

# Responding to Disasters: Academic Medical Centers' Responsibilities and Opportunities

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## Abstract

Disaster preparedness and disaster response should be a capability of all academic health centers. The authors explore the potential role and impact of academic medical centers (AMCs) in disaster response. The National Disaster Medical System and the evolution of disaster medical assistance teams (DMAT) are described, and the experience at one AMC with DMAT is reviewed. The recent deployment of a DMAT sponsored by an AMC to the Hurricane Katrina disaster is described, and the experience is used

to illustrate the opportunities and challenges of future disaster medical training, research, and practice at AMCs.

AMCs are encouraged to identify an appropriate academic unit to house and nurture disaster-preparedness activities, participate in education programs for health professionals and the public, and perform research on disaster epidemiology and response. Networks of AMCs offer the potential of acting as a critical resource for those AMCs stricken by a disaster and for communities

needing the infusion of highly trained and motivated health care providers.

The Association of American Medical Colleges can play a critical role in assisting and coordinating AMC networks through its relationship with all AMCs and the federal government and by increasing the awareness of medical educators and researchers about this important, emerging area of medical knowledge.

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**D**isaster preparedness and disaster response have received increased attention and interest since the Hurricane Katrina disaster<sup>1</sup> and with the recent concern about the risk of an avian influenza pandemic.<sup>2</sup> Academic medical centers (AMCs) have been victims of disasters<sup>3–5</sup> as well as potent resources for disaster response and mitigation.<sup>3,6</sup> However, there has been little discussion about roles and opportunities for AMCs in disaster medicine. This may be attributable to the infrequent occurrence of disasters, the competition for scarce resources at AMCs, the historical absence of disaster medicine in medical school curricula, and the national research-funding agendas. AMC hospitals also do not derive any clear financial advantages from participation in disaster

preparedness beyond a required minimum level, unlike their involvement in lucrative clinical areas such as cancer care or cardiac care. However, the increasing frequency and intensity of disasters<sup>7</sup> and concerns about the effects on AMCs are likely to change the perception of how important this area is, and what kinds of responses are possible or appropriate for AMCs.

Disaster medicine encompasses planning, surveillance, and response. Disaster preparedness involves the first two aspects and should be a capability of all AMCs. Disaster response involves prehospital care, hospital evacuations, transport, definitive care, and rehabilitation. Disasters generally follow a cycle described as prodrome, impact, rescue, recovery, and quiescent.<sup>8</sup>

Prodrome consists of initial awareness of the disaster threat and preparation for a response with activation of a variety of internal and external resources. Impact involves the actual disaster event and damage as well as mitigation activity as the event unfolds. Rescue involves deployment of resources to aid victims of the disaster. Recovery includes rebuilding and application of additional resources to infrastructure needs. The quiescent stage is the period after the recovery when preparedness for future disasters occurs. A disaster-response strategy generally involves the first four phases of the cycle, although continued training should occur

during the quiescent period for optimal performance. In this article, we emphasize the first four phases of response.

Optimal response to a potential disaster requires an understanding of the disaster medical system in the United States and the possible ways in which an AMC could be integrated into the system. The history and evolution of disaster response in the United States as compared with other nations provides an important context for understanding the present disaster-response infrastructure.<sup>9</sup> We will describe one particularly relevant component of the emergency-response infrastructure, the National Disaster Medical System (NDMS), discuss the organization and deployment of disaster medical assistance teams (DMATs), and provide an example of an AMC with a DMAT at the University of New Mexico (UNM). We then describe the recent deployment of the New Mexico (NM) DMAT to Hurricane Katrina, and, finally, discuss the case for involvement of AMCs in disaster preparedness and response and end with specific recommendations.

## The NDMS

The NDMS is a national medical response system that was established by President Ronald Reagan in 1981 and that originally resided in the Department of Health and Human Services (DHHS).<sup>10</sup> In 2002, the NDMS was moved to the newly created Department

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of Homeland Security under the auspices of the Federal Emergency Management Agency. The Public Health and Medical Emergency Coordination Act of 2006 moved the NDMS back to DHHS under the Office of the Assistant Secretary for Public Health Emergency Preparedness.

