—Short Communication—

Medical Relief Activities, Medical Resourcing, and Inpatient Evacuation Conducted by Nippon Medical School due to the Fukushima Daiichi Nuclear Power Plant Accident Following the Great East Japan Earthquake 2011

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Abstract

On March 11, 2011, after the Great East Japan Earthquake and tsunami, the government declared a nuclear emergency following damage to the Fukushima Daiichi Nuclear Power Plant. A second hydrogen explosion occurred on March 14 at the plant's No. 3 reactor and injured 11 people. At that time the prime minister urged people living 20 to 30 km from the Daiichi plant to stay indoors. Under these circumstances, many residents of Iwaki City, which was largely outside the 30-km zone, left the city, making it difficult to get supplies to the remaining residents. The only transportation route open for supplies and medical resources was roads, and many drivers feared the rumor that the city was contaminated by radioactive materials and, so, refused to go there. Nippon Medical School (NMS) heard that medical resources were running short at Iwaki Kyoritsu Hospital, which requested water, medications, food, fuel (gasoline), medical support, and the evacuation of 300 inpatients. As a first step, NMS decided to evaluate the situation at the hospital and, on March 16, the director of the NMS Advanced Emergency Center visited the hospital and helped provide triage for about 200 patients. Critically ill patients receiving ventilatory support were given priority for evacuation because they would be most at risk of not being able to evacuate should the Japanese government order an immediate evacuation of the city. We tried to evacuate the inpatients via an official framework, such as the Disaster Medical Assistance Team (DMAT), but DMAT could not support this mission because this hospital was not within the 30-km evacuation zone. Moreover, the Iwaki City government could not support the evacuation efforts because they were fearful of the rumor that Iwaki was contaminated by radioactive material. Ultimately, we realized that we had to conduct the mission ourselves and, so, contacted our colleagues in the Tokyo metropolitan area to prepare enough hospital beds. We evacuated 15 patients to 8 hospitals over a 5-day period. As a result, we could reduce the number of patients at Iwaki Kyoritsu Hospital, and, thereby, the collapse of medical services in the city was avoided. In retrospect, someone might say the government—either central or local—should ideally have carried out this mission and created a system by which to do it. At the same time, however, to overcome any future bureaucratic issues, we should also prepare private networks, such as those used by NMS, because they can respond flexibly to unexpected large-scale disasters.
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Key words: disaster, radioactive hazard release

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Introduction

On March 11, 2011, after the Great East Japan Earthquake, the government declared a nuclear emergency following damage to the Fukushima Daiichi Nuclear Power Plant caused by the tsunami. Around 3,000 residents living near the plant in Fukushima prefecture were advised to evacuate[1]. The Chief Cabinet Secretary issued the evacuation advisory to those living within a 3-km radius of the plant, while those living within a 10-km radius were requested to stay indoors. The nuclear power plant had lost cooling ability, and radioactive cesium and iodine were detected in nearby areas on March 12. When the problems escalated with a hydrogen explosion at the No. 1 reactor building, the prime minister urged all residents living within 20-km of the Daiichi plant and 10-km of the Daini plant to evacuate. Another hydrogen explosion occurred on March 14 at the Daiichi plant's troubled No. 3 reactor, injuring 11 people. At that time the prime minister urged people living 20 to 30-km of the Daiichi plant to stay indoors.

Under these circumstances, many residents of Iwaki City, which was largely outside the 30-km zone, left the city, making it difficult to get supplies to the remaining residents. Medical resources were also running short at Iwaki Kyoritsu Hospital, because the only transportation route for daily supplies and medical resources was roads, and many drivers feared the rumor that the entire city was contaminated by radioactive materials and, so, refused to go there. It was in these circumstances that Nippon Medical School (NMS) offered support to the hospital. This report describes how our team helped to overcome the bureaucratic difficulties that arose in delivering medical supplies, providing medical care, and evacuating inpatients.

