Field Organization and Disaster Medical Assistance Teams

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SUMMARY

Disasters cause an acute deterioration in all stages of life. An area affected by the disaster in which the normal activities of life are disrupted is described as a "Field" in disaster terminology. Although it is not easy to define the borders of this zone, the area where there is normally functioning society is accepted as the boundary. Disaster management is the responsibility of the local government. However, in many large disaster responses many non-governmental and international organizations play a role. A Disaster Medical Team is a trained, mobile, self-contained, self-sufficient, multidisciplinary medical team that can act in the acute phase of a sudden-onset disaster (48 to 72 hours after its occurrence) to provide medical treatment in the affected area. The medical team can include physicians, nurses, paramedics and EMTS, technicians, personnel to manage logistics, security and others. Various models of Disaster Medical Teams can be observed around the world. There is paucity of evidence based literature regarding DMTs. There is a need for epidemiological studies with rigorous designs and sampling. In this section of the special edition of the journal, field organizations in health management during disasters will be summarized, with emphasis on preparedness and response phases, and disaster medical teams will be discussed.

Keywords: Field organization; disaster; medical team; DMAT.

Introduction

Disasters cause an acute deterioration in all stages of life. The effects of disaster on the community and the scope of these effects may be explained by Maslow's Hierarchy of Basic Human Needs.[1] In the pyramid of Maslow's Hierarchy of Needs, the first and the basic steps consist of physiological and security needs (figure 1).[2] Although disasters with a large magnitude damage all levels of this pyramid, the fear and chaos experienced at the community level mostly are caused by the damage at the first step. Disaster management can be described as a systematic method to strengthen the pyramid or to provide resiliance before a disaster occurs. When the disaster strikes these principles also dictate how to rebuild the pyramid. Health Management covers the first step of the Maslow's Pyramid and is one of the most important responses in the early phases of a disaster incident. At the same time, disaster management should include various factors other than health concerns which require an equal emphasis. An area affected by the disaster in which the normal activities of life are disrupted is described as a "Field" in disaster terminology. Although it is not easy to define the borders of this zone, the area where there is normally functioning society is accepted as the boundary. In this section of the special edition of the journal, field organization in health management during disasters will be summarized, with emphasis on preparedness and response phases.

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Disaster management is the responsibility of the local government. However, in many large disaster responses many non-governmental and international organizations play a role.[3] Some organizations involved in disaster management and humanitarian assistance are listed in table 1.[3,5]

The Incident Command System (ICS), first established in the 1970s in the U.S., for firefighters in the forest service and later adapted for all disaster and emergency situations, provides tenants of response organization.[6,7] ICS consists of effective command and control, safety, information processing and public information, liaison and operation elements (figure 2). Many intervention consisting of health concerns include planning, logistics and finance. The system is based on the principle that, a single command, a single action manager, a single unit manager and a single individual for a single job must exist with a limited and manageable scope of control.[8]

Preparation for Field Response

Preparation for the field response is in essence a risk management process and it should begin with risk analysis. High-risk emergencies and disasters and the health effects that will be caused by these events should be determined beforehand. These can be used to create a solid database to determine the steps that should be taken.

During any disaster the initial response to help affected people come from bystanders and community citizens rather than professionals or rescue organizations. For this reason basic skills in search, rescue and first aid skills should be instilled in the general population akin to civil defense programs taught in schools during the cold war in the United States. Currently, fire drills and most recently, active shooter drills which have become ubiquitous in schools could be adapted to include basics of staying alive and helping neighbors in need during mass casualty events. These programs could be customized using a hazard and vulnerability analysis of the community.

The main objective of health services in disasters is to save lives and maintain the health of the community. A continuous service flow should be created beginning from the disaster scene to final treatment centers. In the early phase after a large disaster there is often a shortage of both search and rescue activities and medical services. These difficulties are can be mitigated by creating mobile medical units outside the disaster zone, equipped with rapid response capabilities and combining basic search-rescue skills with effective emergency medical services. These units are generally known as Disaster Medical Teams (DMT) and they will be discussed further in this manuscript. [DMAT is a specific team in the US and does not perform search and rescue, only medical treatment]