This system supplements state and local medical responses during major disasters and was designed to care for up to 100,000 casualties arising from a massive peacetime disaster or an overseas conventional military conflict.<sup>11</sup> The major components of the NDMS include (1) patient evacuation, (2) definitive medical care, and (3) medical response. In collaboration with the Department of Defense, the NDMS participates in the evacuation of patients from disaster-affected or disaster-threatened areas. This typically involves aeromedical evacuation using military assets, with NDMS personnel providing medical support at the sending and receiving sites. As part of the second component, the NDMS coordinates a national network of public and private hospitals that serve as the receiving facilities to provide definitive medical care to evacuated patients. The third and possibly most well known aspect of the NDMS is the medical response system. The NDMS organizes and deploys a variety of disaster-response teams that include DMATs, disaster mortuary operational response teams, and veterinary medical assistance teams. DMATs are the primary mechanisms for medical care within the disaster area.

DMATs are teams of professional personnel including physicians, nurses, and emergency medical technicians and are designed to provide care during a disaster.<sup>12</sup> Each team has a sponsoring organization, which could be a hospital AMC, or public health safety agency, that will be responsible for overseeing the training and recruitment of members under the provisions of a memorandum of agreement with the NDMS. There are presently 80 DMATs in the United States.<sup>13</sup> The organizational structure of a DMAT is based on an incident command system model led by a team commander and organized into the major activities of medical operations, logistics (resource and materials management), administration, communications, and safety.

Teams are deployed to disaster sites with sufficient equipment to sustain

themselves for a minimum of 72 hours while providing care in extremely austere disaster environments. Typically, DMATs deploy as 35-member teams composed of physicians, nurses, emergency medical technicians, pharmacists, and support personnel. DMATs are occasionally deployed during the prodrome phase in anticipation of a natural disasters such as hurricanes; for other types of disasters, they are deployed during the impact and the rescue phases. DMATs often remain during the recovery period until the health care infrastructure regains capacity to provide health care services.

The organizational structure and support for DMATs has evolved over the past 20+ years. Financial support of DMATs was initially based on local resources. In 1989, the NDMS system began to provide financial support for DMATs.<sup>14</sup> The use of the funds was limited to equipment initially, but later it also included some support of personnel and training needed to maintain the team.

### The UNM's DMAT

The UNM Health Sciences Center is one AMC that has a long history of sponsorship and leadership of a DMAT as well as education and research in disaster medicine. In 1984, UNM started the NM DMAT under the leadership of the director of the division of emergency medicine, Dr. Paul Roth (now the vice president of the health sciences and dean of the school of medicine), and it was among the first teams to become a member of the NDMS. Initial equipment was purchased in 1984 using departmental clinical resources, which included two tents and a variety of medical and logistics equipment. The team was made up of nurses, paramedics, emergency medical technicians, communication experts, and other volunteers, who conducted training exercises and received no additional pay for their activities. Participating physicians were from the department of emergency medicine and other UNM School of Medicine departments. The nurses, paramedics, and logistics experts came from the university hospital and community organizations. The original vision was to use the DMAT to provide direct humanitarian assistance, to gather information about the nature of problems and disasters to which it was sent, and to identify training needs and materials.

In 1989, the NM DMAT was the first DMAT in the NDMS to be deployed to a major disaster. In response to the devastation to the Caribbean islands from Hurricane Hugo, the NM DMAT deployed 70 members to St. Croix to establish a field hospital.<sup>15</sup> Since then, the team has been federally deployed 22 times (see List 1), making it one of the most deployed DMATs in the nation.

Support for team members when deployed occurred through a variety of mechanisms, including a federalization mechanism somewhat like activation of military reservists. Faculty and staff previously had a choice of taking annual leave and accepting a federal stipend or not taking annual leave and allowing the university to directly recoup the cost of the salary paid during the deployment. However, now all DMAT members deploy as federal employees and are paid directly by the federal government. At UNM, they take 15 days of leave, allowing them to receive university pay in addition to their federal pay. Clinical shift backfill costs were covered at some times, but presently they are not covered, which causes the costs to be borne by UNM and the department of emergency medicine.

