

Systemic Collapse: Medical Care in the Aftermath of Hurricane Katrina

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This article describes and analyzes key aspects of the medical response to Hurricane Katrina in New Orleans. It is based on interviews with individuals involved in the response and on analysis of published reports and news articles. Findings include: (1) federal, state, and local disaster plans did not include provisions for keeping hospitals functioning during a large-scale emergency; (2) the National Disaster Medical System (NDMS) was ill-prepared for providing medical care to patients who needed it; (3) there was no coordinated system for recruiting, deploying, and managing volunteers; and (4) many Gulf Coast residents were separated from their medical records. The article makes recommendations for improvement.

THIS ARTICLE describes and analyzes key aspects of the medical response to Hurricane Katrina in New Orleans, based on interviews with individuals directly involved in the response and on an analysis of published reports and news articles. This article does not attempt to describe the dedicated and heroic individual efforts of the thousands of medical professionals from the New Orleans region and around the country who responded to Katrina. There is no doubt that their compassion and dedication saved countless lives. Rather, we focus on a number of the key institutional and systemic responses that were intended to provide medical care in large catastrophes and make suggestions for improving them in future disasters.

METHODOLOGY

Over the months following Hurricane Katrina, the authors gathered information for this article via telephone and email conversations with 22 physicians, nurses, hospital administrators, public health officials, government officials, and academic medical center staff, all of whom

were involved in the medical response to the disaster. Many of the people interviewed were at the time actively involved on the ground in the medical response. Conversations took place between September 1, 2005 and January 2006; they were voluntary, unstructured, and non-remunerated. Respondents were assured that their comments would not be attributed to them in ways that could reveal their identities. Individuals contacted were chosen based on their expertise, their willingness to participate, and their knowledge of the medical systems and institutions involved in the response. In addition, we reviewed hundreds of newspaper articles, journal and magazine articles, government websites, government press releases and reports, healthcare organization websites, and scientific articles identified via PubMed to find information related to these issues.

Throughout the article, where quotes from individuals are specifically attributed, it is because the quote was acquired from a public news source or government document. Where comments or opinions are not attributed, they are from one or more of the individuals who were interviewed for this article under an assurance of anonymity.

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We recognize that it may be difficult to generalize from some of the interviewee observations, but we concluded that many of the individual accounts of the events after Katrina are compelling and clear illustrations of where medical response systems succeeded and where they didn't.

We have made a serious effort to distinguish the facts in the historical record from individual views or accounts. Due to space limitations, not all of the complex and important issues related to the medical response could be discussed in a single article. We do not claim that this is an exhaustive account of the medical response in New Orleans. For example, the article does not attempt to examine how the American Red Cross or CDC's Strategic National Stockpile functioned in the crisis.

A number of government reports on Hurricane Katrina have provided important findings and recommendations on issues related to the response, particularly the White House report,¹ a report from the U.S. Senate Committee on Homeland Security and Governmental Affairs,² a report released by the U.S. House Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina,³ and a report titled *Public Health and Medical Response* from the Congressional Research Service (CRS).⁴ This article is meant to add to this existing body of information on these issues.

Under Key Findings, we discuss the most important common findings from the individual accounts and the literature review. In Conclusions and Recommendations, we reflect on how these findings should influence future planning of the medical system response to disasters.

KEY FINDINGS

KEY FINDING #1: Federal, state, and local disaster plans did not include strategies or provisions to keep hospitals functioning during a large-scale emergency such as Hurricane Katrina.

In the wake of Hurricane Katrina, 9 of New Orleans's 11 hospitals were incapacitated. Hospitals were isolated from local first responder assistance due to flooding, and the arrival of federal assets was delayed for days after the storm, leaving hospitals to fend for themselves.⁵ Charity Hospital, Louisiana's largest healthcare facility, was left without power for 5 days, in 100 degree heat, and with little food and water.⁶ Without electricity, it was impossible to deliver the usual standard of care for the sickest patients in hospital ICUs. There was no power for mechanical ventilators, bedside monitors, or dialysis machines; many functions had to be performed by hand or not at all.

Nearly every hospital in New Orleans faced security problems, as individuals attempted to raid what was left

of hospital supplies and pharmaceuticals.⁶ Security threats on the streets of the city forced doctors to move patients to upper floors of hospitals, and reports of snipers on nearby buildings (whether or not they would later prove to be true) hindered rooftop evacuation efforts. "At every [hospital], there are reports that as the helicopters come in people are shooting at them," confirmed Coast Guard Lt. Cmdr. Cheri Ben-Iesan, spokesman at the city emergency operations center.⁷ Fear of this seemingly unstable situation outside the hospital no doubt slowed the evacuation process.

