Composition of Disaster Medical Assistance Team Personnel in Taiwan: Comparison with USA System

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Abstract

The purpose of this study is also attempting to find out the adequacy of DMAT composition and to help further modification of DMAT set-up. With the preliminary data in this registry, we tried to analyze the composition of these DMAT personnel and make comparisons between them and the available data from nine DMATs in United States. A multivariate analysis model revealed that: total DMAT members (in USA) = 0.74 x (Number of Physicians) - 21.15 x (Number of Nurses) - 21.04 x (Number of Paramedics) - 8.96 x (Number of EMT) - 101.67 x (Number of Pharmacists) + 346.92 x (Number of Respiratory Therapists) + 58.03 x (Number of Psychological Consultants) + 13.94 x (Number of Other Categories) - 33.09. The variations of the other two teams are less than 170. In contrast, the multivariate analysis model revealed: total DMAT members (in Taiwan) = 44.07 x (Number of Physicians) - 6.28 x (Number of Nurses) + 3.66 x (Number of EMT) + 1.72 x (Others) - 1425.6. The variations of other teams ranged from –375.1 to –1075.86. The paramedics or EMT account for more than 50% of DMAT personnel in USA whereas they comprise only 6.4% in Taiwan ($p<0.001$). In conclusion, there are no consistencies in the compositions among different DMAT personnel in Taiwan. The establishment of uniform policies and overall planning may be the only method resolving this problem. *(Ann. Disaster Med 2002;1:11-19)*

Key words: DMAT; disasters; paramedics

Introduction

According to the definition from National Disaster Medical Team (NDMS) in the United States,[1] The central government should be responsible for Disaster Medical Assistance Teams (DMATs) as prearranged sources of support. A DMAT consists of a volunteer group affiliated with NDMS. Although a DMAT consists of approximately 35 individuals in each deployable unit, each particular team may consist of more than three times the number to avoid any possible unavailability of a key person at the time of deployment. Each DMAT is composed of members with a variety of health or medical

skills and many other support personnel such as communications, logistics, maintenance and security. Many teams also include a Critical Incident Stress Management subunit.

DMATs are categorized according to their ability to respond. A Level-1 DMAT can be ready to deploy within 8 hours of notification and then remain self-sufficient for 72 hours with enough food, water, shelter and medical supplies to treat about 250 patients per day. Level-2 DMATs lack enough equipment to make them self-sufficient but are able to deploy and replace a Level-1 team utilizing and supplementing their equipment which is left on site. Level-3 DMATs consist of teams in various stages of development.

Some of the DMAT Functions include triage of victims at the disaster site.[1,2] Providing sophisticated medical care in austere conditions and maintaining casualty clearing or staging locations just outside the site of the disaster.[1,2] DMATs can also provide care at a reception area when the patient evacuation part of NDMS is activated. They can receive victims of the disaster in areas across the country that were unaffected and thus can handle the large quantity of injured people.

In order to be ready to respond to a disaster, DMATs undergo specialized training both at the team level and during local and national level exercises. Along with this training and exercise, DMAT members provide medical care at special events and attend annual training conferences. Each team develops and maintains plans for deployment to various disasters. Supplies and equipment are provided through DOD excess property sources, federal budget requests, local donations and funding and other sources.

After Chi-Chi earthquake, our government has been engaged in the establishment of a good disaster response system including DMATs since July 2000.[3] Taiwan Society of Disaster Medicine has also set up a registry program in our website (http://www.disaster.org.tw)for Disaster Response HOspital and PErsonnel registry (Dr. Hope registry)[4] under partial grant from the Department of Health since 2001. With the preliminary data in this registry (till November 30 2001), we tried to analyze the composition of these DMAT personnel and make comparisons between them and the DMATs in United States. The purpose of this study is also attempting to find out the adequacy of DMAT composition and to help further modification of DMAT set-up.

Methods
Dr. Hope registry
We have established Dr. Hope registry for registration of disaster response

hospital and medical staffs in the website of Taiwan Society of Disaster Medicine since January 2001. All participants of DMATs (either national or local) have to fill in their basic data such as name, gender, location of residency, and specialties. The specialties include mainly the background of previous training in emergency care such as Emergency Medical Technician-I (EMT-I), EMT-II, basic life support (BLS), advanced cardiovascular life support (ACLS), advanced pediatric life support (APLS), advanced trauma life support (ATLS) and emergency trauma training course (ETTC). All inputted data were kept confidential and analyzed by only specified personnel of our society. The data were summarized mainly under the categories of different locations of residency.

