

After KATRINA



Hospitals in Hurricane Katrina
Challenges Facing Custodial Institutions in a Disaster

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The evacuation order contained exemptions for certain people, including city, state and federal officials, inmates of the parish prison, those in hospitals, tourists staying in hotels, and members of the media.

New Orleans Times-Picayune, Sunday, August 28, 2005

Hospitals were part of the problem and the solution during the Hurricane Katrina crisis. They cared for some of the city's most vulnerable people, but they also presented some of its most difficult challenges once flooding made evacuation necessary.

In the days after Hurricane Katrina struck and New Orleans' infrastructure failed, hospitals and other organizations that have custodial responsibility for human beings (such as nursing homes and jails) faced special difficulties. In some two dozen hospitals, patients had to be evacuated because of the loss of power, water, and sewage service,¹ and many of these hospitals required external assistance that was slow to arrive. Meanwhile, patients' needs for care continued unabated. Some hospitals evacuated all patients successfully, but by the end of that long week, some had become places of death.

This paper explores what happened in New Orleans-area hospitals during and after Hurricane Katrina and why hospitals had such varied experiences. We conclude with lessons based on the Katrina experience.

A Note on Methods

This paper is based on interviews with a dozen hospital executives, public officials, leaders of trade associations, and others who had firsthand experience of the flooding in New Orleans. We also use accounts published during and after the events of that terrible week.

At the time of our interviews, the Louisiana attorney general's office had opened criminal investigations into the deaths of hospital and nursing home patients, once the scale of the tragedy became clear. Some hospital officials were not willing to speak with us, and some spoke only off the record. Some information we obtained in interviews is thus unattributed. Also, one hospital

responded to our questions in writing rather than in an interview. We are grateful to all who shared their experiences with us.

This project was approved by the institutional review board at the Urban Institute. At its suggestion, we obtained a Confidentiality Certificate from NIH to assure that we could not be compelled in any legal proceedings to identify anyone who gave us information.

The Problem

Hurricane Katrina presented New Orleans and its hospitals with the effects of two related but distinctive events. The first was the hurricane itself, which arrived on Monday morning, August 29, 2005, with heavy rain and sustained winds of 120 to 130 mph, with gusts up to 160 mph. Electrical and communications services were disrupted by the destruction of landlines and the toppling of cell phone and radio repeater towers, but hospitals and other large buildings suffered only superficial damage.

For hospitals, the problems created by the storm would have been minor were it not for the second event—the failure Monday night of the levees protecting New Orleans from Lake Pontchartrain and the Mississippi River. By Tuesday morning, large sections of the city were under as much as 15 to 20 feet of water, far exceeding the capacity of the city’s pumping system (which was designed to pump water into the very canals whose walls had been breeched). Evacuation became essential in the flooded areas.

The situation was particularly urgent for the hospitals that lost power, communications, and water/sewerage service, and that couldn’t resupply such essentials as drugs, blood, linens, and food. According to figures assembled by the Louisiana Hospital Association (LHA) during the storm, 1,749 patients occupied the 11 hospitals surrounded by floodwaters.² Many of these beleaguered hospitals received much publicity during the crisis—Charity Hospital, University Hospital, Tulane University Hospital, Veterans’ Affairs Medical Center, Lindy Boggs Medical Center, and Memorial Medical Center.

The LHA’s compilation also showed that these 11 hospitals housed more than 7,600 people in addition to their patients. Some were staff members, but hospitals, like the Superdome and convention center, became refuges for patients’ families and for thousands of others who left their homes. Hospitals also housed pets. Personnel at Lindy Boggs Medical Center dealt with 45

dogs, 15 cats, and a pair of guinea pigs brought in by staff and patients to ride out the storm.³

Conventional modes of transportation were used to evacuate a dozen or so hospitals that were not isolated by water. But evacuation from the 11 flood-bound hospitals posed the most difficult problems, requiring the use of boats or helicopters.

Why Didn't Hospitals Evacuate in Advance?

Hospitals threatened by the approach of Hurricane Katrina faced a dilemma. It was certainly understood that Katrina was an unusually powerful storm with the potential to do terrible damage; but its course was uncertain, and hospitals had survived numerous previous storms. Officials at Charity Hospital said they did not consider evacuation in advance because Charity had always been where nursing homes and other facilities sent patients in major storms.

In advance of the hurricane, many hospitals in the New Orleans area discharged ambulatory and stable patients. One hospital told us that its psychiatric patients were bused to Tennessee on Saturday. Officials at another hospital wanted to evacuate ICU patients in advance of the storm but were unable to find a hospital that would accept them. These hapless patients were then transferred to another local hospital that was subsequently surrounded by floodwater.

But many patients could not simply be discharged in advance of the storm. Some were recovering from surgery or debilitated by disease. Some depended on mechanical assistance to breathe. Demented patients, newborn babies, and others also couldn't be released. Some patients had even come in anticipation of the storm, including those requiring dialysis and those transferred from nursing homes.

