BRIEF REPORT

Experience from the Great East Japan Earthquake Response as the Basis for Revising the Japanese Disaster Medical Assistance Team (DMAT) Training Program

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ABSTRACT

Objective: The objective of this study was to draft a new Japanese Disaster Medical Assistance Team (DMAT) training program based on the responses to the Great East Japan Earthquake.

Methods: Working group members of the Japan DMAT Investigative Commission, Ministry of Health, Labour and Welfare, reviewed reports and academic papers on DMAT activities after the disaster and identified items in the current Japanese DMAT training program that should be changed. A new program was proposed that incorporates these changes.

Results: New topics that were identified to be added to the DMAT training program were hospital evacuation, preparations to receive DMATs at damaged hospitals, coordination when DMAT activities are prolonged, and safety management and communication when on board small helicopters. The use of wide-area transport was reviewed and changes were made to cover selection of various transport means including helicopter ambulances. Content related to confined space medicine was removed. The time spent on emergency medical information system (EMIS) practical training was increased. Redundant or similar content was combined and reorganized, and a revised DMAT training program that did not increase the overall training time was designed.

Conclusion: The revised DMAT training program will provide practical training better suited to the present circumstances in Japan. (*Disaster Med Public Health Preparedness*. 2014;8:477-484)

Key words: disaster medicine, emergency medicine, information systems, natural disasters, chemical hazard release, medical transportation

Training of Japanese Disaster Medical Assistance Teams (DMATs) began in 2005. Unlike DMATs from the Unites States, Japanese DMATs work in teams of 4 to 5 persons. The team members include doctors, nurses, and logistics personnel, often from the same hospital. Japanese DMATs are small because emphasis is placed on readiness for quick mobilization after a disaster. Consequently, their activities in the field are limited to 48 to 72 hours. A feature of the Japanese DMAT training program is its breadth, covering operations that deal with nearby or local disasters that occur near hospitals to those that deal with natural disasters that affect large areas.[1] Japan is characterized by a large number of earthquake disasters, so many lectures and simulations assuming earthquakes have been incorporated. After the Great East Japan Earthquake that occurred on March 11, 2011, more than 340 Japanese DMATs were active for 10 days. The various lessons learned from the experiences of the DMATs in this earthquake disaster revealed changes that were needed to the existing Japanese DMAT training program. Current DMAT members received updated training based on the revisions.

METHODS

The Working Group of the Japan DMAT Investigative Commission, Ministry of Health, Labour and Welfare (MHLW), was organized to revise the training program. The members were medical doctors, nurses, and emergency medical technicians involved in regular emergency and disaster medicine.

First, the problems with DMAT activities during the Great East Japan Earthquake were investigated from the following materials: 1) reports that recorded the

activities of DMATs throughout Japan after this disaster (kept at the Japan DMAT Secretariat National Hospital Organization Disaster Medical Center, Tokyo, Japan), and 2) academic papers that covered DMAT activities. A search was conducted by using PubMed (National Library of Medicine, Bethesda, MD, USA) and the Ichushi-Web (NPO Japan Medical Abstracts Society, Tokyo, Japan) for the years 2011 and 2012, with "DMAT," "the Great East Japan Earthquake," and "medical transportation" as key words.

Next, the currently issued DMAT training program was carefully examined, and a revised program was developed on the basis of the results of the above investigation. New and useful content was proposed and added. Inappropriate or unnecessary content was identified and removed. Topics that require longer times were suggested, and the time was increased. Topics with redundant or similar content were combined and reorganized. A new program was proposed under the condition that the total time for the training not exceed that of the existing program.

Analysis

Additional information relevant to but not included in the current training is described here.

Even hospitals that do not collapse from damage caused by an earthquake will become isolated if utilities are disrupted over a long period or the supply of materials is insufficient, and patients at these hospitals need to be moved to other medical facilities or evacuation centers by various means.[2] DMATs provide hospital support to complement the functions of damaged hospitals.[3] When hospitals within a disaster area have DMATs, it is expected that these DMATs can start operations soon after the disaster occurs, and that support teams can implement their operations more smoothly.

