

MCEER SPECIAL REPORT SERIES
Engineering and Organizational Issues Before,
During and After Hurricane Katrina

HURRICANE KATRINA

Volume One
EMERGENCY RESPONSE



Hospital Decision Making in the Wake of Katrina:
The Case of New Orleans

Lucy A. Arendt and Daniel B. Hess



MCEER is a national center of excellence dedicated to establishing disaster-resilient communities through the application of multidisciplinary, multi-hazard research. Headquartered at the University at Buffalo, State University of New York, the Center was originally established by the National Science Foundation (NSF) in 1986, as the National Center for Earthquake Engineering Research (NCEER).

Comprising a consortium of researchers from numerous disciplines and institutions throughout the United States, the Center's mission has expanded from its original focus on earthquake engineering to address a variety of other hazards, both natural and man-made, and their impact on critical infrastructure and facilities. The Center's goal is to reduce losses through research and the application of advanced technologies that improve engineering, pre-event planning and post-event recovery strategies. Toward this end, the Center coordinates a nationwide program of multidisciplinary team research, education and outreach activities.

Funded principally by NSF, the State of New York and the Federal Highway Administration (FHWA), the Center derives additional support from the Department of Homeland Security (DHS)/Federal Emergency Management Agency (FEMA), other state governments, academic institutions, foreign governments and private industry.

MCEER Special Report Series

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**Hospital Decision Making in the Wake of Katrina:
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Foreword

On August 29, 2005, Hurricane Katrina made landfall with sustained winds estimated at 125 mph, unprecedented storm surges approaching 30 feet and winds extending 125 miles from its center. It resulted in over 1,300 lives lost, and caused major flooding and damage that spanned more than 200 miles along the Gulf Coast of the United States.

The extensive damage to the built environment far exceeded the expected damage for a storm of this size. Based on measured wind speeds and the Saffir-Simpson scale, Hurricane Katrina reached Category 5 strength while in the Gulf of Mexico, but quickly dissipated to a Category 3 storm before landfall. Although the wind speeds were substantially reduced before striking land, the storm surge apparently maintained the momentum associated with a Category 5 storm and is likely responsible for the majority of damage. It should be noted that early estimates ranked Hurricane Katrina as a Category 4 storm at landfall; the National Hurricane Center downgraded this ranking after revising wind speeds in December 2005.

Hurricane Katrina caused significant damage to engineered infrastructure including levees, commercial and public buildings, roads and bridges, utility distribution systems for electric power and water, waste water collection facilities, and vital communication networks. Damage to critical infrastructure such as hospitals and communication systems crippled the affected communities, and more importantly, the response and recovery efforts following the hurricane. In the aftermath of Hurricane Katrina, the important question now is: How can we better prepare ourselves to prevent or minimize the level of damage and the subsequent catastrophe in the next extreme event?

Funded by the National Science Foundation, a multidisciplinary team of investigators from the Multidisciplinary Center for Earthquake Engineering Research (MCEER), headquartered at the University at Buffalo, conducted post-disaster field reconnaissance to examine the impact of Hurricane Katrina on physical engineered systems and the response and recovery efforts that followed. Their objectives were to examine wind, storm surge and debris damage from a multi-hazard perspective. Implications of lessons learned from this reconnaissance effort are being examined to mitigate damage and improve response and recovery efforts not only from future hurricanes, but also from other extreme events such as earthquakes or terrorist attacks. By

collecting this multi-hazard information, MCEER is seeking to develop engineering design strategies and organizational strategies that will make communities more resilient against any extreme event.

The MCEER special report series “Engineering and Organizational Issues Before, During and After Hurricane Katrina” was initiated to present the findings from the field reconnaissance mission. The topics addressed include advanced damage detection using remote sensing, damage to engineered structures, organizational decision making primarily in hospitals, and environmental and public health issues. The reports will contribute to the development of a better understanding of how to cost-effectively enhance the resilience of the nation’s infrastructure against future extreme events.

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The authors are grateful to the many individuals in the New Orleans area who, despite their urgent need to deal with the tragic outcomes of Hurricane Katrina, were generous with their time and insights.

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1.0 New Orleans Hospitals and Hurricane Katrina

At 7 a.m. CDT on Sunday, August 28, 2005, Hurricane Katrina was upgraded to a Category 5 hurricane, the highest category on the Saffir-Simpson scale. By 9:30 a.m. CDT that same morning, New Orleans Mayor Ray Nagin called for a first-ever mandatory evacuation of his city of just under 500,000 inhabitants. The evacuation order exempted government officials, prison inmates, hospital patients and staff members, tourists in hotels, and members of the media (Russell 2005; Glasser & Grunwald 2005).

Ryan Shannon was an intern at Tulane University who had been assigned to work at the New Orleans Veterans Administration (VA) Medical Center (Shannon 2005). In response to Mayor Ray Nagin's evacuation order, Shannon received a page from the VA telling him that the hospital was under "code gray" (severe weather). That meant that Shannon would need to report to work that day, and plan to stay through the hurricane and afterward, until replacement staff members appeared.

As the hurricane made landfall on Monday, August 29, 2005, Shannon and his fellow hospital employees worked to maintain their patients' health and safety. Concerned that the windows might not withstand greater than 100 mph winds, staff members relocated patients to rooms without windows.

The hurricane subsided by Monday evening. Staff members assessed the damage, and decided to move patients back to their rooms, most of which were undamaged. The city's power was off-line, but the hospital's generators were working as expected. Hospital staff and patients breathed a collective sigh of relief. They had survived another hurricane.

Early Tuesday morning, August 30, 2005, relief changed to dread. At least one levee had been compromised, and the water from the city's canals was rapidly flooding its streets. The "bowl" that was New Orleans, a city mostly under sea level, was filling with water from the Gulf and from Lake Pontchartrain (Lewis 2003). As Shannon (2005) describes the situation,

"There was no way out of the hospital, and no one had any idea when or how we were going to leave. Furthermore, there were stories about the chaos that was going on outside in the city. Communication was limited and nobody knew what was truth and what was rumor. My wife frantically called and confirmed the rumors of looters that were invading other hospitals in the area in search of food, drugs and supplies. I thought we might be next."

Inside the hospital, conditions worsened (Rohde et al., 2005). Without access to the city's water supply, people had difficulty finding something to drink. Concern about the hospital's generators, vulnerable to flooding because of their location in the hospital's lowest level, prompted staff members to initiate an evacuation of life support patients. Evacuating the remaining 142 patients and additional 700 people in the hospital became the next priority. Still, according to Shannon (2005), "No official plan seemed to be in place."

With their cellular telephones no longer working, staff members had great difficulty communicating outside the VA. Uncertainty fueled everyone's anxiety. Were they going to be rescued? If yes, when?

Good news arrived on Thursday, September 1. The VA – located in close proximity to other medical facilities in the downtown "hospital district" – was going to be evacuated, starting at 9 a.m. CDT. That gave the hospital's staff three hours to vertically evacuate patients down seven flights of stairs. Despite the lack of air conditioning, and staff exhaustion, patients were loaded into Army National Guard trucks that then transported them and the hospital's staff members to the airport at the edge of the city. From there, VA personnel were airlifted to Houston. The evacuation was a success.

The decision to evacuate a hospital is not an easy one. First, in the wake of a natural disaster such as a hurricane, we expect hospitals to play the role of responders, not of victims. If a hospital closes after a disaster, then where do people go for medical assistance, emergency or otherwise? Second, in the wake of a natural disaster such as a hurricane, we expect hospitals to be capable of self-sufficiency for a period of at least 72 hours. After that, we expect that power, water, and communication systems will be restored, at least enough to permit basic hospital functioning. As described by Chavez and Binder (1996),

"Evacuation from a patient care environment is a serious matter. Patients are by definition compromised in some way. Many are elderly, have underlying medical problems, and many are frail. There is no easy answer to the question: 'When do you evacuate patients?'" (p. 450).

Of the 15 acute care hospitals in the immediate area of New Orleans¹, all but three evacuated in the days after Hurricane Katrina. All but four of those that

¹ The following acute care hospitals are the subject of this study: Chalmette Medical Center (St. Bernard Parish); East Jefferson General Hospital, Lakeside Hospital, Meadowcrest Hospital, Ochsner Clinic Foundation, and West Jefferson Medical Center (Jefferson Parish); Children's Hospital, Lindy Boggs Medical Center, Medical Center of Louisiana at New Orleans-Charity Hospital, Memorial Medical Center, Methodist Hospital, Touro Infirmary, Tulane University Hospital, University Hospital, and Veterans Administration Hospital (Orleans Parish).

evacuated remain closed through the writing of this report, more than five months after Katrina made landfall. Understanding how and why these hospitals decided to evacuate, as well as the consequences associated with those evacuation decisions, is the compelling focus of inquiry of this report.

1.1 Study Objectives

This study examines New Orleans hospital decision-making as it relates to disaster preparedness and emergency response. Our primary objective is to describe New Orleans hospital decision making before, during, and immediately after Hurricane Katrina. In doing so, we articulate the lessons learned by New Orleans hospitals, as described by hospital executives and others knowledgeable about hospitals and disaster preparedness and response. We link the lessons learned to organizations other than hospitals, and to hospitals and other organizations facing not only hurricanes but also a variety of both natural and manmade hazards. Finally, we use the information gathered to anticipate recovery of the New Orleans hospital system.

Hospitals in New Orleans have received significant attention from the news media in the days since Hurricane Katrina (Rohde et al., 2005). This study differs from the majority of journalistic reports in that its purpose is to analyze and synthesize the lessons learned across a range of hospitals and the larger medical system, and not to highlight the successes and failures experienced by individual hospitals. Likewise, the traumatic experience of Ryan Shannon was shared by many staff members at many New Orleans hospitals. To the extent possible, our purpose is to describe decisions and events that may be generalized beyond their initial actors, individual or organizational.

1.2 Motivation for this Study

Acute care hospitals are essential to the infrastructure of modern communities (Sternberg 2003). Private citizens and organizations include the availability and quality of acute care hospitals in their assessments of community amenities, in the same way that they include the availability and quality of employment opportunities, residential housing, K-12 schools, potable water, and energy. Well functioning acute care hospitals are at the heart of healthy and productive communities.

Typically, acute care hospitals provide emergency, secondary, and tertiary medical services to individuals based on geography, patient socio-economics, and hospital specialty. In the event of a disaster, people needing acute care

think first of “their” hospital, the one closest to them, the one that is affiliated with their insurance provider, the one with which they have previous experience, and the one that they think can best attend to their current medical need.

While this report focuses on the specific case of New Orleans hospitals as they dealt with Hurricane Katrina and the subsequent flooding of the city, the results of this study are relevant for and transferable to other types of disasters. Without question, people expect their hospitals to withstand all manner of natural disasters, including floods, hurricanes, blizzards, and earthquakes. Similarly, people expect their hospitals to play the role of responder when their community faces nuclear, industrial, or transportation disasters. Finally, people expect their hospital to serve as a haven in the case of mass violence, whether perpetuated on a relatively small scale (e.g., neighborhood shooting sprees) or on a much larger scale (e.g., terrorist attacks).

In considering the consequences of disasters for communities, hospitals merit special attention thanks to their complexity and occupancy characteristics, and thanks to their role during disaster situations (Pan American Health Organization 1993; Sternberg 2003).

1.2.1 Complexity and Occupancy Characteristics

Hospitals are complex systems, comprising inpatient care units, outpatient consultation, diagnostic and support services, and administrative offices (Pan American Health Organization 1993). The range of services and expertise needed to deliver those services is extensive. Support staff members park cars, admit patients, interact with insurance providers, order pharmaceuticals, deliver mail, purchase supplies, maintain patient and staff safety, clean and sanitize rooms and equipment, create patient information databases, and so on. Patient care staff members diagnose illnesses, dispense medications, perform surgery, interact with patients’ family members, and so on. Administrative staff members set strategic direction, secure financial resources, select capital projects, engage in media relations, and so on. While some staff members have yet to receive their high school diploma, others have the highest degrees in their functional area of expertise (e.g., M.D., Ph.D.).

Such complex organizations require continuous access to electricity, potable water, fuel, food, medical-surgical supplies, liquid and solid waste disposal services, communication services, and skilled staff members. Interrupted

access to these needed inputs threatens the ability of hospitals to maintain the health and safety of patients.

Hospital occupants generally include resident patients (e.g., those in neonatal intensive care units), transient patients (e.g., those in the emergency room), patients recovering from surgery, staff members, and visitors. Hospitals are open 24 hours per day, 365 days per year. While the number of occupants is generally lower in the evening hours when there are fewer staff and visitors, there are always occupants.

Because of their complexity and occupancy characteristics, then, there are three primary reasons for hospitals to engage in disaster preparedness planning (Pan American Health Organization 1993). First, patients will continue to need care during a disaster. Staff members who are essential to continued patient care must be available. Next, safety and security for all hospital occupants must be ensured at all times. Anticipating and addressing breaches in safety and security can diminish negative physical, mental, and emotional consequences. Finally, patient and staff evacuation may be necessary during an extreme event (Sternberg et al., 2004). Executing such an evacuation may be complicated by the presence of patient family members and others unfamiliar with a hospital's evacuation plan.

1.2.2 Hospitals' Role during Disasters

When disasters strike, hospitals are expected to continue treating resident patients and those seeking medical attention after the disaster (Pan American Health Organization 1993). Hospitals are critical components of communities' disaster response. They are expected to respond to disasters, and not to be victims. Continued and additional treatment of patients depends on the uninterrupted availability of essential personnel, buildings, equipment, services, and supplies. Essential personnel must be identified, trained, and evaluated. Buildings must be designed to withstand expected disasters and once built, examined and retrofitted to ensure continued functioning of critical areas. Equipment should be inspected, maintained, and properly anchored. Services provided by municipal government and other external entities should be reviewed for possible internal backup. Supplies should be inventoried and secured, and contracts for additional supplies made with multiple vendors. To the extent that doing so is financially feasible, hospitals should build slack into their essential systems and personnel, thereby maximizing their operating flexibility during and immediately after a disaster.

1.3 Methodology

The methodology used to gather the information contained in this report is qualitative. We traveled to New Orleans approximately one month after Hurricane Katrina and were able to observe firsthand the devastation wrought by Katrina and the subsequent flooding of the city. Using a directory of hospitals and clinics generated by the Louisiana Hospital Association, we performed a thorough visual tour of what remained of New Orleans' hospital infrastructure. In addition to observing and taking visual stock of most of the acute care hospitals in Orleans, Jefferson, and St. Bernard Parishes, we met with and were able to interview various individuals. Those individuals included hospital administrators and staff members, their family members, security personnel, remediation personnel, public health officials, health association representatives, and federal, state, and local emergency experts. Locating key hospital decision makers was an exceptionally difficult task, since all Orleans Parish hospitals were still closed during the first week of October, and hospital administrators were scattered to command centers in other cities, such as Baton Rouge. Follow-up telephone interviews were conducted with several hospital administrators who were unavailable during our stay in New Orleans.

In addition to our own interviews and observations, we also undertook an extensive review and interpretation of archival materials, including news reports, web sites, and other means used by hospitals to communicate with staff, patients, and the community at large. The purpose of this archival review was to assess the representativeness of and augment what was learned from the interviews and observations.

In gathering information from these diverse sources, we develop a comprehensive, balanced view of New Orleans hospital decision making before, during, and immediately after Hurricane Katrina. We are mindful of the lessons that might be learned from all New Orleans hospitals: those that stayed open, that those evacuated and then reopened, and those that evacuated that may never reopen, at least not as acute care hospitals. Not surprisingly, hospitals that were able to stay open and performed well during the disaster were eager to share their experiences. As described earlier, the purpose of this report is to analyze and synthesize the lessons learned across a range of hospitals, and not to highlight the successes and failures experienced by individual hospitals. To that end, we have chosen to keep confidential the identity of all individuals interviewed. As needed, we have adjusted descriptive details to ensure that proprietary information remains such.

2.0 Hospital Decision Making Before and During Hurricane Katrina

2.1 Overview of Hospitals in New Orleans Pre-Katrina

This study focuses on the 15 acute care hospitals that were the primary providers of patient care in the New Orleans area before Hurricane Katrina. Together, these hospitals were licensed for a total of 5,649 beds. Ownership of the hospitals varied: one was owned by the federal government, two were publicly owned, five were not-for-profit, and seven were investor-owned. While St. Bernard's Parish was served by one hospital, Jefferson Parish was served by five hospitals, and Orleans Parish was served by nine hospitals. Table 2-1 lists the hospitals by location, ownership type, and number of licensed beds.

2.2 Hospital Emergency Management Plans

Hospitals accredited by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) are required to have an emergency management plan that they can enact during a disaster (Joint Commission Perspectives 2001). Having an emergency management plan makes social and economic sense. As previously described, people expect hospitals to be responders in the face of a disaster, not victims. To that end, people expect hospitals to anticipate possible impediments to providing adequate patient care and make plans to address those problems. Likewise, people expect hospital administrators to be good stewards of hospital buildings, equipment, and staff members.