In the organization of field response, deciding the responsibilities of personnel and establishing job descriptions are the initial steps to take. It should be very clear who will do what, when and how. In this context, it should be very clear who the incident manager is, who will provide the security and traffic flow, who will be liaison and coordinate the units, and who will collect information, process and provide feedback. During the pre-disaster phase, the locations for a

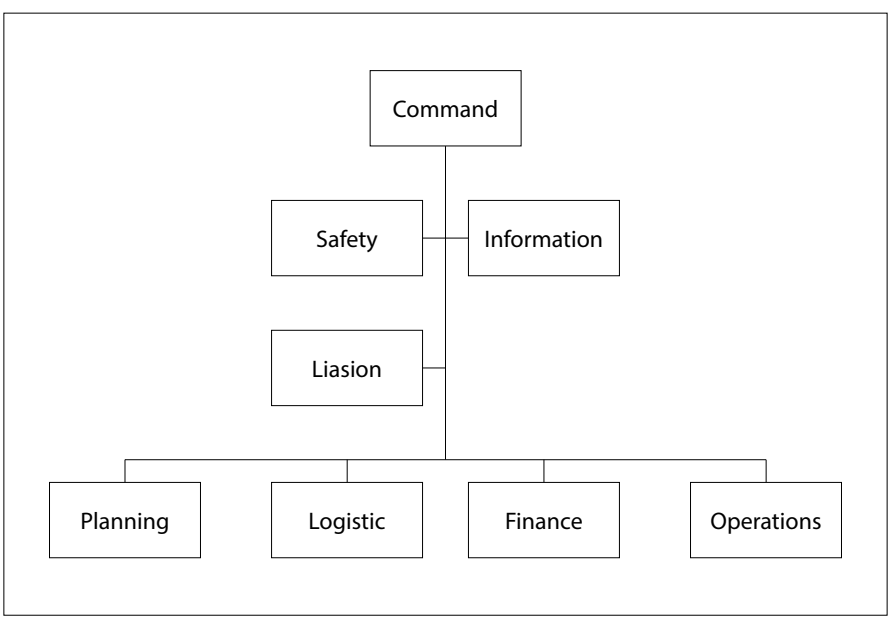

Figure 1. Incident command system.

