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The Role of Physiatrists in Natural Disasters

Guest Discussants: Monica Verduzco-Gutierrez, MD, Lisa Pascual, MD, Lauren T. Shapiro, MD, MPH, Luis Baerga-Varela, MD, Belmarie Rodriguez-Santiago, MD
Feature Editor: Debjani Mukherjee, PhD

The Role of Physiatrists in Natural Disasters

After Hurricane Katrina hit New Orleans in 2005, the images and stories of the role of health care providers caused alarm. Questions of misconduct, extreme duress, and unimaginable choices emerged. In a recent article entitled, "The Duty of Mind: Ethical Capacity in a Time of Crisis [1]," the authors argue that "the physician is obliged to always make life-and-death decisions under conditions of maximal ethical clarity." (pg. 1) and that the stresses and chaos of a disaster can impact decision-making. They outline an ethical framework including (1) duty to care; (2) duty to steward resources; (3) duty to plan and accountability; (4) distributive justice, consistency, and fairness; and (5) transparency. They conclude that the "most humane choice is to prepare before the disaster comes" (pg. 5).

In addition to the life and death struggles and the choices that may present themselves during a disaster, there are other ethical issues to consider. What is the role of physiatrists in disaster preparedness and response? In this column, I invited physiatrists from 4 regions that recently experienced natural disasters to share their perspectives. The first columnist, Monica Verduzco-Gutierrez, MD, is Medical Director of the Brain Injury and Stroke Program at TIRR Memorial Hermann, Assistant Professor in the Department of Physical Medicine and Rehabilitation (PM&R), and Vice Chair of Quality, Compliance and Patient Safety at the McGovern Medical School at The University of Texas Health Science Center at Houston. She speaks to the various ethical issues that arose during her experience of Hurricane Harvey in Texas. The second columnist is Lisa Pascual, MD, who is the Chief of Rehabilitation Services at Zuckerberg San Francisco General Hospital and Trauma Center, Chief at Laguna Honda Hospital and Rehabilitation Center, and Clinical Professor in the Department of Orthopaedic Surgery at the University of California at San Francisco. Dr Pascual addresses the role of physician volunteerism in the context of the devastating fires in Northern California.

The third columnist, Lauren T. Shapiro, MD, MPH, an Assistant Professor in the Department of PM&R at the University of Miami Miller School of Medicine, specializing in brain injury medicine, describes her experiences during Hurricane Irma in Florida. Finally, Luis Baerga-Varela, MD, Director of Rehabilitation Services at the Puerto Rico Center for the Acute Care for Polytrauma Patients, Medical Director of the Puerto Rico Sports and Pain Medicine Institute, and Associate Professor in the Department of Physical Medicine, Rehabilitation and Sports Medicine at the University of Puerto Rico, Medical Sciences campus at Rio Piedras and Belmarie Rodriguez-Santiago, MD, a resident physician in the same department, give a comprehensive view from Puerto Rico after Hurricanes Irma and Maria. Their commentary highlights that the impact of disasters can be far-reaching, as they practice in a location that continues to be impacted many months after the disaster was declared.

The columnists were given the following writing prompt:

> Natural disasters raise various ethical issues, including allocation of resources, triage and emergency management, the toll of the disaster on health care personnel, and our responsibilities to our most vulnerable patients. As a PM&R doctor working in a United States region that was recently impacted by a natural disaster, what are some of the ethical issues you experienced? What recommendations do you have for improving readiness?

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Flooded With Ethical Issues in the Wake of Hurricane Harvey

Monica Verduzco-Gutierrez, MD
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Two days before a Category 4 hurricane made landfall on the Texas coast, a last-minute call decision was made. My colleague, Dr Thomas, lives in a flood-prone area that has flooded twice before. Much to my husband's chagrin, I called her to take her on-call duties. I don't live far from the hospital (and more importantly don't live so close to a bayou), and my children are older than hers and presumably less dependent on me. Such was the start of the longest, most stressful call that I have taken as a physiatrist while 1 trillion gallons of water fell on Harris County. Ethical issues surrounding PM&R care during a natural disaster include a clinician's sense of personal obligations, professional boundaries, financial ethical issues, and clinical issues such as the possibility of suboptimal providers and care.