Emergency management plans tend to address a wide range of possible disasters. In the case of New Orleans hospitals, these plans tend to address bomb threats, external disasters (e.g., major fire in the surrounding community), internal disasters (e.g., major fire on hospital property), infant abduction, loss of utilities, bioterrorism incidents, chemical incidents, and severe weather. No matter how richly detailed these plans may be, those involved in their creation recognize that even the most carefully crafted plans may need to be set aside in the face of an actual disaster. As described in one emergency management document shared with us², these "plans are intended to be a flexible guide in (the hospital's) response to a disaster or emergency situation."

² This document was shared with the understanding that it was not for public distribution. Therefore, we have chosen not to list the source of this statement.

Table 2-1. Hospitals in the New Orleans Area as of April 1, 2005

Facility Name	City	Parish	Ownership Type	Licensed Beds
Chalmette Medical Center	Chalmette	St. Bernard	Investor-owned (Universal Health Svcs)	265
Meadowcrest Hospital	Gretna	Jefferson	Investor-owned (Tenet)	207
West Jefferson Medical Center	Marrero	Jefferson	Not-for-profit	451
East Jefferson General Hospital	Metairie	Jefferson	Not-for-profit	454
Ochsner Clinic Foundation	Metairie	Jefferson	Not-for-profit	475
Tulane-Lakeside Hospital	Metairie	Jefferson	Investor-owned (Hospital Corporation of America)	102
Children's Hospital	New Orleans	Orleans	Not-for-profit	201
Lindy Boggs Medical Center (Mercy)	New Orleans	Orleans	Investor-owned (Tenet)	187
Medical Center of Louisiana at New Orleans (Charity)	New Orleans	Orleans	Public	714
Memorial Medical Center (Baptist)	New Orleans	Orleans	Investor-owned (Tenet)	317
Methodist Hospital	New Orleans	Orleans	Investor-owned (Universal Health Svcs)	427
Touro Infirmary	New Orleans	Orleans	Not-for-profit	567
Tulane University Hospital	New Orleans	Orleans	Investor-owned (Hospital Corporation of America)	362
University Hospital	New Orleans	Orleans	Public	329*
Veterans Administration Hospital	New Orleans	Orleans	Federal government	591*
All Hospitals (Total)				5,649

Sources: Louisiana Department of Health and Hospitals, http://www.dhh.louisiana.gov/offices/publications/pubs-112/HO_bed%20avail%20and%20census%20spreadsheet.xls (Accessed January 29, 2006); and Health Resources & Services Administration 2005

A typical emergency management plan identifies three categories of hospital staff members: individuals comprising the central emergency management group, additional staff members designated by department managers as essential for continued operations, and staff members not designated as essential. The central emergency management group typically includes all members of the C-suite (e.g., CEO, COO, CNO, CFO) along with those individuals responsible for the emergency department, security, facilities management, information systems, and other support services. Essential staff members are expected to report to work once an emergency has been declared or is anticipated or predicted regardless of when their assigned shift or schedule would otherwise compel them to report. Non-essential staff members are expected to remain off hospital premises for the duration of the

emergency, unless and until they are called in to relieve essential staff members.

One hospital executive told us that essential staff members (and their family members, if brought to the hospital as a last resort) are told to prepare and bring supplies as if they are going on an “extended camping trip.” Typically recommended supplies include non-perishable food, drinking water, bedding materials, air mattresses, flashlights and batteries, lanterns, personal medications, reading materials, toys and games to occupy children, personal hygiene items, extra clothes, plastic bags, a portable radio, and pocket change. That individuals would be asked to bring enough to meet their physiological needs makes sense, especially in light of the large number of people who usually shelter at New Orleans hospitals during hurricanes. At one hospital, for example, nearly 4,000 individuals were in residence throughout Hurricane Katrina and immediately thereafter – patients, family members of patients, hospital essential staff members, family members of hospital staff members, emergency workers, local politicians, and other private citizens seeking refuge.

Without exception, the hospital executives we interviewed said that they tell their essential staff members to establish a personal evacuation plan for their families and pets in the event of a disaster. Some hospitals are specific in their advice; personal evacuation plans “should include transportation, personal supplies and a designated destination – this designation should be north of I-12.” Despite such strongly worded recommendations, however, many essential staff members bring immediate family members (e.g., children, dependent parents) and pets with them to the hospital when reporting for disaster duty. Most executives we interviewed expressed the belief that failure to accommodate family members and pets would result in a high number of essential staff “no shows.” Thus, hospital executives choose the relative certainty of having these essential staff members report over the possibility that the hospital’s resources will be strained to the point of exhaustion by the additional individuals who shelter at the hospital during the disaster.

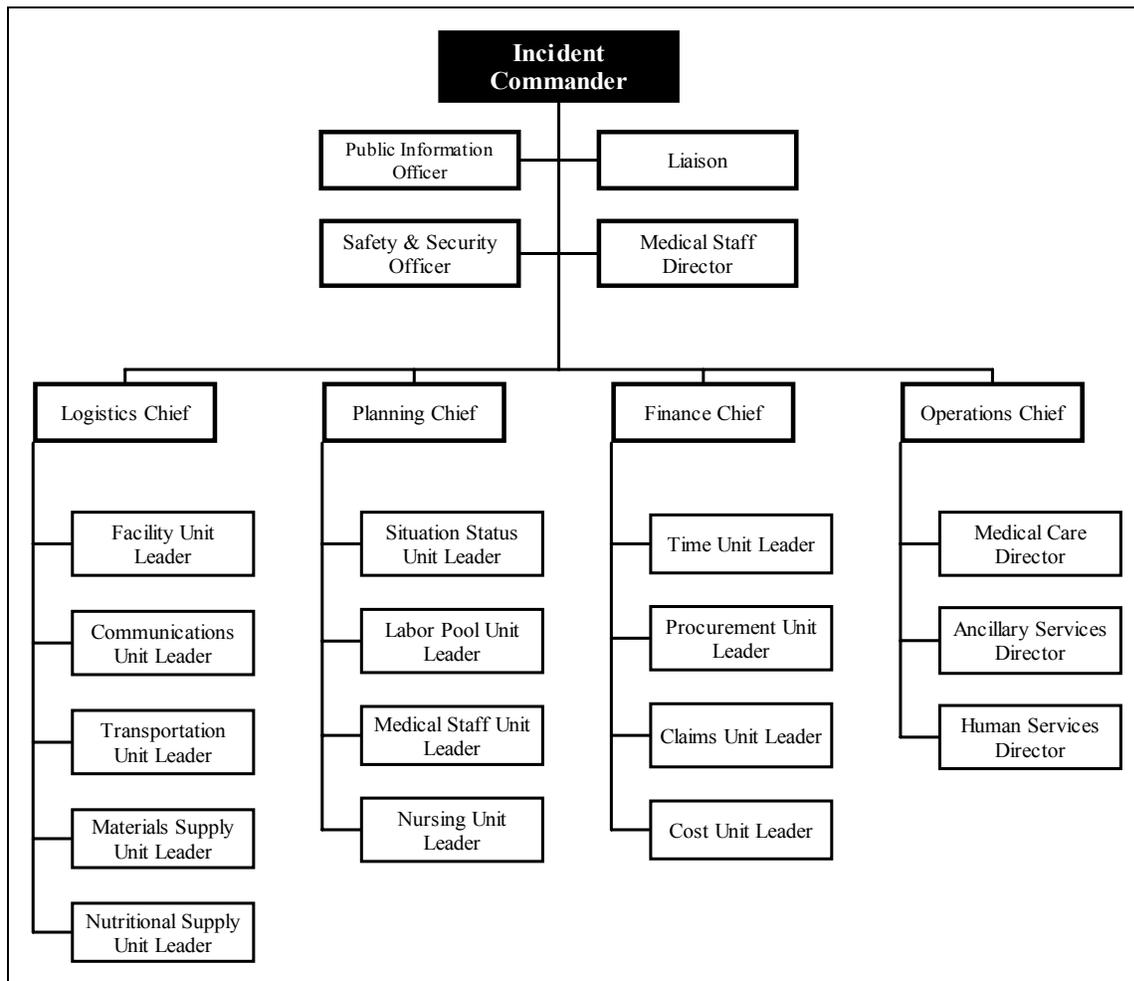
While all New Orleans hospitals appear to have accommodated the family members and pets of essential staff members during Hurricane Katrina, not all hospitals had previously codified the processes needed to effectively make such accommodations. Some hospitals found themselves without enough sleeping space or bedding materials. Others had established “check-in” policies that assigned individuals to an area for sleeping and that specified the bedding materials required for admission (e.g., sheets, pillows). Some hospitals found themselves having to figure out how to kennel a large

number of pets brought by staff members. Others had detailed pet care policies that designated space for the animals (e.g., a section of the parking garage) and that listed the supplies required for kenneling (e.g., carrier/cage, food and water supply, medications, waste handling supplies). Some hospital staff members found themselves overrun by family members and pets walking the halls. Others benefited from policies dictating the terms of child, dependent, and pet care. In most cases, child and dependent care services were provided by trained hospital staff members while other staff members were on duty or during their sleep time. Off-duty staff members were responsible for their own child and dependent care.

As the days wore on after the flooding of New Orleans, most hospitals discovered that they did not have enough food and water for everyone. With the temperature in the high 90s, water was critical to keeping people properly hydrated. The lack of readily available caffeinated beverages (e.g., coffee, soda) caused problems for staff members and others faced with caffeine withdrawal. Unfortunately, several hospitals appear to have located many of their food inventories in their lower levels, levels that flooded after the hurricane.

In addition to identifying who should report and what they should bring, most emergency management plans specify the physical location of an emergency operations or command center within the hospital and an incident command reporting structure for communication and decision making purposes. Typically patterned after the Hospital Emergency Incident Command System (HEICS) shown in Figure 2-1, the incident command reporting structure identifies who is responsible for the myriad functions needed to sustain the hospital during an emergency, along with specific tasks for each position in the structure. Whether each position in the incident command reporting structure is occupied by a unique individual depends on the size of the given hospital and the expertise of individual staff members. As might be expected, individuals in smaller hospitals tend to wear multiple hats during an emergency. Figure 2-1 depicts the top three levels of the prototypical Hospital Emergency Incident Command System (HEICS) organizational chart.

Besides specifying the internal communication and decision-making structure, most hospital emergency management plans also delineate various community response agencies that may be contacted by the hospital's emergency management group at its discretion. Clearly, hospitals want to coordinate their efforts with those of the local emergency services and law enforcement. One emergency management plan that we viewed included agency names and telephone numbers for a wide variety of services,



Source: Louisiana Hospital Association (<http://www.lhaonline.org/displaycommon.cfm?an=1&subarticlenbr=258>)

Figure 2-1. Prototypical Hospital Emergency Incident Command System (HEICS) Organizational Chart

including the fire department, police department, water department, energy services, parish and state emergency management, suppliers of generators and diesel fuel, state department of health, and so on. Importantly, while agency names were listed, individual contacts within those agencies were not listed. Without an individual contact name, anyone trying to contact a given agency might well struggle to communicate the urgency of a given request, or even establish the validity of a given request.

All hospital executives that we interviewed believed that their emergency management plans had been properly vetted. Several mentioned that their essential staff members – at least those listed in the incident command

reporting structure – had participated in emergency drills at least twice annually. Besides participating in these mock exercises, most hospital executives and many of their essential staff members had real experience with hurricanes, having lived through more than a few during their time as hospital employees and residents of the Gulf Coast.

A hurricane checklist for CEOs, available on the Louisiana Hospital Association’s website, reinforces the descriptions of emergency management plans as they were described by the hospital executives that we interviewed. Figure 2-2 is an abbreviated version of the checklist that lists the checklist’s primary “actions for consideration in preparation for a hurricane.”

- | 2005 Hurricane CEO Checklist | |
|-------------------------------------|--|
| <input type="checkbox"/> | Review Hurricane Security and Safety Plan for your hospital <ul style="list-style-type: none">○ Ensure an adequate inventory of supplies, including medications, blood and blood products, food, water, fuel, linens, and oxygen to sustain operations for up to 72 hours is available ... |
| <input type="checkbox"/> | Review transferring and evacuating procedures and protocols |
| <input type="checkbox"/> | Ensure that the process for admitting and discharging patients is identified |
| <input type="checkbox"/> | Ensure that backup emergency generators work |
| <input type="checkbox"/> | Determine alternate communication methods for key staff |
| <input type="checkbox"/> | Review Mutual Aid Agreements |
| <input type="checkbox"/> | Review or develop alternative plan for elevator access to ensure patients can be transported throughout the hospital in the event of power lost or damages to elevators |
| <input type="checkbox"/> | Educate employees regarding current events and review plans regularly |
| <input type="checkbox"/> | Ensure that all staffing and sheltering issues are addressed in your emergency plan <ul style="list-style-type: none">○ Ensure behavioral healthcare services are provided. Ensure stress levels and post-traumatic issues of staff members and their family members are addressed before, during, and after the event. |
| <input type="checkbox"/> | Review and ensure that your Hospital Emergency Incident Command System (HEICS) procedures are in place |

*Source: Louisiana Hospital Association
<http://www.lhaonline.org/associations/3880/files/Hurricane%20CEO%20Checklist.pdf>*

Hospital evacuation procedures were perhaps the least well-developed components of the emergency management plans that we learned about. Generally, hospitals had codified extensively the procedures to be used in the event of partial evacuation (vertical or horizontal). Likewise, hospitals had determined the procedures to be used for moving patients in the event of a complete hospital evacuation. Instructions tended to exist in the areas of communication, patient evaluation, operating room and other specialty evacuations, appropriate staging areas, utilities and supply management, elevator use, and security. Less clearly articulated were the procedures for ensuring transportation of patients, staff, and other hospital occupants away from the hospital building. Plans tended to assume either continued availability of land-based transportation (e.g., ambulances) or access to government or military aircraft (e.g., Coast Guard helicopters). Whether contracts existed with various private transportation firms (e.g., ambulance companies, helicopter services) was not clear from many of our conversations with hospital executives. As one executive said, “Worse case scenario, we figured we would relocate to the roof, and the Coast Guard would pick us up. In all our planning, we never really thought that we would have to do a complete evacuation.”

Clearly, New Orleans hospitals developed their emergency management plans in line with the expectation that hospitals *respond to* and are not *victimised by* disasters (e.g., hurricanes). Even the “2005 Hurricane CEO Checklist,” prepared and distributed by the Louisiana Hospital Association, seems to have been created with that expectation in mind. Hospitals were expected to ride out storms, relying on their own cache of supplies and emergency power, and resume normal operations after about 72 hours. All statements except for one on the two-page “2005 Hurricane CEO Checklist” are predicated on the belief that hospitals will weather any storm, albeit self-sufficiently for a relatively brief period, and then continue as if the storm had never happened. Such was a reasonable expectation, given the prior experience with storms of the many executives associated with Louisiana hospitals in general, and New Orleans hospitals in particular.

2.3 Riding Out the Storm

Unlike some natural disasters (e.g., earthquakes), hurricanes generally provide some measure of warning. Unknown, of course, is the precise path of a hurricane and its likely severity when it makes landfall. Still, the National Weather Service and the National Oceanic and Atmospheric Administration (NOAA) both take pains to track the likely paths of tropical storms and hurricanes, and to communicate this information to persons likely to be affected.

Hurricane Katrina was upgraded to a Category 5 hurricane early Sunday morning, August 28, 2005. Preparations for the storm had begun at many hospitals at least two days before. First, orders for hurricane supplies – food, water, fuel, medications, and so on – were placed. Second, essential staff members were notified of their likely call-up, and urged to make evacuation plans for their family members and pets. Third, steps were taken to secure hospital facilities. Grounds and rooftops were cleared of anything unneeded that might be dislodged by 100 mph hurricane winds, and security forces were assigned to needed locations. Finally, residential and expected patients were evaluated to determine how many could be released, transferred, or have their admissions postponed, in order to minimize the number of patients needing care during the storm. The fewer the number of patients needing care, the fewer the number of hospital staff members needed to provide care, and the fewer the supplies needed to sustain those sheltering at the hospital.

Once Mayor Ray Nagin ordered the mandatory evacuation of New Orleans (Rohde et al., 2005), hospitals acted quickly and communicated to essential staff their need to report as soon as possible. Having done what they could to secure their facilities, most of the hospitals went into lockdown around 5 p.m. CDT on Sunday, August 28. Individual departments continued to dispatch the responsibilities assigned to them as part of their hospital's emergency management plan. Communications staff members established protocols for making public address announcements, environmental services staff members relocated furniture and equipment, facilities management staff members monitored incoming water pressure, materials management distributed needed supplies, and public relations set up its media information center. Security personnel locked all entrances and exits except for the emergency entrance, which they guarded. To the extent possible, many hospitals relocated mobile critical equipment from the first to the second floor of their facility. Patient care staff members worked to maintain the physical, mental, and emotional health of their patients.

Hurricane Katrina was downgraded to a Category 4 hurricane at 4 a.m. CDT on Monday, August 29. The storm made landfall that same morning between Grand Isle, south of New Orleans, and the mouth of the Mississippi River with 140 mph winds at about 7 a.m. CDT. The worst part of the storm hit New Orleans less than three hours later.

