

An Analysis of Japan Disaster Medical Assistance Team (J-DMAT) Deployments in Comparison with Those of J-DMAT's Counterpart in the United States (US-DMAT)

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Abstract

Lessons learned from the Great Hanshin-Awaji earthquake of 1995 underscored the necessity of establishing Disaster Medical Assistance Teams (DMATs) in Japan, and in 2005, the Japanese government's Central Disaster Prevention Council revised its Basic Disaster Management Plan to include full deployment of DMATs in disaster areas. Defining a DMAT as a trained, mobile, self-contained medical team that can act in the acute phase of a disaster (48 to 72 hours after its occurrence) to provide medical treatment in the devastated area, the revised plan called for the training of DMAT personnel for rapid deployment to any area of the country hit by a disaster. This paper presents descriptive data on the number and types of missions carried out by Japan DMAT (J-DMAT) in its first 5 years, and clarifies how J-DMAT differs from its counterpart in the United States (US-DMAT). The DMAT that the present authors belong to has been deployed for 2 natural disasters and 1 man-made disaster, and the operations carried out during these deployments are analyzed. Reports on J-DMAT activities published from 2004 through 2009 by the Japanese Association for Disaster Medicine are also included in the analysis. After training courses for J-DMAT personnel started in fiscal 2004, J-DMATs were deployed for 8 disasters in a period of 4 years. Five of these were natural disasters, and 3 man-made. Of the 5 natural disasters, 3 were earthquakes, and of the 3 man-made disasters, 2 were derailment accidents. Unlike in the United States, where hurricanes and floods account for the greatest number of DMAT deployments, earthquakes cause the largest number of disasters in Japan. Because Japan is small in comparison with the US (Japan has about 1/25 the land area of the US), most J-DMATs head for devastated areas by car from their respective hospitals. This is one reason why J-DMATs are smaller and more agile than US-DMATs. Another difference is that J-DMATs' activities following earthquakes involve providing treatment in confined spaces, triage, and stabilization of injuries: these services are required in the acute phase of a disaster, but the critical period is over in a much shorter time than in the case of water-related disasters. In response the kind of man-made disasters that occur in Japan—mainly transportation accidents, and occasional cases of random street violence—J-DMATs need to be deployed as soon as possible to provide medical services at the scene at the critical stage of the disaster. This means that J-DMATs have to be compact. The fact that J-DMATs are smaller and more agile than US-DMATs is a result of the types of disaster that hit Japan and the relatively small size of the country.
(J Nippon Med Sch 2010; 77: 318–324)

Key words: Disaster Medical Assistance Teams (DMATs), medical response, disasters

Introduction

Lessons learned from the Great Hanshin-Awaji earthquake of 1995 underscored the necessity of establishing Disaster Medical Assistance Teams (DMATs) in Japan. A working group tasked with establishing DMATs in Japan and defining the role of Japan DMAT (J-DMAT)¹ was set up in 2001 by the Ministry of Health, Labour and Welfare (MHLW) under the chairmanship of Hiroshi Henmi, Director of the National Disaster Medical Center. In 2005, the government's Central Disaster Prevention Council revised its Basic Disaster Management Plan to include full deployment of DMATs in disaster areas. In 2006, the MHLW sent an outline of J-DMAT's activities to all prefectural health departments, along with basic guidelines on the management of prefecture-based DMATs². DMATs were defined as trained, mobile, self-contained medical teams that can act in the acute phase of disasters (48 to 72 hours after their occurrence) such as major earthquakes, plane crashes, and railway accidents to provide medical treatment in affected areas, and the MHLW directed prefectural health departments to include the promotion of training of DMAT personnel in their local disaster management plans.

The MHLW started monthly J-DMAT training courses in fiscal 2004, and there are currently (2010) 4,557 registered J-DMAT personnel, with 734 separate J-DMATs in 393 medical facilities across the country, each of which can be rapidly deployed in the event of a disaster. Every deployment so far has led to improvements in the J-DMAT system.

The purpose of this paper is to provide descriptive data on the number and types of missions carried out by Japan DMAT (J-DMAT) in its first 5 years, and to clarify how J-DMAT differs from its counterpart in the United States (US-DMAT).

Material and Methods

The DMAT that the present authors belong to has been deployed for 2 natural disasters (the 2007 Niigata Prefecture Chuetsu Offshore Earthquake,

and the 2008 Iwate-Miyagi Inland Earthquake) and 1 man-made disaster (the Tokyo [Akihabara] stabbing spree in 2008); the operations carried out during these deployments are analyzed. Reports on J-DMAT activities published from 2004 through 2009 by the Japanese Association for Disaster Medicine are also included in the analysis.

