Personnel Damages and Ambulance Service Associated With Great East Japan Earthquake

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Abstract

The Great East Japan Earthquake that occurred on March 11, 2011 caused human suffering comprising 16,079 deaths and 3,499 missing persons (as of November 11, 2011). According to the results of autopsies in three prefectures of the Tohoku area, the cause of 92.4% of deaths was drowning.

A survey of the ambulance service associated with this disaster showed that the total number of ambulance dispatches was 21,312, and the number of people transferred by ambulance was 19,701 within 1 week after the onset of the disaster in six prefectures struck by the tsunami. Among these dispatches, 700 dispatches (accounting for 3.3% of the total) and 643 people (3.3%) were related to the earthquake, whereas 499 dispatches (2.3%) and 597 people (3.0%) were related to the tsunami. Miyagi Prefecture had the greatest number of natural disaster sufferers (532 persons) transferred by ambulance.

During the 3 months after the onset of the disaster, there were 5,192 ambulance dispatches and 5,207 people transported by ambulance from shelters. In particular, 2,650 people were transported from shelters in Miyagi, accounting for 50.9% of the total.

The Fire and Disaster Management Agency of Japan set up a task force to explore the desirable emergency services in disasters, and discussed problems and measures on emergency services in disasters.

Key words Great East Japan Earthquake, Personal suffering, Ambulance transport, Transported people

Outline of Great East Japan Earthquake

At 14:46 on March 11, 2011, an earthquake of magnitude 9.0 occurred, originating offshore of Sanriku, about 130 km east-southeast of the Oshika Peninsula of Miyagi Prefecture, with the focal zone covering the offshore area of Iwate Prefecture to Ibaraki Prefecture. The seismic scale was the highest in domestic recorded history. Intense quakes were observed in extensive areas, e.g., intensity 7 in Kurihara City of Miyagi Prefecture and intensity 6 upper in Miyagi, Fukushima, Ibaraki, and Tochigi Prefectures.

Because this earthquake was a large-scale ocean trench-type earthquake, the tsunami associated with the earthquake was also huge and extensive, reaching a maximum tidal level of 9.3 m in Soma City, Fukushima Prefecture. In addition, the tsunami reached up to 40.5 m was measured by National Tsunami Joint Survey Group, which was the greatest in domestic recorded history.

Personal Suffering

Personal suffering associated with the Great East Japan Earthquake was enormous, with 16,079 deaths and 3,499 missing persons (as of November 11, 2011) (**Table 1**).

According to the results of autopsies carried out in three prefectures of the Tohoku area during the 3 months after the onset of the earthquake, 92.4% of deaths were due to drowning (**Fig. 1**).

Fire defense headquarters and volunteer fire corps in seacoast areas called up personnel

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just after the onset of the earthquake to the disaster responses, including evacuation guidance and information service. However, many fire defense personnel and volunteer firefighters were damaged by the tsunami during these activities; the victims comprised 27 staff members of fire departments (including 4 missing) and 254 volunteer firefighters (including 12 missing) (**Table 2**).

According to the 2011 Police White Paper, 30 police officers (25 died on duty, 5 missing) also were victims (**Table 3**).

Table 1 Number of persons dead and injured by prefecture (as of November 11, 2011)

Prefecture	Dead	Missing	Injured
Hokkaido	1		3
Aomori	3	1	61
Iwate	4,665	1,427	188*
Miyagi	9,462	1,995	4,013*
Akita			11
Yamagata	3		40
Fukushima	1,885	73	241*
Ibaraki	24	1	706
Tochigi	4		132
Gunma	1		41
Saitama			104
Chiba	20	2	251
Tokyo	7		117
Kanagawa	4		131
Niigata			3
Yamanashi			2
Nagano			1
Shizuoka			3
Mie			1
Osaka			1*
Kochi			1
Total	16,079	3,499	6,051

* Including municipalities where numbers are unclear or under survey.