The response to the Great East Japan Earthquake required DMAT activities over a period longer than 48 to 72 hours because of the large-scale damage across a wide area.[4] Several teams withdrew when the time scheduled for their activities elapsed. The loss of a medical team in a location that still has medical needs can give rise to major confusion.

During evacuation of Ishinomaki City Hospital, rescue operations were done with Self-Defense Force (SDF) helicopters with support from helicopter ambulances and DMATs.[2] Characteristic safety management and methods of communication associated with boarding and deboarding small helicopters is important.

The current program includes training on only wide-area transport of severe trauma patients. In this earthquake, however, greater percentages of patients with endogenous and chronic diseases were moved by wide-area transport, whereas trauma patients with high degrees of urgency or severity were moved short distances by helicopter ambulances.[5,6] Furthermore, patients with a variety of injuries and illnesses were transported to the staging care unit (SCU) from the sites where they were rescued or from evacuation centers. Because of the scale of the disaster, patients in different disease states were transported by use of different methods to various places.[5,6]

Even for a huge disaster like the Great East Japan Earthquake, there is only one report of confined space medicine (CSM) being used, and that was to alert people to its danger rather than to describe its efficacy.[7] Therefore, training related to CSM was removed.

Even though Japanese DMATs comprise 4 to 5 members, multiple teams come together to form a large organization during their activities. In this situation, an emergency medical information system (EMIS) is an essential information-sharing tool.[8] The Great East Japan Earthquake served as an occasion to move ahead with modifications for an enhanced EMIS. Given the importance of this system, the time for EMIS training was extended.

RESULTS

The current program is shown in Table 1, with the number (#) for each revised point shown in the right-hand column. Questions on hospital evacuation were added to the simulation in Lesson 14, and the time was increased (#1). A new desktop simulation was established that includes content on the initial activities that should be carried out by DMATs within damaged hospitals and content on information sharing and collaborative activities with external DMATs that come as support (#2; new lesson, not shown in Table 1). Questions and discussion on the conditions for DMAT withdrawal were added to the simulation in Lesson 14 (#3). A new lecture on precautions during activities on board small helicopters was also added (#4; new lesson, not shown in Table 1).

Selection criteria for wide-area transport patients, in which patients with severe trauma, severe burns, or crush syndrome are the main candidates, were removed. The lecture in Lesson 17 was changed to include information about patients with a variety of pathological conditions such as endogenous and chronic diseases as candidates for wide-area transport. Patients in severe medical situations are managed with consideration of quickly selecting transport to nearby medical facilities that have maintained their functions. This transportation is carried out by various means, including helicopter ambulances and ambulances. Practical training about selection and treatment methods at emergency base hospitals and SCUs, by use of the simulator in Lesson 18, was also changed (#5).

Lesson 24 "CSM," a classroom lecture on CSM, and Drill 1 "CSM" were removed. The content on coordinating with

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TABLE 1

Existing Japanese DMAT training program[a]

