

No-Notice Health Care Facility Water Loss: HCA Houston Healthcare Tomball's Experience

In March 2021, ASPR TRACIE met with health care subject matter experts (SMEs) from HCA Healthcare and Medxcel who weathered Winter Storm Uri in the State of Texas one month prior. The storm brought about sub-zero temperatures and caused extended losses of power and water to over 4.3 million residents, in structures built to repel rather than hold heat. In March 2023, Jake Marshall (Senior Director of Enterprise Emergency Operations, HCA Healthcare) and Toni Carnie, Safety Officer and Emergency Management Coordinator (HCA Houston Healthcare Tomball) shared their lessons learned as part of an ASPR TRACIE Speaker Series from the event from one facility's perspective and how they have incorporated them as their system continues to recover.

Planning Assumptions and Realities (Jake Marshall)

Jake Marshall provided a summary of HCA, their scope (over 270,000 employees and affiliates working in 182 hospitals in 23 states), core priorities, and incident management structure. Next, he shared some operational assumptions, realities, and planning considerations specific to water outages:

Assumptions	Realities and Planning Considerations		
No-notice water outages are a high probability incident in many areas.			
Impacts from severe weather frequently cause community infrastructure impacts, including to municipal water systems.	 Cannot rely on traditional partnerships with public safety for emergency water resupply; they may not have access to it either. Community water stations may not be hardened against damage – may cause prolonged outages. Water supplies may have to be brought from outside of the region or state. Vendors should have plans that are exercised. 		
All U.S. health care facilities are required to have a plan for water sustainability. Without municipal water pressure, few can operate 96 hours without resupply by a vendor.	 Plans must include support to staff and their families over a prolonged period of community-wide outage. 		



Health care facility operations (e.g., hemodialysis, sterilization of supplies and lab equipment, HVAC, laundry) require significant supplies of water to maintain continuous clinical operations. Drinking water is another significant need for health care facilities.

- Hospitals should always be on a prioritized restoration list for water services, but consider other critical locations (e.g., free-standing emergency rooms and dialysis centers).
- Work with health care coalitions to harden community hemodialysis capability against prolonged water loss event.
- Evaluate the ability to install deep water wells.

A Tale of No Pressure (Toni Carnie)

HCA Houston Healthcare (HCA HH) Tomball is a designated Level III trauma center, a primary stroke center, has 350 licensed beds, and is located on a 150-acre campus. It also has a Level II neonatal intensive care unit, an ambulatory surgery center, a women's center, an MRI facility, and two free-standing emergency departments (EDs). In 2021, emergency management staff conducted a hazard vulnerability analysis and determined that their top six hazards included HVAC failure (listed first), other utility failures (third), and water contamination (sixth).

On February 9, 2021, almost a full week before the storm, employees were encouraged to begin preparing their loved ones and homes while facility staff began work to ensure continuity of operations. We expected infrastructure impacts similar to a Category 5 hurricane but did not know at the time that Uri would be one of the most impactful and costly winter events in recent history that brought multiday road closures, power outages, loss of heat and water, broken pipes, and other societal impacts for the region.

Figure 1: Timeline of events in Houston, February 11-20, 2021

Source: https://www.weather.gov/hgx/2021ValentineStorm





We encouraged our employees to access our emergency preparedness SharePoint site which includes a playbook on building a kit, preparing homes, and protecting people, pets, pipes, and plants. We reminded staff to stay informed regarding forecasts, road conditions, and power outages. Emergency management staff activated our winter weather playbook 120 hours out from the anticipated winter storm.

HCA HH Tomball's 120-24 Hour Winter Weather Playbook

120-72 Hours Prior	48 Hours Prior	24 Hours Prior
 Establish incident battle rhythm. Create CodeReady incident (HCA's emergency incident platform). Activate Safety/Liaison Officer to monitor weather and provide daily updates. Verify response equipment and resources: Patient/staff food Potable water Generator status/fuel, etc. Review infrastructure checklist. Establish shelter-in-place lodging. 	 Communicate command structure to all staff with point of contact for resource requests. Communicate weather briefing and incident action plan with all staff. Verify off-site sheltering options. Update emergency management hotline for EOP activation levels/incident phases 	 Finalize winter weather response planning and objectives. Verify all facility vehicles are fueled. Identify employee assistance liaison. Cancel all non-emergent procedures. Discharge patients without parameters. Instruct non-essential staff to stay home. Gather community "at-risk" population surge data.