Prior to Katrina, New Orleans hospitals represented a critical and reliable community resource for the city's residents, but after the hurricane struck, most hospitals were no longer open as a place of refuge and care. "The hospital is the backbone of the community because the lights are always on," said Knox Andres, an emergency nurse and regional coordinator for a federal emergency preparedness grant covering Louisiana. "When hospitals can't take care of people and the rescuers need rescu[ing] there's no social fabric left."⁷

- ***Emergency plans did not ensure that critical hospital systems, such as electricity and backup power sources, would continue to be available. Without power, hospitals were unable to function and were forced to evacuate.***

In years prior to Hurricane Katrina, hospitals in the Gulf Coast region experienced a number of storms that tested their disaster preparedness. For example, in 2001 Tropical Storm Allison stalled over Texas, unexpectedly dropping torrential rains that flooded Houston's bayous. Floodwaters filled Houston's Hermann Memorial Hospital with 5 feet of standing water, swamping the lower levels of the facility, which housed the hospital's emergency generators. The hospital lost electricity, its backup power source, running water, sewer services, and communications capabilities, and it had to evacuate 540 patients. In response to this experience and in preparation for future storms (including Hurricane Rita in 2005), Houston's Memorial Hospital moved its generators off of the first floor of the building and installed floodgates around the outside of the hospital.⁸

Yet most hospitals in New Orleans, including Charity Hospital, had emergency generators on the first floor of their buildings when the levees failed during Hurricane Katrina, 4 years after Houston Memorial Hospital's experience. According to one physician in a New Orleans hospital interviewed for this article, moving the generators to another floor of the hospital was something that could not have been done in the midst of the crisis, since it would have involved not only moving the generator unit but also moving and rewiring the electrical connec-

tions. For the hospitals in New Orleans, the lack of electricity to run essential equipment needed for patient care was the limiting factor that ultimately forced them to evacuate and close.

- *New Orleans hospitals had little functioning backup communications equipment, and it was unclear which emergency response agency(s) they should call or rely on for help.*

As has been the case in other major disasters, in Hurricane Katrina, the telephone communication infrastructure was one of the first casualties of the storm. By the time the hurricane had passed, many cell phone towers had been destroyed or disabled and most land telephone lines were dead. Some hospitals were without a backup communications system such as satellite phones or two-way radios. And according to one Louisiana physician, those hospitals that had backup equipment found it to be largely unreliable.

A few physicians whom we interviewed commented that ham radios were the one piece of communications equipment that could be consistently relied on, but there were very few of these radios and even fewer personnel who knew how to operate them. The result was that, in their time of greatest need, New Orleans hospitals had very little ability to contact the outside world. They were unable to request evacuation, to request additional staff and supplies, or to update other hospitals and local incident command on their status. Having gone 5 days without rescue, and after exhausting every other avenue of appeal, Dr. Norman McSwain, chief of trauma surgery at Charity Hospital, finally was able to contact the Associated Press with this message: “We have been trying to call the mayor’s office, we have been trying to call the governor’s office . . . we have tried to use any inside pressure we can. . . . We need coordinated help from the government.”⁷

Others interviewed relayed that when hospital staff could make use of functional communications equipment, or when they used messengers to relay information, they often did not know whom they should contact to communicate their needs. Was it the New Orleans or Louisiana State Emergency Operations Centers (EOC), the health department, a hospital association, or the federal government? Charity Hospital did not know whom to call or how to get in touch with the right people when they needed urgent assistance and evacuation of their patients.

Meanwhile, evacuation efforts by local, state, and federal responders were underway, but, without established lines of communication with hospitals, it was often unclear to responders which facilities were in need of assistance and which had already been evacuated. At one hos-

pital, as staff and patients waited for evacuation, listening to news updates on a portable radio, they heard an announcement from the governor’s office saying that their hospital had already been evacuated.⁶

- *There was no regional hospital authority or entity able to provide coordination or serious assistance to New Orleans hospitals in the aftermath of Hurricane Katrina.*

In many respects, the scale of destruction caused by Hurricane Katrina was beyond the ability of any individual hospital to prepare for or cope with. Hospitals that had good disaster plans were still surprised by the unanticipated and severe consequences of the storm. In the aftermath of the hurricane, there was no functioning regional emergency coordinating authority for hospitals. According to the Southeast Louisiana Catastrophic Hurricane Functional Plan and the State of Louisiana Emergency Operations Plan, the Louisiana State University Health Sciences Center (LSUHSC) was to have the lead role in coordinating hospital planning with private hospitals and other facilities under Emergency Support Function 8 (the entity charged with ESF-8 is responsible for public health and medical services in an emergency).⁹

While LSU successfully ran major medical response activities in Baton Rouge in the wake of the hurricane, it was unable to simultaneously coordinate emergency planning and response activities with its own health-care facilities and other private hospitals in the New Orleans area, since many of these facilities were isolated for days after the storm and unable to make contact with authorities to request evacuation. One physician from a Louisiana academic health center interviewed for this article commented that there was no one overarching authority or leader to provide assets or to ask who needed what during the response to Hurricane Katrina, and hospitals did not know whom to ask for help.