While Hurricane Katrina caused a fair amount of wind and rain damage to New Orleans hospitals, the executives we interviewed agreed that their facilities had been spared from major hurricane damage. Trees were uprooted, some windows were blown out, rain had entered the buildings

through air conditioning vents and other openings, some roofs and rooftop equipment had been damaged, and at least one emergency generator was destroyed (see Figures 2-3 and 2-4). Generally, though, the property damage attributable to Katrina was minimal for all but a few hospitals. Chalmette Medical Center in St. Bernard Hospital was a notable exception, having sustained major damage from Katrina's storm surge as it made its way up the Intercoastal Waterway (see Figure 2-5).

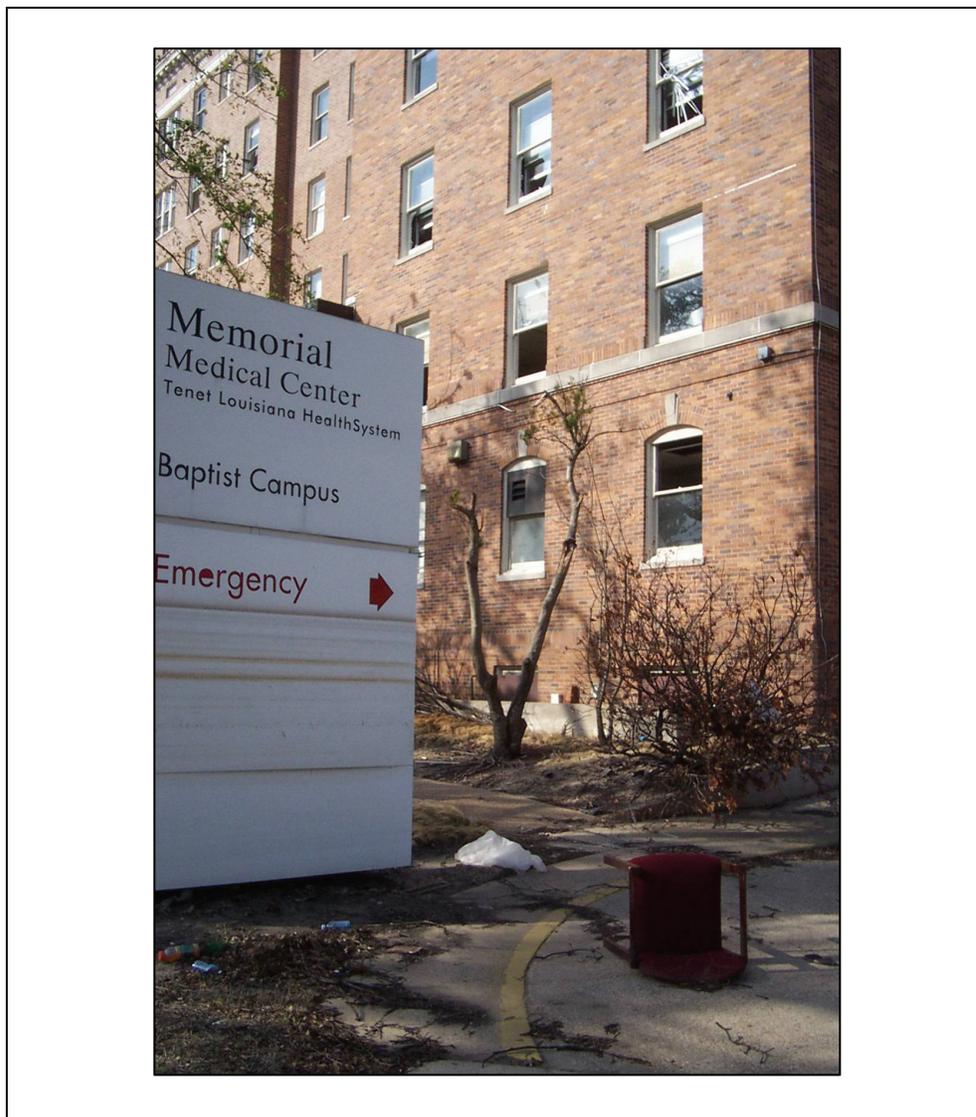


Figure 2-3. Damage at Memorial Medical Center



Figure 2-4. Damage at Lindy Boggs Center



Figure 2-5. Damage at Chalmette Center

3.0 Hospital Decision Making Immediately After Hurricane Katrina

3.1 The Levees Break, and Flooding Starts

By 8 a.m. CDT on Monday, August 29, Mayor Ray Nagin was announcing that water was topping the levees near the city's lower Ninth ward and St. Bernard Parish. Later that same morning, a large section of the 17th Street Canal levee gave way, sending water across the Lakeview community and into Mid-City, Carrollton, Gentilly, City Park and neighborhoods farther south and east. Water from Lake Pontchartrain began filling the city, in the same way that had been forecast by those who studied New Orleans' vulnerability to major hurricanes and subsequent flooding (e.g., Ivor van Heerden, deputy director of the Louisiana State University Hurricane Center, NOVA 2005). Though New Orleans had "dodged the bullet" of Hurricane Katrina, a second disaster was on its heels. It was this second disaster, widespread flooding that covered 80 percent of the city, that incapacitated the majority of New Orleans hospitals.

In trying to understand the unfolding events at New Orleans hospitals in the wake of Hurricane Katrina, the phrase "location, location, location" comes to mind. Like most New Orleans residential and commercial buildings, hospitals in New Orleans tend to be about five to eight feet below sea level. When the levees failed, and the water began filling the bowl that is New Orleans, the hospitals near the center of the bowl flooded. Six of nine hospitals in Orleans Parish are located "in the bowl" – Lindy Boggs Medical Center, Memorial Medical Center, Medical Center of Louisiana at New Orleans (Charity), Tulane University Hospital, University Hospital, and Veterans Administration Hospital. Only two hospitals in Orleans Parish managed to escape serious flooding, Children's Hospital and Touro Infirmary. Both are located on relatively higher ground, closer to the levees that protect New Orleans from the Mississippi River. The ninth Orleans Parish hospital, Methodist Hospital, near the northeast shore of Lake Pontchartrain, flooded as well. The three Jefferson Parish hospitals on the east bank of the Mississippi were spared from serious flooding as the 17th Street Canal levee was breached on the Orleans Parish side of the levee. Likewise, the two Jefferson Parish hospitals on the west bank of the Mississippi were spared from serious flooding, as there were no levee failures there. Chalmette Medical Center in St. Bernard Parish experienced massive flooding resulting from both the initial storm surge from the Intercoastal Waterway and the Industrial Canal levee breaches. Figure 3-1 shows the location of each of the 15 New Orleans area hospitals.

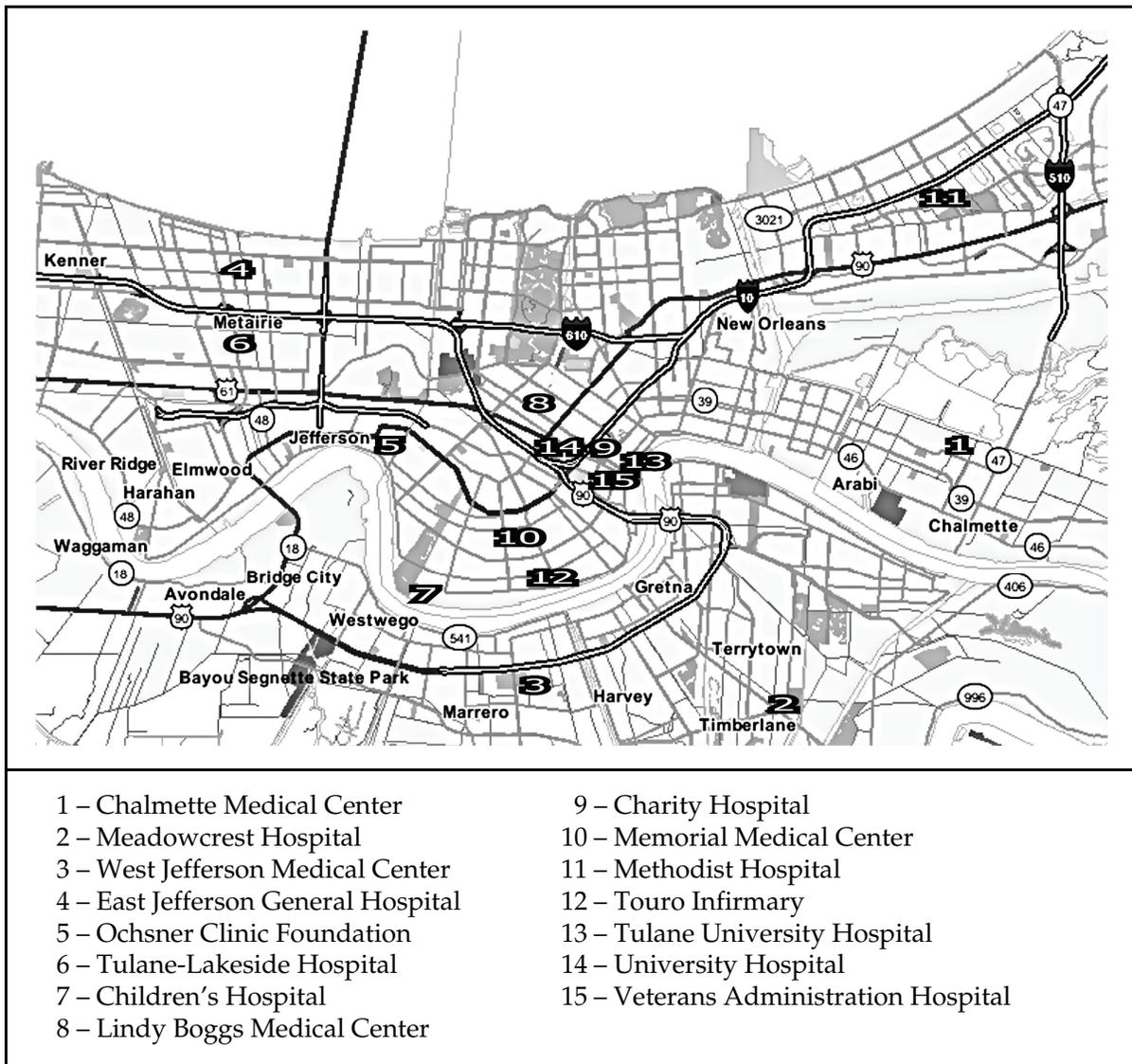


Figure 3-1. Location of 15 New Orleans Area Hospitals

Water filled the streets, making surface transportation impassable. Water began to fill the basements and first floors of the Orleans Parish hospitals. One hospital executive described what it was like to try to forestall problems with first floor flooding,

“As the hurricane approached, we moved critical services from the first to higher floors. Services such as the ED (emergency department), central supply, and any expensive equipment. When the hurricane passed, we inspected the building, and found no damage on the lower floors. So we moved critical services back to where they belonged. Then, we heard rumors that the levees had failed, and that water was making its way into the city, toward our facility. So we began the process of moving critical services back to higher floors.”

City power was out, and hospitals were forced to run essential services on emergency generators. Neither air conditioning nor elevators were considered essential services. City water was unavailable, and rationing of potable water supplies was initiated. Even those hospitals that did not experience flooding lost access to city power and water for at least a week to ten days. Some hospitals that flooded quickly were unable to access food and water supplies that had been stored in basements and first floors. As the temperatures inside the hospitals continued to rise along with the floodwaters, hospitals became extremely unsafe places to be.

Every hospital executive that we interviewed expressed surprise and shock at the “disaster double-whammy” of Hurricane Katrina followed by widespread flooding. That said, this “disaster double-whammy” was a known threat, if not a known certainty. The citizens of New Orleans had been told by disaster experts – repeatedly – about the possibility of a devastating hurricane and flood combination. To illustrate what should have yielded widespread knowledge and a desire to act, Tim Russert read the following excerpts from *The Times-Picayune* (the New Orleans local newspaper) that were published in 2002, while hosting Meet The Press on September 4, 2005,

“... A major hurricane could decimate the region, but flooding from even a moderate storm could kill thousands. It’s just a matter of time. ... The scene’s been played out for years in computer models or emergency operations simulations ... New Orleans has hurricane levees that create a bowl with the bottom dipping lower than the bottom of Lake Pontchartrain. ... the levees would trap any water that gets inside – by breach, overtopping or torrential downpour – catastrophic storm. ... The estimated 200,000 or more people left behind in an evacuation will be struggling to survive. Some will be housed at the Superdome, the designated shelter for people too sick or infirm to leave the city. ... But many will simply be on their own, in homes or looking for high ground. Thousands will drown while trapped in homes or cars by rising water. Other will be washed away or crushed by debris. Survivors will end up trapped on roofs, in buildings or on high ground surrounded by water, with no means of escape and little food or fresh water, perhaps for several days.”

Despite such warnings, citizens and hospital executives alike were taken aback as they witnessed and experienced the consequences of the failed levees alongside the 17th Street Canal, London Avenue Canal, and Industrial Canal. While some may question how anyone could be surprised by what happened given the extensive research and media coverage of what might happen to New Orleans, we offer at least two explanations for people’s reactions. First, in their lifetimes, most people had not experienced a “double-whammy” the likes of Hurricane Katrina and the subsequent flooding. The last such major disaster to strike New Orleans was in 1965. That year’s

hurricane was named Betsy, and she was followed by flooding in the Ninth Ward of New Orleans and Chalmette (Forrest 1979). Personal experience is a powerful, though often inaccurate, teacher. As stated by one hospital executive who had lived in the New Orleans area for a decade, “You get jaded after a while. Every hurricane that I’ve seen since I’ve lived here has produced minimal damage. So, you figure that you’re going to be OK.” Likewise, people living in the Lakeview area of New Orleans, near the 17th Street Canal, told us they never believed that their neighborhood would flood as badly as it did. Such confident assertions were made by everyone with whom we chatted in the Lakeview area, even though their homes and property were visibly below sea level!

Second, trying to visualize what 10 feet of water will look like in one’s hospital and the surrounding area is an enormously challenging task. Many of the hospital executives that we interviewed had participated in the FEMA-sponsored hurricane simulation known as “Hurricane Pam” in 2004. All agreed that Hurricane Katrina had played out much as the simulated Hurricane Pam had projected. Still, as one executive told us, “You really can’t picture what that amount of water looks like, and what it covers and makes inaccessible, until you see it.” Hospital executives were not aided by the fact that the Hurricane Pam exercise fell short in terms of specifying the details of response and recovery, and that a scheduled “Return to Hurricane Pam” did not materialize in the summer of 2005. Without the ability to visualize clearly and accurately the devastating effects of water so deep, hospital executives could not readily imagine having to evacuate completely their facilities without access to surface transportation. As one hospital executive said, with no pun intended, “the massiveness of the problem just blew our plans out of the water.”

3.2 Hospital Responses to the Second Disaster

The news media have communicated many personal stories of patient care that characterized the days for those in New Orleans hospitals immediately after Hurricane Katrina. Thanks to an increasingly accessible Internet, and thanks to candid weblogs written by New Orleans hospital staff members (e.g., <http://www.barrocas.com/Katrina/katrina.htm>, <http://www.livejournal.com/users/auryn24/298313.html>), anyone can read inspiring stories of personal survival and heroism. Hospital staff members – whether they were administrators, doctors, nurses, facilities managers, public relations specialists, security personnel, and so on – worked diligently to maintain the physical, mental, and emotional health of their patients, their families, and themselves. We heard stories of staff members who manually bagged patients for hours on end, of other staff members who shared personal stores of food

and water, and of still other staff members who carried patients up and down darkened stairwells so they might be evacuated. As their diesel fuel ran out, and emergency generators ceased to work, staff members in some hospitals were forced to rely on “manual medicine,” a phrase shared with us by one hospital executive.

Despite oppressive heat, lack of adequate food and water supplies, and lack of appropriate means for disposing of waste, hospital staff at 15 New Orleans hospitals worked hard to protect their fragile patients. Despite news reports that staff members at one hospital may have considered euthanizing some of their weakest and most vulnerable patients, many would agree that the more likely scenario is that patients at the hospital in question died because they were critically ill in the first place, and unable to withstand the rigors of high heat, inadequate food and water, and being moved around. Without question, New Orleans hospitals and their staff members were operating in the worst conditions. One person that we interviewed equated what he observed in a hospital with what one might see in a “war zone.”

As the water rose inside and around most of the Orleans Parish hospitals, most found themselves without the means to communicate adequately with the outside world. At the start of one interview, the executive in question said, “You’ve got to understand. Once the levees were breached, and once our power was gone, we had a complete lack of communication with the outside world. We had no real idea what was going on, not even across the street.” When the levees were breached initially, no one knew how long the water would continue to rise, or how high it would reach. Once the water stopped rising, no one knew for certain what steps were being taken by city, state, and national government officials to rescue people trapped by the floodwaters. “Should we wait on the roof?” wondered the executives at one hospital. “Is there some way for us to talk to somebody? Is there an evacuation plan for the region? If yes, where do we fit in?” Communication at hospitals inside the hurricane/flood zone was impossible while, ironically, those outside the disaster zone could watch round-the-clock coverage on the television news.

