Review

Hurricanes Katrina and Rita: role of individuals and collaborative networks in mobilizing/coordinating societal and professional resources for major disasters

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Abstract

The medical support for the coordinated effort for Harris County Texas (Houston) to rescue evacuees from New Orleans following Hurricane Katrina was part of an integrated collaborative network. Both public health and operational health care was structured to custom meet the needs of the evacuees and to create an exit strategy for the clinic and shelter. Integrating local hospital and physician resources into the Joint Incident Command was essential. Outside assistance, including federal and national resources must be coordinated through the local incident command.

> A small group of thoughtful people could change the world. Indeed, it's the only thing that ever has.
>
> *Margaret Mead*
> (http://www.brainyquote.com/quotes/quotes/
> m/margaretme130543.html)

Introduction

A significant archive of written material on disasters exists, much of it in literature that clinicians do not read [1–8]: in city, state, federal and organizational documents and brochures; in military and technical brochures; and in course material for a relatively small group of international responders who go to areas after a disaster to assist with recovery efforts, medical care, and support. During the acute phases of any emergency, local civic leaders, sheltering organizations, and health professionals respond to help save lives and preserve property when possible [9–12]. It is logical that these forces, resources, philosophies, and personalities would both interact and 'clash' during a major disaster [13]. Such was the case during and following Hurricanes Katrina and Rita in August/September 2005.

The reports surrounding hurricane Katrina with regard to the levees, flooding, and prolonged human tragedy on rooftops,

in isolated hospitals, the Convention Center, and the Superdome have been retold to the point of saturation and need not be repeated. This article focuses on the initiation, planning, logistics, implementation, and exit strategy for movement of trapped, hungry, thirsty, and ill persons from (initially the Superdome) New Orleans to the Reliant Astrodome complex (Reliant AstroCity) in Houston. Also, a brief description of the role of critical care and trauma physicians in such an effort is given, and the trauma and critical care health challenges relating to this disaster are addressed. A few key points and lessons are cited. Finally, as this manuscript was being completed, hurricane Rita threatened Houston/Galveston at category 5 forces and an anticipated sea surge of 25 feet. Despite its '13th hour' turn away from Houston, massive preparations were put into action, including the evacuation of in excess of 2.7 million persons over a time frame of 72–96 hours. Houston then served as the dispatch point for restoration of services to the Beaumont/Lake Charles area and distribution center for needed fuel trucks to automobile arteries across Southeast Texas. Lessons learned from the management of these events serve as the basis of this review.

Overriding governing principles for medical reaction to disaster preparedness and response

More than 4000 articles on medical response to hurricanes can be found in peer-reviewed journals, with more than 10,000 articles on 'disaster' related topics in published literature. Numerous books, monographs, and documents exist. From representative articles and chapters, a resume of overriding governing principles for medical planning, response, support, and involvement can be constructed.

- Less than 10% of the challenges faced during a disaster are medical.

HCHD = Harris County Hospital District; PACS = picture archiving and communications system.

- Only 10% of persons who arrive at a hospital or shelter following a disaster are in need of acute medical attention.
- Only 10% of those presenting to a shelter clinic or a hospital following a disaster have a potentially life-threatening condition.
- Communications are essential but are always a challenge.
- All disaster response is local (at least for the first 48–96 hours).
- The time, effort, and expense needed to transport out-of-state doctors and nurses into the area is rarely justified or needed, especially during the first 48–96 hours.
- All outside assistance and resources should be locally coordinated and arranged at the local level, because that is where the knowledge base for need is most reliable.
- Most successes or failures in disaster response are determined within the first 36 hours.
- Local leadership always emerges, although it often is not part of prior preparedness exercises and drills.
- Federal (top down) programs are primarily politically driven and are fraught with red tape, regulation, time delays, and frustration.
- Most major disasters do not involve an acute need for a significant volume of surgical and procedural expertise.
- For a shelter population of less than 5000 evacuees, an on-site clinic is not required or necessary.
- Every population has an indigent population segment.
- Integrated, collaborative networks with intrinsic local discipline, support, and assignment of responsibility represent the most effective planning and action model.
- Examples of integrated collaborative networks exist and should be replicated to optimize disaster response.