Clinician's Sense of Personal Obligations

Personal obligations can create difficult ethical situations. Some physicians have competing personal obligations, especially regarding their families and homes. If you live in a place that would likely flood or in a mandatory evacuation area, then you must decide between your duty to family or duty to your job/patients. During the storm, some physicians also had family members or pets that could not be left alone. They offered to go into work if their pets or families could also be sheltered in the hospital, but that too would be a strain on resources. After the storm, 4 staff attendings had evacuated their homes, and 2 of those flooded homes were totaled. There were competing personal obligations at that point that made it (understandably) difficult to work in the aftermath of the flood.

Clinician's Sense of Professional Boundaries

Ethical issues regarding a physician's sense of boundaries abound at the time of a hurricane. Will you sign for a handicap parking placard for a patient who is ambulatory but has chronic pain or fatigue? Will you refill a medication that their primary care physician should be handling? Our clinic is hospital-based, and therefore it was open right after the hurricane and calls were being answered 24/7. There were calls for medication refills that usually would not be the physiatrist's responsibility (eg, diabetes medications). I also was asked to write a letter to the Red Cross to help get a patient's military family member out on emergency leave. The Red Cross needs verification that the emergency at home is life-threatening. This patient's home was flooded, he had lost everything, and he was hospitalized due to an infection and wound acquired in a shelter. I had to self-define life-threatening in this case. He had a severe mobility impairment and got injured in a shelter; that was ultimately reason enough for me to provide the necessary documentation.

Financial Ethical Issues

There is also rationing of resources post-hurricane. Many of our physicians and therapists are involved in volunteer care at a free rehabilitation clinic, the RSVP Clinic. Nonresource patients presented to the free clinic with unimaginable losses and needs. Issues came up regarding allocation of the resources available. Who do we preferentially serve with limited resources? Was it first come, first served? Was it based on their financial capacity? Was it based on their functional need? Furthermore, patients were often in financial need during this time. Even in our own inpatient units and clinics, patients were hit hard. In this case, was it ethically appropriate for clinicians to give money to patients in need? Many did. Questions arise if it is appropriate, how much should be given and in what manner (cash, check, goods, gift cards), and does it change the doctor—patient relationship?

Clinical Issues Regarding Possible Suboptimal Care

The potential for suboptimal care is most thought provoking when it comes to ethical issues concerning disaster medicine. In times of crisis, medical care cannot be delivered at the same high-quality standards by the most experienced experts. Physiatrists, and other medical professionals, are called on to participate in aspects of medical care with which they may not be comfortable or trained to provide. Although some professionals worked at the shelter, doing what needed to be done to keep people alive, I was still in the premiere rehabilitation institute in the Southern United States. At times when limited practitioners are available and in the setting of limited resources, this becomes an ethical issue. The storm hit in the middle of the night, and the hospital was like a castle surrounded by a moat. The previous day shift of nurses and techs had been allowed to leave. If you did not sleep at the hospital, you were stuck at home, and there were team members who could not make it into the hospital to do their work. The night shift now had to become the day shift.

I stand in awe of our trainees who remained in-house. Some of them passed out food trays, helped with transferring patients, and even helped with bowel and bladder care. Therapists did the same. It was all hands-

on deck. They were also answering calls from concerned family members on the night shift, turning patients every 2 hours, and changing diapers. Rationing of hot food was an issue. All patients who could be fed were fed, but the food wasn't always the warm food from the cafeteria. There were administrators making sandwiches and other easy go-to items.

When roads began to clear, the doors were opened to a new batch of physicians who could come in to round in the hospital. But many of our physicians were flooded out themselves and could not make it in. I organized a group message and figured out who was not flooded, who lived close enough, and who could make it in. We have a pediatric rehabilitation physician who was able to make it in to help. Although adult inpatient PM&R is no longer in her practice, she took the responsibility to work with a trainee and round for 2 days on a unit of patients.

With the advanced hurricane warnings, we had time to discharge inpatients early in anticipation of the storm. This could be considered an ethical issue, because some of them would have wanted to stay longer and possibly would have benefited from a longer length of stay for their rehabilitation. There was also the question of whether they were being discharged to a safe location. The Texas Department of Transportation stated more than 185,000 homes were damaged and 9000 destroyed throughout the state [1]. Nevertheless, we made the best decisions we could under the circumstances of this looming storm.