[Prepared from the Disaster Countermeasures Office of the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications (2011).[1]]

Activity of Emergency Fire Response Team

At 15:40 on March 11, the Fire and Disaster Management Agency (FDMA) of Japan instructed 20 prefectural governments to put Emergency Fire Response Teams including firefighting teams, rescue teams and emergency teams in action. For 88 days until June 6, 2011, more than 30,000

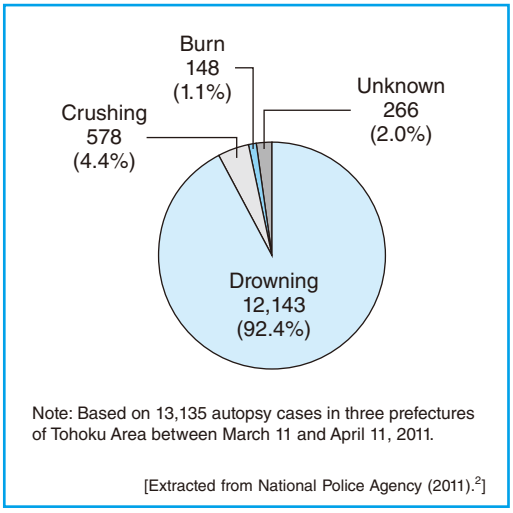


Fig. 1 Causes of death in disaster (as of April 11, 2011)

Table 2 Injury of fire department personnel and volunteer firefighters in major three affected prefectures (as of November 11, 2011)

(persons)

Classification	Department personnel				Volunteer firefighters		
	Dead	Missing	Injured	Total	Dead	Missing	Total
Iwate	8		1	9	117	2	119
Miyagi	15	4	4	23	98	10	108
Fukushima					27		27
Total	23	4	5	32	242	12	254

[Prepared from the Disaster Countermeasures Office of the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications (2011).[1]]

staff members from 712 fire departments in 44 prefectures carried out backup activities as Emergency Fire Response Teams (**Fig. 2**).

Emergency Activities

Emergency activities in six prefectures affected by tsunami (Table 4)

In six prefectures affected by the tsunami, the number of ambulance dispatches totaled 21,312, and the number of people transported by ambulance 19,701, within 1 week after the onset of the disaster.

Among these, there were 700 earthquake-related ambulance dispatches (accounting for 3.3% of the total) and 643 people transported by ambulance (3.3%). The numbers of tsunami-related ambulance dispatches and transported people were 499 (2.3%) and 597 (3.0%), respectively. The number of transported people due to the natural disaster was highest, 532, in Miyagi Prefecture.

People transported by ambulance in relation to severity of injury and type of natural disaster (Fig. 3)

Earthquake-related people transported by ambulance comprised 369 mild cases (57.4%), 195 moderate cases (30.3%), 52 severe cases (8.1%) and 18 deaths (2.8%).

On the other hand, tsunami-related people transported by ambulance comprised 183 mild cases (30.7%), 286 moderate cases (47.9%), 76 severe cases (12.7%), and 29 deaths (4.9%).

Table 3 Number of police officers pronounced dead (as of June 20, 2011)

(persons)

	Died on duty	Missing	Total
Tohoku Regional Police Bureau	1	0	1
Iwate Prefectural Police	9	2	11
Miyagi Prefectural Police	11	2	13
Fukushima Prefectural Police	4	1	5
Total	25	5	30

[Extracted from National Police Agency (2011).[2]]