KEY FINDING #2: The National Disaster Medical System was a valuable source of dedicated medical professionals. But as a whole, it did not function as a system and was ill-prepared to provide medical care to the thousands of patients who needed it.

The National Disaster Medical System (NDMS) is cited by the U.S. Department of Homeland Security (DHS) as the U.S. federal government’s primary civilian medical response asset (see sidebar). The mission of NDMS is to provide “state of the art medical care under any conditions at a disaster site, in transit from [an] impacted area, and into participating definitive care facilities.”¹⁰ With most New Orleans hospitals closed or inop-

Medical Response Programs in Brief

The following are descriptions of and key facts about some of the existing systems that are intended to prepare for and respond to large-scale national medical emergencies. These descriptions are taken directly from the program websites.

National Disaster Medical System (NDMS)

From NDMS website: NDMS is a section within the U.S. Department of Homeland Security, Federal Emergency Management Agency, Response Division, Operations Branch. It is responsible for supporting federal agencies in the management and coordination of the federal medical response to major emergencies and federally declared disasters. NDMS teams (including Disaster Medical Assistance Teams [DMATs]) are designed to provide care under any conditions at a disaster site, in transit from the affected area, and into participating definitive care facilities.²⁹

FY2006 Budget Estimate: \$134 million³⁰

Facts: Hospitals in large metropolitan areas (usually over 100 beds in size) partner with NDMS and commit a certain number of their acute care beds for NDMS patient care in an emergency.³¹

Medical Reserve Corps (MRC)

From MRC website: MRC is a specialized component of Citizen Corps, housed within the Office of the Surgeon General, Department of Health and Human Services (HHS). MRC units are community-based and function as a way to locally organize and utilize volunteers. MRC volunteers supplement existing emergency and public health resources. MRC units also can be called on to volunteer for national deployment in a federal emergency.³²

FY2006 Budget Estimate: \$10 million³³

Facts: As of February 2006, MRC had 370 units based in 49 states, and more than 70,000 volunteers from around the country.³⁴

Emergency System for Registration of Volunteer Health Professionals (ESAR-VHP)

From HRSA website: The ESAR-VHP system is a state-based electronic database of healthcare personnel who volunteer to provide aid in an emergency. An ESAR-VHP System must (1) register health volunteers, (2) apply emergency credentialing standards to registered volunteers, and (3) allow for the verification of the identity, credentials, and qualifications of registered volunteers in an emergency. The ESAR-VHP program is managed through the Health Resources and Services Administration (HRSA).³⁵

Facts: 60 U.S. states and territories and the District of Columbia have all received funding (about \$200,000 each) and guidance to begin development of an ESAR-VHP system.³⁴

During Hurricane Katrina, 7 states that had not already developed systems each set up a temporary ESAR-VHP in order to facilitate volunteer credentialing and management.³⁶

Emergency Management Assistance Compact (EMAC)

From EMAC website: EMAC is a congressionally ratified organization that provides form and structure to interstate mutual aid. Through EMAC, a disaster-affected state can request and receive assistance from other member states quickly and efficiently, resolving two key issues upfront: liability and reimbursement.³⁷

Facts: 49 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands have enacted EMAC legislation. Since 1999, EMAC has been activated 53 times for events such as hurricanes and terrorist attacks.³⁸

Metropolitan Medical Response System (MMRS)

From the MMRS website: The MMRS began in 1996 and has been part of the U.S. Department of Homeland Security since March 1, 2003. The primary focus of the MMRS program is to develop or enhance existing emergency preparedness systems to effectively respond to a public health crisis, especially a weapons of mass destruction (WMD) event.³⁹

FY2006 Budget Estimate: \$30 million³⁰

Facts: There are 125 MMRS jurisdictions.

MMRS jurisdictions are encouraged to establish and fund MRC units. Up to \$25,000 of FY2006 funds for each jurisdiction may be used to support MRC units.⁴⁰

erative, NDMS became the source of medical care for tens of thousands of displaced patients.

