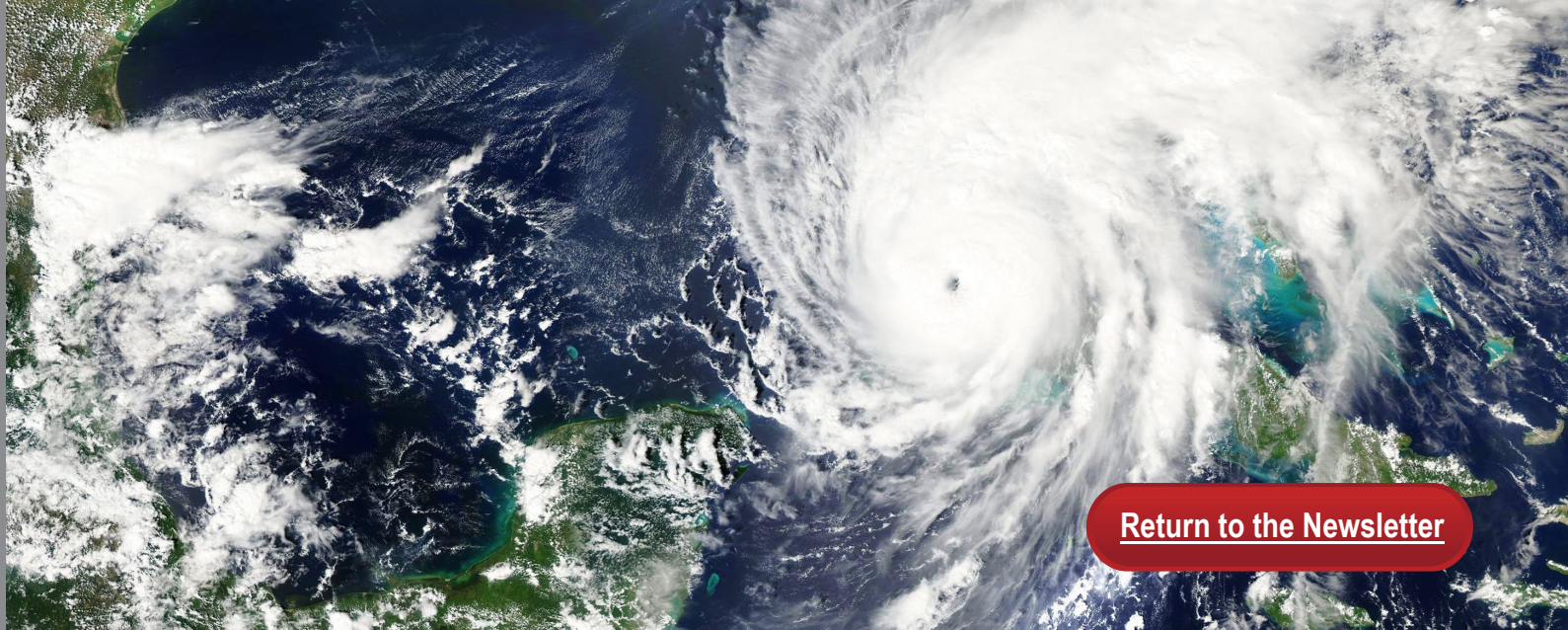




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The Hurricane Ian Experience at Lee Health: Wreckage, Resilience, and Recovery

More than 150 direct and indirect deaths and over \$112 billion in damage have been attributed to 2022's Hurricane Ian, which made landfall in southwestern Florida as a Category 4 storm ([National Oceanic and Atmospheric Administration and National Weather Service, 2023](#)).¹ Dave Kistel (Vice President and Chief Facilities Executive at Lee Health) met with ASPR TRACIE and described how the hospital system prepared for, responded to, and recovered from Hurricane Ian, which caused \$12 million in damage to Lee Health facilities.

Research suggests that climate change is causing hurricanes to move slower and remain destructive for longer (e.g., [Knutson, 2023](#)). Hurricane Ian was a very slow-moving storm, which increased its impact. The barrier islands (Captiva, Pine, and Sanibel islands) experienced 10-15 feet of storm surge and more than 150 lives were lost ([Rabb, 2023](#)). Nearly 2.7 million people lost power ([National Air and Space Administration, n.d.](#)), and more than 10% of the state's cellphone towers were out of service (60% of those towers were located in Lee, Hardee, Henry, and Charlotte Counties) ([Collier, 2022](#)).

Lee Health Prepares for the Storm

Lee Health is comprised of four acute care hospitals and two specialty hospitals with a total of 1,865 beds, 4.4 million square feet of physical plant, one nursing home, and over 100 outpatient/physician office sites. The State of Florida has incorporated a lot of lessons learned since Hurricane Andrew in 1992, a few years after I started working at Lee Health. Our system now goes through a thorough checklist before, during, and after a storm.

