

ORIGINAL REPORT

HOW DID REHABILITATION PROFESSIONALS ACT WHEN FACED WITH THE GREAT EAST JAPAN EARTHQUAKE AND DISASTER? DESCRIPTIVE EPIDEMIOLOGY OF DISABILITY AND AN INTERIM REPORT OF THE RELIEF ACTIVITIES OF THE TEN REHABILITATION-RELATED ORGANIZATIONS

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Objective: Inter-organizational coordination is important for rehabilitation disaster relief. The 2011 Great East Japan Earthquake and Disaster was unprecedented, being geographically widespread and multifaceted. Faced with the crisis, rehabilitation professionals established the 10 Rehabilitation-Related Organizations of Rehabilitation Support Service (10-RRO). The objectives of this paper are to provide descriptive epidemiology and assess the activities of 10-RRO.

Design: Descriptive.

Methods: Epidemiological data on disability were collected, mainly from official sources. Relief activities were reviewed from daily reports, and the preparedness, initial response and functioning of 10-RRO were assessed with a questionnaire directed at 36 executives of individual organizations.

Results: The disaster was characterized by a very low ratio of injuries to death of 0.372, and an odds ratio of deaths among disabled persons of 2.32. 10-RRO provided relief activities at 3 shelters. The total number of dispatch days ranged from 107 to 146, and the cumulative number of professionals and evacuees served was 1,202 and 7,300, respectively. Support activities included prevention of immobilization, daily life support, environmental improvement and transition to temporary housing. The questionnaire survey revealed poor preparedness, satisfactory initial response and support activities, and problems of data collection and advocacy.

Conclusion: The disaster was characterized by minimal trauma and a great need for preventing immobilization. This first collaborative endeavour was successful.

Key words: natural disaster; preparedness; immobilization syndrome; community-based rehabilitation.

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INTRODUCTION

Following a series of large-scale natural disasters, such as Hurricane Katrina (1–3), the Kashmir earthquake (3, 4), the Sichuan earthquake (3) and the Haiti earthquake (3), there has been increasing international interest in rehabilitation support at the time of disasters (3, 5). During disaster relief activities, coordination among organizations and professionals is important (6–8). However, as symbolized by the panel discussion focusing on the critical question “How can rehabilitation actors coordinate better in disaster?” at the 6th International Society of Physical and Rehabilitation Medicine (ISPRM) (9), well-coordinated relief activities by various rehabilitation professionals are not easy.

Faced with the recent Great East Japan Earthquake and Disaster (GEJED), which occurred on 11 March 2011, individual rehabilitation-related organizations responded quickly within a few days of the disaster, but they acted independently without inter-organizational coordination. This often resulted in duplication of services or a lack of necessary services, and placed an unnecessary burden on local government officials and healthcare professionals, of coordinating surging volunteers, when the local officials and professionals were often disaster victims themselves and became exhausted in trying to fulfil their responsibilities.

Compared with the Great Hanshin-Awaji Earthquake in 1995 (10, 11), the GEJED was unprecedented, being geographically

widespread and multifaceted (earthquake, tsunami and nuclear power plant failure) (12, 13). This made it impossible simply to apply previous experience, and forced rehabilitation professionals to act together, in particular to prevent immobilization syndrome and progressive functional deterioration among frail elderly survivors and persons with pre-existing disabilities who were forced to stay in shelters that were not designed to encourage physical activity. This prompted us to establish the “10 Rehabilitation-Related Organizations of the Great East Japan Earthquake Rehabilitation Support Service” (10-RRO) 1 month after the disaster in order to try to cope with this unprecedented national crisis.

The objectives of this report are to provide descriptive epidemiology with an emphasis on disability, to describe how 10-RRO was formed and managed, to review its relief activities, and to perform self-evaluation of the activities using a questionnaire directed at the executives of each organization.

METHODS

Descriptive epidemiology of Great East Japan Earthquake and Disaster

Information about the epidemiological data, with emphasis on disability, was searched by accessing the websites of official agencies, such as the Emergency Disaster Countermeasures Headquarters of the National Police Agency, the Ministry of Health and Welfare and the local governments of affected areas. If the information was unavailable through these agencies, other sources, such as newspaper websites, non-governmental organizations (NGOs) and researchers, were accessed. Based on the data gathered, the descriptive epidemiology of the GEJED was summarized, and the injury to death ratio and odds ratio (OR) of death for persons with disability were calculated.

