

Improving Disaster Response Efforts Through the Development of a Disaster Health Care Response System

Jonathan A. Wilson, MSN, RN, CEN, CHEP; L. Kendall McKenzie, MD;
W. Terry McLeod, BSN, RN, CHEP; Damon A. Darsey, MD, EMT-P; Jim Craig, CPM

ABSTRACT

We review the development of a disaster health care response system in Mississippi aimed at improving disaster response efforts. Large-scale disasters generate many injured and ill patients, which causes a significant utilization of emergency health care services and often requires external support to meet clinical needs. Disaster health care services require a solid infrastructure of coordination and collaboration to be effective. Following Hurricane Katrina, the state of Mississippi implemented best practices from around the nation to establish a disaster health care response system. The State Medical Response System of Mississippi provides an all-hazards system designed to support local response efforts at the time, scope, and scale required to successfully manage the incident. Components of this disaster health care response system can be replicated or adapted to meet the dynamic landscape of health care delivery following disasters. (*Disaster Med Public Health Preparedness*. 2017;11:600-604)

Key Words: disaster planning, emergency preparedness, emergency service, hospital, public health

Hurricane Katrina's landfall in August 2005 had catastrophic implications on the health care infrastructure in portions of coastal and southern Mississippi, including hospitals being closed owing to severe damage. The health care response system of the time relied almost exclusively on support resources from the federal government.¹ The National Disaster Medical System (NDMS) comprises teams that deploy to impacted areas and provide disaster health care services. The NDMS teams are designed to deploy approximately 24 to 48 hours after an incident.² Given the scale and complexity of Hurricane Katrina, these teams were not able to support the local health care system of hospitals, community clinics, pharmacies, and emergency medical services (EMS) along the Mississippi coast for several days, leaving a void of services for citizens hardest hit by the storm. The hurricane's impact resulted in hospitals being severely damaged, a complete loss of several community provider practices, and a surge in the demand on EMS for both emergency response and interfacility patient evacuations. Additionally, the loss of land-based radio and cellular phone towers caused an interruption in communications that severely hindered response coordination. During this time, the health care system of Mississippi faced several other critical challenges, including the need for rapid assessment of impacted facilities, movement of patients between hospitals,

and coordination of EMS.³ It is important to note that the disruption of the health care system resulted in challenges associated with a vulnerable population's normal routine of prescription medication refills, home health visits, scheduled physician visits, and other primary care needs being severely interrupted or displaced. Additional complicating factors were a high incidence of exacerbation of chronic illnesses due to environmental conditions, loss of medications, emotional stressors, and other causes associated with the interruption of their normal level of care.⁴ These response challenges, coupled with the void in timely health care services, led to the creation of the State Medical Response System (SMRS) of Mississippi.

DEVELOPMENT OF THE MISSISSIPPI STATE MEDICAL RESPONSE SYSTEM

The Mississippi SMRS is currently tasked with supporting local health care infrastructure during disasters as well as providing a coordinated and integrated approach to health care emergency response. The SMRS is designed around an all-hazards model, meaning the mission profiles are designed to respond to all types of disasters rather than focus on a select few. This all-hazards approach ensures that the SMRS remains as flexible as possible and can meet the emergency health care needs of Mississippians in future disasters, regardless of disaster type.⁵

Following the terrorist attacks on September 11, 2001, the US government began various initiatives aimed at enhancing the national level of preparedness for responding to disasters. These initiatives included the development of the National Response Plan in June 2003, which was updated to the National Response Framework (NRF) in March 2008. The second edition of the NRF was released in May 2013.⁶ The NRF is a component of the overall National Strategy for Homeland Security that establishes the key characteristics of disaster response efforts, including command roles, communication strategies, coordination tactics, and escalation of response efforts. The purpose of the NRF is to strengthen the country's capability to manage domestic incidents, regardless of the incident's scope, scale, or complexity. To that end, the NRF was utilized during the formation of the SMRS of Mississippi.