Lesson/drill	Course is for:	Time (min)	Teaching format	Title	Lecture and practical training content	Revised point
1	All	15	Classroom lecture	"The meaning of DMAT"	Lecture on the meaning of the establishment of DMATs	
2	All	20	Classroom lecture	"CSCA"	Lecture on CSCA basic concept for disaster sites	#10
3	All	20	Classroom lecture	"TTT"	Lecture on TTT basic concept for disaster sites	#10
4	All	50	Practical training	Practical training "Communication at disaster sites"	Practical training in communicating information using a transceiver	
5	All	20	Lecture	"Triage 1 (lecture)"	Lecture on the meaning and methods of triage	#11
6	All	100	Desktop simulation	Simulation "Local disaster"	Desktop simulation on mobilization to nearby disaster and coordinating with other organizations to build on-site systems	
7	All	70	Desktop Practical training	"Triage 2 (writing tags, triage desktop exercise)"	Practical training in writing triage tags and desktop triage exercises	#11
8	Doctor/Nurse	100	Practical training	A. Practical training "Observation procedures and triage for injured and sick persons at disaster sites"	Triage practical training with START using simulated patients and physical anatomical triage practical training with full body observations	
			Classroom lecture	B. Lecture "Clinical states in crush syndrome"	Lecture on the clinical conditions in crush syndrome	
	Logistics personnel	100	Practical training	"Logistics basics, ensuring communication and satellite telephone practical training"	Lecture on importance of ensuring communications and practical training with satellite telephone	
9		20	Classroom lecture	"Stress care"	Lecture on stress care for rescue workers	
10	All	20	Classroom lecture	"DMAT activities and Emergency Medical Information System (EMIS) in wide-area disasters"	Lecture on the meaning of EMIS and how to use it	
11	All	50	Practical training	Practical training "Wide-area disaster Emergency Medical Information System (EMIS)"	Practical training in EMIS using PCs	#7
12	Doctor/Nurse	10	Classroom lecture	"Standard medical care procedures at disaster area first-aid stations"	Lecture on medical care procedures conducted at disaster area first-aid stations	
	Doctor	110	Practical training using a simulator	A. Practical training "Medical care in disaster area first-aid stations (first-aid station simulated care)"	Practical training in disaster area first-aid station medical care using a simulator	
	Nurse	110	Classroom lecture and practical training	B. "Roles of nurses during disasters" "Triage practical training"	Lecture on the roles of nurses during disasters and practical training in triage	
	Logistics personnel	120	Practical training	"Team logistics (remote area operations simulation II)"	Simulation of practical training on the roles of operational coordinators during remote area operations	
13	All	80	Desktop simulation	Simulation "Major earthquake occurrence/DMAT mobilization"	Simulation of dispatch to remote area at time of major earthquake occurrence	
14	All	80	Desktop simulation	Simulation "DMAT activities during wide-area disasters"	Simulation on local DMAT activities during wide-area disaster	#1, #3
15	All	20	Classroom lecture	"DMAT activities in wide-area transport"	Lecture on mechanisms of wide-area transport	
16	All	15	Classroom lecture	"Medical care onboard aircraft"	Precautions on activities with Self-Defense Force aircraft	
17	All	10	Classroom lecture	"Medical activities in wide-area transport"	Lecture on specific DMAT activities during wide-area transport	

Table 1. Continued

Lesson/drill	Course is for:	Time (min)	Teaching format	Title	Lecture and practical training content	Revised point
18	Doctor/Nurse	80	Practical training using a simulator	Practical training "Medical care at emergency base hospitals and SCUs"	Practical training on medical care at emergency base hospitals and SCUs in wide-area transport	#5
	Logistics personnel	80	Practical training	"Roles of operational coordinators in wide-area transport"	Operational coordinator activities in wide-area transport	
19	All	25	Classroom lecture	"Treatment guidelines during disasters"	Conceptual theory on medical care in various situations	#12
20	All	20	Classroom lecture	"Police department disaster countermeasures" (Police department)	Introduction to police response during disasters	#9
21	All	20	Classroom lecture	"Wide-area transport plan during large-scale earthquake disasters" (Cabinet Office)	Wide-area transport plan of the Cabinet Office	#8
22	All	20	Classroom lecture	"Japanese DMAT activity procedures" (MHLW)	Explanation of Japanese DMAT activity essentials	#8
Test	All	200		Written examination Practical examination Doctors: Medical treatment, triage, transceiver/EMIS Nurses: Triage, transceiver/EMIS Logistics: Information gathering, satellite telephone, transceiver, EMIS		
Drill 1	All	110	Practical exercises	Confined Space Medicine	Practical exercises in CSM activities in cooperation with Fire Department	#6
		30	Break			
Drill 2	All	110	Practical exercises	Disaster site first-aid station	Practical exercises for activities at disaster site first-aid stations	#6
23	All	20	Classroom lecture	"Firefighting organization" (Fire Department)	Introduction to Fire Department organization	#9
24	All	20	Classroom lecture	"CSM"	Lecture on CSM	#6
25	All	20	Classroom lecture	"Japan Coast Guard activities during disasters" (Japan Coast Guard)	Introduction to Japan Coast Guard	#9
26	All	20	Classroom lecture	"Disaster countermeasures of the Ministry of Defense and Self-Defense Forces" (Ministry of Defense)	Department of Defense activities during disasters	#9
27	All	80	Simulation using Emergo	Simulation "SCU"	Simulation with Emergo format of SCU activities and practical training on next-day team building	
Drill 3	All	180	Practical training	Staging Care Unit	Field exercises on SCU operation	
Drill 4				Boarding, deboarding	Training in boarding and deboarding patients in Self-Defense Force aircraft	
28	All	20	Classroom lecture	"DMAT activity case examples"	Case examples of activities in past disasters	
29	All	10	Classroom lecture	"Future DMAT training plan"	Explanation of future training needed to maintain DMAT skills	
Total		2205				