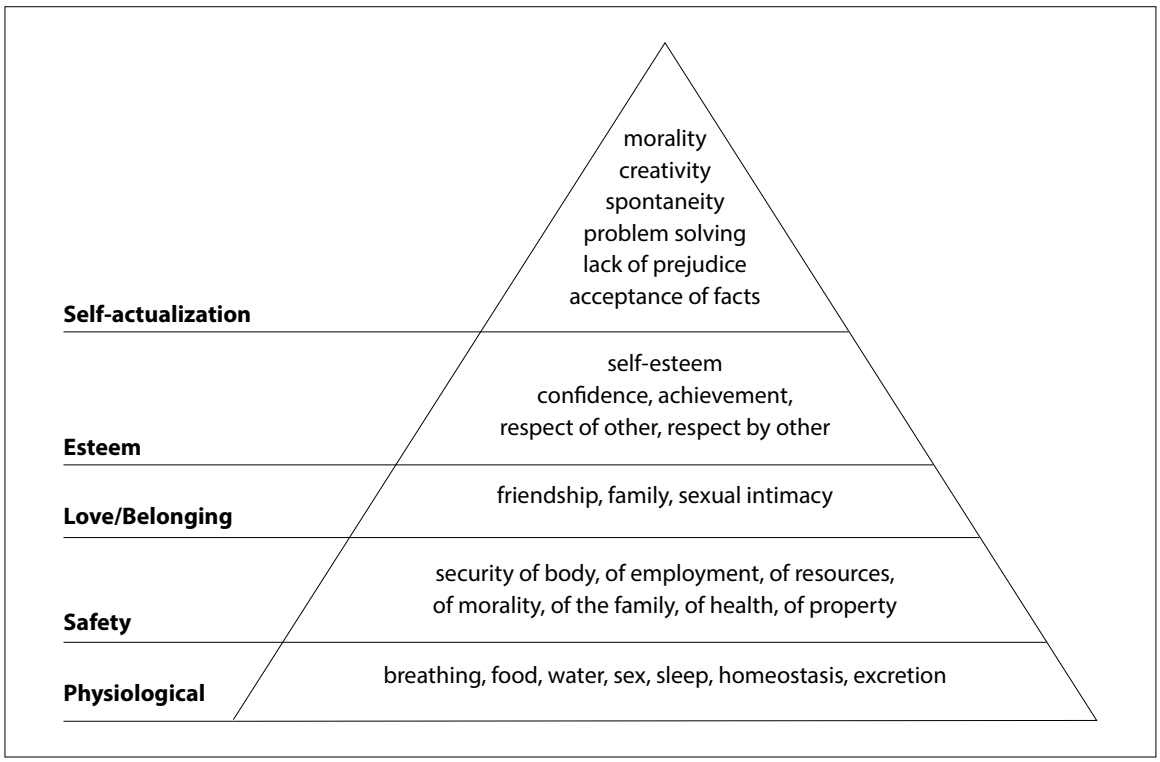

Figure 2. The pyramid of Maslow's Hierarchy of Needs.

command center with alternative, collecting points for the disaster management personnel and casualty collecting points for injured and non-injured people, collecting points for dead bodies, temporary treatment points should be established and communication and coordination methods between these areas established.

For the command centers, an area resistant to the effects of the disaster and fully endowed with communication equipment should be chosen and alternative area identified for backup.[9] During the September 11, 2001 attacks in New York City, the initial command post along with many rescue vehicles were decimated by the collapsing buildings and a backup plan was rapidly established.

A safe location with easy access to the disaster zone, should be chosen as collecting points. Casualty collecting points are a priority. These locations should be easily accessible to land and aerial vehicles (and marine vehicles if the location is amenable). Stadiums, parks and, airports (if coordinated and organized) are the preferred places for creating collecting points since easy access is built into these locations. Ice skating rinks, and cold storage facilities may be suitable alternatives as collecting points for the deceased.

Proper organization of casualty collecting points is essential for rapid flow of wounded. Secure and controlled entry and exit, secondary triage following the entry point, treatment areas segregated by triage levels and transportation areas for evacuation should be deliniated.[10] Mobile healthcare facilities may be integrated, next to or near existing health care facilities (even if they are non-functional). Preferably dead bodies should be collected in a separate location.

Field organization for post disaster phase: In the early post disaster phase, a rapid needs assessment survey of the disaster area must be completed and the emergency action plan must be implemented. In disasters with a small magnitude, adequate information can be gathered from the teams that first respond, but in large disasters that affect an extended area like earthquakes, the magnitude of the disaster and its health effects can be determined more accurately from the air. The number of probable casualties and wounded, and the number of operational healthcare facilities and their current staffing, should be determined rapidly.

Safety is one of the important issues in this early phase. The disaster zone should be encircled in a security belt and all the traffic flow in and out of the area tightly controlled.

An effective communication network is one of the key points of a successful disaster management plan.[11]

In disasters that affect a large area it is appropriate to divide the area based on the placement of casualty collecting points. Medical management should begin with secondary

Table 1. Demographic and clinical characteristics of patients

1. Action Against Hunger
2. ALERTNET
3. The Andean Committee for Disaster Prevention and Assistance (CAPRADE)
4. CARE International
5. The Caribbean Disaster and Emergency Response Agency (CDERA)
6. Center for Disaster and Humanitarian Assistance Medicine (CDHAM)
7. El Centro de Coordinacion para la Prevencion de los Desastres NAturales en America Central (CEPREDENAC)
8. Center for Research on the Epidemiology of Disasters (CRED)
9. El Centro Regional de Informacion sobre Desastres (CRID)
10. Doctors without Boarders/ Medecins Sans Frontieres
11. The Disaster and Emergency Management Authority (AFAD)
12. Florida International University (FIU)
13. Global Center for Disaster Management and Humanitarian Action (Global-CDMHA)
14. The Humanitarian Practice Network (HPN)
15. InterAction
16. International Federation of the Red Cross and Red Crescent Societies (IFRC)
17. The Integrated Regional Information Networks (IRIN)
18. Organization of American States (OAS)
19. Office for the Coordination of Humanitarian Affairs (OCHA)
20. The Office of U.S. Foreign Disaster Assistance (OFDA)
21. ONEWORLD.NET
22. Oxfam International
23. Pan American Health Organization (PAHO)
24. ReliefWeb
25. The Sphere Project
26. United Nations Development Programme (UNDP)
27. United Nations High Commissioner for Refugees (UNHCR)
28. United Nations International Children's Emergency Fund (UNICEF)
29. University of Wisconsin – Disaster Management Center (UW-DMC)
30. World Food Programme (WFP)
31. World Vision International