An exemplar in the development of the SMRS of Mississippi has been the state of North Carolina. The North Carolina Office of Emergency Medical Services (NCOEMS) began initial development of the SMRS concept of operations in January 2002. This SMRS program was designed similarly to the NDMS but with a focus on more rapid deployment to support state-level response efforts. During the 2003-2005 time frame, there was a continued refinement of the concept and program objectives.⁶ During this time, NCOEMS purchased much of the initial equipment and developed a system of host facilities for the SMRS program assets, all of which were placed at established trauma centers.⁷ The culmination of the North Carolina SMRS development process was its initial deployment to Waveland, Mississippi, on September 4, 2005, in support of the state of Mississippi following the impact of Hurricane Katrina.⁸

In 2006, NCOEMS welcomed public health and health care leaders from Mississippi to visit North Carolina and observe an SMRS field exercise. The visit sparked a collaboration between the 2 states' key response leaders with the North Carolina SMRS serving as the template for the creation of an SMRS in Mississippi. This mutually beneficial interstate partnership has continued to grow, support, and refine the SMRS in both states. Members of the SMRS of both states meet regularly and review overall plans and processes since the systems are, by design, very similar in operation. The partnership allows the SMRS of both states to utilize economies of scale, exchange response planning guides, and share training opportunities, all of which have resulted in the creation of multiple disaster medicine best practices as they relate to deployment of medical resources.

Under the Mississippi Comprehensive Emergency Management Plan signed by the governor, the Mississippi Emergency Management Agency (MEMA) coordinates emergency responses in a systematic manner. MEMA utilizes the National Incident Management System according to the NRF. In these systems, areas of responsibility are divided into

Emergency Support Functions. Emergency Support Function-8 (ESF-8) is Public Health and Medical Services where the lead agency is the Mississippi State Department of Health (MSDH) and the primary agencies are MSDH and the University of Mississippi Medical Center (UMMC).⁹ The UMMC is the only academic medical center in Mississippi and houses the Mississippi Center for Emergency Services. As such, UMMC provides coordination of acute medical services alongside MSDH in incidents requiring disaster health care response resources. MSDH and UMMC provide various systems of support of local response efforts during disasters; one of these systems is the SMRS of Mississippi.¹⁰ The SMRS is typically activated as the result of a disaster or emergency situation that exceeds the local response capabilities and is requested through the emergency management process. Components of the SMRS may be activated by MSDH and UMMC in coordination with MEMA and may also be deployed out of Mississippi based on requests from other states through the Emergency Management Assistance Compact.

Design of the State Medical Response System

The SMRS of Mississippi is a collection of state assets created to support local ESF-8 response efforts when needed. The SMRS has a scalable design to meet an event or incident needs—ranging from small teams of personnel with specific missions all the way up to large mobile field hospitals capable of providing a wide range of clinical services. The SMRS is coordinated by the Mississippi Center for Emergency Services housed at UMMC. This is done in collaboration with MSDH, Office of Emergency Planning and Response, and MEMA. The SMRS of Mississippi has equipment purchased from federal grant sources including the US Department of Health and Human Services Office of the Assistant Secretary for Preparedness and Response, the Centers for Disease Control and Prevention Public Health Emergency Preparedness, and the US Department of Homeland Security. The SMRS relies on staff and personnel from participating partners willing to support Mississippi when needed. These efforts result in a system that provides enhanced coordination and collaboration to support local response efforts.¹¹

Health Care Partnerships

A key component of the SMRS is the coalition of the various hospitals and EMS providers in Mississippi. This partnership is championed by the Mississippi Hospital Association through funding from MSDH, Office of Emergency Planning and Response. These health care partnerships are designed around memoranda of understanding developed to strengthen the collaboration among Mississippi hospitals (see Appendix A in the online data supplement) and EMS providers (see Appendix B in the online data supplement) to improve community resiliency in the face of a disaster. These partnerships provide a clear mechanism for participation at various levels in support of disaster medical response efforts.