[a]Content of the existing program and points that should be revised. The revision point number is the same as the number in the Results section. CSCA indicates command and control, safety, communication, assessment; DMAT, disaster medical assistance team; MHLW, Ministry of Health, Labour and Welfare; SCU, staging care unit; TTT, triage, treatment, transportation.

firefighting organizations handled in Drill 1 was modified and added to Drill 2 "Disaster site first aid station" (#6). The time for Lesson 11 "Practical training in EMIS" was increased (#7).

The content of Lesson 21 had some overlaps and so was merged with Lesson 22 (#8). Four lessons (20, 23, 25, and 26) on related organizations (police department, fire department, Japan Coast Guard, and SDF) were reduced to 2 time slots, and the lectures were reduced to 2 organizations each time in rotation (#9). Lesson 2 "CSCA" (Command and Control, Safety, Communication, Assessment) and Lesson 3 "TTT" (Triage, Treatment, Transportation) were merged, and the time was shortened (#10). Lessons on triage, Lesson 5 "Triage 1 (lecture)" and Lesson 7 "Triage 2 (writing tags, triage desktop exercise)," were merged and the time was shortened (#11). Lesson 19 "Treatment guidelines during disasters" was removed because it duplicated content taught in other lectures (#12). The new program was designed to have a total time of 2165 minutes, which was less than the 2205 minutes for the existing program (Table 2).

DISCUSSION

Based on the experiences of the Great Hanshin and Awaji Earthquake in 1995,[9] Japanese DMATs are required both to have the mobility to act as a quick response team and to be self-contained. However, if either mobility or self-containment is emphasized, the other may not be satisfactorily met. Hence, the activity period for Japanese DMATs was established to maintain a reasonable balance between the two requirements. In large disasters such as the Great East Japan Earthquake, however, the activities of DMATs are extended over a longer period. While firmly maintaining that one team will be active for the conventional short period, overall Japanese DMAT activities can be conducted over longer periods with deployment of second and third teams as replacements.

Changes in the DMAT education content were brought about by the substantial changes in social circumstances that have occurred since the establishment of Japanese DMATs, and the excessive bias toward the Great Hanshin and Awaji Earthquake in 1995 in the initial references to actual disasters. For example, CSM education was adopted because of the large number of injured or ill people in collapsed houses who were difficult to rescue.[1,10] These activities are extremely risky and should be carried out only with sufficient training. However, the time for teaching CSM is very short in the existing program, and acquiring sufficient skills with such little training is impossible.

Moreover, helicopter ambulances were not in use in Japan at that time. It was thought that the number of deaths in disasters could be reduced by transporting patients by use of aircraft to places far outside the disaster area. Thus, the government took the lead in developing a wide-area transport plan to transport patients long distances by using SDF aircraft. According to investigations following the Great Hanshin and Awaji Earthquake in 1995,[10] the main candidates for wide-area transport are patients with severe trauma, burns, and crush syndrome. However, unlike the situation when the wide-area transport plans were developed 10 years ago, helicopter ambulances are now stationed throughout Japan. With this deployment, helicopter ambulances can be assembled when a disaster occurs to allow the option of air transport over shorter distances from the SCU.[6] This early transport plan laid the foundation for development of a more practical patient transport system.