triage at the entry point (primary triage is conducted at the scene). The START triage methodology is an accepted mode in field triage. Patients should be channeled to the treatment areas according to their triage levels. During the treatment phase, patients' need of surgery or other specialized treatment options requiring evacuation should be taken into consideration. When transporting patients for care, the current capacities of the healthcare facility in the area should be determined. The priority of patient transportation should be based on triage level and hospital capacity. In the initial hours after a disaster, transportation of patients with non-lethal trauma should be delayed. This can be more effectively accomplished if there are properly equipped and trained teams consisting of healthcare providers who can respond from the hospital to the scene.

In the post disaster phase, receiving outside assistance can be considered as the second step for the field organization. Integration of outside resources into the response can be challenging. Entry to the disaster zone should be controlled and if possible medical relief resources should be managed by a single authority. The uncontrolled flow of personnel and haphazard relief supplies in the disaster zone can be at worst hazardous and often a waste of vital resources. At this stage, the performance and morale of the personnel working in the disaster zone should be evaluated and any sign of burn-out or stress should be addressed accordingly.

The long term goal for healthcare services is to recreate the infrastructure including public health services, providing psychological and psychiatric support, providing health services for chronic patients who need frequent follow up. These are all efforts for recovery of a normal healthcare system. Healthcare services should be coordinated with other services during a disaster situation. Before and during the recovery phase, acute medical emergencies should be managed effectively while the basic needs of the individuals such as water, food, clothing, shelter and security should be maintained.

Field operations during CBRN-E incidents: CBRN-E incidents have specific management considerations in disaster management. These incidents cause a disproportionately high psychological impact and even a small suspicion can trigger a massive wave of fear and panic in the community. Rumors of a chemical attack during the initial days of the rescue operation in NYC on 9-11-2001 caused a level of panic among responders and irrational operational adjustments. In order to manage these incidents properly, well trained professionals using special protective and detection equipment, unique medications, rarely used in day to day patient care, special decontamination units and regimented safety protocols are needed. Maintaining teams and equipment is expensive requiring extensive financial and organizational recourses. For this reason, a community-wide risk analysis is required to determine the number of personnel and equipment required to respond CBRN-E incidents, and the distribution of these teams.

Ideally CBRN-E incidents should be managed mostly at the incident zone by determining hot, warm and cold zones according to risk levels and provide proper decontamination and initial treatment in these zones and transport only patients who have been decontaminated. In reality, patients still reach destination hospital without initial decontamination and treatment either by self-transporting or due to lack of rapid response teams to properly manage care (the flooding of emergency departments with contaminated patients after the Tokyo Sarin attacks in the mid 1990's is a good example of this phenomenon).

Disaster response plans should be constantly revised and refined by repeated exercises and real world experiences.

Disaster Medical Teams (DMTs)

In 2013, approximately 100 million people were affected by disasters, and for the last decade this figure was 2 billion.[12] The majority of affected people were living in countries of medium and low income.[12] Even within developed countries, large scale disasters will occur. In large disasters, the preparedness most countries will be unable to meet the demands of numbers of injured patients. There may be request for disaster medical and humanitarian aid following such disasters, which will require rapid mobilization of national and international resources.[13-17]

A DMT is a trained, mobile, self-contained, self-sufficient, multidisciplinary medical team that can act in the acute phase of a sudden-onset disaster (48 to 72 hours after its occurrence) to provide medical treatment in the affected area.[18-20] The medical team can include physicians, nurses, paramedics and EMTS, technicians, personnel to manage logistics, security and others.[21]

Various models of DMTS can be observed around the world. Some are detailed below:

1. USA

The National Disaster Medical System (NDMS) is a federally coordinated system within the US Department of Health and Human Services that serves the Federal response by providing disaster medical care to the US and more recently with responses to the Bam Earthquake in Iran and the Earthquake in Haiti, to the world. NDMS can provide medical response to disaster area in the form of personnel, teams, supplies, and equipment, patient movement from a disaster site to unaffected areas, and definitive medical care at participating hospitals in unaffected areas.[22]

