

## Disaster Preparedness of Dialysis Patients for Hurricanes Gustav and Ike 2008

Myra A. Kleinpeter

---

*Hurricanes Katrina and Rita resulted in massive devastation of the Gulf Coast at Mississippi, Louisiana, and Texas during 2005. Because of those disasters, dialysis providers, nephrologists, and dialysis patients used disaster planning activities to work to mitigate the morbidity and mortality associated with the 2005 hurricane season for future events affecting dialysis patients.*

*As Hurricane Gustav approached, anniversary events for Hurricane Katrina were postponed because of evacuation orders for nearly the entire Louisiana Gulf Coast. As part of the hurricane preparation, dialysis units reviewed the disaster plans of patients, and patients made preparation for evacuation. Upon evacuation, many patients returned to the dialysis units that had provided services during their exile from Hurricane Katrina; other patients went to other locations as part of their evacuation plan.*

*Patients uniformly reported positive experiences with dialysis providers in their temporary evacuation communities, provided that those communities did not experience the effects of Hurricane Gustav. With the exception of evacuees to Baton Rouge, patients continued to receive their treatments uninterrupted. Because of extensive damage in the Baton Rouge area, resulting in widespread power losses and delayed restoration of power to hospitals and other health care facilities, some patients missed one treatment. However, as a result of compliance with disaster fluid and dietary recommendations, no adverse outcomes occurred. In most instances, patients were able to return to their home dialysis unit or a nearby unit to continue dialysis treatments within 4–5 days of Hurricane Gustav.*

---

From: Tulane University Health Sciences Center, New Orleans, Louisiana, U.S.A.

*Hurricane Ike struck the Texas Gulf Coast near Galveston, resulting in devastation of that area similar to the devastation seen in New Orleans after Katrina. The storm surge along the Louisiana Gulf Coast resulted in flooding that temporarily closed coastal dialysis units. Patients were prepared and experienced minimal interruption of dialysis services. Early planning and evacuation in the face of hurricane landfall—lessons learned from Hurricane Katrina in 2005—prevented disruption of treatment.*

### **Key words**

Disaster, emergency preparedness, hurricanes, evacuation

### **Introduction**

Hurricane Katrina was the worst U.S. natural disaster on record, with devastating consequences to the health care infrastructure, resulting in interruption of dialysis services throughout the Gulf Coast of the United States in 2005 (1–4). Lessons learned from that disaster and from Hurricane Rita in 2005 were implemented in subsequent disasters throughout the United States (1–3,5). The 2008 Atlantic hurricane season was the first real test of emergency preparedness on both a local and a system level (4). Dialysis patients in hurricane-affected areas executed their personal disaster plans and experienced good outcomes overall.

Community disaster plans included considerations and allowances for special-needs patients, including dialysis patients. Dialysis units and providers implemented their disaster plans, referring patients to dialysis services in areas not affected by the 2008 storms. Dialysis providers receiving patients from hurricane-affected areas provided transient dialysis services for the evacuated patients. Information from a systematic review of the response to the 2008 hurricanes for dialysis patients can be used to plan for future disasters.

### Materials and methods

Disasters can occur at any time and in any place with or without advance warning (6). Most disasters are natural weather-related disasters, but human-precipitated disasters can affect individuals with or without warning as well. With natural disasters, there is often ample time to evacuate out of harm's way. However, many disasters strike without warning. In these instances, disaster planning affords individuals the opportunity to plan for the worst-case scenario, to practice the plan during disaster drills, and to implement the plan when disasters occur. After the danger of the disaster has passed and while recovery is ongoing, a thorough review of the disaster response should occur, including an analysis of preparation, evacuation, and recovery to that point. Changes in the disaster plan should then be made, based on lessons learned from the most recent disaster.

#### *Summary of events*

Hurricane Gustav approached the Gulf Coast at Louisiana and Mississippi on the third anniversary of Hurricane Katrina (7). Emergency management workers issued a mandatory evacuation order for most of the areas affected by Hurricane Katrina. Dialysis units implemented their disaster plans, and individual dialysis patients implemented personal disaster plans.

The personal disaster plans of dialysis patients include assembly of emergency supplies, emergency medications and medical equipment, important documents, medical records, and emergency contact information or lists. Personal disaster plans also include provision for evacuation should evacuation from the community be required as part of the emergency response to an approaching storm or other event. In this instance, the personal disaster plans of dialysis patients included evacuation from the projected area of impact. In many cases, assisted evacuation from the New Orleans metropolitan area and along the Mississippi Gulf Coast occurred. Individuals were taken to shelters out of the projected hurricane impact areas. However, the level of service available to special-needs patients, including dialysis patients, was limited. Availability of special-needs shelters was also limited.

