

Tropical Storm Allison: The Houston Flood Of June 9th, 2001

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Abstract

On Tuesday, June 5, 2001, the Southeast Texas region was placed on alert by the Federal Emergency management Association (FEMA) of Southeast Texas and the National Weather Service to prepare for heavy rains and potential flooding as a result of Tropical Storm Allison. During the afternoon of June 6, 2001, Tropical Storm Allison reached land, resulting in approximately twenty inches of rain in the greater Houston area. For the 24 hour time span ending Saturday, June 9 at 3:00AM, approximately 17 inches of rain fell on the Texas Medical Center. On the night of June 9th, the rain created flooding. While floodwaters rose during the night at Memorial Hermann Hospital (MHH) and Memorial Hermann Children's Hospital (MHCH) (picture 1), patient care continued until at approximately 3:00AM when all electrical systems were submerged in water and the power to all buildings stopped. This internal disaster created an unusual situation for a Level One Trauma Center that is accustomed to dealing with disasters of an external nature. With extensive flooding around the Texas Medical Center, it was impossible for physicians and staff to make it to the Hospital via ground transport until approximately 9 AM Saturday morning. The patients in the Hospital became the focus of concern. Doctors, nurses and other clinical and non-clinical staff that were there that night focused on the needs of patients, while administrators and engineers rallied to determine the extent of the damage and estimate the time until power could be restored.

Figure 1

Picture 1. Partial view of the Texas Medical Center. Memorial Hermann Hospital (left lower corner)



THE COMMAND CENTER

By 8:30AM Saturday morning a Command Center (CC) was established in the Emergency Department to facilitate communication and act as a clearinghouse for the transfer of patients. It took several hours for the Corporate Communications Department to assess the state of the internal telephone system and set up a bank of telephones using external phone lines. The CC became the central hub of activity and was coordinated by our CFO, Barrie Strickland. The CC first job was to develop an accurate list of all of the patients and their location in the hospital. The CC team developed a list of hospitals in the surrounding community that would accept patients from Memorial Hermann. A large white board was used to identify the hospital, the number and type of beds they had available. This list included whether the receiving hospital needed patient care staff and equipment. In most cases they had beds but needed our staff to care for the patient.

During the first 48 hours team leaders returned to the CC

frequently to discuss issues and make plans. There were many times I did not know the names of the individuals manning the phones. I recall one time asking a person about their work, sans the flood, and the person stated, 'I'm a unit secretary'. I later found out that this person was a doctor. Everyone was performing whatever job needed to be done; no questions asked, no complaints.

The patient care units in the hospital communicated with the CC by courier or by cell phones owned by the staff. Each of the units had emergency phones that were connected to outside lines (red phones). Many of the units had never used the red phones and it took some time for them to become functional. One of the lessons learned was that the Hospital needed to maintain a list of all of the phone numbers for these phones and that we should include their use in our mock disaster drills.

MEDICAL TRIAGE TEAMS

Medical Teams triaged patients and created a list of patients for transfer. Two teams were developed one for the adult patients and the other for pediatric patients. The Adult team consisted of a trauma surgeon and the Medical Director of Shock Trauma Intensive Care Unit (STICU) Dr. Christine Cocanour, and Janine Mazabob, RN, Director of Neuro Surgical Services. Dr. Cocanour made rounds on all of the adult ICU units to discuss with the doctors and nurses the status of the patients. The unstable patients were transferred first. The patient would be brought to the Emergency Department from the unit and transferred by ground or helicopter transport. The three helicopters owned and operated by Memorial Hermann Hospital, as well as, military helicopters from the National Guard and U.S. Coastguard accomplished air transport. The Director of Life Flight and Emergency Services, Tom Flanagan coordinated the transport system.