Another issue that did not come up, but could have, was the need to do procedures that we as physiatrists would usually not do or refer out, for example, the need to perform a lumbar puncture in a patient with possible meningitis. Had the neurosurgeon, neurologist, or interventional radiologist not been available, this would fall to a physician who does not do these procedures with enough frequency to feel competent.

Regarding Improving Readiness

With a hurricane (versus an earthquake), you have advance warning. This warning gives you time to prepare disaster teams and ready the hospital's floodgates (yes, our hospital literally has floodgates) and other resources. A disaster contingency plan should be in place to help guide clinicians on how to proceed in these situations. Our larger hospital system had an Incident Command Center to coordinate with local governments, first responders, and to communicate with practitioners and patients. TIRR Memorial Hermann had an internal Command Center conference call that occurred at least twice a day in the week around the storm. Administrative and physician leaders spent time reporting and assessing the current needs of the hospital, the employees, and of course, the patients. The service line medical directors—myself included—spent necessary hours on these calls and coordinated physician coverage in our hospital and across the rehabilitation network. The system also initiated a "Code Gray," where all employees are asked to stay in place at their current location until further notice. Program directors and chief residents also coordinated teams of physicians who stayed in-house to work in shifts. Benjamin Franklin said, "An ounce of prevention is worth a pound of cure." This is quite fitting in case of a disaster. Above all during times of disaster, be willing, be flexible, be gracious, and be patient.

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Physician Volunteerism After Natural Disasters: Key Considerations

Lisa Pascual, MD
University of California, San Francisco

I awoke to the smell of smoke. My first thought was, "how close is it?" The concern was valid. The firestorm that engulfed the Oakland Hills in 1991, just a few miles away from my home, left 25 people dead and almost 300 homes lost.

I listened for sirens. There were none. As it turned out, the fires blazing 50 miles away in California's famous wine country were fanned by high winds that sent smoke billowing throughout the northern state.

Many San Francisco employees reside in the fire zone, just north of the city, so the impact of these fires, quite literally, hit close to home. Concern for fellow colleagues, friends, and families was acute. As a faculty member of the University of California, San Francisco, colleagues living in the area began to reach out with requests for supplies and, later, for medical assistance.

The human toll from natural disasters touch us profoundly, especially as we are committed to provide care for the suffering. Often, our first impulse is to provide assistance. For some, assistance is given through donations. For others, the desire is to volunteer. Although surgeons and emergency medicine physicians are often associated with immediate deployment to disaster sites, more recently, physiatrists are joining the ranks of volunteer physicians. What factors should be considered if one is motivated to volunteer?

Physician Volunteerism

Physician volunteerism through religious missions was popularized in the late 19th century by Nobel Prize—winning Albert Schweitzer. A devout Christian, he traveled to Africa as a medical missionary, successfully garnering funding for hospitals and attention for charitable works of physicians and nurses [1].

Secular physician volunteerism has become more prevalent. Although the motivation to volunteer has remained largely altruistic, medical missions or "medical tourism" providing short-term care has come under criticism. Sparse resources often are diverted from locals to accommodate the needs of the medical team. Limited attention is given to the cultural views and needs of the population, including the development of infrastructure for ongoing care. Local medical teams are undermined in the absence of training and teaching. However, after a natural disaster when there is such dire need for assistance, do such considerations really apply?

Unintended Consequences

After Hurricane Katrina in the United States, scores of physicians and health professionals self-deployed to the area. Once there, however, their skills were underused, as they lacked affiliations to relief organizations working in concert with local agencies. In the absence of an assigned role within a properly planned framework, highly skilled physicians were left unable to do that for which they were trained [2]. Unfamiliarity with the local culture and available resources further undermined their efforts.

Fracture management was in high demand after the 2001 Gujarat Earthquake in India. Highly trained surgeons performed multiple implant surgeries appropriate to the standard of care in their home setting. However, in the unpurified conditions of this rural setting, there was concern that the aggressive use of implants may have contributed to the high rate of postoperative infections [3]. Furthermore, after departure of the teams, few caregivers were available for follow-up management and rehabilitation.

After the 2010 earthquake in Haiti, volunteer health professionals (VHPs) arrived with minimal equipment, no pharmaceutical or supply cache, no provision for their own food, shelter or security, nor the means to verify their qualifications or credentials [4]. In a system already stretched to provide for the needs of existing relief workers, lone volunteers not only added to this burden but put themselves at personal risk.