Disasters were classified as natural or man-made. Natural disasters are those caused by "acts of God," and include earthquakes, tornados, floods, hurricanes, ice storms, and snowstorms. Man-made disasters include fires, transportation accidents (e.g., plane crashes, and railroad derailments), random street violence, the escape of environmental toxins (e.g., the 1984 Bhopal chemical spill in India, and the 1986 Chernobyl radiation leak in Ukraine), and acts of terrorism (e.g., the 1995 Tokyo subway sarin attack, and the September 11, 2001 attack on the World Trade Center in New York).

For the purposes of this article, a DMAT deployment is defined as an occasion on which a DMAT actually responded to a declared disaster; it does not include training exercises.

Results

After training courses for J-DMAT personnel started in fiscal 2004, DMATs were deployed for 8 disasters in a period of 5 years. Five of these were natural disasters, and 3 were man-made (**Table 1**). Of the 5 natural disasters, 3 were earthquakes, and of the 3 man-made disasters, 2 were derailment accidents. For each of these 8 deployments, **Table 2** shows the number of DMATs dispatched, the number of personnel in each DMAT, the means by which the disaster site was accessed, the number of casualties and number of patients treated, the types of treatment given, the response time (time taken for the DMATs to access the site), and the total period of DMAT deployment. The 2007 Niigata Prefecture Chuetsu Offshore Earthquake hit an area about 300 km north of Tokyo (**Fig. 1**). More than 40 DMATs were deployed to the affected area, where they gave medical support to local hospitals; they also evacuated victims to other hospitals outside the affected area by helicopter.

Table 1

a. JDMAT Deployments for Natural Disasters in Japan from flotation (2004)

Year	Earthquakes	Tornado	Avalanche
2006		Hokkaido Saroma town 2006	
2007	Niigata prefecture chuetsu offshore earthquake Noto peninsula earthquake		Aomori Prefecture Hakkouda Mountain
2008	Iwate-Miyagi inland earthquake		

b. JDMAT Deployments for Man-Made Disasters in Japan from flotation (2004)

Year	Street rampage	Derailment accident
2005		Japan Railway Amagasaki line Japan Railway Uetsu line
2008	Tokyo Akihabara stabbing spree	

Table 2 Summary of J-DMAT Deployments

Disaster	N of Teams	Members	Approach	N of Casualties	N of injured/dead	N of treated pts	Medical activities	Response time	Terms of Activity
Tornado; Hokkaido Saroma 2006	2		By land	35	35	0	—	Retreated on the way	1day
Earthquake; Niigata prefecture chuetsu offshore 2007	42	Basically, 1-2 physicians, 2 nurses, 1 logistician	By air/land	>10 thousands	682	682	6 CSMs, Triage Support of hp in suffered area 10 transport of pts by helicopter	Avr: 6hrs46mins Min 3hrs22mins	2days
Avalanche; Aomori Hakkouda Mountain 2007	2	1-2 physicians, 1-2 nurses, 0-1 logistician, 0-1 EMT	By land	24	10	9	Triage Tx on scene (1 chest drainage, 1 cricothyroid membrane incision, 6 DIV)	3hrs	7hrs
Earthquake; Noto Peninsula 2007	4		By land		359		(medical rounds of refuge camp)	12hrs	2days
Earthquake; Iwate-Miyagi inland 2008	40	Basically, 1-2 physicians, 2 nurses, 1 logistician	By land/air		449	Around 60	5 CSM Triage Support of hp in suffered area	3hrs in minimum	2days
Derailment accident; JR Amagasaki line 2005	20		By land/air	662	662	460	3 CSM Triage Tx on scene (intubation, chest drainage, DIV) 10 transport of pts by helicopter	1hr in minimum	2days (because of CSM)
Derailment accident; JR Uetsu line 2005	1	2 physicians, 4 nurses, 2 logisticians	By land	46	38	33	1 CSM	1hr30min	6hrs
Street rampage; Akihabara stabbing spree 2008	4	1-2 physicians, 0-2 nurses, 0-1 logisticians, 0-1 EMT	By land	17	17	17	Triage Tx on scene (2 intubation, 1 chest drainage)	17min	2hrs

N; Number, DIV; drip intravenous infusion, pts; patients, CSM; confined space medicine, Ave; Average, Min; Minimum, EMT; emergency medical technicians, Tx; treatment



Fig. 1 Niigata Prefecture Chuetsu offshore earthquake 2007. The crack was found in affected area (a). refugee camp was established in central Kashiwazaki city (b). Confined space medicine was required in a collapsed temple (c) (d).

A tornado in 2006 and an avalanche in 2007 were the other 2 natural disasters involving J-DMAT deployment³. But these natural disasters were difficult to forecast, and to let J-DMAT deploy quickly on site. In both cases, the affected areas were limited in size, as was the need for medical services.