Traditional means of communicating by telephone were unreliable, at best. Landlines were completely inoperable. Pay phones that weren’t under water usually worked, but they were few in number. Some staff members’ cell phones worked, at least in the beginning of the week, before the cell towers ran out of auxiliary power. One executive said that cell phones with non-New Orleans area codes worked best. Some staff members were able to send the occasional text message. Likewise, the OnStar system in some staff members’ vehicles worked. Though some facilities were equipped with satellite phones,

one hospital executive conceded that their phones did not work, or at least, they did not really know how to make them work well. Ham radios were used by at least two hospitals to communicate with the outside world. According to a letter written by the CEO of Meadowcrest Hospital, Phillip Sowa, "at one point, we asked the husband of one of our employees, who had a portable ham radio, to send a "Mayday" alert from the roof of our hospital to anyone listening."

For some hospitals, contact with the outside world was limited to whatever new arrivals might be able to tell them. In that fashion, rumors of looting and shooting filled the halls of many hospitals, especially those located near the Central Business District and the Superdome. Even on the west bank of the city, untouched by flood waters, fear of looting and crime increased the anxiety experienced by hospital staff and others sheltering at the hospitals. Executives at numerous hospitals expressed dismay when reflecting on the negative effects of such rumors and worse, the chaotic reality that swirled around many of their facilities. As described by Meadowcrest Hospital's CEO, Phillip Sowa (2005),

"Meadowcrest Hospital received minimal security protection from law enforcement and military units during the first three days of the catastrophe, causing our staff to be fearful for their lives. This was made worse by the appearance of armed thugs near the hospital, increasing threats and gunfire from a nearby neighborhood, harassment by armed bandits of at least one supply truck headed for Meadowcrest, and gunshots aimed at a Coast Guard helicopter that attempted to land near our hospital."

Within the hospitals, as high-tech communication devices failed, hospitals resorted to lower-tech yet still effective means of communicating with their staff members. Staff members not directly involved in patient care, along with teenage family members, were asked to serve as "runners," and carry messages throughout the darkened hospitals. Hospital executives described numerous face-to-face meetings, the principal purpose of which was to keep staff members as informed as possible about what was happening. Hospital executives also described walking the corridors of their hospitals, trying to maintain face-to-face contact with their staff members, and to provide a measure of calm in the face of high anxiety and uncertainty. Still, despite these measures, more than one hospital executive said they "were not sure they did a good job helping their employees cope with stress." They tried to ensure that people got adequate rest, and they supported creative approaches to stress management such as the offering of multi-denominational services by their in-house chaplains. Still, the conditions being faced were so extreme

that there did not seem to be any “good mechanisms to help people deal with their stress.”

Without question, the challenges faced by hospital staff members in the days following Hurricane Katrina were extraordinary. Not unexpectedly, when not immersed in work tasks, staff members who had not brought their family members or pets with them wondered about their safety. They also wondered whether their homes had survived the hurricane and subsequent flooding.

3.3 Paradigm Shift: From Responder to Victim

3.3.1 The Decision to Evacuate

In the aftermath of the flood, hospital staff members worked diligently to evacuate their critically ill patients. Patients on dialysis, patients on ventilators, and babies in the Neonatal Intensive Care Units were among the first to be transported. Their needs for electrical power and potable water pushed them to the top of the priority list. Two questions needed to be addressed in order to make these initial evacuations happen. First, by what means could these patients be transported? Surface transportation was not a viable option for those hospitals surrounded by water. Second, to where could these patients be transported? Hospital staff members relied heavily on their personal and professional relationships, their network of contacts, to answer both questions. Off-site administrators did the same.

Making the decision to evacuate everyone who had sheltered at the hospitals during Hurricane Katrina was not easy (Vogt 1990; Sternberg et al., 2004). Again, we expect hospitals to respond to disasters, not to become their victims. As such, detailed evacuation plans tend to be the exception, and not the rule. New Orleans hospitals had withstood many hurricanes. Staff members were accustomed to riding out storms, and helping their hospitals resume normal operations within days of those storms. They were not prepared for what Hurricane Katrina and the subsequent flooding delivered and took away.

3.3.2 The Basis for the Decision

By Tuesday morning, August 30, the floodwaters had risen to dangerous levels around many of the hospitals. Worse, those whose emergency generators were located in flooded basements found themselves without access to reliable and adequate power. Such was the situation at Charity Hospital. As described by a reporter for the *Houston Chronicle*,

“By Tuesday morning, the hospital’s basement was flooded, knocking out the generators, forcing staff to rely on 10 portable diesel-powered generators and a few Vortran oxygen-powered ventilators procured only a week before the storm ... By Tuesday night, ... patients needing dialysis had not received it for two days and were getting sicker. The bathrooms were foul and overflowing. It was stiflingly hot. The patients were uncomfortable. Diesel for the portable generators, liquid gold, was running low.” (Freemantle 2005).

In short order, the situation in many hospitals was becoming untenable. Without reliable power, without knowing how long city power would be out, and without knowing how long it would be before a supplier could deliver additional diesel fuel, hospital administrators and staff were forced to consider the possibility that their ability to deliver quality healthcare was about to be severely compromised. Reliable power is a prerequisite to the functioning of equipment that enables effective modern medicine. Reliable power is a prerequisite to the air conditioning that keeps hospital staff and patients cool, and that keeps mold from overtaking buildings that are inadequately ventilated. Likewise, without a potable water source, the hospitals were on the brink of ineffectiveness. Potable water, like power, is a prerequisite to the functioning of modern medical equipment and to sanitation. Potable water is a prerequisite to keeping hospital staff and patients hydrated. Ironically, while the hospitals were surrounded by water, they did not have enough to stay functional. We suspect that more than one hospital staffer and patient uttered the old saw, “Water, water everywhere, but not a drop to drink.”

While the severity of conditions varied from location to location, in the end all hospitals that evacuated did so for similar reasons. First, their physical plants were degrading rapidly and dangerously. At more than one hospital, emergency generators failed. Some were damaged by the hurricane. Others were damaged by the flooding. Still others ran out of fuel. Without adequate power, hospital staff had to transport patients up and down darkened hallways and stairs. Imagine the challenge of carrying a 400 pound bariatric surgery patient down several floors, across the length of one floor, and then back up several floors. Imagine heat and humidity so overwhelming that everyone and everything smelled increasingly ripe. Imagine trying to conduct evening rounds in that same oppressive heat, and having to rely on the small beam of light from a flashlight. Hospital executives shared these and similar examples when describing what the loss of power to elevators, air conditioning, and lights meant to hospital staff and their patients.

At least two hospitals had their own potable water supplies, thanks to on-site wells. The others were dependent on the city’s water supply. When it became

unavailable, hospital staff struggled to establish sanitation regimens that could be respected by everyone staying at the hospitals. Some staff members designated particular toilets for fluids only, or used red biohazard bags draped inside toilets to collect solid human waste. For whatever reason, some people could not resist breaking the new sanitation “rules.” Staff members persisted in their attempts to impose and enforce the new rules, knowing that improper sanitation can be deadly, especially for those whose immune systems are already jeopardized.

Second, and in addition to the deteriorating working and living environment, hospital executives and staff were increasingly anxious about growing civil unrest in the city. Looting was widespread. Rumors of heinous crimes being committed in the Superdome, the Convention Center, and all points in between had people worried. Addicts were observed trying to break into pharmacies to steal narcotics. We believe, however, that the threat of crime alone would not have been enough to increase significantly the anxiety experienced by hospital staff members. Pre-Katrina, New Orleans had one of the highest crime rates in the United States. According to an *FBI Report of Offenses Known to Law Enforcement* (2003), New Orleans had a murder rate that was 7.5 times the national rate. Similarly, New Orleans endured higher than national rates of rape, robbery, aggravated assault, and other crimes. In brief, New Orleanians were not unaccustomed to crime.

What staff members were not prepared for was the creeping awareness that they were on their own, that they needed to defend themselves and their patients against more than illness and disease. Those hospitals without adequate security and without any visible police or military presence wondered about their heightened vulnerability to crime. Who would protect them and their patients?

With their world falling apart, hospitals were forced to alter their self-perceptions. No longer able to play their preferred role of responder, they were compelled to join the ranks of those needing rescue. In saying this, we do not suggest that hospital staff members were less heroic, less passionate, or less competent than they had been pre-Katrina. Simply put, they were stripped by the hurricane and subsequent flooding of the tools they needed to play their usual and more comfortable role.

3.3.3 Transportation, Access and Evaluation

Once hospitals conceded that they would need to evacuate, they began trying to figure out how to make that happen. What might seem to be a straightforward decision task was in fact extremely complex. *Wanting to*

evacuate today, and *being able to evacuate* within the next 48 hours, were two different propositions. Complete evacuation would take much longer, and would be accompanied by greater uncertainty, than anyone anticipated or wanted.

The hospital executives that we interviewed said that they had discussed previously what it would mean to evacuate their hospitals, at least in general terms. Some had pre-arranged contracts with ambulance companies, bus companies, and van companies to transport patients and staff in the event of a disaster. Others did not have pre-arranged contracts, but were able to secure verbal agreements for transportation assistance once the disaster was underway. In all likelihood, the same limited number of transportation providers (e.g., Acadian Ambulance) had formal and informal agreements with many hospitals, nursing homes, and other facilities. With a disaster as widespread as Hurricane Katrina, such a system of individually negotiated contracts was destined to collapse. After all, how could a transportation provider reasonably determine which of the many hospitals and which patients should be first priority?

An important factor that interfered with the timely evacuation of the hospitals, one that hospital executives (and perhaps everyone) did not anticipate, was the greater community's need for helicopter and other flood-resistant transportation (e.g., trucks with high ground clearance). All helicopters – whether they were owned by private citizens or organizations, the government, or the military – were pressed into duty, retrieving flood victims from their attics and roofs. The number of victims was astronomical; tens of thousands of people were trapped above the floodwaters without access to surface transportation, without food and water, and under the heat of a blazing sun. As one hospital executive told us, “New Orleans weather after Katrina was arguably gorgeous – hot and sunny. The worst possible combination for those trapped in sweltering attics and on tar paper rooftops.” Most would agree that rescuing these individuals was top priority.

One hospital executive said that future transportation contracts would be explicit with respect to performance expectations and consequences for failing to meet expectations. While his hospital did not have a pre-arranged contract to evacuate everyone from the hospital, he was able to secure a verbal agreement two days into the flooding for such assistance. The agreement specified that the transportation provider would send x number of helicopters per hour until everyone had been transported. Initially, all seemed to be going well. Then, the transportation provider's resources were “diffused,” the helicopters appeared with less frequency, and the process of evacuating the entire hospital took longer than expected.

Clearly, most of the hospitals did not expect to evacuate completely. Certainly, most did not expect to evacuate completely by air. The loss of surface transportation in the immediate surroundings of these hospitals had a truly crippling effect. Most of the hospitals had only a few boats on their premises. Several did not have helipads. In at least one instance, facilities personnel were called upon to assess in short order the feasibility of using the top of a parking garage as a helipad. While some might wonder why the hospitals did not plan to evacuate completely by air, we think the answer lies in part in staff members' well informed perceptions that moving critically ill patients by helicopter and by boat is more risky than moving those patients by ambulance. In the end, we expect decision making by hospital staff members to be driven by their concern for their patients' welfare. In the case of New Orleans hospital staff members, this expectation appears to have been well founded.

The *New Orleans Times-Picayune* estimated on August 31 that 1,600 patients and 8,600 staff and their families awaited rescue (Moller 2005). Eventually all of the hospitals were evacuated, and stranded patients and hospital staff were driven or flown to elevated section of interstate I-10, a temporary staging area, or directly to the Louis Armstrong Airport for transportation out of the city. Hundreds of patients, many gravely ill, waited for many hours in the airport at emergency medical facilities established in the passenger concourses. Once they were loaded onto planes, their destinations were hospitals located all over the southern part of the United States – hospitals in Alabama, Arizona, Georgia, Louisiana, Missouri, South Carolina, Tennessee, and especially Texas. Whereas some patients were sent to particular hospitals thanks to previously arranged transfers, others were sent to whichever hospital was the destination for a given plane. As one hospital executive lamented,

“We were under the impression that there were three or four strategic hospitals in the state where they (the patients) were being flown to. In reality, after waiting in the airport for many hours, our patients were flown out of state. ... for weeks after, we had family members calling us, looking for particular patients. But we had no real information. ... we assumed that all of this was being coordinated somehow, but it was not.”

Consistent with this commentary, the Louisiana Hospital Association developed its own web-based patient locator system. The system, available through the Association's home page (<http://www.lhaonline.org/>), was intended to supplement similar locator systems provided by the American Red Cross and FEMA.

3.4 Overview of Hospitals in New Orleans Post-Katrina

Before Hurricane Katrina, the number of licensed beds available in the area's 15 hospitals was 5,649. One week after Hurricane Katrina, the number of licensed beds available in the area's three open hospitals was 1,279. As of January 29, 2006, the number of available beds in the area's seven open hospitals was 1,782. Thus, more than five months after Hurricane Katrina, New Orleans area hospitals had less than one-third of the bed capacity they had before Hurricane Katrina. Eight hospitals remained shuttered, with no announced reopening dates. Table 3-1 lists the damage to and status of hospitals in the New Orleans area as of January 29, 2006.

Of the eight hospitals that remain closed,³ several seem unlikely to ever reopen, based on the amount of hurricane and flooding damage that we observed, and based on statements from hospital executives. **Chalmette Medical Center**, for example, was physically decimated. Hurricane Katrina's 100 mph winds tore at its roof. Storm surge from the Intercoastal Waterway and floodwaters from the overtopped Industrial Canal levee swamped its first floor with 12 feet of brackish and oily water. Marsh grass and muck filled every open building pore. Figure 3-2 illustrates the extent of the damage sustained by the Chalmette Medical Center.

This hospital's buildings and their contents appeared to be the most severely damaged of all New Orleans area hospitals by both the hurricane and subsequent major flooding. Besides obvious and relatively high water marks on all exterior walls (reaching more than 10 feet from street level), the adjacent landscape and hardscape were covered with 1-2 inches of a sludge-like deposit. Extensive mold damage appeared to have resulted from a lack of electrical power and air conditioning. Several exterior dryvit walls had been intentionally removed or significantly destroyed, exposing the broken and contaminated contents within. On-site security was limited to one Sheriff's Department vehicle. Other than being asked politely by Sheriff's Department staff when we visited in early October to "not go in there, because it's too dangerous," we were not stopped from either walking the property or closely inspecting the building's exterior. With no one around and with the building so extensively degraded, the likelihood of anyone causing further damage seemed low.

³ Tulane Hospital, located in New Orleans Central Business District, reopened on February 14, 2006, after this report was completed.

Table 3-1. Damage to and Status of Hospitals in the New Orleans Area as of January 29, 2006

Facility Name	Damage	Post-Katrina Status	Current Status	Available Beds	Census
Chalmette Medical Center	Extensive; hurricane and flood	Evacuated	Closed	NA	NA
Meadowcrest Hospital	None	Evacuated	Reopened 11/6/05	76	76
West Jefferson Medical Center	Limited; hurricane	Open	Open	352	303
East Jefferson General Hospital	Limited; hurricane	Open	Open	454	397
Ochsner Clinic Foundation	Limited; hurricane	Open	Open	452	409
Tulane-Lakeside Hospital	None	Evacuated	Reopened 9/30/05	116	86
Children's Hospital	Limited; hurricane	Evacuated	Reopened 10/10/05	120	107
Lindy Boggs Medical Center (Mercy)	Extensive; hurricane and flood	Evacuated	Closed	NA	NA
Medical Center of Louisiana at New Orleans (Charity)	Extensive; hurricane and flood	Evacuated	Closed	NA	NA
Memorial Medical Center (Baptist)	Extensive; hurricane and flood	Evacuated	Closed	NA	NA
Methodist Hospital	Extensive; hurricane and flood	Evacuated	Closed	NA	NA
Touro Infirmary	Limited; hurricane	Evacuated	Reopened 9/28/05	212	198
Tulane University Hospital	Extensive; hurricane and flood	Evacuated	Closed	NA	NA
University Hospital	Extensive; hurricane and flood	Evacuated	Closed	NA	NA
Veterans Administration Hospital	Extensive; hurricane and flood	Evacuated	Closed	NA	NA

Sources: Various hospital websites; Available beds and census figures drawn from Louisiana Department of Health and Hospitals, http://www.dhh.louisiana.gov/offices/publications/pubs-112/HO_bed%20avail%20and%20census%20spreadsheet.xls (Accessed January 29, 2006)



Figure 3-2. Chalmette Medical Center

As is the case with the rest of the devastated parish in which it resides, the future of the Chalmette Medical Center seems uncertain at best. Like the Lower Ninth Ward in neighboring Orleans Parish, St. Bernard Parish absorbed the worst of the hurricane and flood damage. Located well below

sea level, the area is most likely to flood, to flood deeply, and to flood often. Rebuilding any facility, much less a multi-million dollar facility like a hospital, is a risky proposition in such a location. As described on the Universal Health Services website: (<http://www.uhsinc.com/katrina/physician.html>),

“At Chalmette Medical Center, inspections and tests on the building will tell us whether we can rehabilitate and reuse the existing building or if we will have to raze that building and build a new facility instead. The additional question is how many people will return to St. Bernard parish and when will they return.”

When we visited, sources on site suggested that the facility would likely be condemned, thanks to the overwhelming amount of possibly irreparable damage. Certainly, the lack of apparent remediation at this site suggests an uncertain future for this facility.