INTERNAL TRANSPORT TEAM

The Assistant Vice-President of Operations, Amir Rubin, put together groups of people to transport everything; patients, supplies, food, water and equipment. They gathered outside of the ER and collected supplies to aid them in their work, such as backboards and flashlights. These teams performed some of the most heroic acts. The work was physically taxing and tricky. Patients were carried down several flights of stairs on backboards to the Emergency Department where they were prepared for transfer. Flashlights were the only means of lighting the way while clinical staff managed IV's and bagged patients dependent on ventilators. These teams

also transported food and water up multiple flights of dark stairs to staff and patients. Patient care equipment (IV infusers and ventilators) as well as pharmaceuticals required manual transport through the long hallways and up stairs. When volunteers arrived on the scene, many became transporters. The volunteers included Boy Scouts, local residents and physicians. It was amazing how the teams developed processes, independently. These teams worked together making decisions and moving patients to almost flawlessly evacuate some 406 patients, over a period of thirty hours, over one hundred were from critical care units. Miraculously, no one was hurt.

THE CHIEF EXECUTIVE OFFICER'S ROLE

The President and Chief Executive Officer, James Eastham, took on a very special role of communicating with the Memorial Hermann Healthcare System and the news media. He brought information in and took information out, always keeping the patients and staff in his decisions and communication. He was to become the staffs pride and determination. His leadership was unparalleled.

THE MEMORIAL HERMANN HEALTHCARE SYSTEM

The Memorial Hermann Healthcare System played an essential role during the initial phase of evacuation. The System hospitals were the first to respond when we requested beds. These sister hospitals did everything in their power to help and support us. The corporate Departments were there on the scene early to bring in the manpower and expertise to move quickly and decisively. The role of corporate services became vital as the days turned into weeks. The system staff worked during the first hours of the evacuation providing solutions to telephone communications with outside lines and cellular phones. Marshal Hines, our Vice President for Construction, Engineering and Support Services, was on the phone at 4:00AM Saturday morning calling in experts from all over the country to help us assess the damage and provide for alternative sources of power. The engineering staff was on the scene by early morning implementing short term plans to provide power to the CC and on a larger scale to estimate time of recovery. By early afternoon, our experts determined that the flood had created such damage that power, even partial power, would not be available for several days. That information led to a decision by the Chief Executive Officer that total evacuation of the patients would be required.

TEAMWORK

The teams worked together for 30 hours straight. I have never in my life felt such focused dedication to a single goal by so many people. The strength of the Memorial Hermann Healthcare System was evident not only during the first days but for the weeks to come. If the Hospital had not had the support of a strong System we could not have moved patients as quickly or regained our facility. The Memorial Hermann System showed it's true characteristics during the disaster. The leadership, skill and support were always there from the first hours until July 17th 2001 when we reopened the Hospital.

THE DAMAGE TO THE HOSPITAL

The floodwater that filled the lower two levels of Memorial Hermann Hospital and Memorial Hermann Children's Hospital caused extensive damage and loss. The Hospital lost use of telephone, ventilation, air conditioning, heating, water, flood and fire protection and information systems. Specific departments and equipment that were destroyed include:

- Pathology laboratory
- Clinical Pharmacy
- Cardiac Catheterization laboratory
- Gamma Knife and MEG
- Central Supply
- Biomed
- Physical Therapy

The Hospital experienced 38 feet of flooding, which estimates out to 42 million gallons of water. It took four days to pump the water out so that clean up could begin.

IMPORTANT ISSUES IN DISASTER PLANNING

1. Teamwork within the organization is vital in the management of significant catastrophic events. Leaders must possess the ability to prioritize quickly and implement decisively.

2. A ready supply of the following items should be maintained:

- Fully charged hand-held radios
- Cellular phones
- Oxygen powered aspirators, ventilators, and suction machines
- Flashlights
- Backboards
- Keys to the Pyxis machines
- Back up batteries for the ventilators.

3. Each manager, director and administrator should maintain a current copy of the disaster manual and the emergency phone list at home and the office.

4. Only services that are not critical to patient care should be located in the lower levels of the Hospital.

References

Author Information

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