Once the mayor gave the evacuation order for the population at large on Saturday—an order that excluded hospitals—exit routes from the city became heavily congested. Moreover, there was no city or state plan for moving hundreds of patients from multiple institutions. Nor were enough vehicles available once it became apparent that New Orleans would be struck. Hospitals did have contractual arrangements for ambulance services in an evacuation, but one hospital official said that when he called on Sunday to move 12 ventilator patients to Lake Charles, he was told that the mayor had taken control of all ambulances and that in any case, the traffic was so bad that they would not likely get back and forth before the storm hit.

An additional practical problem was the need for a destination for the patients. Critically ill patients could not simply be transported north or west. Some hospitals reported that in advance of the storm, they had been unable to find hospitals that were both reasonably close and willing to accept patients from New Orleans, in part because those hospitals did not know how they would be affected by the storm.

But even had advance evacuation been possible, it was not clearly the correct course of action. For patients who were disoriented or on respirators or in traction, for example, evacuation posed enormous logistical challenges, especially because external conditions were harsh. Hospital officials believed that many patients in critical condition would be put at undue risk in a hasty evacuation, particularly considering the expected traffic jams. The patients were thought to be safer where they were.

Moreover, before the storm, it was not clear that evacuation would be necessary; where Hurricane Katrina would make landfall and how New Orleans would be affected was uncertain. The unpredictability of hurricanes was well understood by hospital and governmental officials. A year earlier, New Orleans was threatened by Hurricane Ivan. What the *Times-Picayune* called “mind numbing-congestion” resulted, as more than 600,000 people tried to flee the city in a single day. At its peak, traffic backed up for 30 miles. The hurricane then changed paths, turning east to strike the Alabama-Florida coast. New Orleans was spared. Had hospitals evacuated unnecessarily, any patient deaths would have been criticized harshly.

A Hospital that Evacuated before Katrina

Although none of the New Orleans hospitals evacuated in advance of Hurricane Katrina, St. Charles Parish Hospital in Luling, Louisiana, some 20 miles west of New Orleans, made a different decision. That hospital’s patients were evacuated on Sunday afternoon in advance of the storm.⁴

Hospital officials began to consider advance evacuation on Saturday, even though the hospital had never before evacuated in advance of a hurricane. But the hospital was a single-story building, and Katrina seemed particularly threatening. On Saturday afternoon, the CEO called several hospitals; Desoto Hospital in Mansfield, Louisiana, some 300 miles away, agreed to accept the patients. After a night of planning, the decision was made on Sunday morning to

evacuate the hospital's medical patients using three ambulances (for the six sickest patients) and two wheelchair-accessible school buses that had been outfitted for the parish's medically needy. Two additional school buses transported the psychiatric patients. The nursing and pharmacy staff assembled a week's worth of medicines and supplies, and patient care staff (both physicians and nurses) were organized to accompany the patients.

The buses left at 1:00 p.m. on Sunday; the ambulances did not leave until after 4:00 p.m. because of the complexities in arranging a transfer in Baton Rouge to ambulances that would complete the trip to Mansfield. The buses soon encountered gridlock traffic. The first leg to Morgan City, normally a one-hour trip, took 6 to 7 hours. At 10:00 p.m. the buses stopped at a shelter for the medically needy in Lafayette, 120 miles from Luling. The patients rode out the hurricane there, and some were admitted to a hospital in Lafayette. Others were transported to Mansfield as planned, after the hurricane passed.

Patients who were transported by ambulance had a different experience. With the assistance of an escort from the sheriff's department, the patients reached their destination in Mansfield (320 miles from Luling) at about the same time the bused patients reached Lafayette. The transferred patients remained there for the rest of the week, cared for by personnel transported with them from St. Charles Parish Hospital. That hospital's emergency room reopened late Monday afternoon on emergency power, with ancillary clinical department support (e.g., lab, x-ray, respiratory), but the inpatient units did not admit new patients until full power was restored at the end of the week. At that time, most of the patients who had been evacuated were returned to the hospital.⁵ In retrospect, hospital officials believe that they made the right decision in evacuating before the storm.

Conditions inside Hospitals after Hurricane Katrina

Our interviews and press accounts provide a picture of the terrible conditions faced by medical staff and others trying to care for patients after Hurricane Katrina. Some hospitals were short-staffed; those who made it in worked long shifts in adverse conditions. Patient care became exceedingly difficult as hospitals lost power to operate vital equipment such as lab and x-ray equipment, dialysis machines, and elevators. Temperatures rose above 100 degrees in many institutions (fixed windows were smashed from the inside with furniture at some), toilets backed

up, and essential supplies dwindled. Many hospitals reported struggling to care for ventilator-dependent patients after hospitals lost electricity. One hospital told us of emergency surgery being done by flashlight, with little or no anesthesia.

