

History of Disaster Medicine

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SUMMARY

Erik Noji, mentioned, tongue in cheek, Noah as the first disaster manager during a lecture in 2005. The canonical description of “The Genesis Flood” does describe Noah as a master planner and executer of an evacuation of biblical proportions. After gaining knowledge of a potential catastrophic disaster he planned and executed an evacuation to mitigate the effects of the “Genesis Flood” by building the Ark and organizing a mass exodus. He had to plan for food, water, shelter, medical care, waste disposal and other needs of all the evacuees. Throughout history, management of large disasters was conducted by the military. Indeed, the military still plays a large role in disaster response in many countries, particularly if the response is overseas and prolonged. The histories of emergency preparedness, disaster management and disaster medicine have coevolved and are inextricably intertwined. While disaster management in one form or another existed as long as people started living together in communities, the development of disaster medicine took off with the emergence of modern medicine. Similar to disaster management, disaster medicine also has roots in military organizations.

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It is perhaps as difficult to trace a history of Disaster Medicine as it is to define “disaster”. Following the theory of historical genealogy promulgated by Foucault, disaster medicine has multiple origins and a history of parallel development rather than a linear chronology.^[1] Erik Noji, mentioned, tongue in cheek, Noah as the first disaster manager during a lecture in 2005.^[2] The canonical description of “The Genesis Flood” does describe Noah as a master planner and executer of an evacuation of biblical proportions. After gaining knowledge of a potential catastrophic disaster he planned and executed an evacuation to mitigate the effects of the “Genesis Flood” by building the Ark and organizing a mass exodus. He had to plan for food, water, shelter, medical care, waste disposal and other needs of all the evacuees. Similar stories are present in the mythology of many cultures. In more recent

history, some inhabitants of Pompeii evacuated outside the city, when they noticed warning signs of an impending disaster, in the days prior to the massive eruption of Mount Vesuvius. Historical records are few, but one can surmise that these evacuations could have been organized by forward thinking “disaster managers”.^[3]

Throughout history, management of large disasters was conducted by the military. Indeed, the military still plays a large role in disaster response in many countries, particularly if the response is overseas and prolonged. Currently, there are civilian or governmental organizations, separate from military establishments, which conduct disaster response and medical care in most nations. Many of these organizations have sprouted from military roots.

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Social scientists trace the modern history, in the western world, of disaster medicine to the works of Heinrich Zangger, on civilian mine explosions in the early 20th century.^[4] While many developments in military medicine informed medical care during disasters, with Zangger and others who started investigating epidemiology and care during specific disasters, a body of literature started to emerge defining a separate specialty.

The histories of emergency preparedness, disaster management and disaster medicine have coevolved and are inextricably intertwined. While disaster management in one form or another existed as long as people started living together in communities, the development of disaster medicine took off with the emergence of modern medicine. Similar to disaster management, disaster medicine also has roots in military organizations.^[5-9]

The development of triage in the 1790's, by Baron Dominique Jean Larrey, Surgeon in Chief to Napoleon's Imperial Guard¹⁰, rapid evacuation and field surgical care which started in WWII and was further refined in the Vietnam and Korean wars are important links in development of Disaster Medicine. In fact, the aerial view of the mobile army surgical hospital unit depicted in the opening credits of the US TV series *M*A*S*H*¹¹, closely resembles the layout of disaster medical assistance teams (DMAT) during current deployments. Large pandemics such as the 1918 influenza epidemic, the cold war with civil defense programs, ever increasing human impact of natural disasters (particularly earthquakes and hurricanes in the United States), development and use of chemical, biological, radiological, nuclear and explosive (CBRNE) agents and the evolution of humanitarian assistance are all interwoven into the fabric of disaster medicine.

There are certain tipping points in the development of disaster medicine in the United States, some of which are discussed (Table 1).

The Defense Against Weapons of Mass Destruction Act of 1996 (created by senators Nunn, Lugar and Domenici) which established first responder training for weapons of mass destruction (WMD) was an important turning point in disaster medicine after the use of Sarin by terrorists in the Tokyo subway system in 1995. The bombing of the Murrah federal building, killing and wounding scores including children, in the same year by a lone terrorist in the United States was another catalyst for this legislation. This program was the first to establish the education of the principles of medical care specific to WMD to large-scale, non-military audiences. These topics are widely covered in current textbooks on Disaster Medicine. Funding for these programs and the rapid promulgation of information particular to managing casualties from WMD events led to an increase in highly trained

Table 1. Milestones in the development of Disaster Medicine in the United States

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| 1803 | Congressional Fire Disaster Relief Legislation |
| 1964 | Great Alaskan Earthquake |
| 1974 | Disaster Relief Act |
| 1977 | Natural Earthquake Hazard Reduction Program |
| 1979 | Formation of FEMA |
| 1980 | Civilian Military Contingency Hospital system |
| 1980 | Mount St. Helens Volcanic Eruption |
| 1984 | NDMS |
| 1985 | DMATs |
| 1989 | Hurricane Hugo and Loma Prieta Earthquake |
| 1990 | Stafford Act |
| 1992 | Federal Response Plan |
| 1996 | The Defense Against Weapons of Mass Destruction Act |
| 2001 | September 11 attacks and the Homeland Security Act of 2002 |
| 2005 | Hurricane Katrina |

medical personnel with an interest in disaster medicine.