NDMS Disaster Medical Assistance Teams (DMATs) came from around the nation to assist in the medical response to Hurricane Katrina. Nineteen DMATs and other NDMS teams were pre-positioned in the Gulf Coast area prior to Katrina; as the storm passed, those teams and others from around the country were able to move into affected regions.¹¹ The teams were trained to offer hospital-level specialty medical care, but patient numbers often so greatly outweighed the numbers of medical practitioners that DMATs had time only to triage patients and provide basic first aid. The New Orleans Airport became a mass triage site where 10 DMAT teams worked around the clock for nearly a week after the hurricane struck. At its busiest, the shelter was staffed by about 30 individual DMAT medical providers and 100 ancillary personnel. At its peak, it processed around 15,000 patients in a single day.

One DMAT physician recalled that all that could be done was to “provide the barest amount of comfort care.” He said, “We practiced medical triage at its most basic, black-tagging the sickest people and [moving] them [away] from the masses so that they could die in a separate area.”¹² The teams ran out of the most fundamental supplies and medications, including ventilators, and one Oregon-based DMAT’s after-action report stated that “FEMA/NDMS operations at the airport were extremely disorganized and poorly managed.”¹³

- *Poor NDMS/FEMA logistics management of critical medical supplies and medical teams decreased DMATs’ capabilities to respond.*

Numerous DMAT members that we interviewed complained of insufficient federal planning for team transportation, poor coordination and communication regarding where teams were needed, and long delays in deployment of medical supplies and pharmaceuticals. Roy Alson, MD, Commander of DMAT North Carolina-1, testified to Congress that many problems DMATs had in the field during Hurricane Katrina stemmed from the basic lack of a DHS medical logistics support system to coordinate the transport and placement of NDMS assets. Dr. Alson pointed out that in the three DMAT deployments prior to Katrina, the Federal Emergency Management Agency (FEMA) had failed to deliver medical supplies to the teams in a timely manner.¹²

Emergency Medical Technician Bill Engler, whose Seattle-based DMAT flew into the Gulf Coast region prior to Hurricane Katrina, said in an interview with *USA Today* that pre-positioning his team made little difference, since the team’s cache of medical supplies was not

sent in with them. Supplies had to be shipped in from Washington State, and the team was forced to share medicines and equipment with other DMATs, depleting those supplies very quickly.¹⁴

Jake Jacoby, who leads a San Diego-based team that responded to Hurricane Katrina, also commented to *USA Today* on NDMS logistics management. “[NDMS] is a program that on paper looks very good, but [DMATs] are getting abused by being sent into disaster-relief scenes without proper supplies,” he said.¹⁴

Additionally, some DMATs that wanted to be included in the Hurricane Katrina medical response were never deployed by NDMS because of lapses in coordination and internal NDMS communication. One mobile DMAT hospital that had been developed through the Office of Homeland Security after September 11, 2001, with 113 beds, digital radiology, satellite internet, ultrasound, and a full pharmacy with 100 surgeons and paramedics, was stranded for days outside of New Orleans with no authorization to deploy anywhere in the city. A trauma surgeon from Vanderbilt University reported to the Associated Press, “There are entire [DMAT] hospitals that need to take in patients, but they can’t get through the bureaucracy. . . . [Y]ou’ve got millions of dollars in assets and it’s not deployed.”¹⁴

Despite these many difficulties and barriers, Hurricane Katrina did demonstrate the ability and commitment of the DMAT members to care for patients under harsh conditions. DMAT medical providers were highly flexible and able to improvise in many instances when standard medical equipment and facilities were unavailable.

KEY FINDING #3: There was no one coordinated system to recruit, deploy, and manage volunteers during the medical response to Hurricane Katrina.

Many medical professionals attempted to volunteer in the wake of Hurricane Katrina. Offers of help came from academic health centers, the Medical Reserve Corps, medical associations, hospitals, ad hoc teams, and from individuals with no group affiliation. There was no single federal office or national database with the ability to register, track, and manage the thousands of medical volunteers who descended on the Gulf Coast, and many volunteers had trouble engaging constructively in the medical response.

- *Academic medical centers had disaster response plans and resources that might have changed the medical outcomes of many patients, but most of these centers were unable to effectively bring those resources to bear.*

In the medical response to Hurricane Katrina, academic medical centers and large healthcare systems were

unable to contribute their considerable resources, because there were no clear mechanisms for integrating these systems into the federal, state, and local medical response structure. By September 8, 2005, approximately 100 medical schools had been designated as response units to assist the U.S. National Institutes of Health (NIH) in providing care to patients displaced by Hurricane Katrina.¹⁵ One individual from an academic medical center we interviewed said his institution was prepared to send thousands of medical volunteers to the Gulf Coast, and they had offered to provide a wide array of equipment and supplies including helicopters and medical crews; pharmaceuticals, ventilators, and other medical equipment and supplies; trucks with mechanics, staff, food, and water; communications equipment; and more. This academic medical center as well as others tried to offer their resources by directly contacting FEMA officials. However, they were redirected to the American Hospital Association. Ultimately, most of this medical center's contributions were never employed by the federal government.