Rescue to Houston: Katrina

By Tuesday, 30 August 2005, the media informed the world that thousands of people were trapped in a sub-sea-level bowl – the city of New Orleans. Some were trapped in buildings surrounded by water, others were stranded on rooftops, while still others were trapped where they had sought refuge, namely the Superdome and the New Orleans Convention Center. Normal communications were not working, Internet connections were nonfunctional, and cell phone connections were intermittent and infrequent, and so completely unreliable. Information on the number and condition of people in the various hospitals and the rudimentary shelters was incomplete at best and completely inaccurate at worst [14,15].

During the early morning hours of Wednesday, 31 August 2005, the Governors of Louisiana and Texas communicated with the County Judge of Harris County, and Mayor of Houston, Texas, and a plan to move evacuees from the Superdome to the Astrodome was established. By 09:00 hours on Wednesday, 35 individuals from state, county, and city agencies, and many local organizations met to address the mission. Members of the group were already

known to each other from routine daily interaction, participation in previous disaster drills, or actual management of major disasters in the Greater Houston area (upward of 25% of anything that the Federal Emergency Management Agency [FEMA] classifies as a disaster occurs in Harris County, Texas) [16].

A mission statement was agreed, and six working groups were established for logistics, operations, contributions, volunteers, placement and employment, and medical. Each group was given assignments and told to develop a strategy and plan for implementation, and to bring only success reports to a meeting to be held 6 hours later. Excuses for outstanding deliverables were not an option.

The medical group, comprising four physicians and two administrators, was to support the mission by screening evacuees as they arrived, provide a triage area at each sleep area containing up to 25,000 persons, inspect food, and establish a nearby 'clinic', complete with electronic medical record, complete laboratory, pharmacy, and radiology, and most specialties of medicine. Significant support for mental health, special needs patients, eyeglasses, and surveillance for infectious disease was established. The team predicted the number and type of medical, social, mental health and related conditions, and the space and personnel required to accomplish this task. The planning for these missions took 4–6 hours, and the customized clinic was in place in 12 hours. This was accomplished by using existing collaborative networks among the Baylor College of Medicine, community physician members of the Harris County Medical Society, and the infrastructure and networks of the Harris County Hospital District (HCHD). A fourth level of health care was to be provided by area hospitals for patients whose conditions were outside the capability of the Katrina Clinic. In addition, the medical group was responsible for food inspection, sanitation, public health, environmental health, immunizations, and credentialing of volunteer physicians, nurses, and PAs. The group also determined to look after the 'mental health' of the incident command group and others providing leadership and service during the incident.

A shelter cannot and should not exist indefinitely. From the first, the command staff planned for an exit strategy – a time for the shelter and its clinic and other supportive functions to cease to exist. As most disaster shelters do not have an intrinsic clinic, we planned to keep the clinic open only 2 weeks or until the Reliant AstroCity population reached 3000, whichever occurred first. We targeted 17 days from opening date to have all evacuees out of the Reliant AstroCity and in more permanent settings. From day 1, these targets were shared with the media and all of the collaborative network partners. Our new Reliant AstroCity citizens (evacuees) were informed of our vision and told that we would have educational, housing, and job fair opportunities – an infrastructure to assist them in beginning new lives. The evacuees themselves became part of

the exit strategy. One aspect of addressing future mental health problems and depression was to integrate the evacuees into the process and into the same kind of 'can do' mentality of our plan and exit strategy.