NDMS Response Teams are Disaster Medical Assistance Teams (DMAT), Disaster Mortuary Operational Response Teams (DMORT), International Medical Surgical Response Team (IMSURT), and National Veterinary Response Team (NVRT).[23]

A DMAT is a 35-member team of physicians, nurses, emergency medical technicians, pharmacists, and support personnel.[24] DMATs deploy to disaster sites with sufficient supplies and equipment to sustain themselves for a period of 72 hours, and the members are activated for two weeks on average.[18] There are currently 80 DMATs in the United States.[25]

DMATs are principally a community resource available to support local, regional, and State requirements. However, as a national resource they can be federalized. DMAT personnel carry appropriate certifications and licensure. DMAT personnel may be paid while serving as intermittent federal employees and have the protection of the Federal Tort Claims Act.[18]

2. Canada

The Disaster Assistance Response Team (DART) is a 200-Canadian Armed Forces (CAF) member military organization that can be deployed internationally in response to situati-

ons ranging from natural disasters to complex humanitarian emergencies. DART was created by the Canadian government in 1996.[26,27]

The DART can provide assistance for up to 40 days. Interestingly, the DART is not designed to provide first response services, such as search and rescue or emergency trauma care. They serve three critical needs in emergencies: 1. Water purification 2. Primary medical care 3. Engineering assistance.[27]

The primary responsibilities of the DART are stabilizing the primary effects of the disaster, preventing sudden onset of the secondary effects of the disaster, and providing a time buffer for humanitarian aid organizations to deploy to the devastated area and preparing to deliver long-term recovery programs.[27]

DART is composed of 6 main elements: 1. DART Headquarters (about 45 CAF members) 2. DART Company Headquarters (about 10 CAF members) 3. Engineer Troop (about 40 CAF members): 4. Medical Platoon (about 45 CAF members) 5. Logistics Platoon (about 20 CAF members) 6. Defence and Security Platoon (about 45 CAF members).[27]

3. Japan

Japanese DMATs (J-DMATs) are different from US-DMATs, because the natures of disasters that can occur in these two countries are different. Earthquakes are the most common natural disasters in Japan while weather-related disasters are the more common in the United States.[20,21]

J-DMATs are established in 2005 under the control of the Ministry of Health, Labor and Welfare. There were more than 700 DMATs in Japan in March 2010.[28] As of 2010, there are 4557 registered J-DMAT personnel, with734 separate J-DMATs in 393 medical facilities across the country.[20]

The J-DMATs are smaller than US-DMATs, with 5-6 personnel; 1 or 2 medical doctors, 2 or 3 nurses, and 1 or 2 logisticians. J-DMATs are self-sufficient for 72 hours.[20]

The activities of J-DMAT are medical data collection and communication in devastated areas, the 3Ts (triage, treatment, transport), providing medical support to hospitals, supporting staging care units, in-flight treatment of victims being evacuated, and supervision of emergency medical technicians.[20]

It is estimated that Japanese DMATs have prevented up to 500 deaths following the Great East Japan Earthquake.[28,29]

Unlike US-DMATs, J-DMATs do not participate in international missions, Japan supports international missions with medical teams dispatched by Japan Disaster Relief (JDR) that operates under Japan International Cooperation Agency (JICA).[20]

4. Israel

Israel uses a model that is based on military personnel with civilian reservists.[30] They have the ability to integrate civilian and military agencies at all levels.[31] This model is a good example of civil-military cooperation and integration. This strategic, flexible approach may be more difficult to implement in other countries.[30,32]

5. Turkey

After the 1999 Earthquakes, the government in Turkey reorganized the disaster and emergency management organization. Within the scope of Health Organization in Disasters Project, National Medical Rescue Teams (NMRT) were established in 2004 under the ministry of health.[33]

A NMRT is a 5 person healthcare team with at least one doctor. Based on different local risks, NMRTs are may include mountain rescue teams, water rescue teams, CBRN teams, air rescue and/or evacuation teams. The Ministry of Health determines which teams will be established in which cities based on need and risk assessment. NMRTs also participates in international response missions.[34]