Formation and management of 10 Rehabilitation-Related Organizations

On 13 March 2011, the Earthquake Disaster Relief Headquarters of the Japanese Association of Rehabilitation Medicine contacted 5 rehabilitation-related organizations (the Japan Association of Rehabilitation Hospital and Institution, the Kaifukuki (sub-acute) Rehabilitation Ward Association, the Japanese Physical Therapy Association, the Japanese Association of Occupational Therapists, and the Japanese Association of Speech-Language-Hearing Therapists) and called for coordination of the disaster management. Some collaborative activities, such as exchange of information and development of a system to accept patients from the affected areas, were commenced. However, amidst great confusion, individual organizations had made great efforts to collect information, confirm the safety of their members and formulate relief activity strategies, and were occupied with their own organizational matters with insufficient time and energy to pursue active inter-organizational collaboration. The lack of experience of such collaboration in past disasters complicated the situation. Therefore, it was 1 month after the disaster that we began collaborative relief activities, and finally established 10-RRO, consisting of the 6 organizations mentioned above and the Adult Day-care Liaison Council Japan, the Home Rehabilitation Association, the Community-based Rehabilitation Support Council, and the Japan Care Manager Association. Later in May 2011, 10-RRO participated as an official member in the Liaison Conference of Health Care for Disaster Victims, a newly formed all-Japan assembly of healthcare- and welfare-related organizations headed by the Japan Medical Association to facilitate inter-organizational collaboration (14).

The 10-RRO comprises 3 pillars: the strategic council, which formulates overall plans and makes decisions; the think-tank, which analyses and judges the information and situations, and recommends decision-

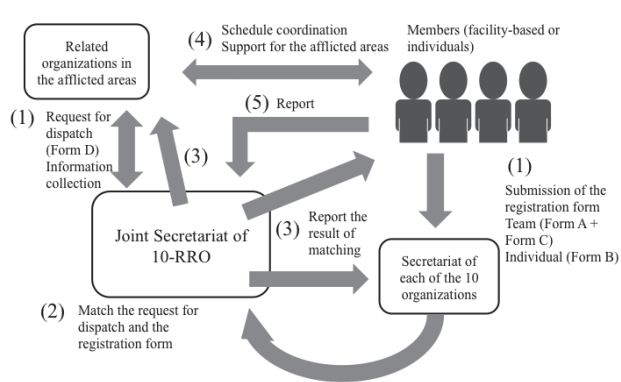


Fig. 1. Volunteer registration and dispatch: requests for dispatch (1) and registration forms of volunteers (1) are sent to the secretariat's office, where matching is performed (2). The result of matching is reported to the secretariat of each organization, to the related organizations in the afflicted areas and to the volunteers (3). Once the schedule is coordinated, support activities are initiated (4). The dispatched volunteers are requested to send daily reports to the secretariat (5). 10-PRO: 10 Rehabilitation-Related Organizations.

making proposals; and the joint secretariat, which gathers and classifies information, performs daily management, and ensures coordination among the organizations and the activity bases in the affected areas. Upon commencement of activities great importance was placed on prior information collection, coordination with local representatives, and respect for the local system and manner of providing community cares, in order to provide as much useful support as possible to the affected areas, and supplement existing systems. Volunteers were recruited from among the members of each participating organization of 10-RRO, and requests for support and the availability of volunteers were matched according to the flow-chart in Fig. 1. The volunteers were expected to undergo thorough pre-dispatch orientation, using a pamphlet providing an overview of the local situation, transportation, living conditions of the dispatched staff, equipment, expected relief activities, schedule, expected behaviour and reference materials. The dispatched staff was asked to submit a daily activity report. The progress of relief activities was monitored and adjustments were made by the think-tank and the strategic council.

Description and qualitative evaluation of the support activities implemented by 10 Rehabilitation-Related Organizations

Based on the minutes of the strategic council of 10-RRO, the daily reports by the secretariat and the daily activity reports from the disaster zone, the actual relief activities implemented by 10-RRO were analysed. The survey period was from 6 May 2011, when regular dispatch of rehabilitation professionals was started, to 30 September 2011, when most of the shelters in the disaster zone were closed. The total number of dispatched rehabilitation professionals, the numbers by discipline, and the number of evacuees served were analysed.