Medical Support for Iwaki

We were alerted to the hospital's plight through an e-mail on March 15 from the director of Iwaki Kyoritsu Hospital's Emergency Center describing the crisis situation that had developed owing to the decreasing supply of medical resources. In the e-mail the director informed us that because staff younger than 40 years had been instructed to evacuate the city, there were not enough staff to provide adequate nursing care, and patients had long waits for care (**Fig. 1**). Moreover, the pharmacies in the town had closed, and there was a shortage of medications at the hospital. The hospital could not perform surgeries, not even appendectomies. Water was in short supply, and there were no plans to provide it. Other hospitals had stopped their outpatient clinic services and hemodialysis because of the lack of lifeline services and shortages of medication. The fire department could not respond to the increased number of emergency calls. The director requested our help in securing water, medications, food, fuel (gasoline), and medical support and in evacuating 300 inpatients. As a first step, NMS decided to evaluate the hospital's situation and Professor Yokota visited there on March 16. After arriving at 19:15, he spoke with the hospital's director and the director of the emergency center and helped to triage about 200 patients there. Critically ill patients receiving ventilatory support were given priority for evacuation because they would be most at risk of not being able to evacuate should the Japanese government order immediate evacuation of the city. We tried to evacuate the inpatients via an official framework, such as the Disaster Medical Assistance Team (DMAT), but DMAT could not support this mission because this hospital was not within the 30-km evacuation zone. Moreover, the Iwaki City government could not support the evacuation efforts because they were fearful of the rumor that Iwaki was contaminated by radioactive hazard release. Ultimately, we realized that we had to conduct the mission ourselves and, so, contacted our colleagues in the Tokyo metropolitan area to prepare enough hospital beds. We started the evacuation on March 17. Only physicians participated in this mission, driving the ambulances themselves, and they evacuated 15 patients to 8 hospitals over a 5-day period (**Table 1**). As a result, through this mission, we could reduce

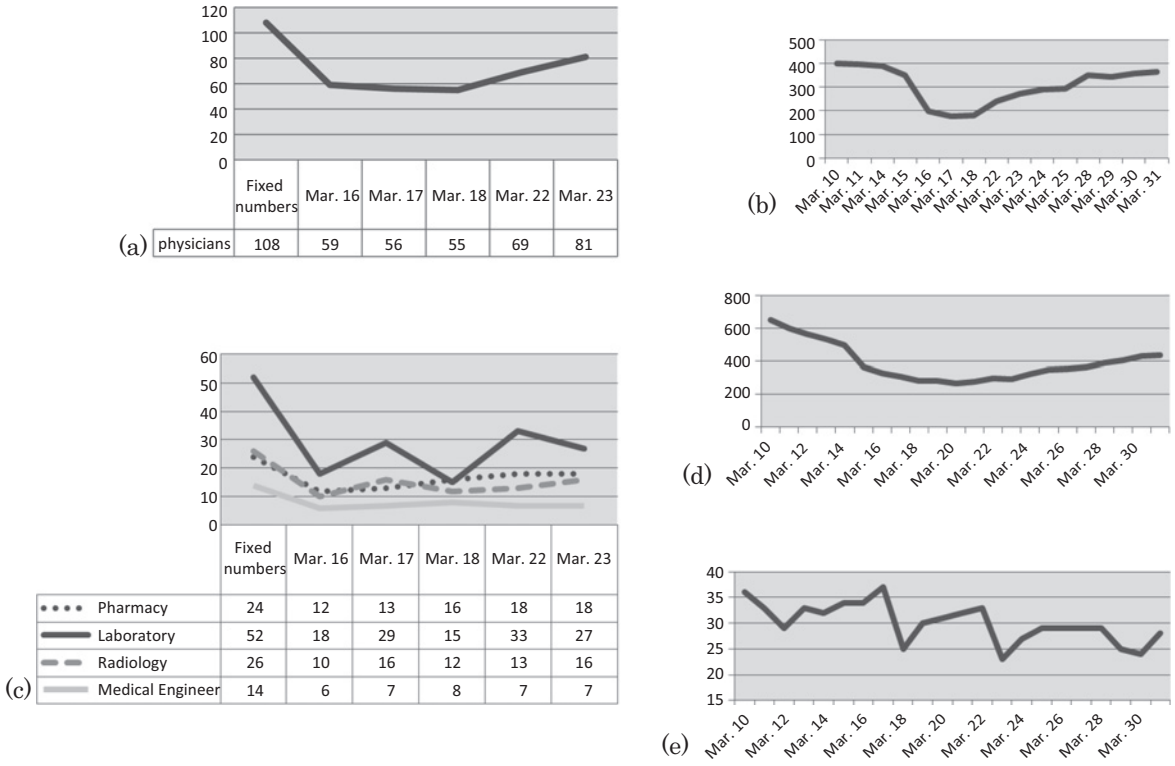

Fig. 1 Changes in the numbers of (a) physicians, (b) nurses, (c) other medical staff, (d) hospitalized patients, and (e) intensive care unit (ICU) patients at Iwaki Kyoritsu Hospital after the nuclear power plant accident. On March 16, the numbers of physicians and other medical staff markedly decreased following the explosion at the nuclear power plant, and the hospital operated like this for 1 week. The number of inpatients decreased continuously from March 11 (day of the earthquake and tsunami), whereas the number of ICU patients increased from March 12 because the hospital's Emergency Center accepted severely ill and injured patients from the disaster area. On March 18, the number of ICU patients decreased because NMS medical teams started to evacuate them to other medical facilities.

the number of patients at Iwaki Kyoritsu Hospital and, thereby, the collapse of medical services in the city was avoided.