With the Congressional Fire Disaster Relief legislation of 1803, the United States federal government provided federal aid to New Hampshire after a series of fires devastated the town of Portsmouth, setting a precedent, which informed future disaster assistance programs. As the population of the United States grew into tighter urban communities and disasters affected larger numbers of people, the need was born for consolidation of programs, which led to the formation of the Federal Emergency Management Agency (FEMA) with President Carter's executive order 12127 in 1974.^[12]

Although the Civilian Military Contingency Hospital System was in place, the National Disaster Medical System (NDMS) was formed in 1984 with the cooperation of the departments of Health and Human Services, Defense, Federal Emergency Management Agency (FEMA) and the Department of Veterans Affairs, with the anticipated need for large numbers of beds outside of the assets held by the military and Veterans Affairs (VA) systems to accommodate casualties from wars. The system relied on civilian cooperation from the private sector, medical community and State governments. The initial Disaster Medical Assistance Teams (DMAT) were formed to receive casualties of war which were transported to the US and distribute them to the network of NDMS hospital beds.^[13,14] These team members trained on military aircraft using equipment and supplies from military surplus stores. Many teams were based on military installations and trained closely with military personnel. DMAT's consisted of civilian volunteers with medi-

cal training and support personnel who were entered into federal temporary employment only during deployment and large training missions. DMAT team members were initially supported by a sponsoring private sector agency (a hospital in many cases). Many DMAT teams formed 501(c)(3) tax-exempt non-profit organizations in order to procure and maintain funding. There was variable governmental support depending on federal budgets, which ebbed and flowed yearly with the political landscape.

Owing to a lack of large number of war casualties, the roles and responsibilities of DMAT's evolved. In the late 1980's, DMAT's were used to care for patients after natural disasters. After the terrorist attacks in Tokyo, utilizing Sarin, a weapon of mass destruction, training and focus of DMAT's expanded to include care of patients following large terrorist attacks as well as natural disasters. The shifting preparedness focus also led to formation of specialized teams within NDMS. Disaster Medical Assistance Team specializing in weapons of mass destruction (DMAT-WMD), Disaster Mortuary Assistance Teams (DMORT), National Veterinary Assistance Teams (NVAT), International Medical Surgical Response Team (IMSURT) are teams formed as the expanded structure and role of NDMS matured.^[13] The goal of maintaining a nimble and robust response capability and 72-hour self-sufficiency with a part-time work-force continues to be challenge. Although criticism of cost effectiveness and timeliness of some responses have been levied and leadership structure and decision making questioned, with a presence during multiple disasters world-wide (including major landmark incidents such as the September 11, 2001 attacks, Hurricane Katrina and the earthquake in Haiti) NDMS teams have cared for hundreds of thousands of patients and assisted states and nations with health-care needs.

NDMS and DMATs are not the only systems for disaster response in the United States. There are local organizations and city and state assets devoted to response as well. Since disasters are always local events and historically federal response has been slow to reach affected areas, capabilities to respond and manage disasters at a community level is essential. The Joint Commission requires hospitals to be prepared with 72 hours of in-house capabilities. Many States have DMAT-like teams and equipment and supply stockpiles. Larger cities and counties also have capabilities, which have been developed from various funding resources such as the Metropolitan Medical Strike Teams.^[15]

With a diverse array of response and surge programs and personnel the challenge is in the coordination and synchronized management of assets. This role often rests upon municipal or state health departments or emergency management agencies. Even with advanced management

techniques and the incident command system along with emergency operation centers, utilizing the latest technology including redundant communication systems, advanced weather forecasting and computerized geographic information systems, there is room for improvement in coordinating assets, particularly after large scale disasters.

In the past 150 years there have only been 10 disasters in the United States, where the death toll exceeded 1000 persons. Increasing urbanization world-wide and the shift of populations to coastal areas, coupled with the anticipated rise in severe weather related events secondary to climate change, there will undoubtedly be an increase in the human impact of large scale disasters in the decades to come. Increasingly, assets for disaster response in the United States have been utilized overseas. This trend will likely continue. However, there are limitations to overcome if such aid is to be effective. First, deployment must be swift and rapid. The greatest need for emergency care is in the immediate aftermath of the incident. In most disasters, the demand persists but diminishes exponentially. One exception to this may be prolonged events such as epidemics and outbreaks. The challenge of a quick disaster response is evident even in the United States but more so when trying to reach remote areas and mired in international bureaucracy and red tape. With improvements in communication technology and advancements in transportation this hurdle is not insurmountable. There may be a role in utilizing existing transportation systems and capitalizing on the established efficiencies of military transportation. This requires extensive and detailed arrangements, which have to be completed and exercised prior to a real event. Second, there must be a designated agency with authorities and capabilities to coordinate the response. Given that local governments are often disrupted or otherwise occupied, an overarching agency such as the World Health Organization can be assigned this task. However, extensive international agreements must be made a priori and sufficient resources allocated to the WHO or similar agency in order to accomplish this task. It may even be possible to create an international task-force, much like the United Nations peace keeping force, to rapidly deploy to disasters. All the political "t"s must be crossed and the financial "i"s dotted for this to materialize. As future disasters cause increasing human suffering, the political will to create advanced response systems will materialize. We have seen with the recent Ebola epidemic in western Africa that ineffective response in one part of the world can have rippling effects throughout the world. We are at an age where there are sufficient technological developments to mitigate the health effects of disasters world-wide.

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