The relief activities were also evaluated with a questionnaire directed at the executives of each organization. This comprised 10 items assessing preparedness (yes or no dichotomized rating), 10 items assessing initial relief activities (rated as very poor, poor, moderate, good, very good) of each organization, and 40 items assessing the activities of 10-RRO (rated as very poor, poor, moderate, good, very good).

RESULTS

Descriptive epidemiology of Great East Japan Earthquake and Disaster

In general, the characteristics of the GEJED were as follows (12, 13):

- it was the fourth largest earthquake in recorded history (M9, subduction zone trench-type earthquake);
- catastrophic damage was caused by a gigantic tsunami (wave height 10 m and higher, maximum run-up height 38.9 m);
- it was geographically extensive (deaths and missing persons in 12 prefectures, and injured persons in 18 prefectures);
- overall, 15,844 persons died, 3,394 persons were still missing, 128,530 buildings and houses were completely destroyed and 240,332 were partially destroyed (as of 11 January 2012);
- there were 400,000 or more evacuees on peak days, and more than 8 million households were affected by power cuts;
- 92% of the deaths were caused by drowning due to the tsunami;
- local infrastructure and livelihood were wiped out by the tsunami;
- fisheries, agriculture, and high-technology component factories received a fatal blow;
- there was direct and indirect damage due to the destruction of the nuclear power plant;
- there was a fundamental shortage of medical and welfare facilities in the disaster areas; and
- a prolonged evacuation period of up to 6 months.

The injury to death ratio was 0.372 (5,891/15,844) (13). Among the injured, the slight injury (requiring <30 days of treatment) to serious injury (requiring ≥ 30 days of treatment) ratio was 0.01 (164/5,527) (13). According to a survey by the

Mainichi Newspaper (15), which sent a questionnaire to 35 municipalities in Miyagi, Iwate and Fukushima prefectures and received 33 responses (94.2%), 13,619 of the 1,603,409 residents (0.89%) died, while 1568 of the 76,568 residents (2.05 %) with official government certification for physical, intellectual or psychiatric disabilities died. This gives an OR of 2.32 (95% confidence interval (CI): 2.20–2.45) of death for persons with disability.

Description and qualitative evaluation of the support activities implemented by 10 Rehabilitation-Related Organizations

Since the disaster, each organization has been actively involved in various relief activities on its own initiative, and although 10-RRO did not attempt formal coordination of these activities, mutual exchange of information was actively practiced at strategic council meetings to facilitate coordination and collaboration. Major support activities implemented by 10-RRO in 3 areas and their basic demographic information are as described below. A summary of the support activities is provided in Table I.

Support for the management of a welfare shelter in Ishinomaki city. Ishinomaki city in Miyagi Prefecture was 1 of the areas most heavily affected by this disaster. The city covers an area of 555.78 km², and its main industries are agriculture, fishery and marine products industries (16). Before the disaster, the population was 162,822 and the percentage of persons aged 65 years and older was 26.6%. The number of persons in need of care,

Table I. Support activities implemented by the 10 rehabilitation-related organizations of the Great East Japan Earthquake Rehabilitation Support Service

	Momou Agriculture Training Center in Ishinomaki	Hotel Kanyo in Kesennuma	Listel Inawashiro in Fukushima	Total
Support requested, date	27 April 2011	30 May 2011	6 June 2011	
On-the-spot investigation started, date	28 April 2011	3 June 2011	8 June 2011	
Support started, date	3 May 2011	13 June 2011	15 June 2011	
Support terminated, date	26 September 2011	30 September 2011	30 September 2011	
Total days of dispatch	146	109	107	
Evacuees, <i>n</i>				
15 June 2011	37	200	780	1,017
20 August 2011	18	138	624	780
20 September 2011	2	20	0	22
Evacuees served, cumulative, <i>n</i>	3,300	1,200	2,800	7,300
Evacuees served per day, mean, <i>n</i>	16.3	7.6	20.7	
Rehabilitation professionals dispatched, <i>n</i> ^a				
Facilities that sent professionals	12	13	8	33
Teams	21	22	19	62
Physiatrists	34	0	26	60
Nurses	100	0	0	100
Care workers	36	0	0	36
Physical therapists	184	209	153	546
Occupational therapists	184	162	114	460
Cumulative number dispatched	538	371	293	1,202
Dispatched per day mean, <i>n</i>	2.7	2.4	2.2	

^aIn terms of the tasks of different professionals, there was fair amount of overlap as we emphasized a generalist approach. In general: physiatrists were responsible for medical examination, healthcare, risk assessment and prescription of specific exercises; nurses provided assistance with medical examination, daily life support, healthcare and assessment and guidance of activities of daily living (ADL); care workers were involved in daily life support; physical therapists offered individualized exercise and fitted orthosis and equipment; and occupational therapists took responsibility for environmental improvement of the shelter, assessment and guidance of ADL, group exercise, recreational activities and assessment of temporary housing.

as defined by the Public Long-term Care Insurance Program (PLCIP) (17), was 6806 (4.2% of the population) (18). It had been an area characterized by a scarcity of medical and welfare resources, with very few rehabilitation professionals.