This strengthens the local community's resilience and enhances overall medical surge capabilities across the state.

Mississippi Med-Com

The need for an interoperable communications platform to coordinate patient transports on a large scale was another gap identified during the Hurricane Katrina response. Based on this need, UMMC proposed the creation of a statewide medical communications center to provide real-time interoperable communication capabilities for ESF-8 operations. This communications center was approved and named Mississippi Med-Com. It was funded initially by the US Department of Health and Human Services through MSDH with continuing operational funding provided by UMMC. In addition to providing communication capabilities, Med-Com provides statewide emergency medical coordination and patient movement in support of local emergencies 24 hours a day.

Mississippi Med-Com provides 3 core services to the state of Mississippi. First, it acts as a support unit to assist the SMRS of Mississippi by providing coordination and logistical support to EMS agencies and hospitals, providing an operations center for the SMRS of Mississippi, and relaying real-time hospital data to response leaders in order to enhance operational effectiveness and improve patient care. Second, Med-Com provides around-the-clock support as a platform for interoperable communication capabilities. This is accomplished through the use of traditional UHF and VHF radio communications, as well as an advanced 700-mHz statewide radio network. Third, the center performs the role of a centralized emergency transfer call center, helping to coordinate emergency and critical care transfers to UMMC from referring hospitals on a daily basis. Together, these 3 core missions allow Mississippi Med-Com to support the health care infrastructure of Mississippi in times of need through a quick and scalable model.

Forward Assessment and Scene Triage Teams

Forward Assessment and Scene Triage, or FAST, Teams are a concept based on lessons learned in 2010 during tornado response efforts in central Mississippi. To support this response, UMMC deployed its critical care transport helicopters along with specially trained nurses from the SMRS to establish casualty collection points with local first responders and EMS providers. These teams served in several key roles that included rapid deployment to support local response efforts, providing incident size-up for decision-makers and interfacing with incoming additional response assets. Because the teams were so effective in these roles, the concept was codified and integrated in the planning, training, and response packages of the SMRS of Mississippi.

State Medical Assistance Teams

For large-scale incidents that require on-scene medical facilities, the SMRS of Mississippi has 3 State Medical Assistance

Team (SMAT) mobile field hospitals that are requested and activated as an ESF-8 resource. Mississippi SMRS SMATs may be requested by other states across the nation to respond to major events through a mutual aid system between states.¹² The SMAT concept was again modeled after the North Carolina SMRS SMAT, allowing for enhanced interoperability between the 2 states. One SMAT mobile field hospital supports up to 50 beds designed to back up impacted health care systems in a disaster. The SMAT units are made up of 6 soft shelters with heating, cooling, and power generation all transported by semi-trailer truck and can be deployed separately or combined. These teams and units provide the state of Mississippi an effective, all-hazards solution to support various missions. The mission profiles include disaster field medical care, alternate care site, weapons of mass destruction response, hazardous material response, contingency management, pharmaceutical point of distribution, and event medical support.¹³ SMAT staff are both nonclinical and clinical providers from around Mississippi who undergo advanced disaster training and orientation to the mobile field hospital setting. Each of the SMAT mobile field hospitals provides a full array of clinical services including cardiac telemetry, digital X-ray, ultrasound, ventilators, and intravenous pumps. Combining the efforts of the advanced trained staff with the latest field medical equipment, the SMAT mobile field hospitals give the SMRS of Mississippi an advanced level of clinical care capable of being delivered in the most austere environments.

