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Session #2

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4. Isidore Kouadio KKI, Uehara UN. Earthquake preparedness for foreign residents in Sendai. (Japan).
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National Disaster Medical Systems Activation in a Public Health Response—A Tale of Hurricane Katrina

Chair: Kristi L. Koenig, MD, FACEP
Correspondence: kkoenig@uci.edu

Hurricane Katrina Background

Hurricane Katrina resulted in 1,826 estimated direct and indirect deaths (mainly in Louisiana, 1,577 and Mississippi, 238)—one of the deadliest disasters in US history. Additionally, with an estimated cost of US$81.2 billion, it had one of the highest economic impacts ever recorded for a disaster. While much of the north-central US Gulf Coast was affected, the highest mortality and most significant property damage occurred following the storm's second and third landfalls on 29 August 2005, with the subsequent flooding in the city of New Orleans due to a failed levee system.

Session Summary

This session described critical issues surrounding the US National Disaster Medical System (NDMS) activation during Hurricane Katrina—the largest full activation of the patient movement portion of the NDMS to that date. After opening remarks by the moderator, three experts with firsthand experience described events surrounding the NDMS public health response to Hurricane Katrina. Panelists presented data from their on-the-ground experiences during and after Hurricane Katrina at all levels from the local/regional front lines in New Orleans to the State and Federal levels. Dr. Klein discussed ground level activities at the New Orleans airport, giving the audience a firsthand glimpse of issues surrounding lack of communications and organization. She also represented Dr. Ray Sweinton (University of Texas Southwestern at Dallas) and Dr. Michael Proctor (University of Texas Southwestern at Houston). She described both local preparedness and the broader response, with specific insights into activities and operational considerations occurring at the level of the State Emergency Operations Center (EOC) and the interface to the US Federal Department of Homeland Security (DHS). Dr. Rinnert then described her experiences in receiving patients who were evacuated from the disaster area to Dallas, Texas. Finally, Dr. Marty provided a Federal perspective delineating the procedures that were in place and those that should have been in place. Panelists highlighted keys issues including: (1) lack of leadership and action by government officials at all levels, (2) challenges with communications and situational awareness, (3) the failure to heed long-term warnings and the failure to prepare for and mitigate them, and (4) the lack of adequate support systems. A brief question and answer session concluded the session.

Summary of Audience Questions (Q) and Panel Answers (A)

Q. Is it possible to use the railways for the patient evacuation?
A. Yes, if railways are functioning, this would be a viable transportation alternative to air evacuation.

Chair Analysis: The US NDMS most commonly uses air evacuation for patients being moved to areas of the country unaffected by the disaster. While there are some civilian aircraft programs as a back-up, this evacuation generally is accomplished using military aircraft. The system is problematic because the primary wartime mission of the US military diverts resources (aircraft, supplies, and personnel) away from domestic missions and they may not be available to assist in patient movement during a civilian disaster. In addition, as was seen after the US terrorist attacks of 9/11 in 2001, airplanes may not be permitted to fly. Thus, alternatives to air transportation such as trains should be considered.

Q. Would it be possible to enlist the help of uninjured laypersons?
A. This technique was used, but some of the rescuers were uncomfortable being in the in the baggage claim area of the New Orleans airport.

Chair Analysis: Many experts encourage the use of uninjured bystanders to assist with victim management and treatment. Not only can this extend personnel assets in a resource poor environment, but it also can provide psychological first aid to the bystanders by giving them something useful to do and diverting their attention from the tragedy. Planners must account for human behavior and realize that people may be willing only to help under certain circumstances.

Q. Which people were evacuated before Hurricane Katrina made landfall?
A. People with money and other assets and patients in resource-rich hospitals were evacuated prior to landfall. The portion of the population with the lowest baseline socioeconomic status remained behind and was not rescued until after the hurricane made landfall.

Chair Analysis: Public health leaders and government officials must ensure that a pre-event evacuation plan is in place for all members of the population at risk, especially

those with special needs or insufficient economic resources to self-evacuate. In addition, the public must be educated as to the need for evacuation and the risks associated with sheltering in place when this is not advised. Evacuation is a key mitigation strategy that can save hundreds if not thousands of lives, particularly in an event with warning (delayed onset), such as a hurricane.

Q. Why did the government fail to evacuate persons who did not have the means to self-evacuate?
A. The government did evacuate persons in Mississippi. However, there was no plan in place in Louisiana. This resulted in more casualties and other deleterious effects of the event in that state.