The damage to the city was tremendous and, according to the statistics released on 11 January 2012 (19), the number of casualties was 3,182, while 595 persons were still missing, and 22,357 buildings were completely destroyed and 11,021 partially destroyed. The peak number of evacuees was 111,295 on 15 March 2011, and they were accommodated in 179 shelters (19). Upon request from Ishinomaki city, 10-RRO commenced provision of support on 6 May 2011 by managing a newly established welfare shelter for disaster victims with disabilities and their families.

The 10-RRO teams comprised a physiatrist, a physiotherapist (PT), an occupational therapist (OT), and several nurses/care workers, and were dispatched on a weekly rotation. As shown in Table I, the cumulative number of professionals dispatched was 538, with a mean of 2.7 per day, and the cumulative number of evacuees served was 3,300, with a mean of 16.3 per day. The professionals took responsibility for adapting the environment in the shelter depending on the disability status of evacuees, provided nursing care guidance aimed at improving (or preventing deterioration of) their activities of daily living, provided group or individual rehabilitation, ensured smooth transfer to temporary housing, gave advice on its environmental improvement, and created links with the local rehabilitation and care resources. The maximum number of persons who required support was 37, together with 7 family members. The number of evacuees gradually declined as they moved to temporary housing, and support was terminated on 26 September 2011. Because local health care providers had become sufficiently functional by this time, follow-up was entrusted to them.

Rehabilitation support at a secondary shelter in Kesenuma city. Kesenuma city in Miyagi Prefecture was another area that was badly affected, especially by the tsunami and fires. The city covers an area of 333.37 km², and its main industries were fishery and marine products (20). Before the disaster, its population was 73,489 and the percentage of persons aged 65 years and older was 30.7%. The number of persons in need of care, as defined by PLCIP, was 3,502 (4.8% of the population) (18). Kesenuma had been an area with very limited medical and welfare resources, which deteriorated after the disaster, with very few rehabilitation professionals.

The damage to the city was enormous, and the statistics released on 11 January 2012 (19) showed that the number of casualties was 1,030, while 343 persons were still missing, 8,486 buildings were completely destroyed and 2,540 were partially destroyed. The peak number of evacuees was 20,360 on 12 March 2011, and they were accommodated in 64 shelters (19).

In response to requests by the General Leader of the Medical Aid Group and local Disaster Relief Headquarters, 10-RRO commenced provision of support from 9 June 2011. At that time, the need for acute disaster medical care had subsided,

but the healthcare and long-term nursing care of those living in shelters, temporary housing or at home had become a growing concern. According to a survey conducted by the rehabilitation team of Yamagata University, there were 4,593 persons in 55 evacuation shelters as of 9 May 2011, and they estimated the percentage of victims at risk or already developing immobilization syndrome secondary due to the inactive and very restricted lifestyle in the shelters to be approximately 30% (personal communication with Dr. Michiaki Takagi of Yamagata University Hospital). Therefore, an urgent need existed for the management of persons requiring support and the prevention of new cases of immobilization syndrome.

Meanwhile, local staff on the ground actively implemented various initiatives, starting from the immediate aftermath of the earthquake. 10-RRO studied the possibility of providing complementary assistance that would be useful on the ground and lead to the establishment of a community-based rehabilitation system in the future. After thorough discussions and coordination with local representatives, 10-RRO was asked to provide assistance centred on rehabilitation support at a secondary shelter for elderly persons using Hotel Kanyo, and one PT and one OT were dispatched on 9 June 2011. Among approximately 200 evacuees accommodated at the shelter, there were 20 persons who required support and individual assistance to improve their everyday life functions. As shown in Table I, the cumulative number of professionals dispatched was 371, with a mean of 2.4 per day, and the cumulative number of evacuees served was 1,200, with a mean of 7.6 per day. The number of evacuees gradually reduced as they moved to temporary housing, and the support was terminated on 30 September 2011. Because local health care providers had become sufficiently functional by this time, follow-up was entrusted to them.