The six members of the medical group were required not only to expedite the plans for the clinic and 'missions', but also to serve as local, regional, and national communicators of our mission, timeline and implementation to the medical profession, professional institutions and organizations, press, general public, and evacuees. This was accomplished by having a member of the medical group on the podium at each press conference, coordinating the medical information with the Joint Information Center, and neutralizing any mis-information or incomplete information from 'maverick' physicians (or others) who did not have access to all of the coordinated plans and actions. The disaster, emergency medicine, surgical, critical care, and trauma Internet websites were used to great advantage to imprint international readers with the progress of the program. All of these activities were successful in alerting the press and the community on what to expect from a medical standpoint, even before an event occurred (i.e. the diarrhea outbreak). In addition, the physicians of the nation were extremely supportive of the collaborative network of information, as well as the concept of this program. When new and 'out of the box' support was required, personal phone calls to appropriate agencies and organizations, as well as via Internet and handheld communication devices, were received with very positive responses. During this process, the Joint Incident Command was required to change the 'game plan' dozens of times because original objectives given to the command staff often changed as a result of local changes in numbers of evacuees and availability of resources.

Through enfranchisement of each group, a military management style that required all agencies to work through the central command (all others to be considered maverick activities), tight discipline, and ample security, a shelter – complete with an extensive clinic – was in place receiving evacuees approximately 18 hours from the time when the central command was assembled. Each member of the central command developed their integrated networks, and each in turn was empowered to develop tertiary integrated linkages. Actions of each group had an influence on all other group activities, and careful records allowed for review, accountability, and subsequent requests for funding. Regardless of the altruism of any maverick group (i.e. groups functioning outside the parameters of the command center), their activities were eliminated. These maverick groups included some unnecessary and/or redundant medically related activities, which seemed to appear mysteriously on a daily basis and, at times, were totally counter to the mission and plan of the central command. Medical personnel who wished to volunteer were scheduled into the approved medical activities.

Key decisions of the medical group

The medical group and directors under the command group negotiated more than a thousand decision nodes each day. However, a few key decisions were the most important in ensuring that this operation was successful.

- The clinic was located in a building adjacent to but separate from the shelter buildings, which allowed for expansion, storage, and development of a large isolation area when required.
- As evacuees exited vehicles bringing them into Reliant AstroCity, nurses, PAs and/or paramedics identified patients with critical care conditions, and they were immediately taken to the clinic.
- A medical director was appointed and empowered to make independent but integrated decisions and was supported at the highest levels. This medical director was a member of the joint incident command staff and invited to attend the three daily briefing meetings.
- Total absence of narcotics, including methadone, at the shelter clinic site was mandated.
- Health care practioneers, including physicians, were subject to credentialing and confirmation of licensure. No 'maverick' clinical activities were allowed.
- Medical personnel were scheduled in a 'staff to volume' ratio, eliminating excessive numbers of 'medical voyeurism'.
- All press releases were cleared by the Joint Information Center, including medical comments relating to all medical branch responsibilities. The medical spokes-persons could utilize local professional expertise for special detailed information, but independent, contradictory and/or discouraging comments to the press were not approved or tolerated by the Joint Information Center.
- By day 10, any patient sent to an area hospital emergency room from the Katrina clinic was treated in the same way as all other Harris County/Houston patients seeking care at that Emergency Center.
- Developing an 'end game' for when the clinic should be closed and how to provide customary community health care for evacuees was critical.

Steps on setting up the clinic

Although at least four integrated locations existed to evaluate and treat the evacuees, the clinic made the success of the other locations possible. The existing collaborating medical networks in place in Houston were rapidly enlisted and mobilized on the day before the clinic opened [3,17–23]. The HCHD was already managing 10 community-based clinics for populations approximating 25,000 each. The Vice Chair of Baylor College of Medicine's Department of Family and Community Medicine was selected to serve as the Medical Director of the Reliant AstroCity Clinic. He contacted his department to assist in personnel resources. An administrator from the HCHD contacted the key hospital/clinic support structures such as nursing, administration, medical records, medical affairs, security, supply, laboratory, and others.