The LSU medical response to Hurricane Katrina in Baton Rouge is one example of the great potential benefit of bringing to bear the expertise and resources of academic medical centers in emergency planning and response. LSU established a field hospital at the Pete Maravich Assembly Center (PMAC) in Baton Rouge within hours after Hurricane Katrina. The PMAC became the site of the largest acute care field hospital in U.S. history, with an 800-bed facility and about 1,700 volunteer medical personnel. Over the course of its operations, about 6,000 patients were cared for in the PMAC, and more than 2,000 faculty, students, and staff on the LSU campus volunteered to assist evacuees, by providing volunteer hours, housing, and meals for evacuees and medical personnel.¹⁶

LSU attributes its successful Baton Rouge field operation to advance planning. LSU had sponsored and participated in numerous hurricane drills; had stockpiled supplies and medicines necessary for field hospital setup; and had recruited and trained both medical and nonmedical volunteers to staff the field operations. LSU was a key partner in developing Hurricane Pam, an exercise held in 2004 by Innovative Emergency Management in coordination with FEMA, which simulated a direct hit on New Orleans by a Category 3 hurricane. LSU was one of the few participants in the Hurricane Pam exercise to implement lessons derived from the drill. LSU determined that in the event of a catastrophic hurricane, large temporary hospitals would be needed to replace permanent medical facilities, which would be incapacitated either by damage from the storm, by flooding, or by the overwhelming influx of thousands of patients. Having made

this judgment, LSU began to plan and drill to set up field hospitals. In fact, only 2 weeks prior to Hurricane Katrina, LSU had held its latest in a series of practice drills. Organizers felt that this advance planning and drilling had been key to LSU's successful Katrina response in Baton Rouge.¹⁷

• ***Medical Reserve Corps (MRC) units provided medical support to their own local communities in the aftermath of Hurricane Katrina, enabling other volunteer health professionals to respond to the crisis. MRC members also volunteered in the Gulf Coast area, yet a coordinated national MRC deployment could not be organized.***

The MRC (see sidebar) played a unique role in the medical response to Hurricane Katrina. It not only rallied volunteers to travel to New Orleans and other affected areas, but MRC units also activated within their local communities and established medical needs shelters for Gulf Coast evacuees, provided medical support in evacuee shelters and clinics, and filled in at local hospitals for other volunteers who had been deployed to the Gulf Coast. Following Hurricane Katrina, an estimated 6,000 MRC volunteers around the country were activated at home to support local medical response efforts.¹⁸

Approximately 1,500 MRC team members were deployed to hurricane-affected areas of the Gulf Coast. This deployment was coordinated through state agencies, the American Red Cross, and HHS.¹⁹ The national MRC response following Hurricane Katrina was less effective and less organized than the community MRC response, primarily because the MRC National Program Office did not have the capacity to act as an effective coordinating body for MRC units. MRC members assigned to Red Cross shelters were prohibited from providing any advanced medical care to sheltered individuals, because Red Cross liability allows only basic-level medical care within its shelters.¹⁹ MRC units raised concerns that their teams were not utilized to their highest potential.

HHS launched its own website for medical and support volunteers both to rally volunteer support and to verify professional credentialing. However, many MRC volunteers were already registered and credentialed through the Health Resources and Services Administration's (HRSA) Emergency System for Advanced Registration of Volunteer Health Professionals (ESAR-VHP) program (see sidebar). Because HHS was operating more than one credentialing system, it was unclear to some MRC volunteers which system they were supposed to use.

- *Professional medical associations were a potentially valuable resource, but they were not well utilized by the federal government.*

In the immediate aftermath of Katrina, calls for volunteers to respond to the medical crisis in the Gulf Coast went out separately from organizations such as the American Hospital Association (AHA), the American Medical Association (AMA), the American Association of Medical Colleges (AAMC), the Federation of American Hospitals, the State, Regional and Metropolitan Hospital Associations, the National Association of Public Hospitals and Health Systems, and many more. But with so many associations calling for help, and with most health practitioners having multiple allegiances to and memberships with various organizations, it was difficult for members of the healthcare community to know how to plug in to the response efforts.