The most detailed descriptions of conditions during the crisis came from Charity Hospital, the venerable public hospital that was surrounded by waist-deep water. There were accounts of dozens of critically ill patients being carried up and down dark stairwells because the elevators were not working (the ICU was on the 12th floor), hospital personnel using “jerry-rigged ventilators” to “physically breathe” for patients, family members fanning patients for hours in sweltering rooms, workers using buckets or plastic bags as toilets, doctors making rounds by flashlight, personnel unable to check lab values or use electronic devices for IV medications, patients occupying stretchers in the halls, the emergency department moving from the first to the second floor to escape the floodwaters, personnel brushing teeth and feeding each other with IV fluid after food ran out on Wednesday, people sleeping on the roof to escape the heat and stench, bodies being stacked in a stairwell because the basement morgue was both full and inaccessible, and personnel feeling that the hospital had been forgotten after telephones and electronic communication failed.

By Tuesday morning, after flooding put Charity’s generators (which were in the basement) out of commission, it became evident that patients in the ICU had to be evacuated. By Wednesday, *all* patients (more than 350 by the LHA’s count) clearly needed to be evacuated. The process was not completed until the end of the week. Even so, and notwithstanding the terrible conditions described above, only 8 patients at Charity died during the ordeal, mostly ICU patients who, according to the CEO, were expected to die.

Many more deaths were reported at two hospitals owned by Tenet Healthcare Corporation: Memorial Medical Center and Lindy Boggs Medical Center. Nineteen bodies were found at Lindy Boggs and 45 at Memorial, though company officials indicated that 11 had died before the storm. Those deaths became the subject of separate criminal investigations by Louisiana’s attorney general and the New Orleans district attorney,⁶ so information is limited to contemporary press accounts and an interview given by George Saucier, the CEO of Lindy Boggs Medical Center, to Joseph Parker, the president of the Georgia Hospital Association.⁷

By Saucier’s account, Lindy Boggs Medical Center suffered only superficial damage during

the storm. But by that Monday evening, flooding had begun, the hospital's generators had stopped working, water pressure was gone, and all communications with the outside world were severed. When the hospital heard from no one on Tuesday, people began to get nervous.

The hospital lost power in the storm or soon thereafter. Saucier reported that a team of nurses alternated 30-minute shifts to hand-operate the ventilators sustaining four ICU patients; then family members were trained to take over. Dr. Thiagarajan Ramcharan, a transplant surgeon working at Lindy Boggs during the crisis, said in a press account a few days later that patients in the hospice unit were already dying by Tuesday from heat and dehydration, as the temperature in the hospital rose to nearly 100 degrees.⁸ He believed that hospice patients accounted for most of the deaths at Lindy Boggs.

A lack of supplies contributed to the crisis. The hospital ran out of blood for transfusions and had "very little medication besides morphine."⁹ At some point the pharmacy was locked, which Dr. Ramcharan described as standard evacuation procedure. The water supply was also depleted.

The experience at Memorial Medical Center was even grimmer. Between 220 and 300 patients and 1,500 others were stranded.¹⁰ Only fragmentary information is available on conditions in the hospital. The failure of generators and the resulting debilitating heat are undisputed, as is the loss of running water and sewerage.¹¹ But reports about, for instance, whether looters broke into the hospital and whether the hospital had to ration food and water are conflicting. Heroic efforts by hospital personnel were reported,¹² as were allegations that hospital personnel had ended the lives of some patients they believed would not survive the ordeal.¹³

Louisiana's attorney general opened an investigation of the deaths at Memorial by issuing 73 subpoenas in late October and calling for autopsies of all 45 bodies removed from the hospital after the storm.¹⁴ The investigation was continuing as of April 2006, and there have been conflicting reports about Tenet's cooperation. The company claimed that it cooperated fully, but the attorney general charged that a letter from Tenet's assistant general council to advise staff members of their rights if "contacted by a representative of a state or federal agency [or] the media" had a "chilling effect," prompting subpoenas.¹⁵

The two hospitals where so many died shared several characteristics. First, control of both hospitals had changed several times over the previous decade. Both had a long history as religiously affiliated (Baptist and Catholic) before merging in 1994 and being acquired by Tenet

in 1995. Tenet had been operating them as separate institutions for little more than a year when Katrina struck.¹⁶ Second, both hospitals contained entities other than traditional medical/surgical units: Lindy Boggs Medical Center had a hospice unit, and Memorial Medical Center had an 82-bed “long term acute care” unit operated by LifeCare Holdings. Who was responsible for the seriously ill patients in the unit may have been unclear. Although the patients were in a Tenet hospital, the company quickly announced that 24 of the patients who had died were “under the care and supervision of LifeCare Holdings and its staff.”¹⁷

On September 6, LifeCare Holdings issued a press release stating that all patients and staff had been evacuated from its units in three hospitals in the New Orleans area and that, although these hospitals had “contributed approximately 12.5% of [the company’s] consolidated revenue in the previous six months,” the financial impact on the company could not yet be estimated. The deaths of the 24 patients in its unit at Memorial Hospital were not mentioned.