### The NM DMAT and the Katrina Experience

The recent deployment of the NM DMAT to assist with Hurricane Katrina treatment and recovery occurred 24 hours before the hurricane struck. The team was staged in Houston in preparation for the hurricane. Five UNM faculty members from the department of emergency medicine deployed with the team. All clinical responsibilities for the team physicians were filled by the remaining department physicians. The assumption that all shifts would be covered was critical to the rapid deployment and has been an underlying commitment of the faculty of the department of emergency medicine since the DMAT was created. Other nursing personnel received permission from their supervisors to leave and had to arrange their own coverage in some cases.

On arrival in New Orleans, the uniqueness of this deployment became clear. Whereas most previous deployments of the NM DMAT had involved temporary primary care support and supplementation of local medical

## List 1

**University of New Mexico Disaster Medicine Assistance Team Deployments, 1989–2005**

Response '89	Travis AFB, Calif	August 7, 1989
Hurricane Hugo	St. Croix, USVI	September 29, 1989
Hurricane Andrew	Dade County, Fla	August 28, 1992
Hurricane Iniki	Kauai, Hawaii	September 19, 1992
Steel Cure II	Cape Girardeau, Mo	October 22, 1992
Northridge earthquake	L.A. County, Calif	January 18, 1994
Hurricane Opal	Camp Shelby, Miss	October 5, 1995
Summer Olympics	Atlanta, Ga	July 5, 1996
Hurricane Georges	Maxwell AFB, Ala	September 27, 1998
Kosovo refugee intake	Ft. Dix, NJ	May 1999
Hurricane Bret	San Antonio, Tex	August 22, 1999
Floods and mudslides	Venezuela	January 6, 2000
Cerro Grande fire	Los Alamos, NM	May 13, 2000
Pres. G.W. Bush Inaug.	Washington, DC	January 18, 2001
T.S. Allison floods	Houston, Tex	June 10, 2001
Terrorist attack	World Trade Center, NY	September 29, 2001
Winter Olympics	Salt Lake City, Utah	February 14, 2002
Hurricane Lili	Shreveport, La	October 2, 2002
Guam deployment	Guam	January 28, 2004
Hurricane Frances	Stuart, Fla	September 3, 2004
Hurricane Katrina	New Orleans, La	August 27, 2005
Hurricane Rita	Woodville, Tex	September 27, 2005

resources,<sup>12</sup> after Katrina most other medical resources were knocked out or severely limited. Care of evacuated patients with exacerbations of chronic conditions who had lost their ongoing care (dialysis patients, diabetics, and ventilator patients) mixed with the more typical primary care needs. The team set up operations in the arena adjacent to the Superdome with the mission to provide medical care to the evacuees during the evacuation. The most common complaints encountered during the operation were exacerbations of chronic medical conditions from patients who had been separated from their medications, oxygen, and outpatient medical care for several days. When flood waters and security concerns endangered the DMAT, they were evacuated and became the providers of care at a field hospital on the campus of Louisiana State University (LSU) in Baton Rouge.

At LSU, the NM DMAT joined personnel from the Louisiana Department of Health, the Illinois Emergency Response Team, and the Public Health Service Corps in setting up a 170-bed field hospital in the Pete Marovich Athletic Center. The team members, trained and

experienced in disaster response, were predominantly assigned to command and control duties at the field hospital, and the direct patient care was primarily provided by a wide variety of volunteer health care professionals, many of whom were displaced from New Orleans. In the course of about six days, over 6,000 patients were cared for at the field hospital, and over 15,000 evacuees passed through the campus. The DMAT personnel during this deployment were predominantly assigned to command and supervisory positions within their specialties. For example, the DMAT physicians participated as medical command over operational areas such as triage or patient-care units. The DMAT medical directors served as medical command for the full facility.

### Partnering AMCS and DMATS

The recent Hurricane Katrina and the subsequent flooding created a situation unlike any previous disaster. The extent of the need, the inadequacy of local resources, and the loss of life is unparalleled in recent U.S. history. The UNM sponsored DMAT and the other DMATs that were deployed provided critically needed emergency

medical care but also exposed some limitations of the present NDMS concept for a disaster of this magnitude.<sup>6</sup> The provision of care was compromised by inadequate planning and logistics, inadequate supplies and pharmaceuticals, inadequate communications systems, an inadequate number of health care providers, and transportation and deployment issues.<sup>16–19</sup> Although the NDMS was conceptually designed to handle 100,000 casualties, limitations of the system have been an ongoing concern.<sup>19,20</sup> In a survey of governmental response agencies, only 31% of the federal and 26% of the state and local respondents believed there were sufficient combined governmental and private resources to meet the medical needs of 30,000 disaster casualties.<sup>21</sup> These deficits suggest opportunities for improvement if appropriate organizational and resource changes are made.