After the danger had passed, utilities and essential services were restored in the evacuated areas to allow evacuees to return. Individuals who evacuated by assisted evacuation were staged to return as resources were made available.

Dialysis patients were often provided with copies of a disaster medical record before evacuation. The disaster medical records often included copies of a demographic ("face") sheet; history and physical data; dialysis patient identification card; medication and allergy profiles; recent dialysis flow sheets; dialysis orders; and recent laboratory studies, including tuberculin skin testing results or chest radiograph results, hepatitis B status, and other pertinent information. In many instances, patients were provided a list of dialysis units to contact in their planned evacuation destinations to receive temporary hemodialysis services. Patients affiliated with the large dialysis organizations were provided an emergency toll-free number to report their location; they were encouraged to continue dialysis at an affiliated provider, because their electronic medical records would be available.

Upon evacuation, patients notified dialysis units in their temporary locations that dialysis would be needed on a temporary basis, and they were able to make arrangements for transient dialysis services without difficulty. Evacuated patients arriving at dialysis units for hemodialysis provided the transient unit with a copy of their disaster medical record. These patients continued dialysis—often uninterrupted—and suffered no adverse outcomes. The transient units provided copies of the dialysis flow sheets for treatments given. Upon return, patients submitted to their home dialysis units copies of the flow sheets and other information that had been provided to them.

Patients at shelters were transported to designated sites to continue hemodialysis as well. Uniformly, patients reported positive experiences at the transient hemodialysis units.

Peritoneal dialysis patients fared well, as they often did during Hurricanes Katrina and Rita in 2005 (4). Patients evacuated with their peritoneal dialysis (PD) cyclers, PD supplies, medications, monitoring devices, and personal supplies to their evacuation locations. These patients continued PD without interruption and with relatively little or no difficulty.

Hurricane Gustav affected nearly the entire state of Louisiana because of tornado activity throughout the state resulting from the severe thunderstorms associated with the hurricane (7). Electrical services were interrupted throughout the state of Louisiana for at least brief periods of time and for up to 3 weeks following the passage of Hurricane Gustav. Dialysis services occurred in acute-care settings in the areas

directly affected by Hurricane Gustav, because hospitals had operating generators. However, most hospitals were prepared for only 3 days of service operation with generators and not for prolonged periods of time. Community dialysis units lost power for prolonged periods of time, and many used temporary generators to provide dialysis services. However, the temporary generators at most hospitals and dialysis facilities did not operate the air conditioning or other ventilation systems, leading to hot and uncomfortable environments for patients and providers. Fortunately, hospitals and dialysis facilities in the New Orleans metropolitan area experienced little interruption of services and were able to handle transfers from other areas of the state to provide continued medical services without difficulty.

Although Hurricane Ike affected Louisiana approximately 3 weeks after Hurricane Gustav, the primary impact was to the Texas Gulf Coast community of Galveston (7). By this time, most communities and health care facilities in Louisiana had largely recovered from Hurricane Gustav. Storm surge and tornado activity were the primary causes of damage in Louisiana (7). The situation for hospitals, health care facilities, businesses, and houses ranged from total devastation to flood and wind damage. As with Hurricane Katrina, the storm surge and flooding prevented a return to the affected areas and delayed recovery. Fortunately, the dialysis patient population in the affected areas was relatively small compared with that in other areas of the state, and patients were able to receive dialysis services in nearby communities without difficulty.

#### *Key lessons learned*

Disaster recovery begins with emergency planning and preparation by all health care stakeholders, integrated with the community disaster plan (Table I). Individuals, health care facilities, physicians, and other providers need to develop disaster plans, to participate in disaster drills, and to revise plans based on best practices and effective solutions during emergency situations (Table I). Lessons learned from hurricanes Katrina and Rita in 2005 enabled almost all dialysis patients to evacuate before the expected landfalls of hurricanes Gustav and Ike in 2008, thus resulting in minimal interruption of dialysis services to patients and in little disaster-related morbidity and mortality among dialysis patients (1,3,5). This contrasts with the case in 2005, when many patients failed

to evacuate and required rescue from their homes or from the communities and shelters inundated by flood waters (1,3,5). Many patients missed hemodialysis sessions because of destruction of health care infrastructure and inundation of remaining services outside of the hurricane-affected communities; morbidity and mortality resulted from conditions after passage of the storms or from missed dialysis treatments (1,3,5). Because patients evacuated in 2008, they experienced minimal interruption of their health care services by dialysis providers.

Despite the best plans, unexpected events will occur. The tornadoes and severe thunderstorm activity associated with Hurricane Gustav affected a larger area than had originally been predicted (7). The area affected by the storm surge associated with Hurricane Ike was considerably larger than had originally been predicted (7). Disaster plans had to adapt to the situation on the ground as the disaster evolved. Regional disaster planning allowed for other areas to rapidly adapt and to accept patients, and for providers to continue providing services to those needing medical care.