At **Lindy Boggs Medical Center**, no remediation appeared to be underway when we visited in early October. Staff on site reported that some environmental assessment had occurred. Like Chalmette Medical Center, Lindy Boggs Medical Center sustained significant flooding damage. Staff members on site during Hurricane Katrina indicated that the surrounding neighborhood had flooded quickly when a nearby levee was breached. Besides obvious and relatively high water marks on all exterior walls (reaching at least five feet from street level), the adjacent surface parking lot had approximately 100 vehicles that were completely submerged. The basement and first floor sustained the majority of direct flooding damage. Figure 3-3 illustrates the extent of the damage sustained by the Lindy Boggs Medical Center. On-site security consisted of one security officer and two hospital staff members. Temporary chain-link fence surrounded the entire hospital facility, about a large city-block's worth. The neighborhood was quiet and largely bereft of people, with the exception of a father and daughter stopped outside their cars on an adjacent street. The father was working to keep started a car that had obviously flooded. As we watched, he was able to start the flooded car, and drove away, with his daughter following in the second car.

The Medical Center of Louisiana at New Orleans, which includes both **Charity Hospital** and **University Hospital**, is administered by the Health Care Services Division of Louisiana State University (LSU). “Big Charity” is a public hospital and Level 1 trauma center that accepts indigent cases and those without medical insurance.



Figure 3-3. Lindy Boggs Medical Center

Well-publicized news reports have suggested that both Charity Hospital and University Hospital are unlikely to reopen, thanks to extensive flooding damage to the basements and first floors. According to Walt Adams of Adams Management Services Corp., a structural engineering firm that led a media tour of Charity Hospital on October 5, 2005, “The water that decimated Charity’s basement was ceiling high or higher at the peak of the flooding. The basement was probably flooded for eight or nine days, and medical records, specimens and research were lost. Metal doors were bent by the force of the water. Rooms that house the electrical and mechanical systems were submerged. Ceilings throughout the basement ... collapsed, including in the morgue, where wiring and piping hangs down” (Gyan 2005).

Figure 3-4 illustrates the extent of the damage sustained by Charity Hospital. No obvious remediation efforts were underway when we visited in early October, in contrast to extensive remediation efforts underway at Tulane University Hospital, across the street from Charity Hospital. Security personnel staffed entrance doors and ramps, precluding a close visual inspection of the building and its contents. According to Donald Smithburg, CEO of LSU's Health Care Services Division,

“Both hospitals were damaged and are closed.” For Charity’s landmark building, which opened in 1939, ‘the storm was a death knell. For decades it has been recognized that Charity needs to be replaced. The building has needed upgrading, and the storm completely wrecked the electrical system’” (USA Today 2005).

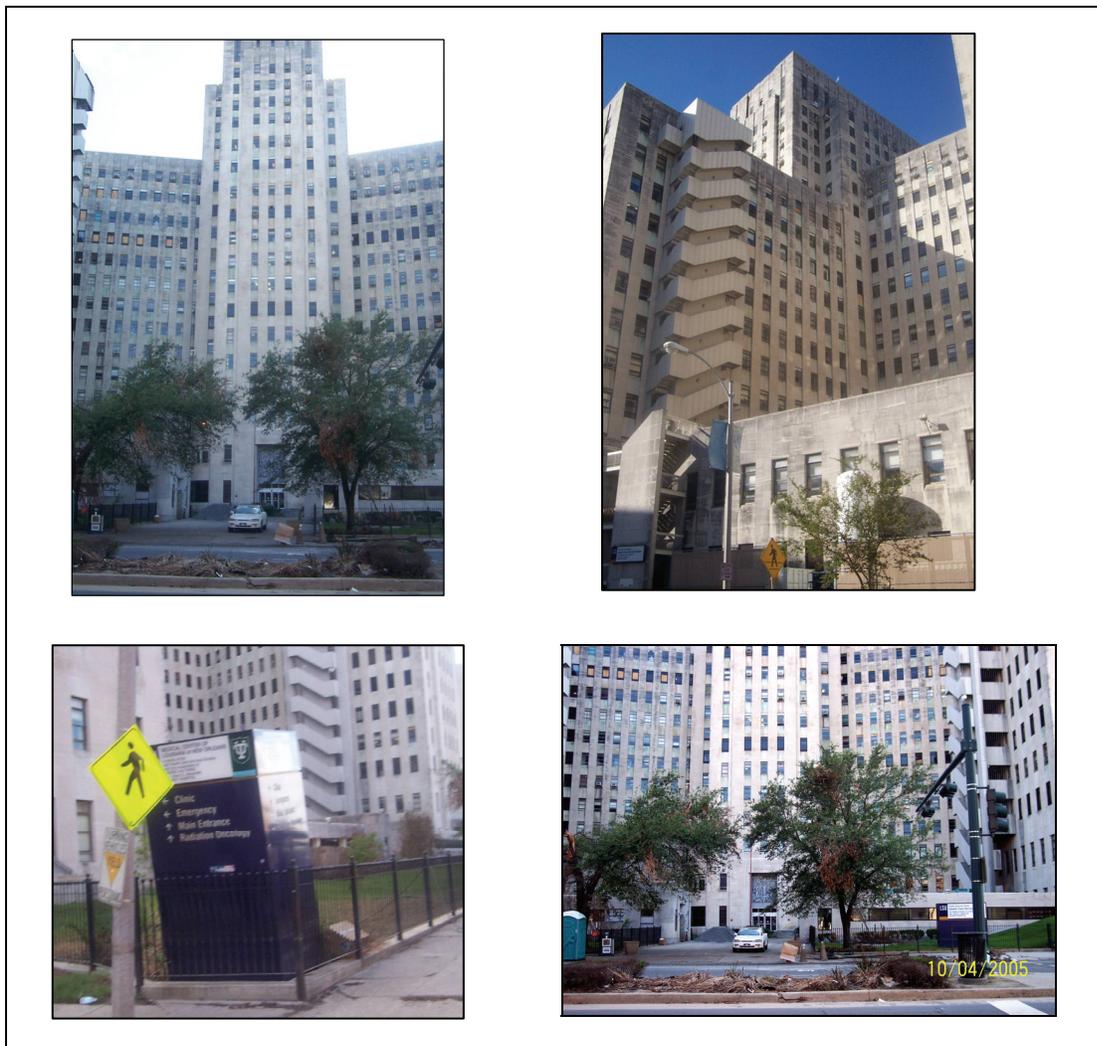


Figure 3-4. Charity Hospital

According to Smithburg, LSU was developing plans to replace the aging and deteriorating Charity facility before Hurricane Katrina struck (Alpert 2005). Smithburg says it's too soon to say whether either hospital building will ever be used again for medical care. "It's highly unlikely Charity would be reusable without hundreds of millions of dollars in renovations," he says (USA Today 2005). While Adams estimated that it would cost \$340 million to repair Charity and \$561 million to replace it (Gyan 2005), LSU has estimated that it would cost \$750 million to replace Charity Hospital (Alpert 2005).

At **Memorial Medical Center**, basic remediation and environmental assessment were underway in early October. Visual inspection of the building housing the hospital's emergency department (ED) revealed widespread water damage from at least six feet of flooding. Personnel on site confirmed our observations, and commented on water damage that occurred when water service was restored to the facility. Mold and mildew had taken hold. Approximately 20 percent of the windows in the building housing the ED appeared to have been broken, though not necessarily because of hurricane damage. Instead, many of the windows were broken apparently by medical staff who remained on site with patients after the power (and air conditioning) went off, in order to partially ventilate the otherwise sweltering building. As was the case at its sister campus, Lindy Boggs Medical Center, Memorial was protected by a chain-link fence that surrounded the entire hospital facility, several city-blocks' worth. Unlike the quiet that blanketed Lindy Boggs, however, Memorial was abuzz with activity, as personnel in HAZMAT suits prepared to examine the building and security personnel ensured that no one approached the buildings. Figure 3-5 illustrates the extent of the damage sustained by Memorial Medical Center.

According to the *New Orleans Times-Picayune* (Darce 2005), Memorial's owner, Tenet Healthcare Corp., reports that the structural damage is sufficient to warrant tearing down the hospital and replacing it with a \$200 million facility. One proposal being floated recommends demolishing the eight-story hospital building in about six months, and building a new 200-bed facility within three years. The cost of a new facility would be about \$1 million for each patient bed.

Methodist Hospital, located to the east of the London Avenue Canal levee breach, sustained both hurricane and flooding damage. Basic remediation and environmental assessment were underway in early October. The difference in the activity level between this facility and the other one owned by Universal Health Services (UHS), Chalmette Medical Center, was striking and dramatic. While this facility seemed to be on its way to recovery, the other one seemed to have been forgotten. Visual inspection of the main

building housing the Emergency Department (ED) indicated that approximately four feet of water surrounded the building, causing flooding in both the basement and on the first floor. Figure 3-6 illustrates the damage sustained by Methodist Hospital. During our visit in October, remediation teams in HAZMAT suits were busy removing damaged equipment, furniture, and supplies. Security personnel had established a visible presence. While we were permitted to approach the ED main doors, we were unable to walk the



Figure 3-5. Memorial Medical Center



Figure 3-6. Methodist Hospital

fenced site to make a quick damage assessment. Information on the UHS website (<http://www.uhsinc.com/katrina/physician.html>), seems consistent with our observations,

“From preliminary reports, it appears that Methodist Hospital could potentially be made ready to reopen in several months, after we rehabilitate the first floor and repair damage caused by the hurricane on the upper floors. However, the greater question at hand is when the population of East New Orleans will return in sufficient numbers to justify reopening.”

Clearly, the issue of whether to reopen a hospital facility in the New Orleans area will depend not only on the cost of rebuilding or rehabilitating, but also on the projected residential population. East New Orleans, like St. Bernard Parish, was hard-hit by Hurricane Katrina and the subsequent flooding, and estimates vary widely as to the likely number of residents who will return and rebuild their homes and lives. Hospitals need an adequate service base to function. Whether that base will return in time for Methodist and other hospitals is unknown at the time of this report’s writing.

Tulane University Hospital, like its neighbor across the street, **Charity Hospital**, sustained extensive flooding damage. Both hospitals received substantial media attention in the days following Hurricane Katrina, in large part because Tulane’s owner, Hospital Corporation of America (HCA) successfully arranged for helicopter evacuations of its patients and staff. In the meantime, Charity Hospital appeared forgotten. Some speculated that Charity had been forgotten because it served the poorest of the poor. Without question, Charity’s staff and patients did not benefit directly from an externally coordinated evacuation effort. In fact, many of their patients and

staff were evacuated from Tulane’s helipad, most of them having made their way across the street in boats.

During our visit, extensive remediation at Tulane Hospital was underway, including demolition, removal, and drying of sheet rock and other materials from the first floor of the main hospital building that had been damaged by water. Personnel in HAZMAT suits hauling refuse were observed at every entrance of the hospital. Besides medical equipment (e.g., stretchers, IV poles), personnel also removed refrigerators and furniture that had been damaged by mold and mildew in the weeks following the flooding, when lack of power meant no air conditioning. There did not appear to be any major damage at the second floor or above. Personnel on site indicated that no major equipment or emergency generators had been damaged by the flood, because they were located above the flood line (i.e., not in the basement). We observed some limited window breakage on upper floors of the main hospital building. We also observed air remediation efforts in one of the garage facilities that had flooded with about 10 inches of water. As of late



Figure 3-7. Tulane University Hospital

November, Tulane University Hospital had opened a small walk-in, primary-care clinic on the ground floor of this garage facility. Overall, and based on the number of remediation personnel on site in early October, we expect that Tulane University Hospital may well be operational within a relatively short time compared to other hospitals in the Central Business District (e.g., Charity, University, the VA). Figure 3-7 illustrates the damage sustained by Tulane University Hospital.

Veterans Administration (VA) Hospital is located in the Central Business District of New Orleans along with Charity and University Hospitals, and Tulane University Hospital. Armed security personnel on site during the first part of October prevented close examination of the hospital building for hurricane or flooding damage. Our view of the hospital was from a distance, as illustrated in Figure 3-8. Thus, we base our assessment of VA Hospital on testimony from R. James Nicholson, Secretary of Veterans Affairs, before the Senate Committee on Veterans' Affairs on November 10, 2005. According to Nicholson (2005),

“At New Orleans, the VA facility initially weathered the hurricane with minimal damage. Following the hurricane, water from the breached levees flooded the entire area around the medical center, including the basement and sub-basement of the main building. These areas house the facility’s major electrical, mechanical, and dietetics equipment. The costs associated with



Figure 3-8. VA Hospital

replacing this equipment are still under review. VA is still assessing the total effects of having no electrical power and no air-conditioning in the medical center for a prolonged period. A major cost of restoring the facility to operational status will include those costs incurred from damage to equipment and interior finishes. VA is continuing to monitor the situation and estimating the costs of damage and repairs.

We are taking steps to mitigate the damage caused by flooding, humidity, heat, mold and mildew. Efforts are underway to restore power, water, limited climate control systems, elevators, and safety systems. Some of these repairs are temporary and do not allow us to use the building in its entirety. Through these interim measures, we will be able to protect the medical center and its \$85 million worth of equipment from further moisture damage. Additionally, the measures will allow us to more fully assess the functional capabilities of the equipment and damage to the building.”

Hence, while the VA Hospital sustained major hurricane and flooding damage, remediation efforts have been in full swing. The likely consequence will be a return of the VA Hospital to New Orleans in relatively short order.

Two Orleans Parish hospitals have reopened since Hurricane Katrina. **Children’s Hospital**, located on relatively higher ground in Uptown New Orleans near the Mississippi River, sustained no structural damage. Only a handful of windows were broken by the hurricane. Relatively minor remediation efforts were underway in early October to enhance overall air quality and to address a mold problem in an auditorium caused by condensation and lack of air conditioning. The building exterior appeared pristine and untouched by either hurricane or flooding, as shown in Figure 3-9. In fact, floodwaters did not reach the hospital’s property. Contrary to fears and rumors at the time, looters and vandals did not enter the facility.

While the hospital was undamaged, it was closed immediately after Hurricane Katrina and the subsequent flooding in response to the Mayor’s mandatory evacuation order. The hospital stayed closed until city water and power were restored. Professional security was brought in to provide a round-the-clock presence that would discourage criminal activities, protect the physical plant, maintain the safety of those individuals involved in the hospital’s clean up, and control the flow of people in and out of the hospital. While there was no fencing preventing our approach to the building, armed security personnel stopped us, and politely informed us that further visual inspection would not be possible.



Figure 3-9. Children's Hospital

Located in the Garden District of Uptown New Orleans, **Touro Infirmary** suffered limited hurricane damage. Relatively minor remediation efforts were underway in early October to enhance overall air quality and to address mold problems caused by condensation and lack of air conditioning. As was the case at Children's Hospital, Touro's exteriors appeared untouched by hurricane, as seen in Figure 3-10, and floodwaters did not reach the hospital's property. Still, thousands of ceiling tiles had to be replaced, and some furniture, equipment, and supplies were destroyed by mold and had to be replaced. ServiceMaster Clean, a global disaster restoration firm, was hired to clean the hospital building.

Though the hospital was undamaged, it was closed immediately after Hurricane Katrina and the subsequent flooding in response to the Mayor's mandatory evacuation order, degradation of the physical plant (failure of emergency generators, lack of elevators, lack of lighting, failure of the city water system, degradation of sanitary conditions, high heat and humidity), and growing civil unrest in the city. The hospital stayed closed until city water and power were restored. The Emergency Department reopened on September 28, 2005. Hospital executives had to delay reopening the rest of the hospital until the second week in October thanks to Hurricane Rita.

While we were not prevented from visually examining the exterior of Touro, security personnel on site limited access to the main hospital building's interior. A Disaster Medical Assistance Team (DMAT) was established in tents outside the Emergency Department (ED). Its responsibility was to triage patients presenting to the ED, and administer immunizations to the public. According to information provided on the Touro website, Touro's ED was serving 20 patients per day (<http://www.tourohurricaneinfo.com/FrequentQuestions/tabid/78/Default.aspx>) as of early October.