The Evacuation

Options are limited for evacuating patients from hospitals surrounded by floodwater. A few hospitals were accessible by helicopter. To leave other hospitals, patients had to be boated to where ground transportation or a helicopter was available. From there, some patients were transferred directly to another hospital, but many went to triage points on a nearby highway overpass or the Louis Armstrong New Orleans International Airport. The boats, the ambulances, and many of the helicopters could transport only one or two patients at a time, and the round trip could take an hour or more, so the pace of evacuation was excruciatingly slow.

Some stories about the evacuation were almost as disturbing as the events inside the marooned hospitals. The Veterans Affairs (VA) Medical Center and the nearby Tulane University Hospital were relative success stories because they shared a common factor—access to an effective external source of help.

In a published account, critical care nurse Frank Millette described the experience at the VA hospital, which housed 150 patients and about 550 others.¹⁸ By Tuesday morning, the hospital had no running water or air conditioning, temperatures rose well above 100 degrees, and flood damage to the electrical wiring in the basement knocked out the elevators. A distress call to the Veterans Affairs Department in Washington prompted someone to contact the VA Law

Enforcement Training Center in North Little Rock, Arkansas. The center's director, Ron Angel, who had recently returned from Iraq, called upon his colleagues from the Arkansas National Guard. Without higher authorization, 16 national guardsmen and 7 military trucks headed toward New Orleans, arriving at the VA Medical Center at 9:30 Tuesday evening. Putting patients on mattresses in the truck beds for the one-hour trip, the guardsmen began evacuating patients to the airport on Wednesday.¹⁹ The hospital was not completely evacuated until Friday afternoon. Although Millette felt that the hospital had been well taken care of by the federal government,²⁰ elements of the evacuation were clearly ad hoc.

At Tulane University Hospital, officials told us that planning for evacuation began three days before the storm hit. The decision to evacuate was made midafternoon on Tuesday, prompted by the rising waters endangering the generators in the plant facilities area, and by advice from the Louisiana State Office of Emergency Preparedness.²¹

The evacuation from Tulane University Hospital was carried out by helicopters that landed on the roof of its parking garage. Some helicopters were arranged by the hospital through the local company Acadian Ambulance, and some were secured from elsewhere by the hospital's parent organization, HCA (the nation's largest investor-owned hospital company). The company was also instrumental in finding places for patients at other HCA hospitals; the transfer of each patient to a specific hospital was arranged before evacuation. Many other hospitals were not able to make such arrangements.

The evacuation of Tulane University Hospital began on Tuesday and was completed on Friday. It included both 120 patients who had been hospitalized during the storm and another 58 who arrived Sunday evening from the Superdome. Some patients from nearby Charity Hospital were also evacuated from Tulane's roof after they were ferried over by boat. Some controversy ensued over charges that staff from Tulane were evacuated by helicopter before Charity's patients were.²² The facts surrounding this charge are unclear, but it highlights the importance of clear priorities in evacuations.

The evacuation of Tulane University Hospital was not without its challenges. Since elevators were not functioning, patients had to be carried down stairwells to the second floor of the garage, where they were transported on the back of a truck to the roof for evacuation. Some patients required larger helicopters. Two patients had to be moved with 500-pound heart pumps. Two

others were bariatric surgery patients each weighing more than 600 pounds.²³ Some patients had to be accompanied by a nurse. According to Tulane's CEO, none of their patients died during the evacuation, although two patients who had been moved from Charity Hospital to Tulane died during the evacuation.

Notwithstanding this success, Tulane's management told us that its disaster plan, implemented a few days in advance of the storm, was not referred to during the event and was of little help, in part because the hospital's complete inability to communicate was not anticipated. (However, another hospital's CEO told us that their disaster plan's provisions for food, water, medications, security, and physician care all worked.)

Two factors beyond the staff's hard work and competence seem particularly important in the successful evacuation of Tulane University Hospital. First, the hospital was accessible by helicopter. Second, the hospital had external assistance—its parent company, HCA.

However, a parent company was not enough to ensure success in dealing with the crisis presented by Katrina. The two hospitals with the most deaths, Lindy Boggs Medical Center and Memorial Medical Center, were both owned by Tenet, the nation's second-largest hospital company.

The CEO at Lindy Boggs reported that the hospital lost communications systems early in the crisis. On Tuesday, Thomas Jordan, a neighbor who had waded to the hospital to check on conditions, volunteered to wade to the New Orleans Health Department (three hours through thigh-deep water) to carry news of the increasingly desperate situation in the hospital; on his return he expressed doubt that any response would result because the health department itself seemed to be helpless.²⁴

Two boats operated by firemen from Shreveport, Louisiana, arrived at Lindy Boggs Medical Center on Wednesday morning, and the evacuation of the 120 patients began, with patients and families loaded into boats to be ferried a quarter of a mile to a dry berm where they could be airlifted by helicopter. Many patients had been carried down several flights of stairs. Before evacuating patients, doctors had prepared cards for each indicating whether they could walk out on their own ("A") or had medical problems that needed attention ("B"). "C" meant "condition critical"; "C" patients were told by the doctors they would be evacuated first, in accord with hospital policy. But the rescue team brought different priorities, insisting, according to the CEO,

that the city was under martial law and women, children, and the most ambulatory patients had to be evacuated first.²⁵ By day's end, the rescue team was called elsewhere, leaving 30 patients and 80 employees and family members feeling abandoned and worrying that the rescuers might not return.