Chair Analysis: The difference in effective evacuation plans in the two states illustrates the importance of having an evacuation strategy.

US Disaster Management—Basic Information

US Approach to Disaster Management
A key tenet of the US emergency management philosophy is that "disasters are local." Once local response resources are exceeded, state resources can be requested. By protocol, federal resources only are to be used once state resources become insufficient. While there are some nuances to this over simplification of procedures, it is useful to understand the basic philosophical approach when studying US disasters. Conceptually, local government officials are "in charge" and state and federal assets are used to support local programs. In addition, localities are taught that they will be "on their own" for some period of time (perhaps 72 hours or more) after a widespread disaster. Thus, local officials must develop plans to remain self-sufficient during the initial aftermath of a disaster.

National Disaster Medical System (NDMS) Background
The [US] National Disaster Medical System (NDMS) was formed in 1984 as an interagency agreement between four federal agencies: the Department of Health and Human Services, the Federal Emergency Management Agency (today a part of the Department of Homeland Security), the Department of Defense, and the Department of Veterans Affairs. The NDMS was not enacted into public law until 2002, as a part of the overall changes following the terrorist attacks of 11 September 2001.

There are two primary missions for the NDMS. First, in a military conflict overseas, the NDMS provides backup medical support to military and Veterans Affairs (VA) systems. This means that active duty military personnel returning from overseas who require hospitalization can be placed in VA or civilian hospitals enrolled in the NDMS when military hospital capacity within the US has been exceeded. Second, during a civilian, domestic disaster, the NDMS supplements state and local medical resources. When NDMS is activated, victims of a disaster can be moved from affected regions of the US to unaffected areas that have patient care capacity.

The NDMS is a public-private partnership that has three components: (1) medical response; (2) evacuation; and (3) definitive care. *Medical response* refers to teams of federalized personnel who may be activated (after the US President declares a disaster) and deployed to the site of the disaster to provide direct medical care to victims. Disaster Medical Assistance Teams (DMATs), Disaster Mortuary Operational Teams (DMORTs), and Veterinary Medical Assistance Teams (VMATs), such as those deployed to Hurricane Katrina, are examples of such assets. The second component of the NDMS is *evacuation* and refers to the process of moving patients from disaster-affected regions of the US to unaffected areas. Finally, *definitive care* encompasses placement of the evacuated patients into volunteer civilian NDMS hospitals in regions of the country distant from the disaster zone. At the time of Hurricane Katrina, on paper, there were approximately 1,800 hospitals across the entire US with an overall capacity to accept about 30,000 patients. A similar system is lacking for patients requiring nursing home care.

US Department of Homeland Security (DHS)—The Newest Cabinet-Level Department
The formation of the DHS via the Homeland Security Act of 2002 was the largest US government transformation since the Department of Defense was formed in 1947. As there were limited new monies allocated for its creation, approximately 180,000 personnel from more than 22 separate departments and agencies were transferred to form the new DHS, a presidential cabinet-level department. Agency names changed, departments were restructured, and responsibilities were reorganized. Existing communication and activation pathways were rewritten. To date, many new command and control systems are poorly understood and have not been tested fully. The US federal emergency management resources have been affected significantly by the transformation. Many emergency management assets were moved to the DHS, sometimes separating public health and medical assets, and creating confusion as to roles and responsibilities. Dissatisfaction and frustration among long-term staff led to a mass exodus of key personnel in critical positions, with a resulting loss of historical memory. A new National Response Plan (NRP) was created with the goal to integrate federal domestic prevention, preparedness, response, and recovery plans into a unified "all-hazards, all-discipline" plan under the authority of the Secretary of Homeland Security. Thus, despite the name that might indicate a focus on terrorism, DHS is responsible for coordinating the US federal response to all hazards, including hurricanes.

Contributions to the Future Science of Disaster and Emergency Health

The session on the public health response to Hurricane Katrina raised several important issues that would benefit from additional research and could contribute to the science of disaster management and public health emergencies.

Challenges with the Response—Personnel and Supplies
Disasters are local. Every jurisdiction should be prepared to manage the initial aftermath of an event, even when local first responders and healthcare facilities are incapacitated. Even when outside responders arrived in New Orleans, there

were too few. Helicopters arrived every 1 and one-half minutes at peak times with tarmac temperatures >110 degrees Fahrenheit (>43 degrees Celsius). Patients and evacuees were brought in, but no one was transported out. There were no evacuation plans for either patients or responders. Supplies of oxygen and other consumables were depleted within the first 24 hours. Logistical needs went unfilled and basic items such as sheets, urinals, bed pans, stretchers, gloves, hand cleaner, and food were lacking. Thus, better systems for logistics and resource typing must be developed.