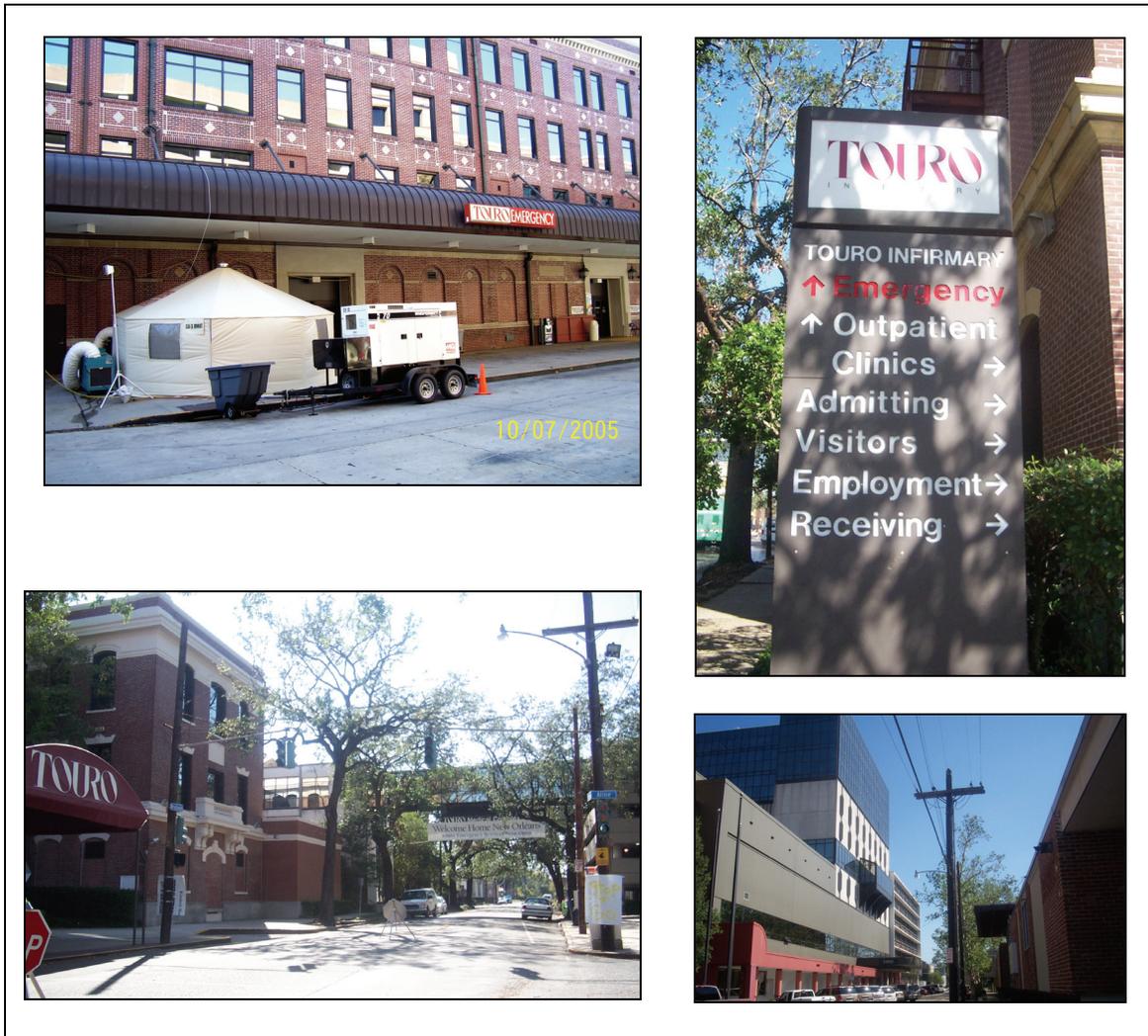


Figure 3-10. Touro Infirmary

Three New Orleans area hospitals never closed. **East Jefferson General Hospital (EJGH)**, located in Jefferson Parish, stayed open throughout Hurricane Katrina and has remained open since then (see Figure 3-11). It is one of only three hospitals in the New Orleans area, along with West Jefferson Medical Center and Ochsner Clinic Foundation, to have remained operational during and after Katrina and the subsequent flooding. During our tour in early October, we observed that EJGH's primary hospital building exteriors were pristine and untouched by either hurricane or flooding. No structural damage was evident. While the streets around EJGH flooded, the hospital itself sits on elevated ground, and was not inundated. Remediation efforts were underway at an off-site administrative building that experienced some minor flooding (less than one foot). As described to us, the purpose of



Figure 3-11. East Jefferson General Hospital

the remediation was to pre-empt the spread of mold and to enhance overall air quality.

Since the hospital did not close, and since it was not damaged by the hurricane or subsequent flooding, it did not require evacuation. Instead, the hospital served as a shelter for approximately 4,000 people during the hurricane and immediately after. As was the case at many New Orleans area hospitals, the individuals who sheltered at EJGH included patients, hospital staff members, many of their family members, National Guardsmen, members of various local government agencies, and other citizens.

Emergency planning appears to have worked well, as the hospital and its patients and staff weathered the hurricane and subsequent loss of city

services (e.g., power, water) without incident. The hospital's success in dealing with the disaster may be attributed, at least in part, to its prior investments in self-sufficiency. For example, besides having backup generators on site, the hospital also has its own well—connected to the emergency power source—which provided potable water. The hospital's success may also be attributed to the experience of its staff with hurricanes and other disasters. Thus, key staff members were able to remain calm in the face of chaos, and were able to reassure their colleagues, patients, and others as well.

Besides serving the individuals sheltered at the hospital, EJGH staff members also were responsible for coordinating emergency medical services among the three hospitals that remained operational during the disaster. To that end, East Jefferson staff members worked with USAR teams to evacuate and triage tens of thousands of evacuees, using I-10 and I-610 for the initial receiving and staging area.

Like EJGH, **Ochsner Clinic Foundation** is located in Jefferson Parish, directly adjacent to Orleans Parish. Ochsner stayed open during and after Hurricane Katrina, and incurred limited hurricane damage as storm water penetrated the facility through a roof leak and windows were blown out by the wind (see Figure 3-12). Though surrounding streets filled with water, the hospital did not flood. Our tour of the facility and surrounding neighborhood confirmed that overall, the hospital had fared well, at least in terms of its structure. Conversations with hospital staff revealed that the lack of city power was complicated by some failures in the hospital's emergency power supply. The result was stifling heat and condensation. Fortunately for Ochsner, the lack of city water did not affect its plumbing and sanitation systems, because they had their own on-site well.

Like EJGH and West Jefferson Medical Center, Ochsner Clinic Foundation had the benefit of both geographical location vis-à-vis Orleans Parish and sufficient opportunity to secure additional resources such as equipment, supplies, and medicine. As described by Warner Thomas, Ochsner's President and COO, the hospital's "positive outcome after the storm was due 50 percent to our location on the "lip of the bowl" of the city, and another 50 percent to very solid strategic planning and preparation that allowed us to be flexible and adapt to the changing situations during and after the storm" (2005).



Figure 3-12. Ochsner Clinic Foundation

Finally, located on the west bank of the Mississippi River in Jefferson Parish, **West Jefferson Medical Center** (West Jeff) also remained open during Hurricane Katrina and stayed open throughout the subsequent flooding. The facility incurred limited damage from the hurricane, including some window breakage and relatively minor exterior damage. Figure 3-13 illustrates the relative lack of damage at West Jeff.

West Jefferson Medical Center did not evacuate during Hurricane Katrina or subsequently. Back-up generators provided power. Onsite were approximately 300-350 hospital patients, 1,000 staff members, 400-500 family members of staff, 80 critical needs patients and their caregivers, and 300-400



Figure 3-13. West Jefferson Medical Center

emergency workers. As was the case at both EJGH and Ochsner Clinic Foundation, West Jeff's extensive emergency plans appear to have worked well, as the hospital and its patients and staff weathered the hurricane and subsequent loss of city services (e.g., power, water) without incident. The hospital's success in dealing with Hurricane Katrina and the subsequent flooding may be attributed also to the experience of its staff with hurricanes and other disasters. Thus, key staff members were able to remain calm in the face of chaos, and were able to reassure their colleagues, patients, and others as well. Written updates of what was happening throughout the hospital were published and widely distributed within the hospital, thereby providing a tangible means of helping people to cope by reducing their uncertainty. Finally, a major component of West Jeff's success appears to have been the extensive personal and professional contacts of its staff members. Whether they needed supplies or a means for communicating their situation to the outside world, West Jeff staff members drew on a long list of people and organizations in their communication networks.

4.0 Lessons For Hospitals and Other Organizations

Asking hospital executives what they would recommend to anyone facing a disaster like Hurricane Katrina typically unleashed a torrent of thoughts, thoughts that had been carefully weighed, measured, and deliberated during the five-week period that elapsed between Hurricane Katrina and our interviews. We always started our interviews with the question, “What worked well?” in an attempt to make clear our interest in learning lessons that might be applied by other organizations dealing with disasters. We were not interested in “pointing fingers” or playing some form of “blame game.” Still, no matter how sanguine the person being interviewed, inevitably the conversations always shifted to “what could have been done better?”

Previous chapters have hinted at lessons learned by one or more New Orleans hospitals. In this chapter, we summarize the lessons that hospital executives shared with us, along with our suggestions informed by observation and investigation. A primary lesson learned by all of the hospitals, we think, is that emergency plans for organizations in multi-hazard locations need to go beyond planning in “one disaster at a time” mode. Specifically, while we heard people say that they were “surprised” by the levees failing, we think that what they really meant to say was that they were unprepared for the levees failing *immediately after Hurricane Katrina*. In other words, they were not prepared to deal with one major disaster on the heels of another major disaster. A corollary lesson, reinforced more than learned, is that hospitals are highly interdependent with their surrounding community. Their fortunes are intertwined. Thus, a healthy New Orleans needs and will continue to need well functioning hospitals. Well functioning hospitals need and will continue to need a healthy New Orleans. The remainder of this chapter focuses on specific lessons in support of these two key themes.

4.1 Building Systems

Lesson: Hospitals should have their own power and water supplies independent of municipal utilities.

Hospitals should do whatever they can to minimize their reliance on **city power** and water supplies when disaster strikes. With respect to emergency generators, at least two lessons seem important. First, hospitals should have enough generators on site (i.e., enough emergency capacity) to power all of their essential equipment. In New Orleans’ climate, air conditioning should be considered essential equipment. Much of the misery reported by both

hospital staff members and their patients, and at least some of the facility damage, could have been reduced if adequate air conditioning had been available. Likewise, any hospital with multiple floors should consider having at least one elevator connected to its emergency power supply. Again, at least some of the misery and stress experienced by both hospital staff members and their patients could have been alleviated if a working elevator had been available for vertical evacuation, rather than stairs alone.

Second, to the extent that the hospital's physical plant permits, emergency generators should be located out of harm's way. In the case of New Orleans, a city below sea level that routinely experiences hurricane winds and rain, "out of harm's way" should be defined as higher than the first floor, and in a building unlikely to sustain wind damage. At least two hospitals, Charity Hospital and Lindy Boggs Medical Center, lost their emergency power because back-up generators were located in the lowest levels. Across the street from Charity Hospital, Tulane University Hospital maintained its emergency power because its generators were above street level.

In the midst of catastrophic flooding, New Orleans hospitals learned valuable lessons about **potable water**. Two hospitals, East Jefferson General Hospital and Ochsner Clinic Foundation, were able to continue using critical medical equipment that relied on potable water thanks to on-site wells. Neither of these hospitals had the major sanitation issues that other hospitals had. Toilets flushed, and water was available for hand washing and other personal hygiene needs. Most importantly, access to potable water meant that hospital staff members and their patients were able to stay hydrated despite the oppressive heat. Hospitals with sufficient financial resources and a suitable physical plant should consider digging an on-site well that can be attached to a back-up emergency power source. If doing so is not possible, then the hospital should consider various methods for storing bulk water, if not for drinking, at least for flushing toilets. Additionally, hospitals should evaluate carefully the water needs of individuals sheltering at the hospital, taking into account both the effect of high heat on people's hydration needs and the likely maximum duration of the sheltering. As suggested by one hospital executive, hospitals should plan to provide their own water (and other supplies) for at least two weeks. At minimum, and to the extent possible, hospitals should consider transferring before any major hurricane as many dialysis and other patients whose medical treatment relies on potable water.

4.2 Self-sufficiency

Lesson: Hospitals should expect to be on their own in the event of an emergency, and they should act like it.

One message that we heard in every interview was that hospitals needed to plan more aggressively to be self-sufficient for an extended period. Beyond having sufficient emergency power and potable water, hospitals must have all manner of supplies: food, fuel, medicine, and so on. Currently, hospital emergency plans do assume a minimum period of self-sufficiency, usually 72 hours. In the aftermath of Hurricane Katrina, however, many hospitals found that they had underestimated the supplies needed to sustain their staff members and others sheltering at the hospital. At some hospitals, supplies that were stored in the lower levels were destroyed by flooding. Others simply ran out of what they needed, primarily food, water, and portable fans. Hospitals that were able to send staff members to nearby food and discount stores (e.g., Wal-Mart, Walgreen's, Home Depot) were sometimes able to "access" those outlets and "secure" needed supplies, often at the store's invitation. One hospital executive told us that in the future he would be certain that his hospital could be self-sufficient for two weeks. Aggressive preparation for such an extended timeframe could help diminish staff members' and others' anxiety since they would know their needs would be met in an emergency.

Besides stockpiling needed supplies, hospitals should plan to "save themselves," and not expect that the government or any other organization will be able to help them. Especially when a catastrophe of Hurricane Katrina's magnitude strikes, the resources needed to evacuate one hospital, much less several hospitals are less likely to be readily available in the near term. As was the case with power and water, hospitals should plan to execute their own evacuation, complete with whatever transportation modes might be necessary – automobile, truck, boat, or helicopter. Hoping that the Coast Guard, FEMA, or someone else will appear with the specialized equipment necessary to evacuate critically ill patients suggests a lack of comprehensive planning. The hospitals that successfully orchestrated their own evacuations, Tulane University Hospital among them, had made arrangements in advance based on prior negative disaster experiences.

4.3 Networking with Local, Regional, State, and National Sources of Assistance (Governmental and Private)

Lesson: Hospital staff members should network, network, and network.

Effective organizations establish multiple contact points with people and organizations in their external environment. The most effective organizations allocate time and resources to building personal, professional, and organizational relationships so that in times of need, those contacts may be called upon for assistance. Never was this statement more aptly demonstrated than in the days following Hurricane Katrina. To the extent possible—and given breakdowns in communication networks—staff members were asked to access their personal and professional networks and contact anyone and everyone that they knew “on the outside” to get the message out that their hospital was in trouble and needed help. Staff members reached out to their suppliers, to local businesses, to their partner organizations, to neighboring and distant hospitals, to the state hospital association, to their local police and fire departments, to their local government officials, to their state legislators, to federal officials – to virtually any person or group who might be able to supply information, food, water, medicine, other supplies, equipment, protection, transportation, and so on. Staff members looked also to their personal rolodexes for home and cell phone numbers of individuals who might be in a position to help – family, friends, former classmates, former colleagues, and the like. Staff members even worked to communicate their hospital’s plight to people they didn’t know via the Internet (via weblogs and e-mail) and the news media (e.g., TV, newspaper).

Many New Orleans hospitals survived the hurricane and subsequent flooding as well as they did because their staff members had extensive personal and professional contacts that came through when they were needed. Based on our conversations with hospital staff members, it seems that the more contacts that staff members had, the better for the hospital and its patients.

If we approach this networking issue from the other side of the relationship, it seemed that hospitals with many external contacts were also more likely to be approached by external contacts with offers of assistance. In other words, the more well connected the hospital via its staff members’ network of contacts, the more likely that someone from the outside would inquire about the hospital’s well-being and take steps needed to help the hospital and its patients.

4.4 Staffing

Lesson: Hospitals should continue to hire the best staff members. Then, they should do whatever it takes to make sure that those staff members are on site when needed.

Hospital emergency management plans tend to specify which staff members are essential and must report to work in the event of an expected disaster. Non-essential staff members are usually instructed to evacuate the city when an evacuation warning is given. Essential staff members are divided into an “A Team” and a “B Team.” The “A Team” reports to the hospital before an expected storm, while the “B Team” is scheduled to report to the hospital and relieve the “A Team” a short while later. Individuals who work at New Orleans hospitals know exactly what to do when they hear on the local radio or TV station that a hurricane is expected to make landfall in the next 48 hours. Pages and phone calls to essential staff members reinforce what they hear on the local news. As described in our opening story, when Ryan Shannon received his “code gray” page on Sunday, August 28, 2005,

“This basically meant that I would have to come in to work (VA Hospital) on Sunday, stay through the hurricane, and then continue to work until a relief team could come in after the hurricane to replace me.

That night, my wife, my daughter, and I hurriedly packed belongings such as clothing, photo albums and other mementos to prepare for their early morning evacuation. They would have to go to Baton Rouge without me. As my wife and daughter made the snail-paced trek to the evacuee-ridden city to stay with relatives, I was scared knowing that my family was going to be 90 miles away and, in all likelihood, I would not be able to contact them for days.”

We chose to include Shannon’s (2005) story in this report because it corresponds to the stories of many New Orleans hospital staff members. Most “A Team” members responded to their pages and phone calls as required by their hospitals’ emergency management plans. Most evacuated their families and pets as recommended by their hospitals’ emergency management plans. Most essential staff had reported to work by Sunday morning, although they weren’t required to be there until late afternoon. Of course, some essential staff members did not report to work. Still other staff members brought family members and pets to the hospital with them, perhaps out of concern that their family members and pets would not be able to evacuate successfully.

Most New Orleans hospitals sheltered a significant number of staff members’ family members during Hurricane Katrina and immediately thereafter. In

fact, the larger hospitals tended to have hundreds of family members on site. Clearly, having these additional people on site added stress to the hospital system, its staff, and its patients. While most emergency management plans specified that people should bring enough food, water, and other supplies to the hospital for their family members, most people underestimated the length of their stay and therefore failed to bring sufficient quantities of emergency provisions. With so many people on site – thousands of people in some hospitals – hospitals found themselves running low on everything: food, water, OTC medicines, bedding, and patience. The hospitals in the worst situations were those whose food and potable water supplies were located on lower floors that flooded.

