

# Activities and Health Status of Dispatched Public Health Nurses after the Great East Japan Earthquake

Yoshie Yokoyama, PhD,<sup>1</sup> Kayoko Hirano, PhD,<sup>2</sup> Mari Sato,<sup>3</sup> Akiko Abe,<sup>3</sup> Mihoko Uebayashi, MS,<sup>4</sup> Emiko Kishi, PhD,<sup>5</sup> Mutsuko Sato, MS,<sup>6</sup> Yuuko Kuroda, MS,<sup>7</sup> Ikumi Nakaita, PhD<sup>8</sup>, and Fujio Fukushima, PhD<sup>9</sup>

<sup>1</sup>Department of Public Health Nursing, Osaka City University, Osaka, Japan; <sup>2</sup>University of Nagasaki, Nagasaki, Japan; <sup>3</sup>Tohoku University School of Medicine, Sendai, Japan; <sup>4</sup>Iwate Prefectural University, Iwate, Japan; <sup>5</sup>Teikyo University, Tokyo, Japan; <sup>6</sup>Kyorin University, Tokyo, Japan; <sup>7</sup>Fukushima Prefectural School of Nursing, Fukushima, Japan; <sup>8</sup>Japanese Nursing Association, Tokyo, Japan; and <sup>9</sup>National Institute of Public Health, Saitama, Japan

Correspondence to:

Yoshie Yokoyama, Department of Public Health Nursing, Osaka City University, Osaka, Japan, 1-5-17 Asahi-machi, Abeno-ku, Osaka 545-0051, Japan. E-mail: yyokoyama@nurs.osaka-cu.ac.jp

**ABSTRACT** *Objective:* This study aimed to elucidate the actual activities conducted by public health nurses during their dispatch and their health status during and after dispatch to the three prefectures most severely affected by the Great East Japan Earthquake. *Sample:* A survey request was sent to a total of 2,237 facilities. Of these, 778 facilities returned questionnaires from dispatched public health nurses. *Results:* The participants of this study were 1,570 dispatched health nurses who participated in activities mostly at evacuation centers, followed by evacuees homes. After dispatch, an earlier postdisaster phase at the start of dispatch was independently associated with poor subjective well-being, low mood, worsened sleep state, and intense fatigue. Work hours per day were associated with poor subjective well-being and intense fatigue after dispatch. *Conclusion:* Results suggest that the factor that most strongly affected the postdispatch health of the nurses was the phase that they began their dispatch.

Key words: dispatch, Great East Japan Earthquake, public health nurses.

Viewed from any angle—the magnitude of the quake, the number of casualties, or the scale of its destruction—the Great East Japan Earthquake of 11 March 2011, was a disaster of extreme severity unprecedented in modern Japanese history (Kazama & Narita, 2011; Meguro, 2011; Nakano et al., 2012; Ochi, Murray, & Hodgson, 2013). Many survivors had to confront painful situation such as life stress after the earthquake, tsunami, and nuclear disaster. In the event of such a disaster, saving and protecting human lives takes all precedence; therefore, acquiring support from disaster relief personnel such as health care professionals and firefighters is essential. According to the Ministry

of Health, Labor and Welfare, approximately 11,266 certified health care professionals and other disaster response personnel were dispatched to the disaster-stricken region after the Great East Japan Earthquake (Ministry of Health, Labor & Welfare, 2012).

Disaster response personnel supported the residents of the affected areas through a wide range of care and support, including rescue and urgent care activities immediately after the disaster and the operation of evacuation centers, recovery efforts (e.g., health survey, health checking, and so on), and provision of mental health care over the following months (Igusa et al., 2012; Kanamori, Kunishima,

Tokuda, & Kaku, 2011; Nishi et al., 2012). Individuals who provide such support while living in a disaster area are likely to themselves be physically and mentally affected by the disaster, similarly to the residents in the area (Kyutoku et al., 2012; Nishizawa, Hoshide, Shinpo, & Kario, 2012; Ogawa et al., 2012). A survey of members of the Disaster Medical Assistance (DMAT) team who were dispatched after the Great East Japan Earthquake reported psychological stress over concerns about potential radiation exposure (Matsuda et al., 2012). In a survey of firefighters involved in rescue activities after the disaster, on the other hand, almost none were reported to develop posttraumatic stress disorder (PTSD; Fushimi, 2012). However, few studies have investigated the activities and health status of public health nurses who were dispatched after the disaster. This study therefore aimed to document the actual activities conducted by public health nurses during their dispatch and their health status during and after dispatch to the three prefectures most severely affected by the Earthquake.

## Methods

### *Design and Sample*

Between December 2012 and January 2013, we conducted a survey of public health nurses who were dispatched to conduct support activities in the three prefectures (Iwate, Miyagi, and Fukushima prefectures) most severely affected by the Great East Japan Earthquake. These nurses were dispatched from other prefectures by local governments under various dispatch conditions, such as the number of nurses in each dispatch group and the timing and length of dispatch. A survey was sent to a total of 2,237 facilities which included prefectural public health centers, health departments of large- and medium-sized cities (defined as having a population of  $\geq 500,000$  or 300,000–499,999, respectively), and health divisions of municipal governments. Of these, 778 facilities returned 1,640 questionnaires from public health nurses who had been dispatched to assist in disaster relief efforts (referred to as “dispatched health nurses”).