Once again, as with hurricanes Katrina and Rita, individuals, providers, and facilities needed to plan to operate without assistance for a minimum of 3–5 days, because supplies staged outside of the disaster-affected areas are delayed for individuals, providers, and facilities. Hospitals, dialysis units, and physician offices operated without difficulty upon restoration of utilities. In the instances in which restoration of utilities was delayed, government agencies assisted hospitals and essential-services providers—including large medical facilities, pharmacies, gasoline and fuel suppliers, and grocery stores—in obtaining generators to restore temporary electrical power until full electrical power was restored. This public–private cooperative response to the disaster prevented prolonged interruption of medical services to the communities affected by the storms.

An all-hazards disaster planning approach allowed for real-time modification of the disaster plan as the events associated with hurricanes Gustav and Ike occurred (Table I). Provision was made to shift resources to communities minimally affected by the storms so that provision of medical services could continue. As more aspects of the community infrastructure were discovered to be affected by the storms, community resources and regional resources were mobilized to assist in recovery efforts. During the disaster and

TABLE I Roles during emergency preparation and disasters

<i>Period</i>	<i>Activity</i>	<i>Responsible person or persons</i>
Preparation	Develop and review personal disaster plan.	Patient, staff, nephrologist
	Prepare disaster medical record.	Staff, nephrologist
	Prepare disaster kit.	Patient, staff, nephrologist
	Integrate personal disaster plan with community disaster plan.	Staff, nephrologist
	Develop emergency contact list.	Patient, staff, nephrologist
Pre-disaster	Monitor weather and events in the community.	Patient, staff, nephrologist
	Monitor community advisories and public safety announcements.	Patient, staff, nephrologist
	Implement personal disaster plan.	Patient, staff, nephrologist
	Evacuate if recommended or required.	Patient, staff, nephrologist
	Prepare for the passage of the storm or event.	Patient, staff, nephrologist
Post-disaster	Notify end-stage renal disease network of status.	Facility administrator, nephrologist
	Maintain a safe environment.	Patient, staff, nephrologist
	Monitor community advisories and public safety announcements.	Patient, staff, nephrologist
	Return to facility, perform safety checklist and system analysis.	Staff, nephrologist
	Notify end-stage renal disease network of status.	Facility administrator, nephrologist
Recovery	Resume operations.	Staff, nephrologist
	Review how disaster plan worked or failed to work.	Patient, staff, nephrologist
	Modify disaster plan based on findings of review.	Patient, staff, nephrologist
	Participate in community debriefing sessions.	Patient, staff, nephrologist
	Share experiences.	Patient, staff, nephrologist

recovery, the large dialysis organizations provided additional generators, supplies, personnel, and computer resources to areas directly affected by the storms and to areas receiving evacuees. This effort assisted in the seamless provision of services to patients.

### Discussion

Recovery from emergencies and disasters begins with emergency preparedness (6). Dialysis patients are often chronically ill, and they are hit hardest by disruption of the health care infrastructure (8). Emergency preparedness occurs at the individual, local, regional, and national levels. On the individual level, patients, dialysis nurses, dialysis patient care technicians, dialysis providers, and nephrologists need to develop personal disaster plans (2,6) (Table I). These plans need to include general information that is specific to each type of disaster that could potentially occur in a given area. Individual plans must take into consideration the personal responsibilities, capabilities, and

requirements that need to continue during any emergency or disaster situation. The development and implementation of these individual plans must also take the community and regional emergency preparedness plans and activities into consideration (Table I).

In the absence of the ability to provide hemodialysis because of a disaster or other emergency, fluid restriction, electrolyte restriction, potassium removal by cathartics and resins, and medical management of kidney failure all may be part of the provision of medical care to dialysis patients. With limited stations available in the affected communities as a result of delayed restoration of utilities, the foregoing considerations were important in the triage process to determine which patients needed dialysis in the acute setting.

Dialysis providers and nephrologists need to participate in local, regional, and national emergency preparedness activities (Table I). This participation includes, but is not limited to, providing copies of the comprehensive disaster plan for the dialysis unit or

medical practice, participating in community disaster drills, and providing surge capacity during emergencies.

Local and community disaster plans need to address several considerations for dialysis patients, including assistance with transportation when evacuations are recommended or required; establishment of special-needs shelters capable of handling the special needs of dialysis patients; priority restoration of utilities to dialysis providers, health care facilities, and pharmacies as essential infrastructure services; review of all phases of the disaster response afterwards to modify future disaster and emergency plans; and planning, execution, and review of periodic disaster drills to maintain community readiness for emergencies and disasters.