On Thursday, hospital employees found a boat that they could “borrow” and siphoned gasoline from abandoned cars.²⁶ Late in the morning, the remaining patients and staff were transported to the berm, in hopes that a helicopter would come, and the evacuation of Lindy Boggs was complete, with at least some of the patients transported by helicopter to an overpass on Interstate 10 for triage and further transportation.²⁷

Regarding Memorial Hospital, where so many patients died, the CEO and some health personnel provided details about the evacuation to the *New York Times*.²⁸ By this account, the CEO sought assistance from Tenet's Dallas offices by e-mail on Tuesday, after the telephones failed. Workers successfully cleared an abandoned helicopter pad on top of the hospital's parking garage, and extension cords from the still-functioning generator provided light to guide pilots. Patients had to be passed through to the hospital garage through a hole in a second-floor maintenance room, transported by vehicle to the parking garage, and then carried up three flights of steps to the landing pad. The first two helicopters that sought to land intended to deliver evacuees to the hospital. Some pilots wanted to transport only pregnant women or babies. Boats were also used to ferry patients and 1,800 residents who had taken shelter at the hospital to dry land for further evacuation.

Midday on Wednesday, Memorial's generators failed. On Wednesday evening, with 115 patients still awaiting evacuation, the boats stopped coming. Patients who had been prepared to evacuate had to be brought back in, fed, given fluids, and put onto cots. On Thursday morning, six helicopters chartered by Tenet arrived and the remaining living patients were all evacuated.

At Charity, the most fragile patients—ICU patients—were evacuated first, but press accounts indicate that 28 babies (including 18 in intensive care) were among the last to be evacuated.²⁹ Among the critically ill patients that had to be evacuated were two from the hospital's prison ward. (Disagreement among staff members was reported about whether these prisoners should be evacuated before other, critically ill patients.)³⁰ Many details of Charity's experience in trying to evacuate their patients plus some 1,200 other people come to light in interviews with senior

officials, including these:

- Telephone communication was spotty.
- No single person or agency could be called for help. Hospital personnel said they had to beg agency by agency for help, since agencies were not coordinated.
- Evacuation plans were not useful because of the flooding, and no one had experience arranging for boats and staging areas.
- Personnel initially had difficulty finding places to send patients, though this was relieved by the availability of other public hospitals in the state.
- Hospital personnel did not know the landing coordinates that helicopter pilots requested.
- There were complications moving bedridden patients, as well as patients on oxygen and IV medications, up and down stairways and in boats.
- Spinal boards needed to move patients down stairwells had to be brought from storage in Baton Rouge.
- A truck high enough to deliver the spinal boards through the flood waters was located but it would not fit on the ramp into the hospital, so personnel hot-wired another truck in the parking garage to complete the delivery.
- Personnel had to make arrangements with the state police to allow the truck through.
- Personnel had to figure out what kinds of buses could be used to move patients.
- Personnel had to triage patients by type, destination, and mode of transportation. For example, ICU patients were evacuated to the triage area at the airport. Ninety psychiatric patients were medicated and sent by bus to a psychiatric hospital in Alexandria, Louisiana.
- Erroneous press accounts of gunfire aimed at helicopters made obtaining help more difficult.

Evacuation was a completely different task at institutions that weren't flooded. Children's Hospital, for example, had to evacuate because the water pressure dropped to zero and the air conditioning failed. Patients were evacuated by ambulances, helicopters, and private cars.

Children's Hospital reported no difficulty finding places to transfer patients. In fact, children's hospitals elsewhere offered more help than needed, according to the CEO. Patients were triaged to hospitals (mostly in Kansas and Miami) that had doctors trained to deal with their particular problems. (The Kansas Children's Hospital also flew doctors and nurses to New Orleans.)

Experiences with FEMA and Other Authorities

Several of our interviews with hospital officials, most of whom would talk only off the record, concerned negative experiences with FEMA or the authorities controlling access to the city. One hospital successfully requested supplies from its corporate headquarters, only to have them confiscated by FEMA before they reached the hospital. Authorities turned back ambulances that had been arranged by another hospital. Another interviewee charged FEMA with diverting a shipment of fuel that had been arranged for by a hospital whose generators had run out. After one organization experienced difficulty getting supply trucks into the city, they downloaded a logo from the state police web site and fashioned authorization letters that got the trucks past the police barricades blocking the city. Methodist Hospital reported that supplies sent by its corporate parent were confiscated by FEMA at the airport; thereafter, the company sent food, water, and diesel fuel to Lafayette (130 miles from New Orleans) then had them transported to the hospital by helicopter, while also evacuating some of the most seriously ill patients.³¹

There were also other accounts of negative experiences with FEMA. One official we interviewed reported that FEMA replaced some patients' hospital bracelets with FEMA ID bracelets, which made tracing transferred patients difficult. Another hospital reported that it had called the police, National Guard, and FEMA when alarming rumors about gang looting made staff feel vulnerable; no one came.