Some family members with little to occupy themselves took to wandering halls. In at least one hospital, staff members complained that family members were constantly hovering around the Incident Command Center. Certainly, some family members were helpful to the emergency effort. As mentioned, some teenagers were “runners,” carrying written messages to various staff members between floors. Other family members helped in myriad ways, including delivery of patient care that didn’t require medical expertise, pet care, child care, laundry, and so on. Overall, though, most hospital executives agreed that the situation faced by the hospitals would have been less stressful had family members not been present.

Given that perception, one might wonder why family members were permitted to shelter at the hospitals at all. The answer is straightforward: Hospital executives believe that a critical number of essential “A Team” staff members might choose to not report to the hospital at all if they could not bring their family members. Which scenario is worse: insufficient essential staff members, or too many family members? Hospital executives wanting to ensure sufficient staff resources unaccompanied by family members might want to consider assisting family members with evacuation and off-site sheltering.

Besides the high number of non-staff members on site, hospitals had an additional staffing problem. Over the span of nearly a week, many hospital staff members worked an extraordinary number of hours with few breaks. Importantly, members of a relief or “B Team” are usually expected to relieve “A Team” members within a couple of days of a hurricane. In fact, emergency management planning is predicated on the assumption that “B Team” members will appear as expected. For example, “A Team” members are told to bring clothes, food, supplies, and personal medications for several days, not a week or more. In the case of New Orleans hospitals after Hurricane Katrina, some people on the “B Teams” were never heard from, or were

unable to make it into work. In at least one instance, hospital executives told us that they would rethink some of their “A Team” vs. “B Team” assignments. In brief, they believed that “B Team” members might need to be stronger (more loyal, more competent, more creative) than anyone had previously believed necessary, since “B Team” members might need to overcome substantial adversity to even reach the hospital after an extreme event.

In terms of behavior during and immediately after Hurricane Katrina, hospital executives agreed that staff members were professional, caring, and undeniably heroic in the face of intense pressure and while enduring incredibly difficult conditions. Figure 4-1 is an excerpt from a letter written by A. Gary Muller, President and Chief Executive Officer of West Jefferson Medical Center to hospital staff members. We include it here because it typifies hospital executives’ perceptions of staff performance.

September 15, 2005

Dear Hospital Family including our Patients, Physicians, Employees, ...

Words cannot begin to express my feelings of gratitude for all of you who have contributed to our ability to serve the needs of this area during Hurricane Katrina and her ferocious aftermath. ...

Because of you, because of your presence in the hospital, because of your assistance on our behalf off-campus, because of the hand you extended from your base of operations and all of the hard work you have done amidst less than ideal circumstances, we have been able to maintain essential healthcare services and more. We were always safe, our needs have been met and all patients received excellent care. To the more than 2,000 persons who rode out Katrina with us despite not knowing how your homes and loved ones fared during the storm, I applaud you for remaining loyal to our mission; you put our patients first. ...

You have my admiration and sincere thanks for all you have done and continue to do to safeguard the health and vitality of our community. ...

Thank you one and all,
A. Gary Muller, FACHE
President and Chief Executive Officer

Source: <http://www.wjmc.org/katrina/WJMC%20CEO%20gives%20thanks.pdf>

Figure 4.1. Letter from West Jefferson Medical Center President and CEO to Employees

4.5 Communicating Emergency Plans

Lesson: Hospitals should plan for the worst. Then, they should make sure that everyone – everyone! – knows what they are supposed to do.

Since September 11, 2001, there has been tremendous interest in hospital readiness for disasters. As stated previously, hospitals are expected to play the role of first responders in the aftermath of a disaster. Both the injured and non-injured can be expected to flock to hospitals after a community disaster, in part because they see hospitals as safe havens. Accordingly, in the months and years since 9-11, a high number of hospital executives throughout the United States have participated in intensive disaster training. In New Orleans, for example, hospital executives have participated in training seminars for smallpox and other bioterrorism events. Such training is considered especially useful because it provides hands-on experience with establishing and running an Incident Command Center for any type of extreme event. Likewise, local government officials have participated in homeland security training and have taken a variety of courses and workshops. Unfortunately, it seems that not all relevant officials have participated in such training. We were told, for example, that several key state officials had not participated in such training. To the extent that these statements are accurate, they suggest a clear recommendation for the future: Everyone likely to play a decision-making role in the aftermath of a community disaster should receive hands-on training in disaster management. Communication breakdowns in the aftermath of an extreme event, such as those observed after Hurricane Katrina and widely reported by the news media, are more likely to occur when key individuals do not share a common background in disaster training.

Most, if not all, Louisiana hospitals use some version of HRSA's Hospital Emergency Incident Command System (HEICS) which establishes a hierarchy of reporting relationships for use in an emergency (<http://www.lhaonline.org/displaycommon.cfm?an=1&subarticlenbr=138>). Besides establishing an emergency hierarchy, well-prepared hospitals also establish a location for emergency decision making. These locations, typically known as Incident Command Centers, are an extremely important part of hospitals' emergency plans. Their primary function, of course, is to physically co-locate all key decision makers and computers and communications equipment.

In thinking about Incident Command Centers (ICC), several recommendations emerged from our conversations with hospital executives. First, all agreed that ICC access should be limited to essential personnel only. In at least one hospital, family members, physicians, and other patient care

staff tended to linger near or in the ICC when they were not seeing patients or resting. Second, several suggested that there were too many people staffing their ICCs during the day, and not enough at night. Finally, several agreed that having a pre-established ICC with all necessary furniture and equipment would be more effective than trying to establish an ICC in the midst of an emergency. Having a pre-established ICC might require substantial redundancy in furniture and equipment, and might take up valuable office space. Still, reflecting on their experience during Hurricane Katrina and the flood, many felt that the advantages associated with having one ready to go outweighed the disadvantages.

When asked who had been involved in the development of a hospital's emergency management plan, most hospital executives listed members of the top management team, unit leaders, and other personnel likely to have a background in emergency management (e.g., risk management staff). Less often mentioned were physicians and other patient care staff members (e.g., nurses, diagnosticians), though certainly some of those individuals were involved in developing or at least vetting the plans. When asked who had been involved in actually testing the hospital's emergency management plan, most hospital executives listed again the members of the top management team and unit leaders. Seldom mentioned were individuals occupying non-management positions, despite the fact that many of those same individuals are considered essential staff who are expected to report to work in an emergency. Of course, anyone living in New Orleans for any length of time has experienced a hurricane, in the same way that those in the Upper Midwest have experienced snowstorms, and those in Southern California have experienced earthquake tremors. Still, having personal experience with a disaster or disastrous conditions is thin preparation for working through a disaster as part of a complex and coordinated team of medical professionals. In other words, knowing what to do for oneself in a disaster is not the same as knowing what to do for and with others as one member of a collaborative group. Who plays what role? When? For how long? These and other questions need to be addressed if people are to be effective within a coordinated system.

It is not enough for people to read and hear about what they should do in the event of an emergency. Actual practice or enactive mastery is the gold standard for learning to do something well and feeling confident about one's ability to perform effectively that same something in the future (Bandura 1997). To that end, hospital staff members should have the opportunity to *physically* practice what will happen in an emergency, over the course of more than one day, in order to simulate the real conditions of a disaster or extreme event. "Tabletop exercises," where key personnel "talk through" protocols

and decision-making during a hypothetical extreme event, are useful exercises that often reveal unresolved communication or other issues. As useful as “tabletop exercises” are – and we believe that they are – very typically, they do not involve many non-management personnel. So, while management personnel have the opportunity to learn a great deal about their organization’s potential response to a disaster, a significant number of hospital staff members are forced to wait for the real thing before learning what to do.

Such experiential disaster training may have revealed, for example, that many floor nurses did not have the triage and critical care skills that were in demand in New Orleans on the Causeway and I-10 overpasses and at the airport where many hospital staff members were taken after being evacuated from their hospitals. Likewise, such experiential training may have helped more hospital members understand and internalize why their family members should have evacuated the city rather than sheltered at the hospital.

With more individuals involved in testing the hospital’s emergency management plans, the level of stress experienced by hospital staff members during the actual disaster may have been reduced, as they may have had a more realistic set of expectations about what it would mean to be trapped in a hospital without air conditioning and without adequate food and other supplies. In thinking about this latter statement, it seems clear that such experiential disaster training could not involve actual patients, as their health and safety could not be jeopardized.

Had more than one area hospital collaborated to engage simultaneously in experiential disaster training, the training may have revealed what many hospital executives said they were least prepared for: The potential vulnerability of hospitals to looters and violence, coupled with *persistent rumors* of looters and violence. In general, hospital executives needed a plan for keeping criminals away from their property, staff, and patients. Of course, hospitals have security personnel on site, and during a hurricane, hospitals are locked down. Still, not all hospitals appear to have as many security personnel as they have exit doors. And, staff members have been known to open doors after the hurricane seems to have passed, perhaps to do something as simple as have a cigarette. One person did this during the hurricane at one hospital, resulting in blown out windows and serious facility damage.

Besides helping to keep certain people away from hospital premises, experiential disaster training may have helped hospital staff members anticipate how they would leave the hospital premises to secure needed

supplies (e.g., medicine from Walgreen's, fans from Home Depot). Such training may have also revealed how the hospitals might deal with drug abusers and members of the general public seeking drugs (e.g., Vicodin, Oxycontin).

Experiential disaster training may have highlighted the need for extensive and sometimes non-traditional communication both within and external to the hospital. With the power down, hospital executives had to improvise ways to communicate with staff members and with the outside world. Hands-on practice with a range of staff members may have revealed the widespread damage to communication systems associated with a continuing power outage. Knowing the likely communication challenges, more hospitals may have established tighter connections to local government and other officials in the days immediately preceding Hurricane Katrina.

Finally, experiential disaster training involving individuals not employed by the hospitals (e.g., individuals likely to be involved in rescue operations) may have revealed that while several New Orleans area hospitals had changed their names within the last few years and months, maps and long-time residents tended to use the former names. Lindy Boggs Medical Center, for example, is widely known as Mercy Hospital. Its sister facility, now called Memorial Hospital, is widely known as Baptist Hospital. We discovered these problems firsthand when we arrived in New Orleans and conducted our first few interviews with folks who referred to several hospitals using their old names. That some rescue personnel were delayed as they tried to figure out where certain hospitals were located seems certain. That this same scenario could play out in another city facing another disaster also seems certain, as hospital name changes tend to occur whenever medical facilities are sold to new owners.

Whether any of these issues could have been anticipated by experiential disaster training is speculative. Nonetheless, the literature on brainstorming and creativity (e.g., Amabile 1996) suggests strongly that involving multiple participants from diverse backgrounds is key to first identifying problems and then generating multiple workable solutions for those problems. We cannot imagine how involving a wide range of staff members in hands-on disaster training could be anything but beneficial.

4.6 Effective Management

Lesson: Having planned for the worst, hospital executives should be ready to lead.

Though many of the hospital executives with whom we spoke were not from New Orleans originally, most had lived in either New Orleans or the southern part of the United States for several years. All reported that they had some type of **disaster experience**. Those with the most disaster experience, especially hurricane experience, seemed to be the best prepared for and most confident in confronting Hurricane Katrina and the subsequent flooding. These individuals seemed to be the most well prepared for what their staff members needed them to do: Lead.

One hospital executive listed no fewer than four major natural disasters that he had lived through while serving as a hospital executive, including the Loma Prieta Earthquake in 1989 and Hurricane Andrew in 1992. As he said, his experience in those disasters prepared him for this. He knew, for example, that he needed to take charge of evacuating his staff and patients, and that he should not count on government assistance. He knew also that he needed to secure any remaining narcotics and medicines in unmarked rooms in the hospital's highest floors before leaving the building. Importantly, he told us how he was able to reassure his staff members that everything was unfolding as he had previously experienced, and so there was no need to panic. To the extent that doing so is possible, then, hospitals should make sure that their top management hires have some relevant disaster or crisis management experience, preferably experience that required them to make important decisions.

Besides having disaster experience, hospital executives should be mindful. As defined by Weick and Sutcliffe (2001), **mindfulness** is:

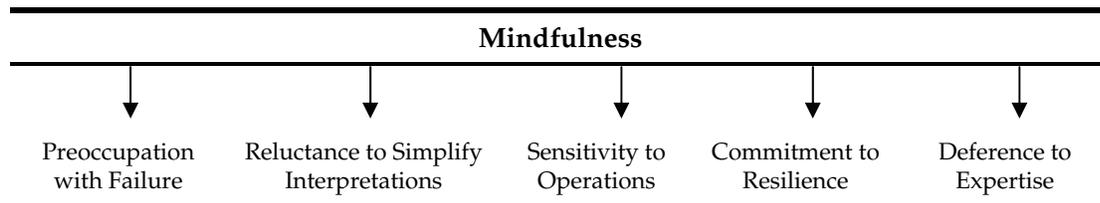
“... the combination of ongoing scrutiny of existing expectations, continuous refinement and differentiation of expectations based on newer experiences, willingness and capability to invent new expectations that make sense of unprecedented events, a more nuanced appreciation of context and ways to deal with it, and identification of new dimensions of context that improve foresight and current functioning” (p. 42).

One comment that we heard repeatedly was that hospital executives were surprised by the magnitude of the “double whammy” that struck New Orleans, i.e., Hurricane Katrina and the subsequent flooding. Importantly, not everyone was equally surprised, and not everyone in essentially the same positions fared as well (or as poorly). There were differences in reaction not

traceable to the physical damage inflicted on the various hospital facilities. We believe that one important factor was the degree of mindfulness that characterized each hospital's top executives and decision makers. To that end, hospitals should make sure that top management hires possess the quality of mindfulness in abundance.

Weick and Sutcliffe (2001) note that some people believe it is impossible to anticipate the unexpected. Still, some organizations appear better able than others are to anticipate the unexpected, and to respond accordingly. Though members of these high functioning organizations may not see the unexpected immediately, they do see it earlier than members of less well functioning organizations do. Most critically, they seem to see the unexpected early enough to act before recovery is impossible. How do they do it?

Five processes account for mindfulness (Weick & Sutcliffe, 2001) as seen in Figure 4-2. First, mindfulness depends on a preoccupation with failure. A preoccupation with failure is characterized by "frequent incident reviews, the reporting of errors no matter how inconsequential, and employees' obsession with the liabilities of success" (p. 54). Hospital executives in charge of the most successful New Orleans hospitals, those that performed at a relatively high level, were dissatisfied still with their results, and anxious to revisit and refine their emergency management plans almost immediately after, if not during, the disaster. Dissatisfaction with the status quo is a hallmark of mindfulness. Second, mindfulness depends on a reluctance to simplify interpretations. The most straightforward way to accomplish this is to create a culture in which diverse perspectives are encouraged and insisted upon. The more complicated the system being managed (such as a hospital), the more complicated that the control system needs to be.



Source: Weick & Sutcliffe, 2001

Figure 4-2. Five Qualities of Mindfulness

The third aspect of mindfulness is sensitivity to operations. Mindful organizations treat operations as though they are what matters most. To that end, "they do not let hierarchies become dysfunctional bureaucracies, they provide everyone with detailed real time information on what is happening,

and they instruct everyone to be on-call to do whatever the ongoing operations require” (Weick & Sutcliffe 2001, p. 64). Flexibility is essential to success. For example, when executives at one hospital discovered that some essential staff members wanted to bring their pets even though the hospital did not have a policy permitting pets, the executives found a way to shelter the pets. In the wake of Hurricane Katrina, when the air conditioning had stopped working in many hospitals, executives chose to forego enforcement of the usual policies around work attire, and to let hospital staff members wear whatever was comfortable. Mostly, hospital executives got out of the way of those involved in patient care.

The fourth aspect of mindfulness deals with commitment to resilience. As described by Wildavsky (1988),

“The mode of resilience is based on the assumption that unexpected trouble is ubiquitous and unpredictable; and thus accurate advance information on how to get out of it is in short supply. To learn from error (as opposed to avoiding error altogether) and to implement that learning through fast negative feedback, which dampens oscillations, are at the forefront of operating resiliently” (p. 120).

Put differently, people with a resilient mindset “think mitigation rather than anticipation,” and believe in “cure rather than prevention” (Weick & Sutcliffe 2001, p. 69). Resilience does not encourage a cycle of ‘think-act-think,’ but rather ‘act while thinking.’

Finally, mindfulness insists on deference to expertise. In traditional organizations, people defer to the hierarchy and what it represents: status, rank, and power. In mindful organizations, people defer to those in the know, those who are closest to a given problem. These individuals are empowered to make critical decisions, and are held accountable for those decisions. In mindful organizations, managers are available to support those in the know, and to act in accordance with their recommendations.

Taken together, these five qualities of mindfulness should enable hospital organizations facing disasters to address them effectively once they have occurred. No matter how carefully and deliberately a hospital’s top decision makers have planned, there is no way to anticipate all possible problems. This is where a heightened sense of mindfulness comes into play. Knowing that it is impossible to anticipate all possible problems, effective managers adopt a mindset that allows their organization to respond adaptively to the changing conditions in various internal and external environments.

5.0 Hospital Recovery: Problems Facing Hospitals in New Orleans

Hospitals have been forced to confront a wide variety of challenges since our visit to New Orleans in the first week of October 2005. Three issues are most salient to hospital executives.