The Incident and Response

3

On Sunday, February 14, the entire state was under a winter storm warning, and we restricted access to the facility at 7:00 PM. We housed approximately 40 employees at a nearby hotel, where the back-up generator failed early February 14. We had to relocate them to our main campus housing, all while being mindful of COVID-19 space restrictions. Shortly thereafter, as our patient census increased, we needed 10 of the patient rooms we were using for housing; we relocated 20 employees. Overall, we provided lodging for an average of 226 employees per day over a four-day period (2/14-2/17). By the 18th, only 8 employees requested lodging.

Things worsened on the 15th; Magnolia (one of our free-standing emergency rooms) lost power, then water pressure, then we closed it. That afternoon, the Tomball hospital campus lost water pressure, pumps failed, and the pump that was supposed to deliver the backup water from the well also failed. The entire city lost water pressure shortly thereafter.

As pipes continued to burst, we became concerned about our fire suppression systems, so later that evening, we trained staff who were not providing direct patient care (including our chief operating officer) in our fire watch procedures, and they conducted hourly checks of fire suppression capabilities on every inch of our campus and off-site facilities.

Related ASPR TRACIE Resources

<u>Crisis in Mississippi: The Emergency</u> <u>Management and Hospital Response</u> to the City of Jackson's Water Outage

Going with No Flow: Coping with Hospital Water Supply Issues

Managing the Storm After the Storm: Healthcare in TX Recovers from Severe Winter Weather

<u>Sudden Water Loss and Actionable</u> <u>Considerations</u> (the PowerPoint recording of this session)

Utility Failures Topic Collection

Tuesday, February 16th brought additional challenges. We requested additional non-potable water for our fire suppression lines, as water pressure was significantly weak on the upper levels of our ten-story tower. Tanker trucks delivered the water early that afternoon, but our fire suppression system had completely failed by then.



That afternoon, a chilled copper water coil froze, failed, and flooded the laboratory (which had just been renovated), the wound care unit, and the adjacent corridor. A few minutes later, the fire suppression pipe burst at the entrance and flooded the administrative area and its corridor, followed by a fire sprinkler failure that flooded the post-anesthesia care unit. Additional failures led to the flooding of the catheterization lab and offices and the loss of air conditioning in the rehabilitation unit. CyFair (one of our free-standing EDs) was able to return to normal operations and discharge patients they had been boarding for various reasons through the storm.

On Wednesday, February 17th, we were able to safely permit a change in staffing to relieve those who stayed throughout the storm, but as lines began to thaw, pressure caused pipes to continue to fail throughout the building.

Recovery

The recovery process overlapped the response, but our goal was to reopen and be functional as soon as possible. Thursday, February 18th, we repaired one cooling tower supply line, but the other tower's line had frozen and broken, affecting multiple units. We did not have toileting available in patient rooms from 2/15-2/19 due to lack of water pressure and the sewer system being unable to handle that much waste. We used bucket brigades and established a task force to maintain rounding and remove red-bagged toilet waste and take it to our central accumulation area. We knew our staff needed assistance, and HCA activated their Hope Fund to help employees with temporary disaster-related needs.

Friday, the city's water pressure was completely restored, and our hospital went off internal disaster and released the water tankers. We continued to experience failures and flooding, and due to the boil-water notice, we still did not have access to potable water. The Magnolia free-standing ED has a different water service provider than the main campus and had power and used bottled water until the lines were flushed.

Systemwide, more than 300 employees reported significant damage to their homes. We set up a food pantry for staff that included grab-and-go family-sized meals, fresh produce, bottled water, and basic household staples. We also provided some heat-and-eat meals and staff were had access to warm these at the hospital and take them home; this alleviated a lot of stress for our employees.

Recovery continued over the next week, as it took nearly ten days before all boil-water advisories were lifted throughout the HCA HH Tomball system. In the meantime, we only distributed and used bottled water. We developed a plan to completely flush every line from the top down, then replaced ice machine filters by February 25th and coffee machine filters by March 3rd. The HCA Healthcare Hope Fund provided employees with financial assistance for losses and needs related to:

- Temporary Housing Up to five days of immediate temporary housing assistance if home is unsafe or power outage duration is significant.
- Food Up to five days of food per person when home is damaged, or an employee is displaced from their home. May be extended depending on need.
- Repairs/Deductibles Disaster damage to home, contents and primary vehicle not covered by insurance.





The HVAC systems presented another challenge; 13 out of 52 were heavily impacted and we had to install temporary units, complete with big yellow lines staged outside the perimeter of the facility feeding and maintaining temperatures throughout the hospital until the units were replaced.