Lessons from Hospitals' Experiences in Katrina

Many of the most important lessons of Katrina are not peculiar to hospitals. The congressional and White House reports, for example, emphasize the need for better advance planning, better communications, more rapid deployment of resources, and better coordination.³² The experiences of New Orleans' hospitals affirm these conclusions, and the failure of communication modes exacerbated all the hospitals' other problems. But hospitals (and nursing

homes) present distinctive and difficult challenges in a community-wide disaster. No other facilities house such large concentrations of people who cannot meet their own needs, who may require ongoing life support, and who cannot manage their own evacuation. Yet, officials at several hospitals spoke of feeling abandoned in the wake of Katrina.

Lessons from Hurricane Katrina

The Possibility of Advance Evacuation

In considering the human misery and tragedy in urban hospitals in the wake of Katrina, should hospitals be evacuated in advance of predicted disasters? Future circumstances may well warrant advance evacuation. Yet, the calculus for whether to evacuate is complex, involving the cost and risk of evacuation, the certainty and anticipated severity of the event, and the time available for action.

Certainly, calls for mandatory evacuation of a metropolitan area should not automatically exclude hospitals. (One hospital CEO told us that the mayor's exclusion of hospitals from his evacuation order created "emotional pressure" to stay behind as the city emptied.) At the same time, a general policy of moving hospitalized patients any time the authorities recommend evacuating a metropolitan area seems unwise. Buildings such as hospitals can withstand events that would severely damage or destroy smaller buildings. Moreover, the evacuation of large numbers of severely ill patients will always be difficult, dangerous, and costly in both economic and human terms. When disaster threatens, its severity and location will be uncertain and, when a city's entire population seeks to evacuate, fierce competition will arise for such scarce resources as emergency personnel, vehicles, and highway space. The possibility of adverse consequences for an evacuation that proves unnecessary must also be considered, since transferring fragile patients is difficult and risky.

We described the experience of St. Charles Parish Hospital, which did evacuate in advance of the storm. Except for the handful of patients who were transported by ambulance with a police escort, patients transported by bus (starting from 20 miles west of New Orleans) became ensnared in traffic and rode out the storm in an emergency shelter established for medically needy patients 120 miles from their hospital and adjacent to a full-service hospital. Use of this shelter was coordinated by the St. Charles Parish Emergency Operations Center and the State

Department of Emergency Medical Services. None of this hospital's patients died in the ordeal. In retrospect, hospital personnel believed that evacuation had been the correct decision and regretted not leaving earlier.

Advance evacuation of patients involves complex tradeoffs between certainty about the location and severity of the disaster and the amount of time needed to transport people with challenging needs. Clearly, sirens and lights and police escorts facilitate the process once gridlock has set in. And gridlock seems certain, even when multilane highways are converted to one-way arteries away from the city (the so-called contra-flow scheme used in the pre-Katrina evacuation). Dedicating a lane for people with special needs (e.g., hospital patients) is an idea that deserves consideration, but many practical difficulties would need to be solved.

Thus, even though it is difficult to imagine a more disorderly and dangerous process than the evacuation of hospitals *after* Katrina, it should be assumed for planning purposes that during most catastrophic events, many affected hospitals will not evacuate in advance.

Improved Planning

Hurricane Katrina showed that hospitals' advance planning had been inadequate in several respects. First, planning was left to individual hospitals, though the disaster was areawide. Advance arrangements (e.g., contracting with an ambulance company) may be inadequate if multiple facilities must be evacuated simultaneously. Clearly, hospitals must be a major part of *areawide* disaster and evacuation planning.

Second, disaster plans before Katrina implicitly assumed that hospitals (and other large buildings, such as hotels and office buildings) could withstand a hurricane. The New Orleans emergency preparedness plan, for example, included instructions for nursing homes but nothing for hospitals. Although the assumption that hospitals would not be destroyed proved to be correct, their vulnerability to the secondary consequences of the storm was not anticipated either by governmental officials or by hospitals themselves. (One hospital CEO told us that its disaster plan was not helpful because it did not include evacuation procedures and had no provision for a command center.) Katrina showed that hospitals depend heavily on citywide infrastructure—electrical power, communications, water, security, and transportation—that can be disrupted by an areawide disaster. As described here, it was the combined loss of essential infrastructure and utilities that put hospitals and their patients into such perilous circumstances. Disaster planning

for hospitals must incorporate the possible loss of essential infrastructure.

More particularly, special attention must be devoted in disaster plans to the possibility that hospitals (and other facilities with custodial responsibility for people) will need to evacuate their charges. In locales vulnerable to flooding, this possibility must be considered both in facility design and in contingency planning for evacuation. It is now obvious, for example, that generators should not be vulnerable to predictable contingencies and that plans for refueling should be in place. Indeed, the generators' failure, for reasons that seemed to vary from institution to institution, is one of the most striking and disappointing parts of the post-Katrina experience.