Self-deployment can add burden to an already-stressed system. The short-term deployment of medical teams after disaster may have the unintended consequences of taxing limited resources and, with little attention to the postoperative capabilities of the local staff, can result in high morbidity. Lack of knowledge of the local culture and existing resources further confound rendering effective care.

Barriers

Thirty-three thousand VHPs either responded to calls to serve or self-deployed to Louisiana [5]. Credentialing, licensure, civil liability, and reparations for harm delayed or prevented many VHPs from providing care. Similar barriers were encountered after Hurricane Rita in 2005 and Hurricanes Gustav and Ike in 2008.

Conversely, after the 9/11 attacks in New York, more than 8000 physician volunteers registered via a hotline set up for that purpose. One hundred ten physicians, nurses, and paramedics attending a conference across the street from the World Trade Center immediately went to work setting up a field hospital nearby. Although the response to this sudden disaster was likely reflexive and not encumbered by the immediate consideration of applicable New York State's laws (in fact, New York State is volunteer-friendly), in general, variations in state law can impact the ability to swiftly use VHP when disasters occur.

In 1997, the United States Congress passed the Volunteer Protection Act providing immunity to VHP serving in emergency and nonemergency situations. However, it only applies to VHP with licensure in the state of the declared emergency. It offers no civil liability protection from volunteers or volunteer organizations.

Seventeen states have adopted the Uniform Emergency Volunteer Health Practitioners Act. Practitioners who register with appropriate agencies either in advance or at the time of a declared disaster may be credentialed to volunteer in states that have enacted this model legislation. Civil liability protections and workers' compensation are also offered.

Good Samaritan laws provide immunity to protect volunteers who act in good faith. However, Good Samaritan laws also differ between states. The Good Samaritan Health Professional Act of 2017 HE 1876 was introduced as a bill in April 2017. If passed, this would provide licensed VHP civil immunity from federal and state laws when serving as volunteers during declared emergencies, even when rendering care outside of their state of licensure.

Back at Home

Physician volunteerism during times of disaster need not be confined to those with surgical or emergency medicine skills. As physiatrists, we can address the needs of posttrauma patients, patients with chronic illness—whose conditions are often exacerbated by displacement from their homes and families and, taking it a step further, address issues related to their loss of function. Further, our volunteerism need not be limited to work at the disaster site; there is also valuable service to be done at home to support efforts abroad, such

as the procurement and coordination of both human and material resources.

During the firestorm, opportunities for volunteerism at both the disaster site and at our institutions were available. Our institution and Department of Public Health provided regular updates, links to relief organizations, and information about resources available to those directly and indirectly affected by the fires.

Coordination of donations is crucial after natural disasters, even at the grass roots level. Well-meaning individuals spent time collecting and transporting donations, only to find that many of the drop-off sites were at capacity and unable to accept the items. However, through collaboration within the institution and with a corporate sponsor with established connections with relief efforts, our department was able to donate and deliver pallets of requested items to the shelters.

Calls for medical assistance for those in shelters, including more than 200 elders displaced from their skilled nursing facility, were received. Clinicians received information about volunteering. Self-deployment was discouraged; working through relief organizations was advised. The University facilitated volunteerism by providing links to register as emergency responders, to sign up for shifts at local shelters, and to provide volunteers with appropriate professional liability coverage.

Going Forward

My advice for physiatrists who are facing a natural disaster is in alignment with those who are expert in the field of volunteer relief. Position yourself to be a resource, not a burden. Sensitivity to the needs and expectations of the population is key. Consider sustainability of your efforts and seek interventions that can be managed effectively on departure of your team by providing education to local clinicians. Support legislation that facilitates volunteerism and provides you with protections.

Physician volunteerism has become a cultural norm. As physiatrists, our knowledge base in the neuromusculoskeletal system and general medicine makes us uniquely positioned to meet multiple clinical demands.

Although we can make a difference in the immediate response, there are valuable opportunities in the medium- and long-term relief efforts. Not only has this phase of relief been acknowledged as the most challenging in terms of maintaining the physician volunteers' engagement, but maximizing recovery after the sequelae of trauma is at the root of our training. We have the ability to make valuable contributions, not just by providing direct care, but by partnering with clinicians and institutions to better assess how we might help to address their specific needs. Establishing collaborations that include education and training, as well as the sharing of information and resources, will go a long way to help achieve sustainable models of care.