Related Resources

[Global Warming and Hurricanes](#)

[Internet Access Down Across Florida Areas Hit by Hurricane Ian](#)

[National Hurricane Center Tropical Cyclone Report: Hurricane Ian](#)

[NHC Report Ranks Ian as Costliest Florida Hurricane, Shows Forecasting, Storm Surge](#)

[Power Outages after Hurricane Ian](#)

Related ASPR TRACIE Resources

[City of Jackson Water Crisis Response \(Recording\) \(Article\)](#)

[Going with No Flow: Coping with Hospital Water Supply Issues](#)

[Hurricane Resource Page](#)

[Sudden Water Loss and Actionable Considerations](#)

[The Hurricane Ian Experience at Lee Health: Wreckage, Resilience, and Recovery \(Recording\)](#)

1. "It should be noted that the NHC best track intensities typically have an uncertainty of around $\pm 10\%$, and that there is very little practical difference between a 140-kt category 5 and a 135-kt category 4 hurricane." ([National Oceanic and Atmospheric Administration and National Weather Service, 2023](#))

- Ten days out from storm, we:
 - » **Assess the fuel situation.** We have backup generators at all our acute hospitals, but we also have backup and portable generators for our growing outpatient facilities. Without those, people tend to overcrowd emergency rooms.
 - » **Bring in supplies, including backup water supply.** We have a large stock of bottled drinking water at our acute care hospitals and potable water reservoir holding tanks at our campuses. We can fill these tanks with anywhere between 10-15,000 gallons ahead of a storm to supplement any short-term water needs.
 - » **Stage necessary materials for potential repair** (e.g., window breaches, water and roof leaks). It is also important to stage water extraction equipment around campuses.
- Five days out, we will reach out to all our key partners and vendors so we can secure food, water, linens, and other supplies. When winds hit 45 miles per hour, the roads are shut down, making it even more important to get these supplies to our campuses early.
- Three days out, we:
 - » **Shut down any construction** on our campuses.
 - » **Walk through our sites and review our buildings**, starting at the roofs, to ensure they are free of loose debris that could be blown around during the storm. We empty all dumpsters, and pre-check all of our generators.
 - » **Test our generators.** All our hospitals are M2, which means we have backup generator redundancy, including two spare generators per campus. We have the capacity to stand alone during utility outages. We have also expanded our fuel capacity; in some cases, we have dual (gas and diesel) generators, and that can help extend our runtime.
 - » **Activate our incident command structure.** Ours is based on the Hospital Incident Command System, or HICS. Central Command for the health system mobilizes and supports each hospital and off-site campuses from Coconut Point; each acute care hospital has its own local HICS management team.

Damage Sustained

Hurricane Ian caused more than \$12 million in damage to our facilities; relatively speaking, that is not catastrophic for an organization with more than 4.5 million square feet (3.5 million of which make up acute hospital campuses) and 100 facilities. A couple of our facilities were built under updated Florida codes, so the exterior of those buildings was designed to support a wind impact such as that with Ian. Some of our older facilities that date back to the 1950s sustained more damage.

Figure 1. Damage to Lee Health Facilities by Category

Power	Due to the strategic installation of generators, pre-event planning and our work with a specialty vendor, our generators made it through 80+ hours of continuous service with minimal interruption.
Rooftops	Three buildings with older roofs had damage, but there was minimal damage due to the roof upgrades and hardening of our buildings over recent years.
Windows / Drywall / Leaks	Minimal impact and almost immediate response from our Plant Ops teams to make repairs.
Wall / Elevators	Wall failure in Medical Office Building caused damage to three of that building's four elevators, putting us in crisis mode.
Site Landscape	Tress, bushes, and shrubs significantly impacted.

Losing Water Pressure

Our biggest challenge after this storm was losing water pressure. We have four acute care campuses:

- Cape Coral Hospital relies on the city's utility system.
- Lee Memorial relies on Fort Myers' system.
- Gulf Coast Medical Center and HealthPark Medical Center (which includes Golisano Children's Hospital) is supported by Lee County's utility system.

All of these city and county utility systems were impacted by the storm, and leaks in water lines led to low or no water pressure in all of our hospitals. Three of our hospitals had zero water pressure, and one had very low pressure (10 pounds per square inch [psi]). While we had back up supplies of drinking water and water to support critical functions, we had to ration water because it was such a slow-moving storm. In the first 72 hours, we identified the specific issues and worked with local emergency operations centers (EOCs) to determine each of our hospitals' status.

We had no wet fire suppression protection in any of our hospitals; we immediately activated our fire watch plan which included facilities, public safety, and environmental safety teams. We did not have enough water for flushing toilets and had to reduce the number of toilets in use and bring water to various restrooms during the outage.