Support activities for relocated victims in Inawashiro. In Fukushima Prefecture, the GEJED not only caused damage due to the earthquake and tsunami, but radioactivity leaks occurred secondary to damage to Fukushima Nuclear Power Plant Number 1, which made the situation quite different from that in Miyagi Prefecture. As of 11 January 2012, the number of casualties in Fukushima was 1,605, while 217 persons were still missing, and 19,781 buildings and houses were completely destroyed and 61,925 partially destroyed (13). Due to radioactive contamination, many people had to leave their home towns, and as many as 61,659 persons were still living in evacuation in remote areas all over Japan (21).

After the disaster, approximately 5,000 Fukushima residents were first relocated to Saitama Super Arena in Saitama Prefecture in mid-March 2011 together with the administrative officials, and they were relocated again to 103 shelter facilities scattered around Saitama in early April 2011. Under the initiative of a 10-RRO strategic council member, rehabilitation professionals in Saitama joined forces in mid-April 2011 to promote volunteer activities at new evacuation sites. To prevent immobilization syndrome, the following activities were implemented, targeting evacuees in 103 facilities, with old Kisai

Table II. Disaster preparedness of the 10 participating organizations (n = 10)

Questions	Yes	No
1. Did a specific organizational disaster countermeasure system exist?	3	7
2. Were disaster countermeasures listed in the policy agenda?	1	9
3. Was a budget for disaster countermeasures individually appropriated?	0	10
4. Did a disaster countermeasure manual exist?	3	7
5. Had disaster drills and/or simulation trainings been performed?	2	8
6. Had disaster-related information been collected?	3	7
7. Had disaster-related information been utilized?	2	8
8. Were the organization's disaster countermeasures publicized to its members?	2	8
9. Did the organization collaborate with related organizations concerning disaster countermeasures?	1	9
10. Did the organization collaborate with administrative offices concerning disaster countermeasures?	1	9

High School as the main facility: (i) support for rehabilitation volunteers who were already active, such as the provision of individual guidance to persons requiring support/long-term nursing care; (ii) support for the activities of the social welfare council of Futaba town relocated to old Kisai High School, such as a day-care service; (iii) stretch exercises; and (iv) checking for immobilization syndrome risks and triage of those who need individual rehabilitation (referral to medical facilities).

Through the above support activities, Futaba town requested 10-RRO on 6 June 2011 to support evacuees accommodated at Listel Inawashiro, a condominium-type lodging used as a shelter in Fukushima. Futaba town covers an area of 51.40 km² facing the Pacific Ocean, and before the disaster, the population was 8,449 and the percentage of persons aged 65 years and older was 26.8% (22). This is where No. 5 and 6 nuclear power plants are located and, after the disaster, the residents were forced to leave the town. As of 6 January 2011, there were still 3,389 residents relocated to other areas in Fukushima, and 3,639 relocated to other prefectures, mostly the Tokyo Metropolitan area (23).

In the shelter, 780 Futaba residents and officials had been relocated. Due to structural barriers within the building and the psychological stress of long-term evacuation, the evacuees

tended to lead inactive lives. The support activities included: working in partnership with Futaba town and related institutions; weekly dispatch of a psychiatrist to provide risk management during rehabilitation support activities; and weekly rotating dispatch of PTs and OTs. In practice, individual visits were made to persons who had been identified by the public health nurses in advance. The assistance provided included improvement of their living environment and nursing care prevention support. As shown in Table I, the cumulative number of professionals dispatched was 293, a mean of 2.2 per day, and the cumulative number of evacuees served was 2,800, a mean of 20.7 per day. After most of the evacuees had moved to temporary housing, the dispatch was terminated on 30 September 2011. Because local health care providers had become sufficiently functional by this time, follow-up was entrusted to them.

Qualitative evaluation of support activities. Responses were obtained from 36 executives of the participating organizations. As for disaster preparedness, most of the 10 participating organizations were not well-prepared before the disaster (Table II). Only 3 organizations had a disaster countermeasure manual, and almost no inter-organization collaboration had been attempted. As shown in Table III, nearly half of the executives assessed the initial response as good to very good with regard to setting up a disaster management system, the timing of starting disaster countermeasures, the collection of information about the safety of the members, the collection of disaster-related information, and publicizing to the members. However, the rating regarding the planning of disaster countermeasures, relief activities in the first week, publicizing the support activities to the general public, and collaboration with other organizations and administrative offices was poor to moderate.