Regional and national disaster plans provide coordination of response, resource procurement, and management, and surge capacity for disasters and emergencies (Table I). Regional and national disaster plans must be able to realistically analyze local and community disaster plans and to provide necessary feedback to localities and communities for disaster plan modification when indicated (Table II). Regional and national emergency preparedness professionals need periodically to communicate to local health care providers and individuals the current forecasts for disaster risk and the actions and solutions proposed to minimize the risk of harm during disasters and

emergencies (Table I). These professionals may also provide disaster plan templates for individuals, organizations, communities, and regions. Regional and national disaster professionals may also establish standards for care, response, and safe environments to ensure the safety of people during disasters and to prevent harm during the disaster or recovery period. Through these activities, the health and safety of the vulnerable population, including dialysis patients, is protected.

### Conclusions

Vigilance must be maintained during hurricane season in hurricane-prone communities. Recovery from disasters and emergency situations begins with prior preparation for a variety of situations (Table II). Using an all-hazards approach to disaster and emergency preparedness, patients, dialysis providers, and nephrologists can minimize the interruption of dialysis services during disasters and can recover from emergency situations without encountering the often-associated health and safety risks. The dialysis community needs to continue to participate in these disaster and emergency preparedness activities and to play key leadership roles in protecting their vulnerable patient populations. The global community is ready to respond when disasters occur, but recovery begins with the local plan and response activities.

TABLE II SWOT<sup>a</sup> analysis of hurricanes in 2008

<i>Strengths</i>	<i>Weaknesses</i>	<i>Opportunities</i>	<i>Threats</i>
Information available for disaster plan templates and evacuation routes well in advance of hurricane season	All emergency shelters not equipped for special-needs patients Limited transportation available to and from dialysis facilities	Develop disaster restoration-of-service protocols to restore utilities to life and safety services and facilities	Unanticipated and catastrophic damage to the electrical grid resulting in delayed recovery in the primary staging area for Hurricane Gustav
Early emergency declaration and evacuation recommended	Limited dietary options available at shelters	Develop integrated plans for various levels of disaster	Evacuation or disaster fatigue
Transportation assistance available	Varying opportunities for bathing at shelter locations	Professional staff development to handle disasters	Multiple disasters in a single season stretch resources
Disaster medical records afforded patients seamless dialysis services		Develop more special-needs shelters in metropolitan areas capable of handling a variety of medical needs	Growth of population of patients in coastal communities are at risk for catastrophic disasters

<sup>a</sup> Strengths, weaknesses, opportunities, threats.

**References**

- 1 Kopp JB, Ball LK, Cohen A, *et al.* Kidney patient care in disasters: lessons from the hurricanes and earthquake of 2005. *Clin J Am Soc Nephrol* 2007;2:814–24.
- 2 Kenney RJ. Emergency preparedness concepts for dialysis facilities: reawakened after Hurricane Katrina. *Clin J Am Soc Nephrol* 2007;2:809–13.
- 3 Kleinpeter MA, Norman LD, Krane NK. Dialysis services in the hurricane-affected areas in 2005: lessons learned. *Am J Med Sci* 2006;332:259–63.
- 4 United States, Federal Emergency Management Agency (FEMA). Evacuees cautioned not to re-enter damage areas prematurely (Press release). Washington, DC: FEMA; 30 August 2005. [Available online at: [www.fema.gov/news/newsrelease.fema?id=18488](http://www.fema.gov/news/newsrelease.fema?id=18488); accessed: March 2, 2009]
- 5 Kleinpeter MA, Norman LD, Krane NK. Disaster planning for peritoneal dialysis programs. *Adv Perit Dial* 2006;22:124–9.
- 6 United States, Federal Emergency Management Agency (FEMA). President declares major disaster for Louisiana (Press release). Washington, DC: FEMA; 2 September 2008. [Available at: [www.fema.gov/news/newsrelease.fema?id=45624](http://www.fema.gov/news/newsrelease.fema?id=45624); accessed: March 2, 2009]
- 7 United States, Centers for Disease Control and Prevention (CDC). Home > Emergency preparedness and response > Preparedness for all hazards (Web resource). Atlanta, GA: CDC; n.d. [Available at: [emergency.cdc.gov/hazards-all.asp](http://emergency.cdc.gov/hazards-all.asp); accessed: March 2, 2009]
- 8 Zoraster R, Vanholder R, Sever MS. Disaster management of chronic dialysis patients. *Am J Disaster Med* 2007;2:96–106.

*Corresponding author:*

Myra A. Kleinpeter, MD, MPH, Tulane University Health Sciences Center, 1430 Tulane Avenue, SL-45, New Orleans, Louisiana 70112 U.S.A.

*E-mail:*

[mkleinp@tulane.edu](mailto:mkleinp@tulane.edu)