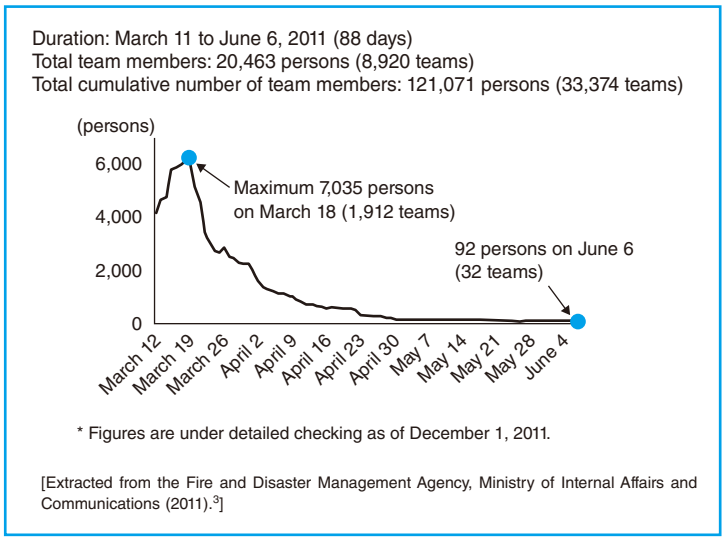


Fig. 2 Dispatches of Emergency Fire Response Teams

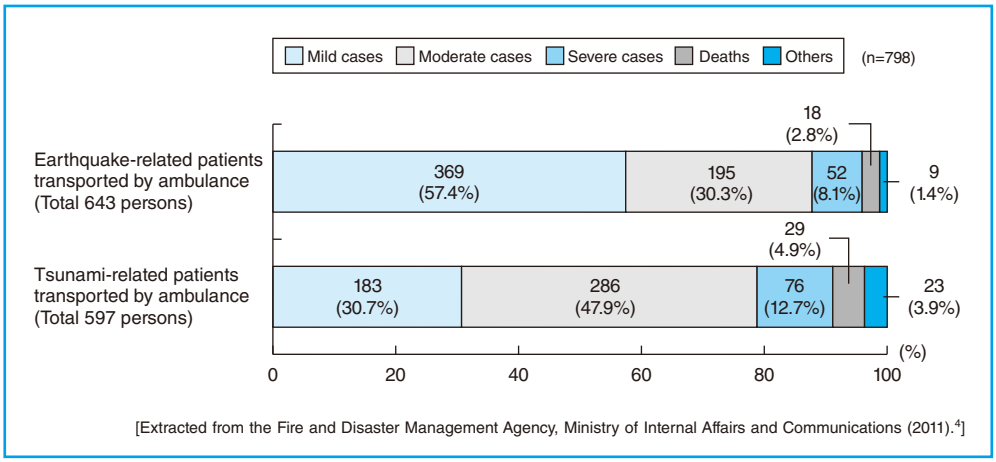
Ambulance dispatches and people transported by ambulance from shelters

There were 2,105 ambulance dispatches and 2,127 people transported by ambulance from shelters during 1 week after the onset of the disaster. Among these cases, the number of earthquake-related ambulance dispatches was 56 (accounting for 2.7% of the total), and the number of transported people was 61 (2.9%), whereas the corresponding numbers of tsunami-related ambulance dispatches and transported people were 125 (5.9%) and 170 (8.0%), respectively. On the

Table 4 Status of ambulance dispatches and people transported by ambulance in six prefectures affected by tsunami (n=798)

	Total	Natural disaster				Acute disease	General injury	Changing hospital	Traffic accident	Others
		(Natural disaster total)	Earthquake	Tsunami	Others					
No. of ambulance dispatches	21,312	1,279	700	499	80	12,960	2,553	1,984	1,249	1,287
	100.0%	6.0%	3.3%	2.3%	0.4%	60.8%	12.0%	9.3%	5.9%	6.0%
No. of transported people	19,701	1,324	643	597	84	11,847	2,385	2,151	1,230	764
	100.0%	6.7%	3.3%	3.0%	0.4%	60.1%	12.1%	10.9%	6.2%	3.9%
Aomori	1,158	14	3	11	0	749	137	134	72	52
	100.0%	1.2%	0.3%	0.9%	0.0%	64.7%	11.8%	11.6%	6.2%	4.5%
Iwate	2,189	239	33	204	2	1,212	229	372	67	70
	100.0%	10.9%	1.5%	9.3%	0.1%	55.4%	10.5%	17.0%	3.1%	3.2%
Miyagi	4,326	532	210	255	67	2,580	376	529	106	203
	100.0%	12.3%	4.9%	5.9%	1.5%	59.6%	8.7%	12.2%	2.5%	4.7%
Fukushima	2,666	194	87	103	4	1,517	294	411	105	145
	100.0%	7.3%	3.3%	3.9%	0.2%	56.9%	11.0%	15.4%	3.9%	5.4%
Ibaraki	3,665	227	209	9	9	2,163	547	316	312	100
	100.0%	6.2%	5.7%	0.2%	0.2%	59.0%	14.9%	8.6%	8.5%	2.7%
Chiba	5,697	118	101	15	2	3,626	802	389	568	194
	100.0%	2.1%	1.8%	0.3%	0.0%	63.6%	14.1%	6.8%	10.0%	3.4%

[Extracted from the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications (2011).[4]]



[Extracted from the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications (2011).[4]]

Fig. 3 People transported by ambulance in relation to severity of injury and type of natural disaster

other hand, there were 1,685 (80%) ambulance dispatches and 1,669 (78.5%) people transported by ambulance due to acute diseases.