Hospitals have received a great deal of media attention, at least some of which has been negative.

The negative media attention began in the immediate aftermath of Hurricane Katrina, when CNN publicized the suffering of Charity Hospital's staff members and patients as they waited for evacuation (Rohde et al., 2005). While privately owned Tulane University Hospital was evacuated in an orderly fashion, publicly owned Charity Hospital was forced to wait. Located across the street from Tulane University Hospital, Charity Hospital has become a lightning rod for conversations about race and inequity in the United States. Why were the poorest of the poor neglected and left to fend for themselves while others in close proximity were being airlifted to safety? In the end, many patients and staff members from Charity Hospital were evacuated from Tulane's parking garage. Still, some asserted (probably correctly, given the apparent chaos and lack of communication) that at least some Tulane University Hospital staff members were evacuated before all of Charity Hospital's critically ill patients were evacuated.

Likewise, staff members at Memorial Hospital have been accused of euthanizing some patients (Anderson 2005; Johnston 2005; Roig-Franzia & Connolly 2005). The likelihood is slim that anyone will be able to determine with certainty the cause of death of the 45 people found in Memorial Hospital after the floodwaters receded. Just as the Tulane vs. Charity Hospital debate has sparked conversation about race relations and resource allocation in the United States, the tragic situation at Memorial Hospital has prompted conversation about euthanasia and the decisions of medical staff members faced with uncertainty amid increasingly desperate and deteriorating conditions.

Finally, at least one hospital has received negative press for its alleged "abandonment" of the community when it decided to evacuate and close in the aftermath of Hurricane Katrina. Meadowcrest Hospital, located across the Mississippi River in Jefferson Parish, has been accused of "... skirt(ing) its responsibilities to the public" (Davis 2005). According to its owners,

Meadowcrest Hospital evacuated amid rumors of looting and increasing violence, despite the fact that it did not suffer serious hurricane or any flooding damage, and despite the fact that its power continued unabated. Some organizations, like Meadowcrest's neighboring hospital facility, the Jefferson Parish-controlled West Jefferson Medical Center, have asserted that Meadowcrest Hospital failed to fulfill its mission. Without weighing in on the specifics of the Meadowcrest case, it seems that the ongoing debate of whether Meadowcrest did the right thing in deciding to evacuate would spark further debate about the need for all hospitals in a community to remain open during and immediately after a disaster like Hurricane Katrina. After all, if a community is under a mandatory evacuation order with which most citizens comply, how much need exists for hospital care in the immediate aftermath of the disaster? In the case of New Orleans, it seems apparent in hindsight that the city with its diminished population could cope with significantly reduced hospital service. Fewer hospitals would have needed evacuation after Hurricane Katrina if at least some had been able to evacuate before Katrina, when traditional surface transportation was still a viable option.

At the same time, hospitals have also received a great deal of positive attention. Hospital staff members have been lauded for their heroic efforts in the face of tremendous adversity. Many have published blogs (e.g., <http://www.barrocas.com/Katrina/katrina.htm>), detailing their own personal experiences and the experiences of their fellow staff members immediately before, during, and after Hurricane Katrina. Images of dedicated hospital staff members abound on the Internet, just as images of dedicated firefighters and police officers filled the web in the wake of 9-11.

Hospitals will have to consider how and when to establish a healthcare system for the city of New Orleans as it repopulates

No one knows how many people will eventually return to New Orleans, how many of them will have health insurance, and what services they might need (Pope 2005). Estimates vary widely. No one expects the city to be repopulated fully by its nearly half-million citizens, and certainly not in the near term. In the meantime, hospital decision makers along with government and other officials need to consider how to provide critical care to those who are in the city. For now, Disaster Medical Assistance Teams (DMATs) have been established throughout the city to work with existing doctors, nurses, and pharmacy services. Their purpose is to provide urgently needed medical care, and to support the existing healthcare infrastructure as needed. Most have served as the primary venue for immunizations.

Neighborhood clinics and mobile services have been established by several hospitals and the local public health department while hospital facilities remain off-line (see Figure 5-1). Doctors and other patient care staff members have been asked to staff these clinics while they wait for their employers to determine if the main hospital buildings will reopen, and if they will reopen, when they will reopen. Tulane-Lakeside has broadened its mission beyond a focus on primarily women and children in order to offer services formerly provided at the main Tulane University Hospital campus. The leadership of Charity and University Hospitals has argued that their previous facilities in the Central Business District cannot be reused to offer medical care, in part because they were in poor and increasingly deteriorating condition before Hurricane Katrina. Instead, they will need to build anew, perhaps with the help of FEMA. Such federally subsidized rebuilding is a distinct possibility, since both Charity and University Hospitals are the only public hospital entities in the New Orleans area. In their capacity as the area's "safety net," they serve as the primary healthcare providers for the area's underinsured and uninsured (Alpert 2005, Gesenway 1999).



Figure 5-1. Mobile Healthcare Center on Canal Street in New Orleans

With the two public hospitals out of commission, the remaining hospitals are faced with increasing loads of indigent and uninsured (or underinsured) patients. Whether they can meet this increasing demand will depend on the array of hospitals eventually established or re-established in the city, and on the availability of clinics and mobile services located in the neighborhoods where the poorest of the poor live (Pope 2005). Before Hurricane Katrina, there were relatively few hospital beds available in the poorest

neighborhoods. In the same vein, there was greater spatial separation of the hospital and medical centers from New Orleans low-income neighborhoods (where automobile ownership would have been lower and travel would have been more burdensome in terms of time and cost) than from middle- and higher-income neighborhoods. In general, the hospitals were not located in places where low-income populations lived (e.g., the Lower Ninth Ward). Instead, poorer neighborhoods were served by city health clinics (see Figure 5-2 for an example). Many of these were closed after they were flooded, lost power, and were destroyed. Some were looted and vandalized, apparently by people looking for drugs.



Figure 5-2. Central City Mental Health Clinic

During our visit in early October 2005, there were fewer than 100 hospital beds available at the three Jefferson Parish hospitals then open (East Jefferson General Hospital, Ochsner Clinic Foundation, and West Jefferson Medical Center). In the event of another disaster, no one knows if there would be enough hospital beds available for the sick or wounded in the metropolitan area. Certainly, with less than half of its pre-Katrina capacity, the New Orleans healthcare system is not ready to serve a fully repopulated city. Even as some smaller portion of the population returns, often on the weekends, to salvage belongings and begin the rebuilding process, hospital decision makers worry about their ability to serve the diminished population (Barringer 2006). Accidents always happen, but it seems that more accidents happen in the wake of a disaster as people return to their homes. More falls, more lacerations, and more rashes tend to be the order of the day. More traffic accidents occur, especially in neighborhoods without power where traffic signals are not working, and uncharacteristically low traffic lulls drivers to the point where they fail to react to temporary stop signs. As

described by Darcé (2005), “some patients are having to spend extra time in emergency rooms because hospital beds aren’t available and some surgeries are being postponed because operating rooms are booked ... with more evacuees returning to the city, the bed shortage could worsen.” Hospital staff members have had to find more creative ways to manage patient load both in their emergency and acute care facilities, including continuing care for individuals who in the past would have been moved to long-term acute care, rehabilitation, or psychiatric facilities after being stabilized. Many, if not most, of those critical facilities have not reopened, adding to the burden of the already overloaded acute care system in the Orleans area (Barringer 2006).

Hospitals are faced with a wide array of staffing problems.

Immediately after Hurricane Katrina and the subsequent flooding, New Orleans hospitals arranged to keep their staff members on the payroll. As time has gone by, and all but two Orleans Parish hospitals have remained closed, continuing to pay people has become increasingly difficult, and some hospitals have been forced to furlough and layoff a significant number of staff members. Clearly, the hospitals that have remained closed are in a challenging position. They cannot generate revenue, and so they cannot pay salaries to their staff members or other bills for that matter.

All of the hospitals have experienced difficulty locating, contacting, and staying in touch with their staff members, at least some of whom had been missing after Hurricane Katrina (King & Pope, 2005). Some have established 800 numbers, and all seem to have created or augmented their existing web sites to serve as communication hubs for their staff members. Still, even when staff members have been located, persuading them to return to the city, assuming work is available, has been tricky. Like the rest of their New Orleans peers, most hospital staff members lost everything, including especially their homes and personal vehicles. Finding livable and affordable housing in Orleans Parish remains a major obstacle even five months after Hurricane Katrina. As shown in Figure 5-3 and in countless pictures available on the Internet, much of the housing in both Orleans Parish and neighboring St. Bernard Parish was destroyed or substantially damaged by the flooding that followed Hurricane Katrina, when up to 80 percent of the city was covered in water. Hurricane Katrina and the subsequent flooding were equal opportunity destroyers of homes and property, affecting nearly all neighborhoods and all socio-economic classes in New Orleans. Thus, all categories of hospital staff members have experienced the loss of home and property – from hospital administrators to doctors, from nurses to laboratory technicians, from housekeeping staff to volunteers.



Figure 5-3. Housing in Orleans and St. Bernard Parish was Substantially Damaged by Flooding

Those with children who have resettled in another city may not be interested in uprooting their family again, knowing that the New Orleans public school system has only just started to reopen as this report is being written. The fabric of normal life has been torn apart for New Orleanians. Consequently, we should not be surprised if returning to so much uncertainty is a choice that many are unwilling to make.

Restoring the healthcare system in New Orleans is no simple matter. In fact, questions about the future of New Orleans in general, and its hospitals in specific, make clear the interdependence of hospitals and their communities. We believe that the following statements hint at the difficulties faced by those wanting to rebuild New Orleans.

- Hospitals need patients to generate revenue. Hospitals need sufficient staff members to care for patients. Hospitals need safe facilities that facilitate the delivery of modern healthcare. If any of these inputs to the hospital system is missing or in short supply, the system cannot function effectively. In fact, the system may not be able to function at all.
- People do not live in cities that do not offer adequate access to quality and affordable healthcare. People do not live in cities that do not offer adequate housing. People do not live in cities that do not offer satisfactory access to education. “Nurses are being hired away because many of them have no homes here and no schools where they can send their children” (King & Pope, 2005). People do not live in cities that do not offer ready access to grocery stores, gas stations, and restaurants. It is difficult for people to live in cities that are shadows of their former selves, especially when critical elements of the city’s infrastructure (e.g., hospitals, housing, and schools) are badly damaged and out of commission.
- Because New Orleans currently is a shadow of its former self, it does not have enough people to be patients and hospital staff members.
- The hospitals and the city must rise together. One depends on the other.

As summarized by Dr. Vincent Berkley, the chief medical officer for Indian Health Service who has been charged with leading a team concerned with the restoration of healthcare in New Orleans, “The challenge a hospital CEO faces is how to bring in additional staff when you don’t know what the patient load

is going to be to provide work for that staff. They've got to pay them to be there to work, but at the same time they've got to have work for them to do" (King & Pope, 2005). The challenges facing New Orleans and its hospitals in the wake of Hurricane Katrina are among the greatest ever faced in the United States.

6.0 Concluding Remarks

Testimony by the Honorable R. James Nicholson, Secretary of Veterans Affairs, on behalf of the VA Hospital represents well what we heard from many New Orleans hospital executives: “We are exploring all our long-term options to reestablish inpatient and tertiary care services for our (patients) in New Orleans” (2005). The hospitals in New Orleans that remain closed have all expressed interest in reopening. Whether those hospitals are able to do so, and whether those hospitals will look anything like they did before Hurricane Katrina, no one can say with certainty as of the writing of this report.

The events at hospitals in the New Orleans area unfolded following first a Category 3 hurricane and then levee failures that resulted in floodwaters up to 19 feet deep throughout the majority of the city. Of concern to the practice of emergency planning is not so much the type of disaster but rather the consequences. For example, the functioning of and safety within hospitals was compromised by loss of utilities (power, water, sanitation) and failure of communication systems, and when building evacuations were necessary, traditional surface transportation was impossible because of the flood. Such outcomes could be replicated in a number of extreme events that hospitals might experience, including natural forces (such as blizzards, tornadoes, or earthquakes), failures of technology (such as nuclear, industrial, or transportation disasters) or mass violence (such as shooting sprees or terrorist attacks) (Norris 2002).

Regardless of the cause, various disasters and extreme events can damage hospital infrastructure, compromise the health and safety of patients, and strain the medical system’s ability to care for residents who become wounded or ill during a disaster. In this sense, hospitals are vital components of a community’s critical lifelines, and emergency planning should ensure that hospitals can fulfill their role of *responders* to a disaster and do not become *victims* of a disaster, as did many hospitals in New Orleans. Hospitals tend to be located in or near population centers and the sheer urban density in communities surrounding hospitals makes them more vulnerable to certain types of disasters and may increase the complexity of recovery from disasters.

We note that the floodwaters in New Orleans covered approximately 80 percent of the city (Whoriskey & Coates, 2005), resulting in a virtual shutdown and mandatory evacuation. Few urban disasters have affected such a wide geographic area. For example, the terrorist attacks of September 11, 2001 in New York City affected a relatively small building footprint in New York City, and earthquakes in urban settings tend to affect various

pockets or corridors across a metropolitan area. In these instances, the majority of the city would be unaffected and could be used for response and recovery of the disaster zone, but in New Orleans, the *entire city* was the disaster zone. This should have an effect on future emergency and evacuation planning not only for buildings and sites but also for larger regions.

A number of hospitals have experienced disasters in the past, but the impassability of surface transportation surrounding *nearly all* hospitals within an urban area was highly unusual, and hospitals were largely helpless because of their inability to evacuate patients and staff using traditional means. Instead, hospitals relied upon FEMA and other emergency response organizations to conduct evacuations. In thinking about other types of disasters, there could be a number of reasons to keep everyone inside a hospital during a disaster – such as a terror event or mass violence – but seldom have hospitals been so powerless to move people to safety when hospitals must be evacuated as they were in the New Orleans flood. Exacerbating this pervasive sense of helplessness was the fact that the hospitals could not communicate effectively with each other, not even when they were located across the street from one another as in the case of Charity Hospital and Tulane University Hospital.

While usually owned by distinct entities, hospitals that operate in relatively close proximity to one another are expected by their stakeholders (e.g., patients, the surrounding community) to adopt what might be called a regional sensibility. That is, individual hospitals are expected to work collaboratively with other hospitals to address a region's healthcare needs, even when their ownership type compels a certain amount of competitive activity. Adopting such a regional sensibility seems especially appropriate for emergency planning and preparedness in larger, urban areas where hospitals are often co-located. In addition to having hospital-specific Incident Command Centers, then, "regions" would do well to have a coordinating Regional Incident Command Center. "Regions" may be narrowly defined to include hospitals in specific neighborhoods or suburbs of a larger metropolitan area, or broadly defined to include hospitals in several counties or parishes. Such a regional structure would perform many of the coordinative functions that the Louisiana Hospital Association voluntarily performed in the tragic aftermath of Hurricane Katrina. For example, such a Regional Incident Command Center would be expected to have a broader view of needs and constraints among all medical facilities in a metro area, and respond accordingly. Acting as both communication and distribution hub, the Regional Incident Command Center would link individual hospitals to each other, and would work to ensure that supplies and personnel were in place where needed. While many hospitals in many regions work

collaboratively with each other and local governments on emergency planning and disaster preparedness, the outcomes of Hurricane Katrina and the flood suggest that at least some fall short of effectively collaborating in the midst of a disaster, as we are recommending here.

We believe that hospitals throughout the United States, especially those in coastal areas, would do well to imagine the worst-case emergency or disaster scenarios, not only for their individual hospitals, but for all of the hospitals in their region. Drawing from the situation faced by hospitals in the New Orleans area, coastal hospitals in particular should consider how they might deal with a “one-two punch” combination of disasters, where one emergency (e.g., hurricane) is followed immediately by another (e.g., flooding). Also, when the disaster is anticipated by at least a few days, as is usually the case with hurricanes, hospitals should consider how they might collectively rather than individually safeguard their patients and provide healthcare to their communities, both during and immediately after the disasters. In the case of New Orleans, with most of the city evacuated in advance of Hurricane Katrina, collective action on the part of the city’s hospitals could have reduced significantly the number of patients and staff members who had to wait several days for evacuation. For example, we suspect that better outcomes might have been realized had there been a way to “consolidate” some of the operations in the city’s Central Business District hospitals that were in close proximity to one another – i.e., Charity, University, Tulane, and the VA Hospital – prior to Hurricane Katrina, such that at least one of the four hospitals was completely evacuated before the flooding began. Such collective planning and action would seem to be even more critical for larger, more congested, urban areas. If a large share of the city’s population has been asked to evacuate, and if the numbers to be served by any one hospital are expected to be low until after the emergency passes, why place staff members at risk?

The key findings about lessons learned in New Orleans presented in Chapter 4 – the importance of resilient building systems and back-up power and water, internal self-sufficiency, the importance of networking and relationships, the importance of personnel and staffing, the importance of communicating emergency plans, and effective management and decision-making – were gleaned from Hurricane Katrina and the flood but are applicable to emergency planning and decision-making for a variety of disasters and extreme events, not just for hospitals but for other organizations and institutions as well. Any organization that depends on the external environment for essential inputs (e.g., human resources, energy, supplies) and that neglects these lessons risks ruinous failure in the face of all-too-likely disasters.

7.0 References

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