To avoid the possible missing of data processing, all of the data were reconfirmed by phone communication with every local health bureau. Final data were presented only after the exact registrations have been keyed in to this database.

Survey of DMAT Composition in the United States

To understand the present conditions of U.S. DMATs, we have searched the website of NDMS (http://ndms. dhhs.gov).[1] According to the files present in the web, there are 38 available websites of DMAT. We then approached the team websites and tried to get the present personnel data of each team. To get reliable data, we also kept in contact with team commanders by e-mail and requested them to provide detailed information of the composition of their team personnel. Among the 38 DMAT websites, there were 9 websites that could not be approached because of technique error. Nine team commanders of the rest 29 teams finally responded our e-mails and provided available information about their personnel. We then included all of these data into statistical analysis.

Statistic Analysis

All the data were processed and analyzed with SPSS 8.0 for Windows (SPSS Inc. Chicago, IL). The techniques applied to data analysis included descriptive statistics generating and chi-square test. The differences in the composition of DMAT personnel between DMATs in Taiwan and those in the United States were also examined by a chi-square test. A P value < 0.05 was considered as statistically significant.

Results
Analysis of the DMAT Composition in the United States

Table 1 depicts the composition of the available nine Level I DMATs in the United States. Of them, we attempted to get a multivariate function from the data of the first 7 teams by using a

multiple-regression model. The function was as follows:

Total DMAT members
= 0.74 x (Number of Physicians)
- 21.15 x (Number of Nurses)
- 21.04 x (Number of Paramedics)
- 8.96 x (Number of EMT)
- 101.67 x (Number of Pharmacists)
+ 346.92 x (Number of Respiratory
       Therapists)
+ 58.03 x (Number of Psychological
       Consultants)
+ 13.94 x (Number of Other
       Categories)
- 33.09

We therefore applied the personnel data of the other two teams to this function to verify its reliability. For example, when the data of "DMAT 8" are applied to the above function, the measured total DMAT members is about 165.38 that is similar to the actual number, 162. It means the composition of "DMAT 8" personnel is similar to those of the above 7 teams. However, when the data of "DMAT 9" are applied to the same function, the measured total number is 302.45 that is definitely higher than the actual number, 107. In other words, the composition of "DMAT 9" may be different from the other 8 teams. The impact factor of each variable is significantly different. In general, the personnel of averagely lower percentage has higher impact factor (such as respiratory therapists and pharmacists).

Analysis of the DMAT Personnel in Taiwan

Table 2 depicts the composition of eight DMATs (either National or Local) in Taiwan. We attempted to get a multivariate function from the data of 3 teams in random by using the same multiple-regression model. The function (based on DMAT 1, 3 and 5) was as follows:

Total DMAT members
= 44.07 x (Number of Physicians)
- 6.28 x (Number of Nurses)
+ 3.66 x (Number of EMT)
+ 1.72 x (Others)
- 1425.6

We therefore applied the personnel data of the other five teams to this function to verify its reliability. Unfortunately, there seemed no consistency among different DMATs. For example, the measured total DMAT members for DMAT 2, 4, 6, 7, and 8 are about –530.62, -1075.86, -939.61, -856.38, and -375.1. The differences between the real numbers of DMAT members and the measured numbers are –717.62, -1167.86, -988.61, -1035.38 and –475.1 respectively. Obviously, all of these personnel were underestimated according to the above model. The compositions among all of these DMATs were significantly different in Taiwan.

The comparison between Table 1 and Table 2 revealed that the paramedics and EMTs comprised around 28.7% of DMAT personnel in the United States whereas they consisted only 6.4% of DMAT in Taiwan. The difference is statistically significant ($p<0.001$). Accordingly, the lay persons attending the DMATs in the

United States may be less than 5% whereas they comprised about 39.9% in Taiwan.

Table 1. Composition of DMAT personnel in the United States

	Doctors	Nurses	Paramedics	EMT	Pharmacists	Respiratory therapist	psychiatrists	Others	Total
DMAT 1	19	9	9	35	10	4	5	11	102
DMAT 2	10	22	23	12	7	4	6	11	95
DMAT 3	13	27	25	15	10	5	7	18	120
DMAT 4	10	23	20	13	3	3	2	21	95
DMAT 5	20	38	27	8	3	4	5	15	120
DMAT 6	14	26	30	14	8	5	5	17	119
DMAT 7	9	36	12	0	6	3	3	39	108
DMAT 8	22	59	11	34	3	1	3	28	161
DMAT 9	10	35	13	8	5	4	2	30	107