In addition, ambulance dispatches and people transported from shelters during 3 months after the onset of the disaster totaled 5,192 and 5,207, respectively. Among these cases, 4,316 (83.1% of the total) ambulance dispatches and 4,302 (82.6%) transported people were related to acute diseases, accounting for the majority (**Table 5**).

Ambulance transportations from shelters occurred in 15 prefectures across the country. Among these prefectures, the number of transported people was highest (2,650, accounting for 50.9%) in Miyagi Prefecture, followed by Iwate Prefecture (1,024, 19.7%) and Fukushima Prefecture (943, 18.1%) (**Table 6**).

Conclusion

The FDMA set up a task force to explore the desirable emergency services in disasters (Chair: Prof. Yoshihiro Yamaguchi, Department of Emergency Medicine, Kyorin University School of Medicine), and reviewed problems and countermeasures based on the reality of emergency services in this disaster.

Through the review of the cooperation between medical care services and fire and disaster management, the task force has concluded that early arrival of medical care teams in the disaster countermeasures office in the affected prefecture enables communication and coordination with other organizations and facilitates smooth implementation of the following activities: emergency

Table 5 Number of ambulance dispatches and people transported from shelters (n=798)

	Total	Natural disaster				Acute disease	General injury	Changing hospital	Traffic accident	Others
		(Natural disaster total)	Earthquake	Tsunami	Others					
Total 1 week after disaster										
No. of ambulance dispatches	2,105 100.0%	194 9.2%	56 2.7%	125 5.9%	13 0.6%	1,685 80.0%	142 6.7%	36 1.7%	3 0.1%	45 2.1%
No. of people transported	2,127 100.0%	245 11.5%	61 2.9%	170 8.0%	14 0.7%	1,669 78.5%	127 6.0%	38 1.8%	3 0.1%	45 2.1%
Total 3 months after disaster										
No. of ambulance dispatches	5,192 100.0%	203 3.9%	60 1.2%	130 2.5%	13 0.3%	4,316 83.1%	378 7.3%	191 3.7%	11 0.2%	93 1.8%
No. of people transported	5,207 100.0%	254 4.9%	66 1.3%	174 3.3%	14 0.3%	4,302 82.6%	359 6.9%	196 3.8%	11 0.2%	85 1.6%

* "Shelter" includes gymnasiums, schools, and parks recognized as such by the fire and disaster management headquarters (excluding hotels and other accommodation).

[Extracted from the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications (2011).[4]]

Table 6 Number of people transported by ambulance from shelters by prefecture (n=798)

Miyagi	Iwate	Fukushima	Ibaraki	Niigata	Saitama	Chiba	Yamagata
2,650	1,024	943	234	82	77	62	45
50.9%	19.7%	18.1%	4.5%	1.6%	1.5%	1.2%	0.9%

Tochigi	Tokyo	Aomori	Hokkaido	Akita	Gunma	Kanagawa	Total
26	18	17	11	9	6	3	5,207
0.5%	0.3%	0.3%	0.2%	0.2%	0.1%	0.1%	100.0%

[Extracted from the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications (2011).[4]]

activity; triage; securement of physicians to take charge of instructing, guiding, and advising emergency members; and coordination in transferring people to the appropriate medical institution.

It has also been confirmed that the presence of a system that allows simultaneous dispatches of medical care teams and emergency fire response teams to affected areas is effective. This system would provide medical care teams with a necessary transportation, logistics, information on the disaster, and ensuring of safety, as well as provide emergency fire response teams with securement of the medical control system and health management of team members.

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