Disaster Triage

When patient care needs exceed medical and public health resources, a shift in triage philosophy occurs so that the goal no longer is focused on the individual patient, but rather the population. This goal often is expressed as "do the most good for the most people." Resources must be directed to save as many lives as possible rather than focused on single individuals who may not have a good prognosis even with the best of care. Yet, when the situation is dynamic and there are unknowns in terms of numbers and acuities of patients and numbers and skills of healthcare workers, it is a challenge to determine the trigger to transition to population-based rather than individual care. In addition, the decision to transition back to standard, patient care procedures may be difficult. Additional analysis of the events surrounding Hurricane Katrina would be useful in developing protocols for disaster triage systems to include, when to implement them, and when to return to standard triage operations.

Coordination of Volunteers

As is commonly seen during many disasters, there were large numbers of volunteer medical and health workers who wanted to assist in the acute response. Yet, many people remained frustrated as, despite a purported system to accept their help, they were unable to organize a way to travel to the affected areas and participate in the disaster responses. As is usually the case, some volunteers simply showed up on their own without being a part of an organized response. This can lead to a diversion of resources away from patients in order to confirm credentials and assist with logistical needs for these well-meaning volunteers. To compound the problem, when the acute phase (relief and live-saving) of the disaster was over and patients needed ongoing primary care, the media stopped covering the story and many of these volunteers lost interest even though mechanisms had been implemented by then that would have allowed them to respond. The development of systems of volunteer management that are realistic and can be operationalized in a timely matter requires more study.

Socioeconomic and Behavioral Factors

More than 50 years of social science literature predicted what would happen in the wake of Hurricane Katrina. People reacted as they normally would in a stressful situation—some fled (including physicians who never returned to their communities), and there was a breakdown in communications. While it is a myth that looting is common following disasters, preliminary reports suggest that looting did occur in post-Katrina New Orleans. In fact, eyewitness and news accounts claimed that much of this looting may have been sanctioned by law enforcement authorities. The reasons for this require further study. As a general concept, planners must consider what people "will do", rather than what we "want them to do". Disaster management is a multidisciplinary field and socioeconomic and behavioral factors must be considered in future research. Currently, there are opportunities to pursue this type of translational research with the new funding emphasis from the US National Institutes of Health.

Infrastructure

In modern times, there is a lack of surge capacity in the US healthcare system. With disruption of this already stretched baseline infrastructure, the challenges became even more pronounced. An Incident Command System to organize the existing and incoming resources was in place at some levels of the response; however, there was no command structure in place above the level of the team commanders at the New Orleans airport site. When command personnel were brought in, there were no plans in place to coordinate with existing command structures. The new leadership was rapidly overwhelmed. Even when resources are sufficient, they must be managed. More research is urgently needed on the coordination of incident management systems—both within (vertical) and between (horizontal) organizations.

Challenges with the NDMS Activation—Planning Assumptions, Patient Tracking, and Reimbursement

The NDMS was based on the planning assumptions that an event (e.g., a massive earthquake) would occur in one part of the country and patients could be moved to other parts of the country that were relatively unaffected. It was not originally developed to address a widespread public health emergency such as pandemic influenza. In addition, the system was designed to transport patients and did not consider the need to evacuate people accompanying patients and well people. After Hurricane Katrina, multiple uninjured, healthy people needed to be evacuated, and the NDMS transportation system helped to accomplish this. Furthermore, family members of patients, in particular parents of children and caretakers for the elderly, were transported in military aircraft along with the disaster patients.

Patient and non-patient tracking, reception, and distribution capabilities were lacking. Repatriation of both patients and non-patients back to their homes also has been problematic. Who organizes and pays for this and where do they go if their homes and communities have been destroyed? In addition, although per national policy, NDMS designated hospitals may bill the US government 110% of Medicare rates on a last dollar basis for disaster victims, reimbursement for patient care services that were provided has been problematic, and the meaning of "disaster-related" victim is ill defined. For example, will the system reimburse hospitals for caring for a diabetic patient who ran out of insulin?