Some health professionals ultimately abandoned efforts to volunteer in any structured way and formed their own ad hoc medical teams, or they simply showed up in the Gulf Coast, hoping to offer their medical expertise in any way they could. Unfortunately, this kind of well-meaning but extemporized reaction often hampered other more organized efforts. One interviewed DMAT member commented that the physicians who just showed up in New Orleans seeking to help actually hindered relief efforts, because they didn't have the training to work in a disaster area.

On August 31, Secretary of HHS Michael Leavitt announced plans to create up to 40 federal emergency medical shelters with a total of 10,000 beds requiring 5,000 medical professionals to staff them. HHS could only staff the first 10 emergency medical shelters with Veterans Affairs and Defense Department medical personnel, DMAT teams, and MRC volunteers. HHS predicted that it would have to rely on private sector volunteers to staff an additional 10 medical shelters and to relieve the first contingent of medical responders.¹⁹

Also on August 31, Secretary Leavitt made an urgent call to the American Hospital Association to appeal for private sector hospital volunteers. The AHA collaborated with other hospital associations to create a website to collect information from hospitals interested in sending teams to staff the emergency shelters.²⁰ Ultimately, 480 hospitals responded to this call, and Secretary Leavitt was able to form 200 teams. Yet volunteers were delayed while HHS checked credentials and altered team deployment locations. Based on documents reviewed for this article (including HHS press releases), as well as on firsthand reports from volunteer health professionals interviewed for this analysis, it remains unclear whether HHS ever deployed the volunteer

teams that were formed in response to the Secretary's August 31 request.

KEY FINDING #4: Hurricane Katrina separated many Gulf Coast residents from their medical records, leaving volunteer health professionals without medical histories to help guide patient care.

Hurricane Katrina displaced about 1 million people from the Gulf Coast area, and most of them were separated from their medical records.²¹ Both immediately after the storm and in the weeks to follow, medical providers had no way to know about or track patients' pre-existing medical conditions, medications, or allergies, and many times patients themselves were unable to provide accurate medical histories for a variety of reasons. Patients were evacuated from hospitals, shuttled between multiple temporary medical shelters, and often were relocated to out-of-state healthcare facilities, all without any form of durable medical records.

A New Orleans Health Department physician interviewed for this article stated that one of the biggest public health problems that medical providers faced in the wake of the storm was the lack of access to patient health information. In order to give patients the best chance of survival, doctors resorted to primitive methods of passing on medical information. At Charity Hospital, for example, the medical staff taped notes containing brief medical records summaries to each ICU patient's forearm before helicopters evacuated them to other locations.⁶

In sharp contrast, the Veterans Administration (VA), which has an extensive national electronic health records system, was able to provide care for its patients in the Gulf Coast with fewer logistical complications because all of its patients' medical records were electronic. Several hundred veterans were evacuated from VA medical centers in Biloxi, Mississippi, and New Orleans.⁴ While this system was most likely not accessible from the heart of New Orleans, where basic infrastructure was down, VA patients could be tracked as they moved around the country, and their care (including histories of chronic conditions) could be maintained despite their changing locations.

Ten days after the landfall of Hurricane Katrina, HHS instituted a program to make pharmacy data from Gulf Coast residents affected by the storm available online on a secure database accessible by doctors.²² This database includes patient medication histories from about 150 zip codes from the Gulf Coast region and has been a collaborative effort of HHS and participating pharmacies such as CVS, Rite Aid, Albertsons, Walgreens, and Wal-Mart. By having a history of patients' prescription medications easily accessible, doctors have been better able to pro-

vide treatment to patients who were separated from their medical records, possibly separated from their families or caretakers, and did not know the medications that they had been prescribed.²³

CONCLUSIONS AND RECOMMENDATIONS

1. Hospitals should identify the critical systems that are essential for facility operations and should make plans to preserve those systems throughout a disaster or public health emergency.

A hospital is far more than just the doctors and nurses who staff it. As was seen in Hurricane Katrina, the functioning of a hospital requires a wide array of nonmedical staff, the continued operation of the physical facility, the pharmaceutical supply chain, physical security, functioning medical equipment, electricity, and more. Hospitals are important and highly valued places of refuge for the citizens they serve, yet in New Orleans hospitals could not fulfill their community responsibility because they themselves were overwhelmed and were seeking rescue. Hospitals need to ensure that their disaster response plans provide for the continuity of systems that are crucial to facility operation and hospital function, such as sufficient medical and nonmedical staff, electricity and backup power, critical supply chains, security, communications, and the like.

