized surgical complications.

PM&R’s response during the 2010 Haitian earthquake will appropriately result in physiatrists being requested for immediate deployment with other traditional first responders in future large-scale natural disasters. The growing recognition of the immediate disaster response capability of PM&R by the global disaster medicine community must be further confirmed by psychiatric disaster research and reinforced with strong advocacy by North American PM&R specialty organizations and international rehabilitation organizations including the International Rehabilitation Forum and the International Society of Physical and Rehabilitation Medicine.^{32,33}

About the Author

Dr Gosney has an active interest in the medical rehabilitation of injured persons in disasters. He serves on the International Rehabilitation Forum Disaster Rehabilitation Workgroup and is a member of the International Society of Physical and Rehabilitation Medicine. He has also participated on the American Academy of Physical Medicine and Rehabilitation Haiti Task Force and sits on the National Disaster Life Support Education Consortium Academic Review Committee.

Correspondence: Address correspondence to Dr James Gosney, Jr, 422 Pembroke Avenue, #5, Norfolk, VA 23507 (e-mail: gosneyjr@hotmail.com).

Received for publication: September 23, 2009; accepted March 22, 2010.

Author's Disclosures: The author reports no conflicts of interest.

Acknowledgments

The author gratefully acknowledges the participation of physiatrists Drs Donna Bloodworth, Faye Chiou-Tan, Andrew Haig, George Kevorkian, Jianan Li, Colleen O'Connell, Bryan O'Young, Farooq Rathore, and Mark Young in the PM&R response to the disasters referenced in this commentary.

REFERENCES

1. Robinson LR. Trauma rehabilitation: an introduction. In: Robinson LR, ed. *Trauma Rehabilitation*. Philadelphia: Lippincott Williams & Wilkins; 2006: 1-10.
2. Kano M, Wood MM, Siegel JM, Bourque LB. Disaster research and epidemiology. In: Koenig KL, Schultz CH, eds. *Koenig and Schultz's Disaster Medicine: Comprehensive Principles and Practices*. New York: Cambridge University Press; 2010:8-9.
3. Hamilton DR, Gavagan TF, Smart KT, et al. Houston's medical disaster response to Hurricane Katrina: Part 1. The initial medical response from trauma service area Q. *Ann Emerg Med*. 2009;53(4):505-514.
4. Chiou-Tan FY, Bloodworth DM, Kass JS, et al. Physical medicine and rehabilitation conditions in the Astrodome clinic after Hurricane Katrina. *Am J Phys Med Rehabil*. 2007;86(9):762-769.
5. Bloodworth DM, Kevorkian CG, Rumbaut E, Chiou-Tan FY. Impairment and disability in the Astrodome after Hurricane Katrina: lessons learned about the needs of the disabled after large population movements. *Am J Phys Med Rehabil*. 2007;86(9):770-775.
6. FEMA National Disaster Recovery Framework. Docket ID; FEMA-2010-0004. American Academy of Physical Medicine and Rehabilitation (AAPM&R) Public Comment; FEMA ID 2010-0004-0100.1: 16. <http://www.regulations.gov/search/Regs/home.html#docketDetail?R=FEMA-2010-0004>. Posted March 1, 2010. Accessed March 8, 2010.
7. Gautschi OP, Cadosch D, Rajan G, Zellweger R. Earthquakes and trauma: review of triage and injury-specific, immediate care. *Prehosp Disaster Med*. 2008;23(2):195-201.
8. Rathore MFA, Farooq F, Butt AW, Gill ZA. An update on spinal cord injuries in October 2005 earthquake in Pakistan. *Spinal Cord*. 2008;46(6):461-462.
9. Rathore MF, Rashid P, Butt AW, Malik AA, Gill ZA, Haig AJ. Epidemiology of spinal cord injuries in the 2005 Pakistan earthquake. *Spinal Cord*. 2007;45(10):658-663.
10. Rathore FA, Farooq F, Muzammil S, New PW, Ahmed N, Haig AJ. Spinal cord injury management and rehabilitation: highlights and shortcomings from the 2005 earthquake in Pakistan. *Arch Phys Med Rehabil*. 2008; 89(3):579-585.
11. Earthquakes with 50,000 or more deaths. USCG Earthquake Hazards Program Web site. http://earthquake.usgs.gov/earthquakes/world/most_destructive.php. Accessed March 9, 2010.
12. Government of Haiti Web site. <http://haitiseisme2010.gouv.ht> Accessed March 9, 2010.
13. Handicap International. Earthquake of 12th January, 2010—Haiti: preliminary findings about persons with injuries—greater Port au Prince area: 15–26 January, 2010. <http://www.handicap-international.us/in-the-world/states-of-intervention/programs/haiti/haiti-earthquake-documents>