In all of the hospitals, the air is cooled by chillers and cooling towers. Without water, the hospital would start heating up immediately. We did have emergency measures in place; we ran hard pipes and soft hoses out to our retention lakes around facilities. We also used a backup well at one of our older hospitals. We worked with water treatment vendors to ensure we had enough biocide (a chemical treatment that controls microbial growth in water) to inject in the water before it went into condenser systems. Keeping hospitals cool was a critical element to keeping them running during the storm.

Because we could not meet the state's timelines and minimum water pressure levels to operate fire suppression systems (i.e., 20 psi), our team began evacuation of HealthPark Medical Center, Gulf Coast Medical Center, and Golisano's Children's Hospital (the only mandatory evacuation). We transferred 67 babies from the neonatal intensive care unit in less than 24 hours via ground transportation and helicopter. At one point, there were three helicopters on the helipad and others waiting to land; the response from hospitals around the state and the Florida Hospital Association was phenomenal. Our previous experiences and recent exercises also helped ensure an orderly, smooth, and safe evacuation.



Cape Coral Hospital was 10 minutes away from being evacuated, but we were able to hook back up to the city's water system (with 22 psi sustained) just in time. Lee Memorial was not evacuated. Overall, 416 patients were transferred over five days to more than 50 hospitals across the state. Other than the mandatory evacuation from Golisano, the other transfers were due to individual, lingering problems that occurred at each of our facilities.

To supplement municipal water supply:

- Cape Coral Hospital ran a giant hose to the retention pond.
- Lee Memorial tapped into an existing well.
- Gulf Coast Medical Center tapped into a pond-fed irrigation system.
- HealthPark Medical Center (which includes Golisano Children's Hospital) set up a pump in a storm drain.

We were running out of the potable water we were rationing and needed a longer-term solution. In the meantime, staff at one facility established a "bucket brigade," bringing water from a nearby lake back to the facility to allow for toilet flushing.

In 1992, after Hurricane Andrew, Florida developed stronger building codes (e.g., stronger hurricane shutters, impact-resistant windows). These helped newer structures withstand Hurricane Ian's winds and generally increased structural resilience over time.

This was a short-term solution but emphasized the importance of having access to water. We were able to stabilize our potable water through water tankers connecting into our domestic water lines at HealthPark, Golisano, and Gulf Coast Medical Center. We requested and received fire service strike force teams at those facilities to assist with active fire watches alongside our staff. This allowed us to stop evacuations and stabilize hospital operations. The emergency rooms never closed and remained open to support community needs. The following day, the county utilities service was able to bring back water at acceptable pressures to support our domestic and fire sprinkler system needs. (This was a heroic effort on their part given the massive destruction to their municipal systems.)



We also worked with the state EOC and brought in water trucks to supplement the domestic water potable systems. This allowed enough time to lay temporary lines to reconnect to local water systems until lasting repairs could be made. We were able to flush toilets and people could wash their hands. We were in touch with all utility partners and received assessments re-timing we would be out of fire sprinkler water.

The storm surge was approximately 15 feet and inundated our parking lot at HealthPark Medical Center. Many of our team members' cars were flooded there, and we lost about 500 cars. Water also submerged one of our helipad sites which is adjacent to our emergency room entrance. After the storm, the streets leading to the hospital were flooded, creating a problem for people trying to get to the hospital. The water did subside quickly, which helped with patient evacuation and access.

Hurricane Ian devastated our community. Buildings constructed more recently did relatively well, but many of those built before 2002 were destroyed. Hundreds of shrimp boats were washed up onto the land. Bridges to the barrier islands (and the islands themselves) suffered severe damage. Many of our staff lived in affected areas; locating and contacting them was very important for us, as we wanted to ensure they were safe and had somewhere to stay.

Looking Ahead

Overall, our buildings performed well in what was close to a Category 5 hurricane. Some of our outpatient facilities in closer proximity to the barrier islands were impacted by the storm surge. None of our hospitals were affected by water intrusion or wind damage. Our wind mitigation strategies (e.g., replacing windows/building skins and hardening areas with shutters) were effective. Bolstering our emergency generator and fuel storage capacity was extremely critical; power was never an issue. We have continuing service contracts with structural, fire protection, and civil engineers and mechanical contractors; after the storm, we brought them in to review our buildings. They quickly identified a few things that needed repair and they helped us plan out those repairs.

Our goal in the future is to maintain critical operations that are water dependent, and we have taken or will take the following steps to meet that goal:

- Request well permits for our acute care hospital sites. We made the request a week after the storm hit and were granted permits shortly thereafter.
- Have a reliable secondary potable water source, particularly if the building is standing and we have power. Adding wells will be critical to our future ability to withstand similar storms.
- Have a reliable secondary fire suppression water source.
- Identify a reliable secondary condensed water source for building cooling. We will continue the practice of using retention ponds and wells to ensure cooling can continue.