2. Hospitals should form and participate in Regional Hospital Coordinating Groups.

A recent study found that only three-quarters of the nation's nonfederal short-stay hospitals are currently integrated into communitywide disaster plans, and fewer than half of all hospitals (41.6%) have memoranda of understanding with other hospitals in their community to accept inpatients during a declared disaster.²⁴ The structure of the U.S. healthcare system puts hospitals in a competitive stance that can make it difficult to create collaborative relationships. However, no single institution had enough resources to prepare for a disaster of the magnitude of Hurricane Katrina without the help of the community.

"The burden of preparation cannot fall [totally] on the hospital itself," said Joseph Cappiello, Vice President of the Joint Council on Accreditation of Health Care Organizations (JCAHO). "This is a community problem."²⁵ If hospitals are to prepare for the next disaster, and for the difficult but looming challenges of a possible influenza pandemic, or a bioterrorist attack, they will need to form community plans and partnerships that allow hospitals to

plan collectively, to share resources and staff as necessary, and to communicate effectively in a crisis.

3. NDMS should be consolidated with other emergency medical response programs at HHS, and its stated missions, concept of operations, and staffing should be reexamined.

Under the National Response Plan (NRP), HHS has the lead role in federal medical and public health response and has the primary responsibility for implementing Emergency Support Function (ESF) #8—Public Health and Medical Services. Yet, in 2003, Congress moved NDMS to the newly created Department of Homeland Security, where it was placed within FEMA, an agency without a medical or public health mission. HHS still has the primary responsibility for implementing ESF-8, and it can call on NDMS teams to assist in a public health or medical emergency. But the oversight and organizational authority of NDMS is under the purview of DHS.

In light of HHS's role as the primary coordinator of the federal medical response, NDMS should be returned to HHS so that it can be directly overseen by the department with the greatest amount of medical resources and expertise. The U.S. House Select Bipartisan Committee to Investigate the Preparation and Response to Hurricane Katrina found that DHS and HHS did not share a common understanding of which agency is responsible for NDMS under ESF-8,³ and the White House recommended moving NDMS to HHS as well.¹ Not only NDMS but all emergency medical response assets in HHS should be organized and consolidated within HHS to maximize their utility: It does not make sense to have volunteer programs in HRSA, the national pharmaceutical stockpile in CDC, and the Medical Reserve Corps in the Surgeon General's office.

Once back in HHS, NDMS's mission, organization, and staffing should be carefully reconsidered. Even if the primary mission of NDMS continues to be delimited to providing proper training to DMAT and other teams and to ensuring the efficient deployment, organization, and staffing of these teams, the NDMS national office staff is too small and lacking in expertise to execute this.

Since its move to DHS, NDMS staff has been reduced from 144 to 57, and, according to an internal DHS report, as of January 2005, that staff did not include a physician, medical planner, or logistician.²⁶ Jeffrey A. Lowell, MD, former DHS Senior Advisor to the Secretary for Medical Affairs, testified before Congress that, within the DHS Emergency Preparedness and Response Directorate, there are "few qualified medical personnel available to develop the requisite medical doctrine, policies and procedures."²⁷

In the medical response to Hurricane Katrina, DMATs lacked sufficient direction, coordination, and logistical support from federal staff, and some DMAT members interviewed for this analysis felt that the absence of clear NDMS medical leadership and coordination led to a highly improvisational on-the-ground response that put teams at risk. Logistics systems that deliver and track necessary supplies and organize and ensure the communication of teams would need to be created in NDMS for future similar missions to be fulfilled.

If the future mission of NDMS were to be expanded to include the provision of widespread, perhaps sustained community medical care in the event of large natural or manmade disasters like hurricanes, pandemics, or bioterrorist attacks, NDMS will need to set expectations and train its teams accordingly and ensure the medical logistics associated with such a system are built. The NDMS website states: "DMATs . . . may serve to augment overloaded local health care staffs."²⁸ Perhaps this is true in the short term, but neither the NDMS, nor any other currently existing federal medical response program, is intended to provide long-term support for hospitals in stricken communities or widespread support for a hospital system under great duress in a crisis. DMATs typically prepare to deploy to disaster sites with enough supplies and equipment to sustain themselves for 72 hours.²⁹

Many DMAT physicians are specialists who are not used to providing generalized patient care, and DMAT teams are ill-equipped to care for patients with chronic medical conditions. Before focusing on the creation of large numbers of difficult-to-staff and logistically complicated field hospitals, the federal government would be well-advised to make sure there is a robust program, be it in HHS or elsewhere, to do all that is possible to ensure the continuing operation of existing hospitals in communities in crisis by organizing its medical volunteers, its medical assets, and its logistics systems accordingly.