Additional areas for future research in the NDMS include the management of contagious and contaminated

patients. It is unlikely that the military would permit such patients to be transported on their aircraft or that distant hospitals would be willing and prepared to receive them. More likely, medical and health assets would need to be brought into the disaster zone rather than moving patients out. However, NDMS protocols currently do not permit this.

Were resources exceeded or was it a lack of leadership and an incident management system?

All areas of the US have vast medical and public health resources. In recent history, until the time of Hurricane Katrina, the last time our health care resources were truly exceeded probably was during the influenza pandemic of 1918. Even during the World Trade Tower terrorist attacks in 2001, the number of surviving victims requiring medical and health care in New York City did not exceed the city's capacity to provide that care. So, was the "black tag triage" that occurred in New Orleans in 2005 a result of insufficient resources? Or could we have organized the public health response more effectively to direct our assets to the locations where they were needed at the times they were needed? Could effective resource typing have matched the personnel and supplies to the people who needed primary care as well as acute medical care? Few people understand the background described above regarding the formation of DHS. How can we expect a well-rehearsed effective response from an organization that had been recently created and consists of personnel from differing backgrounds and corporate cultures? This unique case study (a widespread disaster within a large resource-rich nation) affords an excellent opportunity to study key issues of leadership and incident management.

Conclusions

While planners have expended large amounts of resources into frequent education and training for the NDMS for more than 20 years, Hurricane Katrina represents the first US disaster where the evacuation portion of the system was activated on a large scale. Hurricane Katrina represents a classic public health emergency. Nothing that occurred in the disaster aftermath was unpredictable. Two years later, a large negative public health impact remains, manifested by infrastructure deficiencies. There is a great opportunity to further the multidisciplinary science of disaster medicine by studying the multiple logistical and healthcare policy issues surrounding Hurricane Katrina.

Panelists
Kelly Klein (University of Texas Southwestern at Dallas)
Kathy Rinnert (University of Texas Southwestern at Dallas)
Aileen Marty (Battelle/DHS)
Special thanks to the volunteer medical student scribe: Kevin De Decker (Netherlands)
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Psychosocial Aspects

Prevention

Chair: Gloria Leon
Correspondence: leonx003@umn.edu

This session addressed the psychosocial needs of a range of affected groups, from children to the aged, with a focus on prevention and early intervention. Saenz described the use of play therapy with children exposed to trauma either personally or vicariously through the media, to teach them through games and stories that the world is not as bad as they see it.

Other papers described national programs that provide aid to groups under threat. One example is the Israel Trauma Coalition (Levanon), an NGO that responds immediately to terrorist or other events by organizing evacuations, psychological screening, and support, placement of children in schools in evacuee areas, and later follow-up. Cole described a state-wide disaster mental health training plan developed in New York after the terrorist attacks of 11 September 2001, consisting of a multi-module curriculum applicable for both rural and urban responders.

The final paper, presented by Qureshi, focused on the comprehensive and continuing procedures implemented to protect the mental health of participants and researchers during a longitudinal study of the psychological and psychiatric sequalae of the World Trade Center attack. The ethical concerns in conducting research on victimized groups were addressed.

In summary, this series of papers, presenting programs and experiences from different countries and different types of trauma, has application for planning and implementation by other groups tasked to deal with the psychosocial effects of disasters and terrorism.

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First Aid

Chair: Carol Amaratunga
Correspondence: carol.amaratunga@uottawa.ca

This session provided a dynamic and excellent overview of psychosocial aspects of first aid. A common theme espoused by all speakers was the social imperative to mainstream psychosocial dimensions into disaster management structures and protocols. The five presentations illustrated both individually and collectively how psychosocial aspects embrace multiple dimensions—the individual, family, community, as well as related social and cultural sequelae.

Collectively speaking, the presenters created a strong consensus with respect to the need to incorporate psychological "first aid" into best-practice protocols. The five case studies addressed vulnerable populations and demonstrated the need for culturally appropriate and sensitive interventions, along with the need for psychometrically robust instruments for assessing stress and post-traumatic stress, including intergenerational stress as indicated in the case of Ukrainian women who were exposed to radiation during the Chernobyl disaster.

Both Stephan Vymetal and Paul Deignan's presentations provided clear and interesting examples with respect to the need for critical stress debriefing and psychological first aid. The colorful handout from the Czech Republic for journalists during disasters illustrated an excellent case in point. The five presentation topics covered a wide, yet interrelated, range of issues from psychosocial assistance in emergencies, psychological first aid, family witnessed resuscitation, the integration of mental health policies into dis-