Hurricane Katrina has proven to be one of the worst natural disasters in the history of the United States and caused unprecedented damage to a key American city and region. Not only has there been great personal and commercial damage to the city and its occupants, but the health care systems for both New Orleans and the Louisiana University Systems have also been severely crippled. Louisiana State University Hospitals (LSU & Tulane) and various clinics provide the vast majority of outpatient primary care, inpatient care, and much of the specialty care for the state’s Medicaid and uninsured populations. Equally important is the blow dealt to a successful training platform for the nation’s health care professionals and the only local source of Level 1 trauma care. Never before in the U.S. has an entire city’s health care system gone down overnight. Traditional education and training did not prepare hospital administrators for the following situations:

- Contingency planning of such magnitude
- Patient evacuation in adverse conditions
- Maintaining patients and staff without utilities/food…support
- Reconstitution of a health care system
- Short range planning for health care system survival
- Rejuvenating reimbursement system in temporary medical facilities
- Contingency medical operations

Just prior to Hurricane Katrina the Louisiana Office of Homeland Security and Emergency Preparedness (LOHSEP), DHS/FEMA Response and Recovery, DHS/FEMA Region VI used an exercise called Hurricane Pam, a fictitious slow moving Category 3 hurricane, using the Saffir-Simpson Hurricane Scale. Many of the planning elements in this exercise proved to be valuable with Katrina. However, Katrina was much larger than expected and the New Orleans levees broke (not exercised) causing most of the damage and severe conditions for health care operations. Even with Katrina’s magnitude, the health system would have fared well if the levees had not broken. In general, medical planning did not call for the evacuation of patients and staff. This was not bad planning due to the risks inherent with stabilizing and moving patients. However, risk mitigation is assuming the worse and the breakage of levees was not taken into consideration for contingency planning. Hospital administrators have two major planning choices when confronted with planning for hurricanes of Category 3 or higher: a) evacuate, or b) harden the facility and move patients into safe zones to ride out the storm. The hospital buildings in New Orleans survived the storm. There are a couple of hospitals that may not be re-inhabitable due to water damage, aging, or poor construction relative to being located within areas at risk for flooding.

1. If the decision is to evacuate, do it early and have a plan.
2. If the decision is to ride out the storm, ensure the medical facility can be hardened (e.g. all systems can survive flooding, especially on lower levels). Plus future medical facilities must be constructed or retrofitted to facilitate hurricane, bioterrorism, and/or nuclear survival at the level the medical, political and local community determines important.

In the gulf coast region, hospitals and medical facilities should not have basements. Those that do, need to move critical systems and resources above flood levels. Valuable resources were lost in New Orleans and at Keesler AFB Medical Center in Biloxi Mississippi. Information systems, life support systems, Magnetic Resonance Imaging (MRI), medical records, backup generators, etc. were all lost therefore crippling the health care facility and adversely impacting the future of the health care system. Hospital administrators have learned some valuable lessons from Hurricane Katrina, which soon afterwards assisted in dealing with Hurricane Rita. Some additional lessons noteworthy from Katrina and Rita are:

- Resource protection includes offsite IT system backups
- Medical Facilities must have the ability to be resilient
  - i. Withstand Category 4 plus winds, life support, utility, and IT systems protected from flooding
  - ii. Backup communication systems and protocols for use of radios
  - iii. Contingency supplies to include food
  - iv. Safe zones for patients and staff
  - v. Air systems that kill bacteria
  - vi. Safe guards from dirty bomb’s radiation and bio threats
- Medical facilities need to plan on running self-sufficiently for five to seven days (based on Katrina rescue experience). This means backup capabilities for all utilities (e.g. electric, water, sewage, food, supplies) either in-place or contractor supported. Facilities need to have an easy access for alternative outside utilities sources (e.g. external electrical outlets, electric sewage [push & pull system], water... by way of truck or units).
- Staging capability whereby mobile expansion of medical units can be backed in or collocated (e.g., mobile MRI, surgery unit, morgue)

Medical administrators need training and education in the reconstitution of health care systems. This education and training will pay large dividends in a speedy recovery. Major lessons learned for inclusion into future training and education include:

- Timeliness is everything to recovery
- Reassessing patient and staff for evacuation - remaining in a facility tending to care and feeding of staff, to include rotating staff for rest
- Retaining valuable staff (getting them back to work, protecting their positions, and proving a safety net for families of staff)
- Plan for the use and housing of volunteers
- Integration plan for volunteer providers to include speedy credentialing
- Resource protection in the way of physical security and saving valuable resources (salvaging equipment, records, etc.)
- Reconstitution of health delivery system, rendering services, and reestablishing revenue capabilities
- Logistics/service contingency contract language and/or contracts
- Converting medical clinics and vet clinics to contingency hospitals
- Establish contingency hospitals/clinics using empty buildings, train in the use and operation of military transportable medical facilities, and be aware of alternative temporary component medical facility capabilities
- Understand the planning and establishment of Community Based Clinics that can be strategically placed for converting to contingency hospital operations
- Development of contingency assets as "dual use" for expansion of current health system capabilities
- Operations of temporary medical facilities in shelters
- Patient evacuations systems

Paramount to all, and a lesson learned, is command, control, and communication. All operations depend on this aspect. Yet there was much confusion and redundancy, which led to the following lessons learned:

- Although local governments desire control, when an adverse event is anticipated to be larger then experience, skill, resources, and crosses borders it’s ok to ask for federal assistance early. Control is relative to the anticipated situation and desired outcomes.
- Have a command, control, and communications plan that provides for no telephone or cellular capability. Use of radios and emergency frequencies, but exercise this aspect; exercise with local, state, and federal agencies as if it is an actual disaster. Don’t take short cuts, lessons are better learned in advance and with solutions that will work given worse case scenarios.
- Utilize contractors to provide emergency support services. The communication protocols and capabilities will serve the community well when needed.

In the health care profession medical administrators are challenged on a daily basis. In adverse conditions, it will take a team and well exercised plans in order for all parties to know what to do, when and where to do it, what to expect, and to have established communication protocols. Severe hurricanes and new terror threats demand the rethinking of contingency plans (from operations to facility construction). Extraordinary medical administrators and clinicians were the key to overcoming an American catastrophe, like Hurricane Katrina and Hurricane Rita.

Credits
- TerraHealth Inc. LSU New Orleans Health System Reconstitution Short Term Plan and Report.
- LUIS O. MORALES, Lt Col, USAF, NC, Branch Chief, NORTHCOM Joint Regional Medical Plans and Operations FEMA Regions VI & VII, After Action Reports.
- The Louisiana Office of Homeland Security and Emergency Preparedness (LOHSEP), DHS/FEMA Response and Recovery, DHS/FEMA Region VI used an Exercise Hurricane Pam.
- LA Department of Health and Hospitals, Dr Jimmy Guidry PhD and Roseanne Prats, PhD, AAMA 2005 Conference Presentation.
- Larry A. Mullins, DHA, President/CEO, Samaritan Health Services, A Private Healthcare Sector Response to Hurricane Katrina Relief Effort, AAMA 2005 Conference Presentation.