Even with better planning, however, under similar circumstances, some hospitals will likely have to care for at least some patients for several days. During Katrina, in hospitals that lacked power, surgery was done, babies were born, and severely ill patients received care. But hospitals were unprepared for the loss of essential services and shortages of food, water, and supplies. Delivery of supplies stopped before the storm hit. Thereafter, ordinary deliveries were completely disrupted and in some instances, authorities diverted supplies en route. Hospitals are not ordinarily prepared to be self-sufficient for a week. Authorities assisting after a disaster must recognize and accord priority to hospitals' need for supplies.

The Challenges of Evacuating Patients

Hospitals' experiences with evacuation contained important lessons for the future. Among the lessons gleaned from firsthand experience with Katrina are these:

1. Evacuating a hospital is very different from evacuating a similar-sized hotel or apartment building. Many patients have special requirements for both transportation and an appropriate destination. Patients who require artificial life support or who are immobilized (e.g., in traction) pose particular problems. Challenges posed by bariatric surgery patients were mentioned by officials at several hospitals. (One patient was evacuated from a second-story window into a boat.) Some patients panic or become agitated or disoriented.
2. External coordination is essential, as hospital evacuation is logistically complex. Solutions to hospitals' problems cross agency lines and require assets for which there will be competing demands. After Katrina, some hospitals needed supplies or equipment to be able to evacuate patients. Destinations had to be identified and transportation arranged. Hospital officials had

to make these complex arrangements themselves under the most adverse conditions. Some supplies or transportation arranged by hospitals were diverted by authorities for use elsewhere. Clearly, when large numbers of patients must be evacuated—particularly in chaotic situations in which communications have been disrupted—hospital personnel are not well situated to coordinate necessary services.

3. Suitable destinations must be identified for patients who are to be evacuated, particularly those who have critical care needs. Such arrangements could be planned in advance. (One hospital CEO suggested that undamaged hospitals in a disaster-hit region be required to accept evacuated patients.) Before Katrina struck, some hospitals could not find another hospital to accept their patients. At least one hospital stopped evacuating its patients after learning that they were being transported to a triage location with little capacity for patient care. Thereafter, the hospital decided to release patients only on helicopters that would take them to a hospital on the other side of Lake Pontchartrain.
4. Evacuated patients must be accompanied by their medical records. In the post-Katrina evacuation, some patients were separated from their records, so the receiving hospitals did not have vital information about their diagnoses, medical history, medications, and so on, and not all patients could supply it themselves. As use of electronic health records grows, similar circumstances (e.g., the need to evacuate patients from institutions that have lost power) should be considered to insure records are available after evacuation.
5. A system for tracking evacuees is essential, particularly since some patients, including newborns and Alzheimer's patients, were separated from their families. Some patients were transported more than once. Some hospital officials expressed concern that they did not know where their patients had been taken. One hospital CEO told us that three months after the storm, the staff still couldn't locate some patients who had been evacuated.
6. That many patients had family members with them was both a boon and a complication. Family members performed services ranging from fanning patients in the extreme heat to hand-pumping oxygen. But many family members wanted to be evacuated along with their relatives, which complicated the situation. At one hospital, a family member became extremely agitated when her mother was evacuated without her, leading the CEO to fear that a riot might break out.

7. More generally, it must be recognized that in a crisis, hospitals become magnets for people who want to help or who are seeking refuge. The presence of hundreds of extra people created a significant management problem for hospital officials and exacerbated many of the difficulties faced by hospital staff. These people, too, needed food, water, and plumbing facilities. The newcomers were disruptive in some cases and added to the evacuation challenge. Some hospital executives concluded that, if ever again faced with similar circumstances, they would refuse to shelter family and pets. In any event, decisions should be made in advance about how a possible influx of refugees will be handled.
8. Advance agreement is needed among key parties about which patients will be evacuated first. As we have described, several disputes developed over priorities in the days after Katrina. There was disagreement, for example, over whether the sickest patients or those more likely to survive should be evacuated first. There is also a need to decide on the circumstances under which patients (including infants and demented elderly patients) will be separated from attendant family members.
9. A disaster creates special security problems for hospitals. In the wake of Katrina, hospital officials mentioned several security problems, including protecting hospital supplies (e.g., particular drugs), controlling refugees or patients' relatives, and even protecting space in the garage (many people saw hospital garages as places their automobiles might be safe from the storm). From Touro Infirmary, where half the 240 patients were evacuated by ground, buses, cars, and vans left in caravans under police guard for patients' safety.