A network exists that uses EMIS via the Internet to share information on hospital disaster situations and DMAT activity status. It is very important as a medical information-sharing tool during disasters in Japan. Information on situations that should be considered in hospital evacuation, such as building collapse and utilities disruption, is obtained as basic EMIS information. Given the disaster circumstances in Japan, which has many earthquake disasters, emergency base hospitals nationwide are being made earthquake-resistant or seismically isolated. However, long-term disruption of electricity, gas, and water utilities following the Great East Japan Earthquake left these hospitals with no prospects of short-term restoration. Some hospitals were unable to continue providing medical care. In the case that either a building collapses or utilities are disrupted, DMATs must be deployed immediately to support inpatient evacuation activities. If this is not done in an organized fashion with continued treatment during transport, patients' lives could be put at risk. In Japan today, DMATs are the entity best suited for these activities.

The training of Japanese DMAT members is progressing year by year, and the number of medical institutions with DMATs is increasing. According to an official notice from MHLW, emergency base hospitals at 650 locations nationwide will need to have DMATs. Hence, DMATs are not only dispatched to disaster areas for support but also conduct their own initial activities when their own hospitals are hit by a disaster. The environment will continue to be developed so that they can operate smoothly in conjunction with outside support teams. In this way, a strategy is emerging in which a network of DMATs will spread throughout Japan and conduct rapid-response disaster medicine. DMAT education and training is important in preparation for the large earthquakes that are predicted to strike Japan in the coming years.

This study had the following limitations. A vast number of people participated in this disaster, and reports were presented at various conferences. As a result, we may not have reviewed all the reports and articles on DMATs. Second, the working group members who participated in the study were

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TABLE 2

Proposed new Japanese DMAT training program[a]

Lesson/drill	Course is for:	Time (min)	Teaching format	Title	Lecture and practical training content including changes
1	All	25	Classroom lecture	"The meaning of DMAT"	Lecture on disaster medicine theory and the meaning of the establishment of DMATs
2	All	35	Classroom lecture	"CSCATTT"	Lecture on CSCATTT basic concept for disaster sites
3	All	50	Practical training	Practical training "Communication at disaster sites"	Practical training in communicating information using a transceiver
4	All	100	Desktop simulation	Simulation "Local disaster"	Desktop simulation on mobilization to nearby disaster and coordinating with other organizations to build on-site systems
5	All	100	Lecture, tag-writing practical training, desktop simulation	"Triage (lecture, writing triage tags, triage desktop exercise)"	Integrated training with lecture on meaning and methods of triage, plus tag writing exercise and practical training on desktop in triage using patient cards
6	Doctor/Nurse	100	Practical training	A. Practical training "Observation procedures and triage for injured and sick persons at disaster sites"	Triage practical training with START using simulated patients and physical anatomical triage practical training with full body observations
			Classroom lecture	B. Lecture "Clinical states in crush syndrome"	Lecture on the clinical conditions in crush syndrome
	Logistics personnel	100	Practical training	"Logistics basics, ensuring communication and satellite telephone practical training"	Lecture on importance of ensuring communications and practical training with satellite telephone
7		20	Classroom lecture	"Stress care"	Lecture on the mental states of rescue workers and victims
8	All	20	Classroom lecture	"DMAT activities and Emergency Medical Information System (EMIS) in wide-area disasters"	Lecture on the meaning of EMIS and how to use it
9	All	70	Practical training	Practical training "Wide-area disaster Emergency Medical Information System (EMIS)"	Practical training in EMIS using PCs. Time extended for additional functional learning
10	Doctor/Nurse	10	Classroom lecture	"Standard medical care procedures at disaster area first-aid stations"	Lecture on medical care procedures conducted at disaster area first-aid stations
	Doctor	110	Practical training using a simulator	A. Practical training "Medical care in disaster area first-aid stations (first-aid station simulated care)"	Practical training in disaster area first-aid station medical care using a simulator
	Nurse	110	Classroom lecture and Practical training	B. "Roles of nurses during disasters" "Triage practical training"	Lecture on the roles of nurses during disasters and practical training in triage
	Logistics personnel	120	Practical training	"Team logistics (remote area operations simulation II)"	Simulation practical training on the roles of operational coordinators during remote area operations
11	All	80	Desktop simulation	Simulation "Major earthquake occurrence/DMAT mobilization"	Desktop simulation from occurrence of major earthquake until dispatch to remote area
12	All	80	Desktop simulation	Simulation "DMAT activities during wide-area disasters"	Desktop simulation of DMAT on-site activities during wide-area disasters; Additional content: (1) Judgments and precautions in hospital evacuation, (2) Activities taken over by second or third DMAT or other medical team as a condition for DMAT withdrawal
13 (New)	All	60	Simulation	New! Simulation "First activities and preparations to accept support during disasters"	Discussion on (1) how first activities should be done, (2) how DMAT activities should be accepted, (3) precautions on judgments and execution of hospital evacuations when hospitals are damaged