The man-made disasters included 2 derailment accidents and one case of random street violence. The first was a derailment in 2005 on Japan Railway's (JR) Amagasaki Line (**Fig. 2**), which left 107 people dead, and 549 injured, 139 of them critically⁴. Another derailment occurred later the same year on the JR Uetsu Line (**Fig. 3**), leaving 5 people dead, and 33 injured⁵. J-DMATs and other medical teams were deployed in both cases to perform triage and give treatment at the scene. The third man-made disaster was a stabbing spree in Tokyo's Akihabara area, which left 7 people dead and 10 critically injured. Local DMATs in the Tokyo metropolitan area were deployed to perform triage and provide treatment at the scene.

Discussion

The activities of J-DMAT (**Table 3**) include: 1. medical data collection and communication in devastated areas; 2. the 3 Ts (triage, treatment, transport) in devastated areas; 3. providing medical support to hospitals in devastated areas; 4. supporting staging care units; 5. in-flight treatment of victims being evacuated; and 6. supervision of emergency medical technicians in devastated areas.

In preparation for a massive earthquake expected at any time in the Tokai area (an industrial belt straddling the Pacific coast of Honshu, starting just southwest of Tokyo and stretching westward past Nagoya), J-DMAT personnel training includes not only a basic DMAT course, but also a medical evacuation DMAT course⁶. Additionally, DMATs have been set up at the county level in some areas, such as the Tokyo Metropolitan area, Saitama Prefecture, and Kanagawa Prefecture to ensure an adequate local response.

In the United States, 54% of all DMAT



Fig. 2 Japan Railway Amagasaki line derailment accident 2005. The train was severely crashed against the building (a). Confined space medicine in the crashed trains (b) (d) and medical treatment on scene (c) were performed. (Courtesy of Shinichi Nakayama, M.D. Hyogo Prefectural Disaster Medical Center)

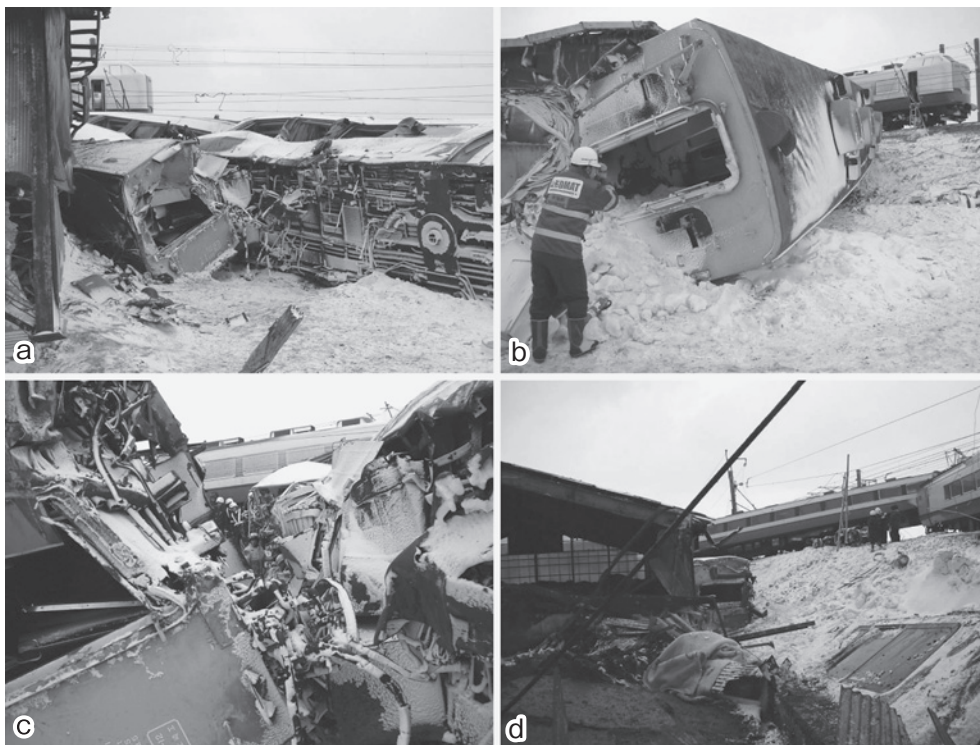


Fig. 3 Japan Railway Uetsu line derailment accident 2005. The train was derailed by severe winds (a) (c) (d). JDMAT was dispatched on scene (b). (Courtesy of Kazumasa Morino, M.D. Yamagata Prefectural Medical Center for Emergency)

Japan DMAT Deployments

Table 3 The roles of DMAT

	Japan	U.S.
1 Medical data collection and communication in devastated area	○	○
2 3T (Triage, Treatment, Transport) in devastated area	◎	◎
3 Medical supports for devastated hospitals	◎	△
4 Medical supports in Staging Care Unit (SCU)	○	○
5 Medical treatments of patients in the airplane for evacuation	○	○
6 Medical control for emergency medical technicians in devastated area	○	△ # 1

○; usually, ◎; quite often, △; not often. # 1; U.S. DMAT originally include emergency medical technicians in their team.