14. Handicap International. Haiti situation update, February 11, 2010. http://www.handicap-international.us/fileadmin/files/documents/sitrep_HI_Haiti_100211_ENG.pdf. Accessed March 9, 2010.
15. Handicap International. More than 2,000 amputees in Haiti, estimates Handicap International. http://www.handicap-international.us/in-the-us/in-brief/?dechi_actus%5Bid%5D=88&cHash=29f01e34c9. Published January 26, 2010. Accessed March 9, 2010.
16. American Academy of Physical Medicine and Rehabilitation Haiti Relief Google online discussion group. USAID/DART message. Humanitarian coordination overview of Haiti response. http://groups.google.com/group/aapmr-haiti-relief/browse_thread/thread/ca6099dceec33a48?hl=en. Published February 7, 2010. Accessed March 9, 2010.
17. Pan American Health Organization/World Health Organization Haiti Health Cluster. OneResponse (Haiti Coordination) Web site. <http://onerresponse.info/Disasters/Haiti/Health/Pages/default.aspx>. Accessed March 9, 2010.
18. Creation of an Injury, Rehabilitation and Disability Workgroup. OneResponse Web site. <http://onerresponse.info/Disasters/Haiti/disabilities/publicdocuments/Forms/DispForm.aspx?ID=6>. Accessed March 9, 2010.
19. Injury, Rehabilitation and Disability Workgroup. OneResponse Web site. <http://onerresponse.info/Disasters/Haiti/disabilities/Pages/default.aspx>. Accessed March 9, 2010.
20. Handicap International. Haiti situation update, January 19, 2010. http://www.handicap-international.us/fileadmin/files/documents/pointdesituationhaiti19janvier2en_1_.pdf. Accessed March 10, 2010.
21. Report from Port au Prince. Team Canada Healing Hands Web site. <http://tchh.org>. Published January 26, 2010. Accessed March 9, 2010.
22. Injury, Rehabilitation and Disability Working Group minutes. OneResponse Web site. <http://onerresponse.info/Disasters/Haiti/disabilities/publicdocuments/Forms/DispForm.aspx?ID=33>. Published February 24, 2010. Accessed March 9, 2010.
23. Injury, Rehabilitation and Disability Working Group minutes. OneResponse Web site. <http://onerresponse.info/Disasters/Haiti/disabilities/publicdocuments/Forms/DispForm.aspx?ID=35>. Published March 3, 2010. Accessed March 9, 2010.
24. Healing Hands for Haiti International Foundation. www.healinghandsforhaiti.org Accessed March 9, 2010.
25. Project Medishare. <http://www.projectmedishare.org/how-to-help>. Accessed March 9, 2010.
26. Partners in Health. Stand with Haiti. <http://standwithhaiti.org/haiti/news-entry/how-you-can-help-volunteer-and-donate-supplies>. Accessed March 9, 2010.
27. American Academy of Physical Medicine and Rehabilitation. PM&R care in Haiti relief efforts. http://www.aapmr.org/member/haiti_earthquake.htm. Accessed March 9, 2010.
28. American Medical Association/National Disaster Life Support Disaster Volunteer Physician Registry. Haiti earthquake physician relief volunteer form. <http://www.ama-assn.org/ama/pub/physician-resources/public-health/center-public-health-preparedness-disaster-response/haiti-earthquake/help/haiti-volunteer.shtml>. Accessed March 9, 2010.
29. del Castillo A. Cuban rehabilitation services in Haiti. Escambray Web site. <http://www.escambray.cu/Eng/Special/haiti100202143>. Published February 3, 2010. Accessed March 9, 2010.
30. American Academy of Physical Medicine and Rehabilitation Haiti Relief Google online discussion group. Teleconference for rehab in Jacmel/southern Haiti discussion. <http://groups.google.com/group/aapmr-haiti-relief/topics?hl=en&start=10&sa=N>. Published March 7, 2010. Accessed March 9, 2010.
31. Injury, Rehabilitation and Disability Working Group minutes. OneResponse Web site. <http://onerresponse.info/Disasters/Haiti/disabilities/publicdocuments/Forms/DispForm.aspx?ID=4>. Published February 10, 2010. Accessed March 9, 2010.
32. International Rehabilitation Forum. <http://www.rehabforum.org>. Accessed March 9, 2010.
33. International Society of Physical and Rehabilitation. <http://isprm.org>. Accessed March 9, 2010.