Table 2. Composition of DMAT personnel in the Taiwan

	Doctors	Nurses	EMT	Other	Total
Taipei city	67	273	10	692	1042
Taoyuan city	36	124	21	6	187
Taichung city	50	100	0	0	150
Chiai county	10	29	0	53	92
Kaohsiung city	50	123	63	0	236
Kaohsiung county	13	22	14	0	49
Pingtung county	18	45	16	0	79
Hualien county	30	49	0	21	100
Total	274	765	124	772	1935

Discussion

The operations plan of the medical disaster-response model organizes surviving health care providers into teams capable of delivering medical care immediately after a catastrophic earthquake. The goal of these teams is to stabilize the condition of victims in the field and then facilitate their transport to intact local hospitals or predestinated evacuation sites. Among them, so-called DMAT is an independent, self-sufficient team that can be deployed within a matter of hours and can set up and continue operations at the disaster site for up to 72 hours with no additional supplies or personnel. The 72-hour period allows federal support, including medical supplies, food, water and any other commodity required by the DMAT, to arrive. It is comparable to the three phases of the operational plan for disasters:[2] hour 0 to 1, solo-treatment period; hours 1 to 12, disaster-medical-aid period; and hours 12 to 72, casualty-collection period.

Under the guidance of specific agencies from central government, the DMAT should be deployed for the responsibilities of medical response of other special works such as victim identification and mortuary services. Special teams such as Urban Search and Rescue Team may help the Department of Defense to evacuate patients. DMAT is also one of the important linkage among medical mutual aid network for consequent definitive medical care.

The deployment of DMAT may be comparable to the "disaster-medical-aid" period.[2] Disaster-medical-aid centers would be evenly spaced in a community, set up no more than an hour's walk from any location to ensure accessibility even if the transportation system failed. There are approximately 3 physicians per site to provide coverage for alternating 12-hour shifts and 1 backup.[5] Sites might include schools, fire stations, and hospitals. Adjacent to each center would be an open area to serve as a helicopter landing zone for patient evacuation and the resupply of equipment. Patients and nonmedical volunteers, as well as health care personnel, would report to these medical-aid centers.

As mentioned previously, a general medical DMAT has a minimum of 35 members, including at least two physicians, ten nurses and ten EMTs or paramedics, with the remainder of the team made up of support personnel.[1] However, these numbers can be flexible.[1] For example, sometimes situations call for more nurses than paramedics, or vice versa. There are also specialized DMATs for burn care, pediatrics, urban search and rescue, mortuary services, infectious disease outbreaks, and other problems. In our survey, the compositions of general DMATs (Level I) are constant

and the non-medical support teams are well established. However, the compositions of our DMATs (either National or Local) individualized, depending upon different policies and different guidance in each team. The phenomenon elucidated that our disaster response system is still lacking in uniform policies and consistent planning.

There are still controversies about the role of volunteers attending in the DMATs. In one of our DMATs, there are more than 60% of the members to be volunteers. It is definitely different from what we can find in the United States.[1,5-8] As we know, most of the volunteers lack in medical training such as BLS, ACLS, ATLS, or ETTC. Although the advanced training course is on-going, the effects may be limited because most of the volunteers have no minimal clinical experiences.

Another issue is concerning about the role of the EMT in the DMATs. Among the total members of Taiwan DMATs, EMT accounts for only 6.4%. It is also different from the DMATs in the United States.[1,2,9,10] The criteria of activation and deployment of either EMT system or DMAT system depends upon the severity and also the stage of the "casualty" or "disaster". In the solo-treatment stage, the involvement of the EMT in the center of the event may be essential for timesaving and efficiencies. However, the DMATs from the surrounding areas come to aid within 6 hours (or the beginning of disaster-medical-aid period) can provide further medical and logistic support.[1,2,11] So even though the DMATs may consist of nearly 50% EMT or paramedics, they will not overlap in workloads with the initial EMT systems because they come from different areas. Besides primary first aid and emergency care, the paramedics and EMT always have accepted the training of "disaster medicine", incidental command system, and have some clinical experiences. So the attendance of them should be a crucial step in setting up a good DMAT. In other words, the paramedics or EMT should play a better role than the volunteers do.

In conclusion, there are no consistencies in the compositions among different DMAT personnel in Taiwan. The establishment of uniform policies and overall planning may be the only method resolving this problem.

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=0.74 × - 21.15

× - 21.04 × - 8.96 × - 101.67

× + 346.92 × + 58.03 × + 13.94

× - 33.09

170

= 44.07 × - 6.28 × + 3.66 ×

+ 1.72 × - 1425.6

-375.1 -1075.86

50% 6.4% *P* 0.001

(Ann. Disaster Med 2002;1:11-19)

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