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Hurricane Irma: Who Goes and Who Stays

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In the days leading up to Hurricane Irma, we received warnings of the possibility of a large Category 5 hurricane hitting the major population centers of South Florida. Evacuation orders were issued for the Florida Keys and zones within Miami—Dade County. Fortunately, Miami did not experience the degree of catastrophic devastation that was, for a time, predicted. However, in preparing for disaster, a number of ethical issues arose concerning the questions of who goes and who stays, both with regards to our patients and our health care team.

The earliest difficult decisions we had to make concerned discharging patients from our inpatient rehabilitation units in the days before the storm. On the one hand, we were concerned with the allocation of a limited resource, namely space on the units. There needed to be room to house essential staff to provide care during the event, as well as to deal with the potential onslaught of patients in the aftermath. Patients on the rehabilitation unit are usually fairly medically stable, and those toward the end of their stays may have been able to function safely at home with some assistance from family or friends. On the other hand, our primary responsibility is the welfare of our patients. Most of these patients were dealing with new disability, which is challenging enough without the added stress of dealing with a major hurricane. Moreover, some lived in evacuation zones and may have been unable to remain in, or even access, their homes. Furthermore, most, if not all, required outpatient or home therapies after

discharge, and we were unable to predict when those services would become available after the hurricane. Ultimately, we worked with patients and their families to devise the best individualized plan for each and halted all discharges approximately 36 hours before anticipated landfall.

Another important ethical concern that our group of physiatrists has given much consideration to after Irma is how to address staffing should there be another mass evacuation of our region. Balancing the safety of medical staff and trainees, and their families, with our responsibilities to our patients is very challenging. Many of our physicians, myself included, reside in zones that were evacuated before the hurricane. Some of those who evacuated to more distant locations had difficulty returning to Miami after the storm—there were cancelled flights, road closures, curfews, and serious gasoline shortages. We were fortunately adequately staffed in the days that followed, but we recognized that we might have struggled had our census at the time been greater. With advanced planning, there are potential solutions that should preserve both our individual safety as well as our ability to carry out our duties as physicians. We have used Irma as a learning opportunity and have worked to improve our readiness for any future large-scale emergencies. Herein, I offer some recommendations for improving preparedness for such disasters.

Patient Education

During our routine patient encounters, we should provide emergency preparedness education and advice. For example, when initiating intrathecal baclofen therapy, we should discuss plans for continued treatment in the event of a natural disaster. And, when returning a mobility-impaired patient back to work in a high-rise building, we should discuss special equipment that can be used to escape down stairwells. It is also important to ask your patients where they would go in the event a disaster struck their community and be prepared to offer suggestions. Those who are dependent on home-accessibility features may not be able to safely evacuate to the home of a family member or friend. Such individuals may be better served by evacuating to a hotel, medical shelter, or the home of a disabled peer.

A great resource for patients and their families is the booklet, "Preparing for Disaster for People with Disabilities and Other Special Needs," a joint effort of the Federal Emergency Management Agency and the American Red Cross. It provides an overview of what one needs to consider in planning for a disaster, including topics like creating a personal support network, assembling emergency supply kits, and devising an evacuation plan. It is available free of charge on the Federal Emergency Management Agency Web site [1]. I recommend this to my patients with disabilities and urge others do the same.

Staying Cool

As demonstrated by the aftermath of recent disasters, it is essential to prepare for the possibility of being without electricity for long periods of time. The loss of air conditioning proved the biggest challenge in Florida, as we faced oppressive heat in the days that followed the hurricane. Elderly individuals and those with disabilities are particularly vulnerable to extreme heat, highlighted by the preventable deaths of 12 residents of a local nursing home after the facility lost power [2]. Battery-operated fans and an ample supply of batteries (or USB-powered fans and solar chargers) are absolutely essential for anyone preparing for emergencies in warm climates. This is true even for those with gasoline-powered generators, as gas may be in very short supply in the days leading up to and after the storm.

Communication

It is also extremely important to have multiple means with which to communicate with those you will need to reach during and after an emergency. Phone and Internet service may be spotty. Important contacts should be printed out in case you are separated from your phone or run out of battery power. I also recommend downloading Zello, a walkie-talkie app that was successfully used during Hurricane Harvey to help rescue flood victims [3].