I also contacted the Functional and Access Needs Coordinator with Harris County Office of Homeland Security & Emergency Management; she provided the registered counts of residents who met those criteria who lived near our facility. Being more familiar with our community's residents helps us plan more effectively to meet their medical needs during weather-related events.



4

After Action Survey and Report

After we shifted to recovery, conducted our hotwash, and resumed "normal operations," we conducted our usual anonymous survey of staff to determine:

- How clearly our winter weather event objectives were communicated
- Overall satisfaction with the facility response
- · Whether the event tested our emergency operations planning and hospital response capabilities
- · Whether the event helped us understand expectations for events with notice
- · If the event strengthened facility information sharing and response capabilities
- If patient and staff safety was a priority throughout the response.

Overall, staff expressed satisfaction with how the response transpired. As an organization, HCA HH Tomball noted the following strengths and opportunities for improvement and the type and status of related corrective action:

	Strengths	Opportunities for Improvement	Corrective Action(s) Taken
Communications	HCC provided thorough communication with experienced and knowledgeable team member involvement. Established relationships with community leaders helped our facility obtain real time information for city capabilities for improved decision making.	Hospital command center set up was delayed until 2/16/21 even though the EOP was activated @ 7:00 PM on 2/14/2021.	 Completed senior leader training 5/20/2021. Ongoing education (FEMA ICS/NIMS 100, 200, 700, 800) provided to senior leaders, department directors, and front-line managers. Hospital Command Center (HCC) activation training now included in each functional and full-scale exercise to reinforce learning.
Resources and Assets	Ability to acquire additional equipment for patient care (e.g., ventilators, personal protective equipment). Cots were readily available.	Alternative needed for bathing when water is not available; potable water storage capacity was inadequate.	 Completed cost and identified product 5/20/2021. EM supply room cache stocked 11/17/2021.
Safety and Security	Zero patients and zero employees were harmed. Screening stations were maintained due to COVID protocols. Interim life safety measures and safety policies hardwired expedited implementation.	Safety officer and emergency management coordinator should not be assigned additional duties during an activation.	 Completed senior leader training 5/20/2021. Ongoing education (FEMA ICS/NIMS 100, 200, 700, 800) provided to senior leaders, department directors, and front-line managers. HCC activation training included in each functional and full-scale exercise to reinforce learning.



Staff Roles and Responsibilities	Plant operations team knowledge with tenured employees.	New employees not as familiar with ride-out/recovery team processes and activation.	 Sr. leader presented training to all leaders on 05/25/2021. Department leaders/ managers included in departmental onboarding and huddles. Department leaders may have employee sign attestation that they understand to which response team they are assigned.
Utilities Management	Adaptability to unforeseen events during multiple utility failures. Emergency process developed to use water from physical chiller plant of facility to maintain boiler heating and life safety continuity during prolonged period of water loss.	 Old tower mechanical drawings were not readily available for Plant 1. City domestic water supply bob valve failed. Non-potable water placed in fire suppression lines did not have adequate pressure for 10-story tower. 	 Worked with vendor to revise/update drawings. Completed 7/28/2021.
Clinical and Support Activities	Lab department developed alternative testing capabilities during water loss and damage equipment.	 Unnecessarily relocated in-patient rehabilitation unit based on assumption that the air handling unit that served the location failed (a switch had been flipped). Needed clearer process guidelines for dialysis patient care during a water crisis. 	 To verify equipment failure issue, we added "Freeze Stat" sensors to the winter weather infrastructure checklist 11/17/2021. Facilities management added dialysis information to our water safety management plan 5/20/2021.

Conclusion (Jake Marshall)

6

There are two key takeaways from this incident. Historically, health care emergency operations have done a fantastic job mitigating and preparing against known threat events common to our respective regions – hurricanes in Texas and Florida, wildfires in the West, and the like. But those once in 500-year events aren't just occurring more frequently, their geographic spread is much greater than ever before. We must transition not just our own mindsets, but those of our organizations' executive leaders, from the 'it'll never happen here" perspective to a more proactive and comprehensive readiness mindset. In a year where we've seen blizzard warnings in Santa Barbara and extremely deadly early season tornado's elsewhere, we owe it to our patients and our people to think beyond where we are today.

Secondly, in these no-notice community-wide incidents we are not responding alone. The relationships we foster with our peers in the health care sector, public safety, transportation, energy, and all our other critical infrastructure partners are mission critical. Success in any prolonged community incident takes all partners working in sync. We have a duty to make sure we are in the best position possible to continue to serve our patients, our communities, and our partners. No matter the threat we face, we are stronger together.

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