Because of difficulty in obtaining a DMAT (disaster medical assistance team) cache of pharmaceuticals, the HCHD brought their own cache until an arrangement could be made with the local pharmaceutical company, CVS, which brought in a complete pharmacy housed in a large trailer. Baylor College of Medicine's Chair of Radiology requested and received a donation of a computerized imaging system from the company Siemens. The images were then transmitted via picture archiving and communications system (PACS) to the Ben Taub General Hospital. Medical volunteers were requested from Baylor College of Medicine and the Harris County Medical Society; the response from both was overwhelming, and by 1 day into the operation physicians were scheduled throughout the next 2 weeks. Nursing and supportive personnel volunteers were also scheduled throughout clinic operations, again with an overwhelming response.

Existing collaborative agencies, institutions, organizations, companies, offices, and volunteers made this almost immediate 'turnkey' clinic possible. Initially, some barriers existed, such as a need to have broadband capability for computer and medical record, and professional credentialing linkages. The same was true for the PACS transmission for radiologic images. Potential barriers existed initially regarding the pharmacy, case management, and nursing home placement. As an obstacle was noted, it was addressed, and whatever measures were needed were taken in an incredible collaborative mode. It took a couple of days to establish programs relating to chronic alcoholism and drug addiction, but these were eventually addressed.

During the 15 days of operation, the clinic had 11,245 patient visits, filled 16,622 prescriptions, gave 6318 vaccinations, and sent 900 patients to area hospitals, approximately 10% of whom were admitted. Twenty-five people who relocated to Greater Houston because of the hurricane died during the time when the clinic was open. Only four of these had been in the Reliant AstroCity area at any time, two of whom had been sent to area hospitals from the clinic and two who were never seen in the clinic. All four died of natural causes.

… and then came Rita
Three days after we closed the clinic at the Reliant AstroCity and on the target day for complete shutdown of all shelter operations, we learned that Hurricane Rita was predicted to hit the Galveston/Houston area at a category 5 force with a 25-foot sea surge. An incident command staff was assembled and a new strategy was developed. For this incident, we faced the need for evacuation of 2.7 million people from danger prone locations. At this time, the homes, hotels, and secondary shelters were already saturated with people displaced by Hurricane Katrina. Public officials were faced with the task of evacuating a large volume of people rapidly, but learned (sometimes the hard way) that movement by private automobiles cannot be accomplished in less than

several days. The challenges and need for public information and allocation of resources were different from those with the Katrina rescue, but the management collaborative networking and leadership requirements were virtually identical.

Top down disaster preparedness and management
A 'top down' management strategy assumes a centrist philosophy and regulation to proscribe subordinate structure to follow a preset list of rules and actions. With larger populations, those establishing the often algorithmic regulations are almost always distanced from the 'local' implementers and those directly involved in the central interpretation of what is best and how it can/should be accomplished. For many centrist approaches, the solution is to provide policy and money, which is often separate from the ability to understand the local ramifications or logistics.

Many hospital and even private citizen group disaster plans and responses have been written from the philosophy of a top down management concept. These are political, sluggish, and awkward, and often disregard local incident command programs and local resources. Top down disaster preparedness concepts have dominated the textbooks and articles on disasters, mass casualty, and terrorism for more than 45 years. Literally hundreds of independent citizens, and state, federal, and organizational disaster groups exist, each with its centrist theme, and with very little integration, cross-communication, or collaborative networking.

Medical collaborative network opportunities
Integrated networks are best exemplified by the Internet. The many component parts can be described and are known, while overriding standards exist to allow integration. The power is in individual computers and servers, and the collaboration is accomplished via common services, list servers, websites, and addresses. Thus, members of a critical care list server (i.e. Critical Care Medicine – list) have a common purpose, basically know each other, and have a web master, but the daily integration of ideas allows for the collaborative network. The American Red Cross is able to have a centrist organization, but it also has regional and local chapters that participate in fundraising, donations, and supervision of shelters. The local infrastructure gives this organization its power, and its functionality occurs at the local collaborative level. Both the professional group on the Internet and the American Red Cross often respond to a new idea, new challenge, or new opportunity at literally a moment's notice. Collaborative networks are able to accomplish this system requirement.