AMCs may have disaster-response plans and resources that can help communities respond to large-scale disasters. Many AMCs were prepared to mobilize their resources in response to Hurricane Katrina but ultimately found that there was no mechanism to integrate these systems into the federal, state, or local response structure.<sup>6</sup>

By sponsoring a DMAT, in the event of disaster, an AMC can ensure that its resources will be used effectively in a coordinated fashion. The teamwork and command structure of a DMAT also provides for the safety of the team members as well as any patients, and can reassure the AMC that volunteer physicians and staff will function as part of a formal system. Among the benefits of sponsoring a DMAT is expertise gained by the volunteers, which can then be applied to local problems and incorporated into educational programs. Besides delivering on its commitment to humanitarianism, the team also may perform in a manner that garners favorable press to the sponsoring institution. A successful DMAT may also provide the nidus of a comprehensive disaster program that may become the recipient of grants and philanthropy. Some institutions may wish to develop a departmental or multidisciplinary center that incorporates all phases of disaster response, education, and research.

UNM has incorporated the DMAT into its Center for Disaster Medicine, a state-

supported program within the department of emergency medicine that provides training, research, and disaster-response capabilities. This center has been fortunate to receive federal grant funding for biodefense education as well as other topics of importance to the public, and to medical care providers and hospitals. However, education of medical students and residents in the principles of disaster medicine remains a sporadic and elective opportunity as opposed to a required educational experience. The Center for Disaster Medicine has also engaged in some unfunded research to help define this young specialty. There is a great need for further research into the epidemiology and response to disasters so that future training can prepare providers for the situations they may encounter. Most research to date has focused on reports of individual disasters and casualty patterns, but because of the infrequency of disasters and the uncontrolled environment for data collection, the conclusions based on such research are of limited utility. AMCs have the opportunity and responsibility to participate in the education<sup>22</sup> and research agenda for disaster medicine because it involves protection of the health of the public—one of the roles of AMCs.

The present federal grant programs provide support for training but very little support for disaster research or the creation of a cadre of disaster researchers or experts. Such expertise is critically important as we prepare for disasters or public health emergencies such as pandemic influenza, emerging infections, or bioterrorism. The location of DMATs and disaster medicine centers in AMCs will provide the expertise and support to help in the further development of this relatively young specialty that combines medical, toxicological, sociological, architectural, political, and psychological disciplines.

On the basis of our experience, we recommend the following:

1. AMCs identify an appropriate academic unit to house and nurture disaster-preparedness and disaster-response programs, to include education of medical students, residents, and faculty in disaster preparedness and response. Support of a DMAT could also be a part of the commitment. AMCs can mobilize a significant number of physicians to be deployed with disaster-response teams because of
2. their ability to spread coverage among the physicians staying behind.
3. Research into the epidemiology and clinical response of disasters should be initiated at AMCs. Funding for such research should be made available by federal, state, and community sources.
4. Public education into disaster preparedness can be coordinated through AMCs. Such education should be coordinated with planning at all levels so that the public is informed appropriately about its role in mitigating a disaster.
5. Organizations such as the AAMC have the opportunity to provide leadership in developing an awareness of the important roles that AMCs can play in disaster preparedness, education, and response.
6. The NDMS should consider a policy for reimbursement of backfill expenses to sponsoring agencies. This would remove an important disincentive for participation in the sponsorship of a DMAT, by AMCs.

Hurricane Katrina exposed some of the limitations of the present NDMS response system and the lack of involvement of many AMCs. Preparation for future disasters should include the active involvement of AMCs in all phases of disaster medicine. The model of a center for disaster medicine that incorporates the multidisciplinary skills and experience needed in disaster preparedness and response should be considered as one possible option for addressing the complex issues inherent in a disaster.

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