Staging Care Unit (SCU): a medical strong point for evacuation to non-devastated area, usually located in military, commercial airports.

(extracted from “research for standardization of Japan DMAT” fiscal 2001 special research of Japan ministry of Health, Labour and Welfare)

Table 4 Structures and Activities in DMAT

	Japan	U.S.
Control by	MLWH	DHHS
Under Laws/Act/system	Basic Act on Disaster Control Measures	NDMS
Number of teams	734	70
Member of team	5-6 # 1	35 # 2
Deployment	<6-24hrs	<24-72hrs
Self-sufficient	<72hrs	<14days
Level	2 level # 3	3 level + special # 4

1, # 2; Members of team in Japan include physicians, nurse practitioners, logistical personnel. In addition to these members, U.S. teams have physician assistants, pharmacists, respiratory therapists, paramedics, emergency medical technicians. # 3; Japan DMATs have 2 level (national and local). # 4; U.S. has advanced DMATs, that specialize in specific types such as hazardous material handling, decontamination, psychiatric, pediatric, burn etc.).

MLWH; Ministry of Labor, Welfare and Health in Japan, DHHS; Department of Health and Human Services, NDMS; National Disaster Medical System.

deployments have been in response to hurricanes and floods⁷. By contrast, earthquakes are the disasters most likely to require DMAT deployment in Japan. The 1995 Great Hanshin-Awaji Earthquake led directly to the establishment of J-DMAT, and 2 of the 4 J-DMAT deployments following natural disaster over the last 5 years were in response to earthquakes.

At only 377,835 square kilometers, Japan's area is about 1/25 that of the United States, so most J-DMATs head for devastated areas by car from their respective hospitals. Each J-DMAT is typically composed of 1 or 2 medical doctors, 2 or 3 nurses, and 1 or 2 logisticians, but the actual composition is determined on the basis of the medical needs in each

situation. This is one reason why J-DMATs are smaller and more agile than US-DMATs (**Table 4**).

Another difference between J-DMAT and US-DMAT stems from the nature of the disasters they are called on to respond to: as mentioned above, earthquakes are the most common natural disasters in Japan, while water-related disasters such as hurricanes, tropical cyclones, and floods are the most common disasters in the United States⁷. J-DMATs' activities following earthquakes involve providing treatment in confined spaces, triage, and stabilization of injuries: these services are required in the acute phase of a disaster, but the critical period is over in a much shorter time than in the case of water-related disasters.

But J-DMAT also has to prepare for earthquakes forecast to be so huge that they have already been named before they occur: the Tokai, Tounankai (southeast coast), and Nankai (south coast) Earthquakes. We know all 3 are coming, simply by referring to known earthquake cycles. An earthquake as large as the Great Hanshin-Awaji Earthquake is also predicted to hit the Tokyo Metropolitan area in the near future. In fact, J-DMAT was established basically in anticipation of such massive earthquakes.

From now on, J-DMAT's activities should be more flexible and seamless, so that a uniform level of service is provided without regard to the size of individual teams or the areas they are operating in. As an initial concrete step in this direction, the command and control system of J-DMAT should be regulated more strictly so that teams can cooperate more closely with Fire Department personnel at the scene of disasters (the Fire Department is also responsible for ambulance services in Japan). On this point, the Ministry of Internal Affairs and Communications has been holding meetings since 2006 to discuss the relationship between medical and rescue teams, and guidelines on cooperation between the 2 services have been issued.

In the United States, the most common man-made disasters for which DMATs are deployed are terrorist incidents like the World Trade Center attack in 2001. The possibility of terrorist attacks cannot be ignored in Japan, but transportation accidents and random street violence are certainly more common at present. Following a derailment accident, the critical period for DMAT operations comes within a few hours; in the case of street violence, it comes within one hour. So that medical services can be offered at the scene of disasters during the critical periods, J-DMATs need to be deployed as soon as possible. This is why J-DMATs are so compact.

US-DMAT also participates in missions outside the United States. In Japan's case, international missions are carried out not by J-DMAT, but by medical teams dispatched by Japan Disaster Relief (JDR), which operates under the umbrella of the Japan International Cooperation Agency (JICA).

Conclusion

Descriptive data on the activities of J-DMAT are presented, and differences between J-DMAT and US-DMAT are discussed. J-DMAT is smaller and more agile than US-DMAT as a result of the types of disaster that hit Japan and the relatively small size of the country.

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(Received, June 22, 2010)

(Accepted, September 14, 2010)