The nation's Trauma System Network, manifest by level I, II, and III trauma centers, is another example of such an integrated collaborative network. During activities in response to both Hurricanes Katrina and Rita, the trauma center directors from Louisiana, Texas, Arkansas, New Mexico, and

Oklahoma were linked via e-mail, cell phone and blackberry-type technology, and regularly communicated with the entire group about caseload, supply needs, new disease outbreaks, and patient movement. This corresponded to the pre-existing network for the American College of Surgeons, Committee on Trauma, Trauma Region VII. This network often provided more accurate information than some of the cross-state public safety agencies. Some states (i.e. Connecticut) have used the existing and well organized Trauma System Network as a foundation upon which to build the states' Integrated Collaborative Network for disaster planning and prepared-ness. In that virtually every state has a mechanism for trauma center verification in place, this trauma collaborative network would seem to be a good place to start in coordinating medical activities for disasters.

Early in the meandering course of Katrina, Doctor Norman McSwain and I talked several times, knowing that Gulf hurricanes are fickle and unpredictable. We were in contact with surgeons throughout Region VII of the American College of Surgeons Committee on Trauma. We developed a mass mailing communication mechanism for us to share information on numbers, diseases seen, trends in patient flow and conditions, and aids in communication with our colleagues in the local Joint Incident Command Center. This network has been in place since the mid-1980s as part of the state and regional trauma system of the American College of Surgeons Committee on Trauma. In that the trauma system of Louisiana was not tied into the state's disaster planning and response non-network, we were unable to arrive at a timely decision regarding evacuation, security, and medical support.

Although I recognize that hospitals, surgeons, emergency physicians, emergency medical services personnel, and public health physicians often write about and drill for a variety of disaster conditions, most of these drills have no similarity to real-time disasters because they are infrequently and inadequately integrated in the manner required to respond to a disaster like hurricane Katrina or Rita. These and other disciplines provide valuable input during planning and response, but physicians who are familiar with and experienced in integrated collaborative networks are best suited from a training and mind set management approach to handle disasters.

The Local Incident Command is a joint organization structure that can be a model of collaborative networking, while having a local centrist command structure. The National Incident Management System has been a training module under homeland security to address this need, but it has excluded the very medical providers that are so important 'on the ground', in the hospital, and at the command post during a disaster. New concepts in physician involvement, training, and utilization are required for future National Incident Management System panels [24–27].

Interpretation of future reports regarding Katrina

Finally, view all 'evidence-based' reports from the Katrina experience with a skeptical eye. There will be many, and I would say that if ever there were a time to 'consider the source', then this would be it. Those who were not involved from day 1 of planning through to the very last day of the Reliant AstroCity clinic probably know not of which they speak. Many came into the situation days later, stayed briefly, and came away with whatever their preconceived idea/intent was. Therefore, be discerning and careful in reviewing 'data' collected, presented, and published. Noncollaborative, non-networked reports will be plentiful, are self-serving and misleading, and can produce data that can mislead future planners. It is imperative that the collaborative network style of management extends to data analysis and future disaster planning and response.

Conclusion

The ability to mobilize resources depends on a pre-existing local collaborative network. Such networks allow for a local integrated incident command structure. The local response to any disaster is more a function of management of people, ideas, supplies, and strategies, and less a matter of practiced drills for chemical, biologic, radiologic, and blast conditions. Outside assistance, including policy, review, epidemiologic, and economic, should be supportive of the local incident command needs, rather than imposing a top down management style on the local prepared response. Even the local professional resources have integrated collaborative networks that can be called in to assist in the emergency disaster response. Future discussions on disaster preparedness should focus on strengthening existing integrated collaborative networks.

Competing interests

The author(s) declare that they have no competing interests.

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