From the interviews and the published accounts of hospitals' experience after Katrina, we want to draw one final lesson pertaining to institutions responsible for people who cannot take care of themselves. Notwithstanding the unresolved allegations of criminal neglect at several nursing homes and hospitals where multiple deaths occurred, there were countless accounts of staff members and volunteers doing extraordinary things under extremely difficult circumstances. It should be recognized, not taken for granted, that many staff members went to the hospital when the city was ordered evacuated, worked day after day until they were exhausted, and improvised with enormous creativity when equipment failed or supplies were depleted.

Conclusion

The story of New Orleans' hospitals in the days after Hurricane Katrina is a reminder of their vital importance and of the deep sense of responsibility shared by the people who work there. It is a story of both success and failure under unthinkably terrible conditions. Shortcomings in planning can be laid at the feet of almost all the hospitals, but these pale in comparison to the failures of public authorities to understand what flooding would do to hospitals and to respond quickly and effectively to the conditions at hand. But the way hospitals dealt with adversity is a part of the Katrina experience that must be remembered for the future.

Notes

1. This estimate is based on information assembled during the crisis by the Louisiana Hospital Association.
2. This information is from an Excel spreadsheet by the Louisiana Hospital Association, "Hurricane Katrina Evacuation Report," compiled between August 31 and September 2, 2005.
3. Robert Davis. 2005. "Hope Turns to Anguish at Intensive-Care Unit." *USA Today*, September 16.
4. This account is based on a telephone interview with Karen Guillot, St. Charles Parish Hospital's COO, and Denise North, its director of nursing, on April 17, 2006.
5. The exceptions were those who had been admitted to the hospital in Lafayette and several who were transferred to a nursing home in Mansfield.
6. Marsha Schuler. 2006. "State Probes 13 Nursing Homes, 4 Hospitals." *The Advocate* (Baton Rouge, LA), September 29; Kevin Johnson. 2006. "Grand Jury to Probe Hospitals." *USA Today*, January 15.
7. Joseph A. Parker. 2005. "A Story You Probably Haven't Heard." *GHA Today*, XLIX (5), November, p. 11. (A publication of the Georgia Hospital Association.)
8. Davis (2005).
9. Davis (2005).
10. The low number comes from the information compiled by the LHA during the hurricane; the high number comes from a press account two weeks later, based on a national guardsman's report that 270 patients were evacuated. Steve Ritea. 2005. "Hospital Staff Fought to Save Dying Patients; 45 Bodies Protected from Water, Looters." *New Orleans Times-Picayune*, September 13, p. A-06.
11. Sewell Chan and Gardiner Harris. 2005. "Hurricane and Floods Overwhelmed Hospitals." *New York Times*, September 14.
12. Ritea (2005).

13. Manuel Roig-Fraza and Ceci Conolly. 2006. "La. Investigates Allegations of Euthanasia at Hospital." *Washington Post*, October 15, p. A3; Carrie Kahn. 2006. "New Orleans Hospital Staff Discussed Mercy Killings." National Public Radio, February 17. <http://www.npr.org/templates/story/story.php?storyId=5219917>. (Accessed March 15, 2006.)
14. Drew Griffin and Kathleen Johnson. 2005. "Dozens Subpoenaed in Hospital Deaths." CNN.com, October 26.
15. Griffin and Johnson (2005).
16. Tenet Healthcare. 2004. "Tenet Louisiana Announces Split of Memorial Medical Center Campuses." Press release, June 1.
17. Tenet Healthcare. 2005. "Tenet Comments on Search of New Orleans Hospital Campus." Press release, October 2.
18. Penelope McClenny. 2005. "VA Medical Center 'Was the Lucky One'." *Mobile (AL) Register*, September 26.
19. Fifteen critically ill patients were reportedly transported to a heliport at the Superdome from where they were evacuated Tuesday. Another 55 people were evacuated by the same route on Thursday.
20. He said, "We were lucky in that we were under the wing of the federal government."
21. This was the only hospital official we interviewed who mentioned this agency as part of the decision to evacuate.
22. Todd Sloan. 2005. "The Real Lessons of New Orleans." *Modern Healthcare*, September 26, p. 22.
23. Officials at another hospital told of the staff using sheets to carry five patients who each weighed more than 500 pounds up stairs to their hospital's roof for evacuation by helicopter.
24. Doug MacCash. 2005. "Bootless Paramedic Wades Miles to Give Generator to Hospital." *New Orleans Times-Picayune*, September 26, p. B1. Jordan subsequently brought a generator from his home to the hospital, whose generators had all failed.
25. Parker (2005).
26. Davis (2005).
27. Tony Plohetski. 2005. "Austin Medics See 30 Victims an Hour." *Austin (TX) American-Statesman*, September 2, p. A1.
28. Chan and Harris (2005).
29. Chan and Harris (2005).
30. "Mayhem Hampering Hospital Evacuations." CNN.com, August 31, 2005.
31. Bob Herbert. 2005. "Sick and Abandoned." *New York Times*, September 15.
32. Select Bipartisan Committee. 2006. *A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*. Washington, DC: U.S. Government Printing Office; The White House. 2006. *The Federal Response to Hurricane Katrina: Lessons Learned*. Washington, DC: The White House.

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