Table 2. Continued

Lesson/drill	Course is for:	Time (min)	Teaching format	Title	Lecture and practical training content including changes
14	All	20	Classroom lecture	"DMAT activities in wide-area transport"	Lecture on mechanisms of wide-area transport
15	All	15	Classroom lecture	"Medical care onboard aircraft"	Precautions on activities with Self-Defense Force aircraft and within air bases
16 (New)	All	20	Classroom lecture	New! Safety management and communications onboard small helicopters	Lecture on safety management, communication methods, and precautions on cooperative activities with helicopter staff when conducting activities onboard small helicopters
17	Doctor/Nurse	10	Classroom lecture	"Medical activities in rearward transport"	Lecture on the need to select among various rearward transport means, not limited to wide-area transport, and standards for non-transport
		80	Practical training using a simulator	Practical training "Medical care at emergency base hospitals and SCUs"	Simulation practical training in selection of various rearward transport assuming an emergency base hospital or SCU
	Logistics personnel	80	Practical training	"Roles of operational coordinators in rearward transport"	Practical training on activities of operational coordinators in rearward transport
18	All	20	Classroom lecture	"Japan DMAT activity procedures and wide-area transport plan" (MHLW)	Japanese DMAT activity essentials and wide-area transport plan by the government at times of major earthquake occurrence
Test	All	200	Test	Written examination Practical examination Doctors: Medical treatment, triage, transceiver/EMIS Nurses: Triage, transceiver/EMIS Logistics: Information gathering, satellite telephone, transceiver, EMIS	
Drill 1	All	200	Practical exercises	Disaster site first-aid station	Activity exercises in disaster area first-aid stations, plus exercises in coordinating with Fire Department
19	All	80	Desktop simulation	Simulation "SCU"	Advanced practice for drill 2 by desktop simulation on SCU activities
20	All	20	Classroom lecture	Lectures by related organizations	Two selected lectures each time from among four related organizations (Fire Department, Police Department, Japan Coast Guard, Ministry of Defense)
21	All	20	Classroom lecture		
Drill 2	All	180	Field exercises	Staging Care Unit	Field exercises on SCU operation
Drill 3				Boarding, deboarding	Training in boarding and deboarding patients in Self-Defense Force aircraft
22	All	20	Classroom lecture	"DMAT activity case examples"	Case examples of activities in past disasters
23	All	10	Classroom lecture	"Future DMAT training plan"	Explanation of future training needed to maintain DMAT skills
Total		2165			

[a]CSCATTT indicates command and control, safety, communication, assessment, triage, treatment, transportation; DMAT, disaster medical assistance team; MHLW, Ministry of Health, Labour and Welfare; SCU, staging care unit.

mainly authorities involved in Japanese DMAT operating plans, and subjective elements cannot be ruled out.

CONCLUSIONS

Analysis of experiences in the Great East Japan Earthquake revealed insufficiencies in the current Japanese DMAT training program and content not suited to current situations. On the basis of this analysis, a new revised Japanese DMAT training program was proposed.

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