Discussion

Our support of Iwaki Kyoritsu Hospital was extremely effective in helping to reduce its burden, but the question remains of why our support was needed. This support was initially requested by the director of the hospital's Emergency Center in a message sent to the Japan-DMAT (J-DMAT) Office of the Ministry of Health, Labour and Welfare (MHLW). The J-DMAT Office tried to support this hospital as much as possible because it is the key medical facility in Iwaki City, close to the evacuation zone. Obviously, this city and its medical services had to keep functioning. The J-DMAT Office staff proposed to complete a wide-area evacuation of inpatients at the hospital as a J-DMAT mission, but the proposal was rejected because the Japanese government had, at that time, given higher priority to supporting hospitals within the 30-km exclusion zone. This measure was implemented according to the distance of the hospitals from "ground zero," not to their importance in the affected area: fairness was judged by the distance from "ground zero." When we heard that the J-DMAT Office could not undertake this mission, we asked the Iwaki Fire Department for permission to use ambulances for the evacuation. The Fire Department understood the situation but did not support the evacuation because they feared that the rumor that Iwaki City was contaminated by radioactive materials would be considered true if they supported the evacuation. This is the dilemma that the central and local governments faced in this situation, which meant they could not support the patients' evacuation. This

Table 1 Details of the evacuation of inpatients from Iwaki Kyoritsu Hospital

No	Day	Age	Sex	Diagnosis	Vehicle	Physician escorts	Admission	Medical resources
1	Mar 17	41	F	Peritonitis/Sepsis/Intubated	Dr. Car (NMS)	2	NMS	Syringe pump/ Sedation/Dopamine
2	Mar 17	80	F	Cervical cord injury (C2)/ ASDH/Tracheostomy	Dr. Car (KMH)	1	KMH	Jackson
3	Mar 17	91	F	Pulmonary embolism/Acute renal failure	Private ambulance	1	NCGM	HD/Ventilator
4	Mar 17	66	M	ALS	Dr. Car (NMS-TN)	1	NMS-TN	Ventilator
5	Mar 17	77	F	Pneumonia/Intubated	Dr. Car (DMC)	2	DMC	Jackson/Dopamine
6	Mar 17	—	—	—	Dr. Car (DMC)	1	DMC	
7	Mar 18	84	M	ALS	Dr. Car (NMS-MK)	2	NMS-MK	Ventilator
8	Mar 18	89	M	COPD/Intubated	Private ambulance	1	NMS	Jackson
9	Mar 18	78	M	COPD/Intubated	Ambulance (IKH)	1	NMS-CH	Ventilator
10	Mar 18	84	F	Asthma/Emphysema	Dr. Car (KMH)	1	TMDU	Tracheostomy
11	Mar 19	80	M	Pneumonia	Private ambulance	1	NMS	Tracheostomy
12	Mar 19	87	M	Pneumonia/COPD	Dr. Car (KMH)	1	NMS	Intubation
13	Mar 19	73	M	Pneumonia	Ambulance (IFD)	1	NCGM	Bi-pap
14	Mar 21	57	F	HOCM	Dr. Car (NMS)	2	NMS	
15	Mar 21	73	M	Pneumonia	Ambulance (IFD)	1	NMS	

NMS; Nippon Medical School Hospital, ASDH; Acute subdural hematoma, KMH; Kawaguchi Municipal Hospital, Jackson; assist ventilation by "Jackson Rees", NCGM; National Center for Global Health and Medicine, HD; hemodialysis, ALS; amyotrophic lateral sclerosis, NMS-TN; Nippon Medical School Tama Nagayama Hospital, DMC; Disaster Medical Center, NMS-MK; Nippon Medical School Musashi Kosugi Hospital, COPD; chronic obstructive pulmonary disease, IKH; Iwaki Kyoritsu Hospital, NMS-CH; Nippon Medical School Chiba Hokusoh Hospital, IFD; Iwaki Fire Department, NCGM; National Center for Global Health and Medicine, Bi-pap; biphasic positive airway pressure, HOCM; hypertrophic cardiomegaly

situation led us to undertake the mission ourselves, which we named "Mission Tomodachi."

Fortunately, we had a multiphase private network to help with this evacuation, which included the medical office network of NMS's Department of Emergency and Critical Care Medicine. We contacted other hospitals via this network to prepare beds in the Tokyo metropolitan area and in nearby areas. Also, vehicles for transporting the patients were prepared. "Mission Tomodachi" was started just 10 hours after the decision was made, was undertaken with the help and support of the private network of medical staff, and was completed within 5 days.

In retrospect, someone might say the government—either central or local—should ideally have carried out the mission and created a system to do so. Indeed, this notion is clearly correct, but at the same time, to help overcome any future bureaucratic issues, we should also prepare private networks, such as those used by NMS, because they can be respond flexibly to unexpected large-scale disasters.

References

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