Readiness to Provide Care

Physiatrists and other health care providers need to be ready to provide care during and in the aftermath of a disaster. Many of us provide hospital-level care to very complex patients who will still need care during and after an emergency. Have a plan in place to care for your own children, pets, and anyone else who may depend on you while your services are needed. Make sure you have a mode of transportation to get to and from work, as public transportation options may not be available. Gas may be in very short supply, so fill your tank at the first forecast of an impending storm. For those who do not provide hospital care, consider helping out in your local medical shelter. In the days, weeks, and months after a disaster, be available to patients who need your assistance with issues like lost equipment replacement and need for medication refills or therapy services while displaced from the affected zone. Be mindful of the particular emotional and financial stresses faced by storm victims and refer for assistance when needed.

In conclusion, as specialists in PM&R, we can play an important role in our patients' preparedness for emergencies, as well in the recovery process for disaster

survivors. To provide optimal care for those that need us, we must also prepare ourselves for such events.

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Rehabilitation After a Natural Disaster: Puerto Rico's Experience After Hurricanes Irma and Maria

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A natural disaster is a catastrophic event generated by the natural forces of earth. It is defined by the World Health Organization as "a sudden ecological disruption or threat that exceeds the adjustment capacity of the affected community and requires external assistance" [1]. The magnitude of the disaster is measured by the number of lives, economic loss, and the ability of the affected population to recover. A large number of disabilities have been reported after natural disasters requiring comprehensive medical management, including rehabilitation. Even though natural disasters can cause many severe disabling injuries and patients with pre-existing disabilities are more profoundly affected during and after a disaster, PM&R has historically been underemphasized in disaster planning and response [2].

The majority of natural disaster literature is based on earthquakes, but different types of natural disasters affect the population and infrastructure in different ways. For example, during earthquakes most injuries occur as direct trauma during the natural disaster such as traumatic brain injuries, spinal cord injuries, long bone fractures, and limb amputations. However, during a hurricane, although direct injuries caused by the flood and flying debris do occur, the majority of injuries occur after the powerful winds and rain have ceased.

Puerto Rico recently experienced a natural disaster caused by Hurricanes Irma and Maria, 2 consecutive Category 4 and Category 5 hurricanes with landfalls on Puerto Rico on September 6 and September 20, 2017, respectively. The majority of injuries due to this natural catastrophe occurred during the cleanup and rebuilding duties in the months after these events. The patients who consulted to the PM&R service in our trauma center in Puerto Rico with injuries related to Hurricane Maria presented with chainsaw, power tool, or other cutting tool accidents; spinal cord and traumatic brain injuries related to falls from roofs and trees; crush injuries; and fuel-related burn injuries. Outpatient visits were due mostly to acute or subacute musculoskeletal injuries or exacerbation of already-controlled chronic injuries from increased volume and intensity of physical activities, lack of medications, interruption of ongoing treatments, and exacerbation of systemic medical conditions. Many patients were injured, or aggravated pre-existing injuries, by carrying or lifting heavy objects such as water or fuel containers, climbing stairs due to nonoperational elevators, climbing on the roof to service generators, or suffering falls at home due to poor visibility and wet surfaces. After this natural disaster, we had to deal with many ethical dilemmas while providing health care services regarding allocation of resources, triaging of emergencies based on their different nature and severity, the toll of the disaster on health care personnel, and our responsibilities to our most vulnerable patients.

Allocation of resources was severely impaired due to disrupted infrastructure and inaccessible roads caused by floods, landslides, or debris. The island experienced a complete loss of electrical power. Increased demand and impaired distribution of fuel resulted in severe shortage of fuel to run generators or motor vehicles. This resulted in long lines to purchase fuel, with waiting times of up to 8 hours. Three months after Hurricane Maria, greater than 50% of the island was still without power. Communications by phone, cell phone, Internet, radio, and television were severely disrupted. Only one AM radio station was working immediately after the hurricane and served as the main method of communication. Increased demand and impaired distribution of supplies resulted in shortages of food, water, and medications. The lack of power aggravated the situation due to an inability to sustain perishable foods. All supplies and relief workers had to brought by airplane or boat, making influx of materials, supplies, machinery, and relief workers slow, expensive, and difficult.