### *Measures*

Survey items were sex, age, place of dispatch, starting and ending date of dispatch, length of dispatch in

days, mean work hours per day, and nature of the activity (e.g., support activities at evacuation centers or activities for home evacuees/temporary housing residents); as well as subjective well-being, low mood, worsened sleep state, and intense fatigue, which were assessed during and after dispatch (within 1 month). Subjective well-being was reported using a 4-point scale of *poor*, *somewhat poor*, *fair*, or *excellent*, and low mood, worsened sleep state, and intense fatigue were reported using *yes* or *no*.

In this study, the postdisaster phases of the Great East Japan Earthquake were defined as:

- Phase 0: within 24 h of the disaster
- Phase 1: 24 to 72 h after the disaster (12–14 March 2011)
- Phase 2: from postdisaster (PD) day 4 to PD day 20 (15–31 March 2011)
- Phase 3: from PD week 3 to PD week 11 (1 April to 31 May 2011)
- Phase 4: from PD week 13 to PD week 29 (1 June to 30 September 2011)
- Phase 5: PD week 30 and later (after 1 October 2011)

### *Analytic strategy*

Statistical analysis was performed using IBM SPSS ver. 22.0 for Windows (Japanese IBM Corporation, Tokyo, Japan). The independence of qualitative variables was investigated using the chi-squared test, and the significance of differences between mean values was analyzed using ANOVA where the comparison was between the five groups of postdisaster phase at the start of dispatch. To reveal factors associated with the health status of dispatched health nurses during and after dispatch, forced-entry multiple logistic regression analysis was performed using subjective well-being, low mood, worsened sleep state, and intense fatigue during and after dispatch as dependent variables and length of dispatch (days), sex, age, postdisaster phase, and work hours during dispatch as independent variables.

### *Ethical considerations*

We clearly informed subjects in writing that their participation in the study was voluntary and that the return of the anonymous self-administered questionnaire would be taken as consent to participate in the study. This study was approved by the

Ethics Committee of Tohoku University Graduate School of Medicine.

**Results**

We had information on support activities from 1,640 participants; 70 dispatched health nurses with unknown information on starting and ending date of dispatch were excluded from the analyses. Almost all (98.1%) of dispatched health nurses were female whose mean age was 45.2 (SD ± 9.3; range 23–63) years. Half (50.6%) were dispatched to Miyagi, 31.8% to Iwate, and 16.8% to Fukushima. The postdisaster phase at the start of dispatch were 0.6% in phase 1, 11.2% in phase 2, 46.4% in phase 3, 31.9% in phase 4, and 9.9% in phase 5. The mean length of dispatch was 8.37 days (±11.03; range 2–183). Dispatched nurses worked an average of 9.73 hours per day (±2.34; range 4–24).

Table 1 summarizes the breakdown of support activities that dispatched health nurses conducted. The majority of activities occurred in evacuation centers: 100.0% in phase 1, 93.0% in phase 2, 85.2% in phase 3, 67.3% in phase 4, and 51.9% in phase 5.

Support activities in evacuation centers included health consultations: 100.0% in phase 1, 90.8% in phase 2, 79.4% in phase 3, 63.2% in phase 4, and 48.7% in phase 5. Preventive

measure against contagious diseases was also common: 100.0% in phase 1, 80.5% in phase 2, 60.7% in phase 3, 34.6% in phase 4, and 34.0% in phase 5. Support activities for home evacuees and temporary housing residents included home visiting for home evacuees: 40.0% in phase 1, 53.0% in phase 2, 58.8% in phase 3, 36.8% in phase 4, and 46.8% in phase 5. Home visiting for temporary housing residents started from phase 3 and 11.8% in phase 3, 66.2% in phase 4, and 49.4% in phase 5 (Table 2).

Table 3 shows the work conditions of dispatched health nurses and their health conditions according to the postdisaster phase. The length of dispatch differed significantly by postdisaster phase and was 5.56 days (±2.24) in phase 1, 6.57 (±3.59) in phase 2, 6.93 (±3.93) in phase 3, 8.60 (±8.30) in phase 4, and 16.94 (±29.42) in phase 5. Work hours per day also differed significantly by postdisaster phase at the start of dispatch: work hours per day in phases 1–3 were longer than those in phases 4 and 5.

During dispatch, there was a significantly higher rate of poor subjective well-being in dispatched health nurses who worked in phases 1 and 2 than in phases 3–5. During dispatch, dispatched health nurses whose postdisaster phase were phases 1 and 2 had a significantly higher rate of intense fatigue than those whose postdisaster phase were phases 3–5.

