The Katrina Experience

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New Orleans was originally settled on a sliver of natural high ground, close to the Mississippi River. Once the original footprint was expanded to include surrounding marshland and low country, the city became vulnerable to flooding. The otherwise-convenient location, as the gateway to Middle America, seemed worth the risk. In the twentieth century, the city continued to expand, and by the late twentieth century, the city had developed all of the available land and was now bordered by Lake Borgne, Lake Pontchartrain and the Mississippi River. The majority of residents now lived in homes located below sea level.

This vulnerability was exposed in 1965, when Hurricane Betsy struck. It quickly became apparent to city, state and national leaders that additional levees must be built to prevent flooding. Massive flooding in 1995, due to heavy rain, exposed the ineptitude of the pumping stations, which prompted pumping capacity upgrades. Even though these improvements were made, residents felt more was needed. The previous failures, coupled with significant erosion of the citys' surrounding coastland and marshland, which had provided buffer from storms in the past, left New Orleanians fearful of any storm creating tidal surge. This presentation will outline the critical elements of a hospital disaster plan, chronicle the Tulane Hospital Katrina experience and describe lessons learned from the storm.

Preparedness starts well before the Hurricane season, which runs from June 1st until November 30th. Although different from response, a "culture" of preparedness saves lives and lessens a community's economic loss when response is needed. For a hospital, the level of commitment is different. They are usually exempt from evacuations and "shelter" in place. They are left with the daunting task of remaining self-sufficient regardless of circumstances.

Hospitals must:

- maintain communication both throughout the hospital and with outside sources
- provide adequate water and power supplies
- shelter staff and patients from the elements
- supply adequate resources to deliver and sustain care for hospital's patients and those who may arrive later in a secure environment.

On August 26, 2005, Hurricane Katrina entered the Gulf of Mexico. A hurricane watch was issued for southern Louisiana triggering an immediate chain of events for Tulane Hospital. This included establishing a hospital command center, broadening communication capability with the arrival of satellite phones, and bringing in generators,

food, water and medical supplies from a nearby HCA distribution center. Patients were discharged, and, if possible, transferred to hospitals in the region. Essential personnel call lists and responsibilities were initiated.

Shelter for family members of essential workers was the first unexpected problem encountered. Due to lack of transportation or economic means, many essential workers were unable to evacuate family members. The hospital secured a 'block" of rooms at an adjacent hotel for these individuals. This allowed higher elevation than most experienced in their neighborhoods, thus vertically evacuating from potential flooding. A "vertical evacuation" was popular with locals frustrated with the financial and lengthy commitment experienced in previous hurricane evacuations.

At 7 A.M., Central Daylight Time on Sunday, August 28, 2005, Hurricane Katrina was upgraded to a Category 5 hurricane, the highest category on the Saffir-Simpson Hurricane Scale. Later that morning, the Mayor of New Orleans called for an emergency evacuation of the city, excluding health care facilities. Historically, hospitals in the New Orleans Central Business District were the destination of choice for local patients during hurricane evacuations. These hospitals were now faced with rising flood waters, limited supplies, loss of communication, loss of power, and loss of traditional "ground" evacuation capability. Even more difficult for the hospital staff and administrators, was the thought that they must be rescued.

The "eye" of the storm was predicted to pass just east of New Orleans. Many locals were unable to evacuate the city, so the New Orleans Superdome and Convention centers were opened as shelters. Due to limited resources, they were struggling to care for multiple individuals with advanced disease states. A Department of Health and Human Services representative visited Tulane University Hospital and asked if we could care for these individuals. By early afternoon, 58 patients and their family members were transferred to our facility. With our hospital hurricane plans in place, we went to bed Sunday night confident in our preparedness.

On Monday, August 29, 2005, Hurricane Katrina made landfall on the coast of Louisiana with sustained winds of 130 mph as a Category 3 hurricane. While wind speeds dissipated before landfall, it still retained the tidal surge of a category 5 storm and cut a land path over two hundred miles wide. The wave of water twenty to twenty-five feet high eventually broke down the levees surrounding New Orleans and inundated the majority of Orleans Parish. As a consequence, over 1,300 lives were lost and tremendous damage was inflicted on the infrastructure of the city.

We awoke early Monday morning to tropical-strength winds and rain as Hurricane Katrina made landfall on the Louisiana coast. By early afternoon, the storm had passed through the New Orleans area. A group inspected the perimeter of the buildings and reported no major structural damage or street flooding. Although we had experienced sustained winds of 130 mph and were on generator power, we felt we had "dodged a bullet." We had our afternoon staff meeting and talked briefly about accepting transfer patients if local hospitals needed help.