Mississippi-1

Mississippi-1 is a Disaster Medical Assistance Team (DMAT) that is a federal NDMS team based in Mississippi. Its mission is to be a rapid-response element to supplement local medical care until other federal or contract resources can be mobilized or the situation is resolved. DMATs deploy to disaster sites with enough supplies and equipment to sustain themselves for a 72-hour period while providing patient care in a fixed or temporary care site.¹⁴ Alignment of the DMAT alongside the SMAT has allowed the SMRS of Mississippi to yield additional economies of scale, joint training opportunities, and team growth for both programs. This alignment has also allowed for a greater degree of interoperability between state and federal disaster health care resources resulting in a more efficient response system.

Medical Reserve Corps

The Mississippi Medical Reserve Corps (MRC) is part of a national network of community-based units that contribute to local health initiatives and assist in response during public health emergencies or events requiring public health or medical surge capabilities. Mississippi currently has 7 MRC units that are each designed around a unique volunteer base.¹⁵ UMMC hosts the Central Mississippi MRC and developed a recruiting and retention program designed to attract, train, and maintain a roster of volunteers for the

MRC to support, integrate, and collaborate with the SMRS. The primary focus of the Central Mississippi MRC program is to support the medical personnel staffing and logistical support staff needs for staffing all SMRS programs and activities and provide a centralized resource of trained and reliable volunteers available on a scalable basis for day-to-day activities, unscheduled incidents, and preplanned events. The Central Mississippi MRC team is subdivided into 2 units: a medical support team and a logistics support team. The MRC unit is primarily tasked with providing staff for all medical and logistical support equipment in events requiring public health or medical surge capabilities.

SIGNIFICANCE

A report from The Trust for America's Health supported by the Robert Wood Johnson Foundation evaluated all 50 states on key indicators of performance in emergency preparedness. These indicators were as follows: effectiveness of chemical terrorism response, staffing plans for a prolonged infectious disease outbreak, an accredited emergency management program, multi-hazard evacuation plans on file, meeting the federal vaccination goal, nurses' ability to practice in other states, and timely notification of public health staff during emergency incidents. While the indicators were not all health and medical centric, ESF-8 capabilities played a key role.¹⁶

At the conclusion of this evaluation, Mississippi was ranked tied with several other states as the best in the nation. The top-tier states were lauded for having a superior level of disaster readiness—a clear reflection of the hard work done on all levels of emergency preparedness in the state. This marked level of improvement in the response capabilities of Mississippi was a clear reflection of the collaboration among public health and other health care leaders following the collective experiences of Hurricane Katrina. The SMRS template provided to Mississippi by North Carolina coupled with the work done by MSDH and UMMC has allowed for the development of a broad spectrum of response capabilities that were nonexistent just a few years prior. Wide-scale disasters may not be preventable, but widespread collaboration can be the answer to improved responses and lives saved.

CONCLUSION

Improvements made to Mississippi's level of preparedness in the health care sector in the wake of Hurricane Katrina translate into significant improvements in the state's overall level of disaster response capabilities. This is a direct result of the meaningful collaboration with the North Carolina SMRS and the coordination of Mississippi ESF-8 between MSDH and UMMC resulting in the SMRS of Mississippi. The SMRS has resulted in an all-hazards system designed to support local response efforts at the time, scope, and scale that is most beneficial. The SMRS of Mississippi allows for

enhanced health care response resources being available in-state, thus reducing the level of reliance for external support. This model of collaboration should be considered by other states facing increased public health preparedness and health care response needs in a reduced funding environment.

About the Authors

Department of Emergency Services, University of Mississippi Medical Center, Jackson, Mississippi (Mr Wilson, McLeod); Department of Emergency Medicine, University of Mississippi Medical Center, Jackson, Mississippi (Drs McKenzie, Darsey); Department of Health Protection, Mississippi State Department of Health, Jackson, Mississippi (Mr Craig).

Correspondence and reprint requests to Mr Jonathan Wilson, Department of Emergency Services, University of Mississippi Medical Center, Jackson, MS 39216-4505 (e-mail: jwilson5@umc.edu).

Supplementary material

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