Turkey is divided into 21 NMRT regions, and there are currently 4909 NMRT members in 81 cities, and approximately 6000 NMRT volunteers.[33]

Consideration about DMTs

Frequently there are delays in mobilizing DMTs, with most not arriving for 3 days or more after the event.[30] Most of the immediate care is provided by local personnel. Teams with sufficient flexibility to deploy rapidly would greatly enhance effectiveness. For an efficient response, limited resources must match the needs. This makes rapid needs assessment an essential component of initial response. To prevent delays in the deployment process pre-arranged agreements, transportation solutions and for international response, customs procedures should be determined before deployment.

Sufficiently agile and multidisciplinary DMTs with appropriate training and predefined strategies management will most effective.[35] Due to the increasing complexity of humanitarian operations, a new multi-disciplinary approach for training and skills development is required.[36] There is a need for training of all members in use of basic equipment like communication gear, tents, shelters and water purification systems.[37] Lectures, simulated training in primary care and radiological emergencies should be included in the DMT training curriculae.[28] Peller et al. emphasized the importance

of context in developing an evidence base for competency training in disaster response and management.[38] Timely topics like hospital evacuation, preparations to receive DMATs at damaged hospitals, coordination when DMAT activities are prolonged, safety management and communication when helicopters were on board have been added to the revised Japanese DMAT training program after the Great East Japan Earthquake.[39] A study of Australian DMT members showed that there should be more emphasis on the education and training, and leadership training has been considered as essential for DMT commanders.[40]

DMATs must be self-sufficient for a minimum period of 72 hours.[37] The teams should bring their own equipment, pharmaceuticals, food, water and shelter. All members of the team should be able to use basic equipment. Logistics, funding, insurance issues should be addressed before deployment. Each organization should develop its own logistics capacity.[37] Communication, command control structure and information sharing are essential elements for DMTs. Also proper communication, both language and cultural, with the local population is essential particularly in international deployments. Using bilingual staff, offering language training and the use of interpreters can be viable solutions (30). Cultural factors and sensitivity should be taken into consideration.

The selection of the members of the team will add to the success of the DMAT. Skill is not the only criteria to be chosen as a member of the team, teamwork and the ability of successfully carrying out the work required in the field are also desirable.[13,41] Personal characteristics such as experience and availability, personality, motivation, physical health, teamwork should be taken into consideration.[30] The members should be in good physical and mental health.[13,42,43]

Stress management training and pre-deployment briefings are needed for all members as well as routine screening by a trained professional during deployment.

Immunizations, of team members should to be current and reflect the geography of the response.[13,44] Sufficient stocks of personal medications, special issues like chemoprophylaxis against malaria and PEP for HIV are also suggested.[44,45] The other pre deployment health considerations are sunscreen, vector control, security of food and water.[13] Travel health consultation should be completed for deployments involving tropical locales or areas with specific health concerns before deployment are needed for DMT members.[44]

Fatigue, morale management and sanitation are main factors that affect personal comfort, hygiene and health during deployment.[30]

Debriefing and follow up should occur at regular intervals during and after deployment. Along formal debriefings, psychological debriefings and medical examinations are needed.[13] 24% of the Turkish Red Crescent Disaster Relief team suffered from post-traumatic stress disorder after Asian tsunami deployment.[46]

Leggat et al. emphasized that organizations should ensure that potential DMT members have a rigorous selection process, medical, dental and psychological screening, appropriate training, adequate security, health and safety intelligence for the area of support, adequate briefing and debriefing, travel health advice, access to medical care and welfare in the field, and an exit strategy and aeromedical evacuation.[17]

In conclusion, there is paucity of evidence based literature regarding DMTs. Most of the articles are descriptive. There is a need for epidemiological studies with rigorous designs and sampling. Cost-effectiveness of DMTs should be discussed. Each disaster is different, and the priorities and the needs will change. Lack of non-medical necessities such as drinking water, sanitation, food, shelter may be more pressing than healthcare needs in certain incidents. As the need for disaster relief work grows, evidence-based standardization becomes essential. International rules, standards and laws are needed for international missions. Improved guidelines for response, and global coordination with teams should be developed.

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