The lack of passable roads, communications, power, fuel, and supplies severely disrupted the delivery of medical care needed by our patients. The few hospitals, inpatient rehabilitation facilities, skilled nursing facilities, and nursing homes that remained operational did so with limited staff and with rationing of water, fuel, and supplies. Many skilled nursing facilities and nursing

homes were forced to send their patients home with family members.

Pharmacies also encountered significant difficulties after the hurricanes. The lack of power caused medications requiring refrigeration to spoil. Pharmacies could not replenish their stocks due to impaired communication and transportation. The lack of communication systems paralyzed electronic prescriptions and impaired communication with patients, physicians, and health plans. The inability to communicate with health plans resulted in having no guarantee of reimbursement for the medications dispatched [3].

Very few outpatient clinics, including PM&R clinics, were operating due to lack of power, water, and fuel, as well as difficulty reaching their staff or patients without a working communications system. Social media was ineffective as a way to communicate with patients and staff because most of the island lacked Internet service, cell phone service, and power. Some clinics were able to operate with power generators and used handwritten signs and message boards to inform patients and staff that they were operational and the hours of operation. This allowed the few patients and staff who were capable of visiting the clinic to be able to receive this information. Unfortunately, the majority of patients could not reach these clinics due to impassable roads and lack of fuel. Relief health care workers from the island, the United States, and other countries visited inaccessible areas to provide basic medical care and first need supplies. The relief medical personnel included many physiatrists, but the majority of their interventions involved primary care, such as diabetes and hypertension control, and distribution of medication, food, and water. The inability to follow up with these patients to ensure efficacy of the interventions and address further needs was also a significant problem.

The disabled population is at a major disadvantage during and after a natural disaster. Evacuation of disabled population presents serious difficulties due to dangerous environments and difficulty with ambulation and mobilization. Most evacuation plans fail to meet transportation needs of the disabled, because planners are unaware of their presence in the community or fail to realize special evacuation needs [2]. Also, many rehabilitation services on which this population relies were interrupted. Home therapies and home care services ceased to be provided. Patients at inpatient rehabilitation and skilled nursing facilities were discharged home. Medications could not be refilled, including medications with risk of serious withdrawal complications, such as intrathecally delivered medications and controlled pain medications.

Fortunately, hurricanes are predictable, occur in the same season of the year, and are usually announced several days in advance. Therefore, education and preparation of the general population and health professionals to prevent injuries and medical complications can potentially be achieved before a hurricane. Preparation should include storage of enough nonperishable foods, potable water, medication refills, batteries, and fuel for at least a few months and having analogue communication alternatives not dependent on the power grid. Patients with medications for chronic diseases or risk of withdrawal complications need to refill the medications before an announced potential atmospheric natural disaster and have a plan on how to reach their physician in case of complete communication loss. Legislation should be passed that assures reimbursement for health services and medications provided without the need for referral, preauthorization, or prescription for refills during the emergency state after a natural disaster. It is also important to constantly maintain and strengthen the infrastructure, including communication networks, roads, and water and power distribution systems, to better withstand the impact of natural disasters.

Physiatrists should play an important role in global planning and response to natural disasters and can help incorporate a rehabilitation perspective to the immediate post disaster response [4,5]. The development of specialties in Disaster Medicine and the emerging subspecialty in Disaster Rehabilitation has increased awareness of rehabilitation interventions in postdisaster response [2]. It has been demonstrated that natural disaster survivors with disabling injuries treated by a PM&R multidisciplinary team presented decreased morbidity and improved functional outcomes and survival [2]. Therefore, it is imperative that physiatrists collaborate in the integration of medical care provided after a natural disaster. There are multiple roles for physiatrist providing immediate medical care after a disaster. Physiatrists can help with emergency surgery support and triaging of victims, pre-, peri- and postoperative consultation, and follow-up. Rehabilitation physicians can participate in mobile community services to identify injuries not presented to medical facilities and provide adequate follow-up, prescription of mobility aids, assistive devices, and adaptive technologies. Physiatrists can also educate patients, family, and health care providers about preventing medical complications and how to implement rehabilitation efforts [4,5].

Rehabilitation physicians should organize and participate in deployable international emergency rehabilitation disaster teams. These teams can provide and help coordinate services to areas affected by catastrophic disasters as well as training of rehabilitation and non-rehabilitation health providers [1]. These efforts will help develop adequate and timely rehabilitation care to prevent medical complications and

improve the quality of life of persons sustaining injuries or impairments after a natural disaster.

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