4. HHS should take the lead role on all medical volunteer coordination in a federally declared emergency, and it should have one office in charge of deploying medical volunteers.

Following the events of September 11, 2001, Congress began a program to establish a national database of licenses and credentials of volunteer health professionals, so that they can be verified during an emergency. This Emergency System for Advanced Registration of Volunteer Health Professionals (ESAR-VHP) is administered by HRSA and is operational in at least 13 states and is being developed in others. Sixty states and territories have received \$200,000 each to develop ESAR-VHP systems based on national guidelines.

ESAR-VHP should be provided with sufficient funds to grow and support the state ESAR-VHP systems that are being developed, and ESAR-VHP should be completed quickly in all 60 states and territories. All health professionals who wish to volunteer within their communities or around the country should be required to register their licensing and credentials through their state ESAR-VHP system, and they should be encouraged to do so prior to an emergency. States should be required to make their systems interoperable, so that when there is a large-scale public health emergency requiring a nationwide response, the national ESAR-VHP office will have the ability to help manage a national volunteer health professional deployment effort.

HHS should create an Office of Citizen Engagement within the Office of Public Health Emergency Preparedness (OPHEP), which would be charged with helping communities to engage medical volunteers in planning and preparation prior to an emergency, mobilizing volunteer health professionals in a federally declared emergency, and managing a national volunteer deployment to affected locations around the country. This office would need to coordinate closely with other offices within HHS, possibly with Strategic National Stockpile (SNS) assets, and with other agencies such as DHS, as well as with the Red Cross and other nongovernmental disaster organizations. It would make great sense for the same office(s) in HHS to organize (and, where appropriate, consolidate) the various volunteer efforts that now exist in the NDMS, the Medical Reserve Corps (MRC), and ESAR-VHP.

5. The Medical Reserve Corps program should be restructured so that MRC units are required to report to the National Program Office.

If the MRC is to continue as a program distinct from other medical volunteer efforts, more clarity is needed in its concept of operations. During the MRC's response to Hurricane Katrina, there were organizational barriers that made the MRC's national response efforts less effective than they could have been. Since MRC units are community-based entities and are not designed for a national response, the MRC National Program Office is unable to mandate units to report on activities such as volunteer numbers, activation/deployment status in an emergency, and unit location.

If MRC units are going to be called on in the future to respond outside of their communities, they should be provided with the training, guidance, logistical capabilities, and liability protection to do so. The National Program Office should be able to organize unit deployment in a national emergency.

MRC units are currently ineligible for FEMA reimbursement and have to seek out funding to run their units

from community sponsors or apply to receive funding via other federal grant mechanisms (sometimes through HRSA Bioterrorism grants). If FEMA reimbursement was made available to MRC units, then the MRC National Program Office could tie unit reporting requirements to reimbursement monies.

The MRC National Program Office should offer liability protection and workers' compensation to their MRC unit volunteers. Currently, MRC volunteers are not offered any form of liability protection by the federal government, and in order for MRC volunteers to obtain information on liability protection, they are instructed by the MRC National Program Office to contact a lawyer or their local office of volunteerism.

6. Leaders in both government and the private sector must continue to work toward developing a national system of electronic health records.

Much of the U.S. healthcare system today still uses paper medical records that must be physically transferred as patients change doctors and locations. It would have been immensely helpful to medical providers at various treating locations if evacuees and hospital patients who had been relocated had had an electronic medical record of their care. In fact, electronic medical records and the ability to efficiently move clinical information electronically between providers would be key in responding to many kinds of catastrophes.

The effort to make electronic medical records standard in the country is moving far too slowly. Congress should pass legislation that accelerates such efforts. Meanwhile, the HHS Office of the National Coordinator for Health Information Technology (ONCHIT) should continue to engage the private sector and to fund pilot projects to produce interoperable electronic medical records that can be implemented in hospitals throughout the country.

7. Place higher priority on hospital preparedness in all community and government disaster planning.

In most kinds of large disasters, there will be many sick people needing medical care, much of it necessarily serious enough that it ought to be delivered in one of the nation's 5,000 hospitals. This was certainly true after Hurricane Katrina, and it would be true in a pandemic, a smallpox outbreak, and the like. But despite this clear and central role in response, hospitals have been given relatively few resources and little technical guidance to prepare for the wide variety of natural or deliberate crises that they could face.

Those charged with disaster preparations at the federal or state government or local community level should pay increased attention to the critical role of hospitals. The

Administration should make clear its commitment to these issues by convening hospital leaders to review these challenges. Congress should make clear its commitment to these issues by passing the Public Health Preparedness Re-Authorization bill that funds such efforts in keeping with the serious and complex nature of the challenges.

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