Table IV shows the results of evaluation of the support activities implemented by 10-RRO. The majority of respondents considered the timing of setting up 10-RRO and of starting and terminating the relief activities as appropriate. However, 25% of respondents thought that the collaborative activities should have been started earlier. The roles of the 3 pillars of 10-RRO, the strategic council, the think-tank and the joint secretariat, were judged as appropriate. Collaboration among the participating organizations, the splitting of expenses for managing the joint secretariat, the method of recruiting and matching, and the

Table III. Initial response of the 10 participating organizations (n = 36)

	Very poor n (%)	Poor n (%)	Moderate n (%)	Good n (%)	Very good n (%)	Total
1. Establishment of a disaster management system	1 (2.8)	6 (16.7)	7 (19.4)	13 (36.1)	9 (25.0)	36
2. Timing of starting disaster countermeasures	0 (0)	8 (22.2)	7 (19.4)	15 (41.7)	6 (16.7)	36
3. Collection of information about the safety of the members	0 (0)	9 (25.0)	5 (13.9)	17 (47.2)	5 (13.9)	36
4. Collection of disaster-related information	0 (0)	9 (25.0)	8 (22.2)	14 (38.9)	5 (13.9)	36
5. Planning of disaster countermeasures	1 (2.8)	10 (27.8)	9 (25.0)	8 (22.2)	8 (22.2)	36
6. Relief activities in the first week	1 (2.8)	11 (30.6)	11 (30.6)	12 (33.3)	1 (2.8)	36
7. Publicizing to the members	0 (0)	8 (22.2)	9 (25.0)	14 (38.9)	5 (13.9)	36
8. Publicizing to society	0 (0)	14 (38.9)	13 (36.1)	5 (13.9)	4 (11.1)	36
9. Collaboration with other organizations	0 (0)	4 (11.1)	18 (50.0)	9 (25.0)	5 (13.9)	36
10. Collaboration with administrative offices	0 (0)	10 (27.8)	21 (58.3)	4 (11.1)	1 (2.8)	36

Table IV. Assessment of the support activities implemented by 10 Rehabilitation-Related Organizations (10-RRO)

	<i>n</i> ^a	Very bad (%)	Bad (%)	Moderate (%)	Good (%)	Very good (%)
Timing						
Of inaugurating 10-RRO	36	0.0	25.0	25.0	47.2	2.8
Of starting relief activities	36	0.0	19.4	13.9	61.1	5.6
Of terminating relief activities	36	0.0	19.4	13.9	58.3	8.3
Management						
Role of the strategic council	36	0.0	0.0	25.0	61.1	13.9
Role of the think-tank	36	0.0	0.0	19.4	55.6	25.0
Role of the joint secretariat	36	0.0	5.6	25.0	55.6	13.9
Collaboration among the organizations	36	0.0	5.6	44.4	41.7	8.3
Split of expenses for managing joint secretariat	36	0.0	11.1	38.9	44.4	5.6
Split of expenses for dispatch	36	6.0	22.2	61.1	11.1	0.0
Method of recruiting volunteers	36	0.0	0.0	44.4	52.8	2.8
Matching the volunteers and the needs	36	0.0	0.0	41.7	47.2	11.1
Selection of dispatch sites	36	0.0	0.0	25.0	52.8	22.2
Profession of dispatched volunteers ^b	100	0.0	1.0	30.0	56.0	13.0
Number of dispatched volunteers ^b	102	0.0	0.0	34.3	61.8	3.9
Support activities ^b	101	0.0	0.0	20.8	63.4	15.8
Collaboration						
With local government ^b	102	0.0	2.0	21.6	57.8	18.6
With local healthcare professionals ^b	101	0.0	0.0	29.7	63.4	7.9
With central government	34	0.0	14.7	64.7	17.6	2.9
With other organizations	34	0.0	8.8	61.8	23.5	5.9
Achievement of the aim of dispatch ^b	102	0.0	1.0	18.6	62.7	17.6
Data collection ^b	101	5.0	26.7	46.5	20.8	1.0
Publicity						
To each organization's members	36	0.0	11.1	52.8	30.6	5.6
To the society	36	0.0	50.0	41.7	8.3	0.0
To the administrative offices	36	0.0	11.1	50.0	22.2	16.7
Scientific output	36	0.0	50.0	38.9	2.8	8.3
Extraction of problems for future activities	36	0.0	13.9	50.0	33.3	2.8

^aThe total number of respondents was 36, but there were missing values for some items.