TABLE 1. Nature of the Activities Conducted by Dispatched Public Health Nurses

	Phase 1 12–14 March, 2011 N = 10 N (%)	Phase 2 15–31 March, 2011 N = 185 N (%)	Phase 3 1 April to 31 May, 2011 N = 797 N (%)	Phase 4 1 June to 30 September, 2011 N = 541 N (%)	Phase 5 After 1 October, 2011 N = 156 N (%)
Collect information and investigation for the activity	8 (80.0)	103 (55.7)	395 (49.6)	217 (40.1)	63 (40.4)
Setting up evacuation centers and administration of them	2 (20.0)	18 (9.7)	36 (4.5)	6 (1.1)	4 (2.6)
Classifying data	2 (20.0)	48 (25.9)	306 (38.4)	207 (38.3)	72 (46.2)
Support activities at evacuation centers	10 (100.0)	172 (93.0)	679 (85.2)	364 (67.3)	81 (51.9)
Support activities for home evacuees	4 (40.0)	100 (54.1)	481 (60.4)	212 (39.2)	76 (48.7)
Support activities for temporary housing residents	0 (0.0)	0 (0.0)	98 (12.3)	368 (68.0)	81 (51.9)

After dispatch, there was a significantly higher rate of poor subjective well-being in dispatched health nurses whose postdisaster phase were phases 1 and 2 than those whose postdisaster phase were phases 3–5. There was a significantly higher rate of low mood after dispatch in these nurses whose postdisaster phase were phases 1 and 2 than those whose postdisaster phase were phases 3–5. Moreover, after dispatch, dispatched health nurses whose postdisaster phase were phases 1 and 2 had a significantly higher rate of intense fatigue than those whose postdisaster phase were phases 3–5.

Table 4 shows the results of logistic regression on the health conditions of dispatched health nurses during and after dispatch with associated factors as independent variables. An earlier postdisaster phase was independently associated with poor subjective well-being during dispatch. Work hours per day were also associated with poor subjective well-being during dispatch. In addition, working hours per day were associated with low mood, worsened sleep state, and intense fatigue during dispatch. Moreover, concerning health conditions of dispatched health nurses after dispatch, an earlier postdisaster phase was independently associated with poor subjective well-being, low mood, worsened sleep state, and intense fatigue. Work hours per day were associated with poor subjective well-being and intense fatigue after dispatch.

## Discussion

The findings of this study revealed that although support activities varied between phases, dispatched health nurses participated in support activities at evacuation centers and evacuees' homes. These nurses supported the health maintenance of the residents by providing health consultation and assessment. Because local public health nurses in the disaster-affected area worked at organizing various support groups and providing administrative support, in addition to providing public health services while themselves being affected by the disaster. Consequently, the local nurses were unable to provide support activities at evacuation centers or evacuees' homes, or confirm the safety of individuals in need of assistance during the disaster (Ochi et al., 2013). Therefore, the dispatched public health nurses, who in their home prefectures held the same positions as the local public health nurses,

performed the support activities that the local nurses were unable to do and reported the health conditions of evacuees at evacuation centers or in their own homes to the local nurses. Moreover, during the 2 months after the disaster (up to Phase 3), more than 60% of the dispatched health nurses provided hygiene management at evacuation centers and more than 50% provided information on health, medical care, and welfare.

The length of dispatch varied by phase and tended to increase in the later phases because the Ministry of Health, Labour and Welfare initially recommended that health nurses be rotated about once every week. However, after May, health nurses were dispatched, presumably undergoing medium- to long-term dispatches as municipal employees or undergoing long-term dispatches between municipalities in accordance with the Local Autonomy Act. In contrast with Phases 4 and 5, work hours at dispatch destinations tended to be longer in Phases 1–3, nearly 10 h on average. Some nurses even indicated that they had 24-hour work schedules. Overall, public health nurses were dispatched for longer after the Great East Japan Earthquake than DMAT members, as indicated by the mean length of dispatch among DMAT members of 4 days (Matsuda et al., 2012).

More than 80% of dispatched health nurses reported their health during dispatch to be *fair* or *excellent* regardless of postdisaster phase. Although the proportion of nurses who had worsened sleep state and intense fatigue during dispatch was 20% and approximately 10% in Phases 1 and 2, respectively, this proportion was reduced in later phases. Low mood was most reported for Phase 2, accounting for approximately 5% of nurses. The factor that most strongly influenced subjective well-being, low mood, worsened sleep state, and intense fatigue was work hours per day at the dispatch destination. Logistic regression analysis showed that the health of dispatched health nurses who worked more than 8 h per day was 1.76–2.11 times more likely to be adversely affected than that of the nurses who worked less than 8 h. The survey conducted by the DMAT revealed that the health status of its members was the major factor for proper support activity (Aitken, Leggat, Harley, Speare, & Leclercq, 2012). Although various difficult situations will of course develop given the harsh conditions after a major disaster, extremely long work hours should







health of the nurse. An enormous earthquake is predicted to occur in near future in Japan, again. Nation and local governments should make disaster management planning to protect both people and disaster relief personnel using scientific evidence.

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