Later that night, as water began seeping into the first floor emergency room, it was apparent that communication with outside resources was becoming less reliable. Water was now rising an inch every five minutes, with no signs of slowing. As we eventually learned, the levees had failed and water from Lake Pontchartrain was quickly flooding Orleans Parish. By Tuesday morning, August 30th, the rate of rising water slowed, but we were now an island with surrounding water depths of five to eight feet. Communication now consisted of sporadic cell phone use and two phone land lines. At our morning staff meeting, we decided to start evacuation via helicopter. After speaking with HCA headquarters, helicopter services were contracted and accepting hospitals located. The hospital had existed for years without a helicopter pad, but after removing light poles from the top floor of the parking garage, a landing surface was now available. The first ICU patients were evacuated by early evening.

Wednesday, August 31st, brought larger helicopters, which accelerated the evacuation of ICU patients. Also, officers from the Department of Wildlife and Fisheries arrived with multiple boats. With generator fuel almost exhausted and plumping facilities no longer functioning, we were relieved when the last patient was evacuated by late afternoon. However, within two hours, we received word from Charity hospital that help was needed evacuating their ICU patients. These patients were brought over by boats and evacuated by helicopter. As Wednesday came to a close, staff and family members' morale was low. Even though larger helicopters had arrived, we still had twelve hundred people to evacuate.

Having been told on Tuesday that higher-capacity Chinook helicopters were coming, morale was lifted as the first Chinook finally landed, Thursday morning, the first of September. These helicopters could evacuate 50-60 people at a time. With Blackhawk and Chinook helicopters landing and taking off at once, we were quickly able to evacuate the remaining Charity ICU patients and a significant percentage of Tulane staff and family members. By noon on Friday we had completed our evacuation.

Our staff and family members were evacuated to Armstrong Airport. An airplane hanger stocked with food and water was used as a temporary shelter. Later, buses arrived and transported to a HCA hospital in Lafayette. In Lafayette, a temporary dormitory housed all evacuees until they established a destination. Once established, HCA provided funding for the purchase of an airline ticket.

Lessons learned:

Communication: The need to communicate with the outside world before, during and after a disaster occurs, cannot be overstated. Tulane University Hospital, like all local hospitals, was unprepared for total loss of cellular, digital and analog phone services. Days before the storm, we acquired satellite phones, but they never functioned after the storm. Radio communication capability, not in place before the storm, took days to establish after the storm. Luckily, our hospital had functioning telephone "land" lines which allowed communication with the corporate headquarters in Nashville. The ability to privately contract with helicopter companies allowed evacuation of these patients by Wednesday; however, limited local communication sources made the coordination of this task extremely challenging.

Evacuation plan: The inability to evacuate patients before the storm and reduce the essential personnel numbers added unneeded difficulty to our evacuation. Over 1200 people were evacuated from Tulane Hospital. The hospital, like the Superdome and Convention Center, became a refuge for patients, staff members, essential workers, their family members and pets. Making a family or personal evacuation plan requires transportation and financial resources. People without these assets were overwhelmed and some, with financial ability, did not want to spend countless hours evacuating. Both groups vertically evacuated to the medical school, hospital or local hotels.

After the mandatory evacuation for Orleans Parish was issued by the Mayor, many hospitals tried to evacuate patients, but it was too late. Local ambulance services were already contracted to the city of New Orleans or other nearby municipalities, so shelter-in-place became the reality for these hospitals. This would foreshadow the fierce competition for rescue resources and the need for hospital self sufficiency. Although our hospital started discharging or transferring patients to regional HCA hospitals three days before the mandatory evacuation was ordered, we still had 120 patients and 58 patients from the Superdome who needed evacuation after the storm.

Sustainable power: Hospitals cannot be effective without reliable power. Our facility had five generators, unfortunately, located in the non-waterproofed basement of the hospital. HCA brought in an additional generator a few days before the storm and positioned it on the street next to the hospital. As water within the hospital and surrounding streets rose, it was evident that the existing basement generators would be lost and the generator on the street, if still functional, would be impossible to refuel. Without electricity, patients had to be transported down darkened stairwells and ventilated by hand.

Water and Sewage: Hospitals need a self-contained, reliable water supply. The ability to continue using critical medical equipment is essential to patient care. Tulane University Hospital was entirely dependent on the city water supply. While there was abundance of bottled water, without a self-sufficient water source for the hospital plumbing, the simple personal hygiene needs of patients and staff were not possible. Two area hospitals with on-site wells were able to avoid these issues.

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