^bThese question items were asked separately for the support activities in Ishinomaki, Kesennuma and Inawashiro, but because the tendency of responses was identical, they were treated together.

selection of activity sites were also rated as appropriate, but splitting of expenses for dispatch was considered inappropriate by 28% of respondents. The support activities in the 3 areas, the professionals dispatched, actual support activities, collaboration with local government officials and healthcare professionals, and the overall achievement were judged as appropriate. However, problems regarding data collection and scientific output, and publicizing the support activities to the general public were pointed out. In the free comments, the needs for a joint rehabilitation disaster relief manual and advocating the importance of rehabilitation in disaster relief were emphasized by executives of all the participating organizations.

DISCUSSION

Descriptive epidemiology of Great East Japan Earthquake and Disaster

Most of the epidemiological data were extracted from central and local governments' official sources. In the first several months after the disaster the administrative function was disrupted in some affected areas, and accurate data collection was difficult. For this study, the data sources were accessed 10 months or more after the disaster, when the administrative function of local governments had been restored. To calculate the OR of death for

persons with disability, we used data collected by one of the 3 major newspapers based on a questionnaire survey sent to local governments in the affected areas, with a high response rate. We therefore believe that the accuracy and comprehensiveness of the data used for descriptive epidemiology are satisfactory.

Compared with previous disasters, the injury to death ratio for the GEJED was remarkably low (24), as was the serious injury to slight injury ratio. No objective data are available, but it is a common understanding of almost all healthcare professionals involved in the relief activities that very few severe traumatic injuries, such as spinal cord injury, traumatic brain injury and amputation, were seen in the current disaster. Therefore, GEJED can be characterized as being a dead or alive situation with few traumatic injuries. At first we expected injuries to be frequent, based on experience of the Hanshin-Awaji Great Earthquake (10, 11), but, in fact, instead of injury management, enormous needs existed in the management of chronic illness and prevention of immobilization in elderly persons and those with pre-existing disability.

The OR of death for persons with disability compared fairly well with previous disasters (24). At the time of the tsunami, most victims with disabilities were at home, and are believed to have been unable to understand what was happening or to move to higher ground. Most of those living in specialized

facilities or joining day-care services successfully escaped from the tsunami with the assistance of staff. A more effective evacuation strategy for persons with disabilities in the community must be established.

Support activities implemented by 10 Rehabilitation-Related Organizations

This was the first attempt by various rehabilitation professionals in Japan to set up collaborative disaster relief activities. Although the importance of inter-organizational/inter-professional collaboration is well recognized and proposals to facilitate it have been made (6–8, 25), such as applying an organizational science theory to coordinating expertise among emergent groups responding to disasters (25), no detailed reports on this topic in the field of rehabilitation disaster relief are yet available, except for the recent ISPRM panel discussion (9). Our experience is therefore unique and useful in promoting future collaborative disaster relief. Based on the questionnaire evaluation of 10-RRO support activities, the appraisal was generally positive. The reasons for the initial success can be attributed to: (i) coordinated functioning of the 3 pillars of 10-RRO, i.e. the strategic council, think-tank and secretariat; (ii) selection of relief sites based on requests by local representatives, careful pre-dispatch discussion and continued coordination with them; (iii) pre-dispatch instruction to the professionals, emphasizing respect for local systems and manner of providing community cares and a broader generalist approach rather than a narrower specialist approach; (iv) formation of a team with members from the same institution or from the same district where community-based rehabilitation approaches had routinely been practiced; (v) dispatch duration of 1 week, with 1 day overlap with the next team to facilitate effective handing over and consistency of relief activities; (vi) daily communication with the dispatched professionals via internet and prompt logistic and mental support by the secretariat. These are the important lessons we have learned from the experience of 10-RRO for enabling future successful collaborative relief activities.

However, problems were highlighted regarding poor disaster preparedness, inadequate advocating and a lack of objective data collection. As for preparedness, only 3 of the 10 participating organizations had a disaster countermeasure manual prior to the GEJED. There is an urgent need to develop such a manual to improve our preparedness and enhance our capability to cope with disasters. The Rehabilitation Disaster Relief Subcommittee of the ISPRM clearly recognized the need for rehabilitation guidelines for the specific health conditions encountered during natural disasters, and it is now embarking on preparing several guidelines for rehabilitation disaster relief, focusing on conditions such as spinal cord injury, traumatic brain injury, amputees, fractures and rehabilitation needs of displaced persons with pre-existing disabilities (26). These guidelines targeting specific health conditions are important, but at the same time, based on the experience of the GEJED, we have become keenly aware of the strong need for guidelines focusing on how to implement and manage better collaborative relief activities by multiple rehabilitation-related organizations and professionals during various phases after disaster, and on how to better prepare for

such activities. Therefore, 10-RRO is now working on developing a joint, multidisciplinary rehabilitation disaster relief manual with the aim of enhancing preparedness during ordinary times and acting in a coordinated manner at the time of a disaster.

The critical role of physical medicine and rehabilitation in disaster response has been emphasized recently (1–3, 5, 9). Unfortunately, however, this is seldom recognized by government officials, healthcare professionals in other fields or the general public. In the relief efforts of rehabilitation professionals after the GEJED, we often encountered this lack of recognition, and struggled to advocate its importance. However, since the establishment of 10-RRO, the situation has improved: 10-RRO is now an official member of the Liaison Conference of Health Care for Disaster Victims and the need for continued involvement of rehabilitation is listed as an item on its policy agenda; responsible officers of the Ministry of Health, Labor and Welfare have participated in the strategic council meetings as observers; good working relationships have been established with local representatives; and several news media have taken up and publicized our activities. However, there remains a serious problem, that, although physicians, dentists, nurses, pharmacists, radiological technologists, medical laboratory technicians, dental hygienists, clinical engineers, and emergency medical technicians are listed as medical professionals providing medical care at the time of a disaster in the *Disaster Relief Act* (27), PTs, OTs and speech therapists are not included. This means that the cost involved in dispatching them cannot be covered by the public sector. At first, therefore, the 10 organizations shared the expenses for managing the joint secretariat, and the member rehabilitation hospitals sending the support teams covered the dispatch expenses. In the long-term this could put an enormous financial burden on the dispatching organizations and institutions. Subsequently, based on 10-RRO activities, the government recognized the importance of rehabilitation interventions at times of disaster, and decided to subsidize the dispatch expenses by allowing a broader interpretation of the *Disaster Relief Act*. This marked an important step for future rehabilitation disaster relief.

Study limitations

Although we suggested the preliminary effectiveness of collaborative rehabilitation disaster relief implemented by 10-RRO by carrying out a questionnaire survey of executives of the participating organizations, this interim report has the following limitations. First, no detailed data for the evacuees to whom the relief services were delivered were reported. This is partly due to the overwhelming nature of the GEJED, which forced us to concentrate on building good collaborative relationships with local administrative officers and healthcare professionals who were often victims themselves, not to mention with the evacuees themselves. The dispatched professionals also worked hard to perform activities that actually brought relief to the victims, and had very limited time to collect detailed data about their disabilities and functioning using objective measures. Another reason for the lack of data collection is that ethical problems related with it under the confused disaster circumstances had not been well addressed, and the professionals had to leave

whatever data they had collected at the local government offices. To facilitate objective data collection at times of disaster, and to carry out rehabilitation disaster relief in a more scientific and evidence-based way, we are planning to contribute a guideline to the above-mentioned rehabilitation disaster relief manual.

The second limitation is that we have only conducted self-assessment of our activities, and assessments by local representatives and victims themselves have not yet been attempted. Therefore, we need to be cautious that bias in favour of 10-RRO activities is highly probable. Although we received letters of appreciation from local representatives from the 3 relief sites and positive remarks from many evacuees, we cannot provide objective data to prove the effectiveness of our collaborative activities from the clients' point of view. The reasons for this limitation are the same as those mentioned under the first limitation.

Despite these limitations, we believe that this first collaborative disaster relief endeavour by rehabilitation-related organizations and professionals has contributed to a strong foundation for future interdisciplinary and inter-organizational collaborative activities. To enhance our preparedness and response capability and to render relief activities more evidence-based, it is mandatory to develop a joint collaborative manual, a practical, efficient and ethical data collection system, and to advocate the crucial role of rehabilitation involvement in disaster response.

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