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Factors Related to Evacuation Intentions of Power-Dependent Home Care Patients in Japan

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ABSTRACT

This study investigated factors affecting disaster preparedness and evacuation intentions among home-care patients dependent on electrical power for life support. Health professionals interviewed 53 home-care patients using the Kanazawa and Kochi Disaster Preparedness Checklist. About half of the participants requiring continuous artificial ventilation or aspiration indicated that they would not or could not evacuate following a disaster—even though their lives could be at risk. The availability of emergency medical equipment for use during a power outage was positively associated with the desire to evacuate. Our results indicate the need for improved systems to assist power-dependent home-care patients.

Despite having escaped the immediate impact of the earthquake tremors and tsunami, users of artificial respirators and oxygen concentrators died owing to power outages following the 2011 Great East Japan Earthquake (Ministry of Health, Labour, and Welfare, 2011). Further, there is insufficient preparation for blackouts caused by hurricanes or earthquakes in the United States, despite the fact that blackout conditions could endanger electricity-dependent children (Sakashita, Matthews, & Yamamoto, 2013). In this way, both nationally and internationally, home-care patients and children using electricity-dependent medical equipment can suffer more damage than that caused by the disaster itself, as their conditions can be exacerbated—and life crises caused—by interruption of their use of medical equipment. Therefore, it is essential to prepare for electricity-dependent individuals to be provided with stable use of medical equipment during a blackout until they can evacuate to institutions, such as hospitals, with secure electricity supplies. However, it is unrealistic to expect patients or their families to shoulder the major burden of such preparations alone. Some individuals who did not evacuate, despite the evacuation order, were not able to evacuate for a physical reason by themselves or because they had to care for someone else (Brodie, Weltzien, Altman, Blendon, & Benson, 2011). It would be effective to prepare evacuation methods and provide for the secure evacuation of supporters in patients' living environments and health professionals who support everyday life.

In the United States, the Federal Emergency Management Agency and American Red Cross have established and widely disseminated an approach to help people with disabilities and special needs to prepare for a disaster or emergency. The planning process includes identifying—in conjunction with family members, friends, and personal care attendants—the support and

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resources that would be required (Federal Emergency Management Agency, & American Red Cross, 2004). Similarly, the Australian Red Cross (2015) and New Zealand Ministry of Civil Defence and Emergency Management (2010) have developed approaches to establish personal support networks and prepare for emergencies; those approaches take into account the characteristics of each major population group with special needs, including people with hearing or visual impairment, physical disabilities, and respiratory problems. However, those efforts have largely encouraged local residents to make their own preparations for emergencies. It is left up to individuals to make decisions for themselves and their families, and their decision-making and enforcement situations are unclear. To help home-care patients in need of support, municipal governments in Japan are required to create registers of citizens requiring assistance and to provide individualized support for local residents based on a combination of self-help capacity and public resources (Cabinet Office, Government of Japan, 2013). However, those registers are created using existing ledger information, and postregistration renewal occurs on an irregular basis. Further, this system assumes application by home-care patients and corrects basic family information. Therefore, municipal governments may not currently possess up-to-date information on all patients needing support. Preparation for urgent evacuation of local patients with spinal cord injury has not been done until now (Hogaboom, Oyster, Riggins, & Boninger, 2013). Older adults who are unable to evacuate, whether or not they barricade themselves, do not evacuate in response to an evacuation directive (Dostal, 2015). Reporting of individuals suffering from hurricanes affects evacuation intention (Lazo, Bostrom, Morss, Demuth, & Lazrus, 2015). Municipal governments in Japan do not always possess up-to-date information on home-care patients. Thus, the disaster preparedness and evacuation intentions of power-dependent home-care patients are generally unknown. It may be anticipated that such people would find difficulty in acting swiftly following a disaster and would therefore be at high risk. Clarifying the state of disaster preparedness and evacuation intentions is, therefore, an important step when developing disaster countermeasures for power-dependent home-care patients.

In light of this situation, the Kanazawa and Kochi Disaster Preparedness Checklist (hereafter, Checklist) was developed as a tool for maintaining up-to-date information on home-care patients and their families. The document was prepared following discussions with health professionals who provide support to such individuals. The Checklist was designed to help patients in identifying (a) the necessary preparations they can perform themselves, (b) those that require support from others, and (c) those that require the support of the national or local government. The Checklist was administered as a survey to clarify the state of disaster preparedness among power-dependent home-care patients and the factors affecting their evacuation intentions.

Methods

Terminology

This study defined the key terminology used in this study as follows.

Disaster: Sudden accident due either to natural causes, such as earthquakes, floods, and typhoons, or human-related factors.

Power-dependent home-care patient: A home-care patient who depends on electrically powered medical equipment for life support, such as invasive or noninvasive artificial ventilation devices and intratracheal aspiration devices.

Home-care patient requiring continuous artificial ventilation or aspiration: A home-care patient who continuously uses an artificial ventilation or aspiration device. Their life would be in immediate danger during an outage if they had no source of backup power.

Home-care patient requiring intermittent artificial ventilation or aspiration: A home-care patient who could survive without artificial ventilation or aspiration for half a day without sustaining any physical harm during a power outage.

Family caregiver: A family member who lives with a power-dependent home-care patient and is the primary caregiver.

Evacuation advisory: A recommendation issued by the mayor of the municipality under Japan's Basic Act on Disaster Control Measures, advising residents and visitors to evacuate to a designated area.

Evacuation order: A directive issued by the head of the municipality under the Basic Act on Disaster Control Measures, instructing residents and visitors to evacuate.

Sample and selection criteria

The participants in this study were 53 power-dependent home-care patients. This study selected participants who used (a) artificial respiration devices (invasive or non-invasive), (b) intratracheal aspiration devices, or (c) other electrically powered life-support equipment. For selection, the frequency of use of this equipment was roughly once a day. There were no specific selection criteria regarding the primary illness for which the equipment was intended. This study excluded from the study patients whose condition was noticeably unstable or if an attending physician or care station attendant determined that it would be difficult for them to participate.

Requests to conduct a survey of power-dependent home-care patients, or their family caregivers, living in the city of Kochi were sent to the Kochi Prefecture Home Nursing Station Liaison Association and the Kochi Care Manager Association. Kochi is located on the Pacific coast of Shikoku, Japan. After the study was approved by the managers of 25 care providers, this study received recommendations of specific patients to participate in the survey from home nursing stations and in-home care support offices. In the past, Kochi has incurred considerable damage due to Nankai Trough earthquakes, which have occurred roughly every 100–150 years. Experts believe there is a 30%–70% probability that the next Nankai Trough earthquake will occur within the next 30 years. It has also been suggested that if an earthquake of maximum intensity occurred, Kochi would be hit by a 15-meter tsunami within 20 min of the initial shock and would suffer long-term flooding, owing to ground subsidence.

Survey method

Health professionals providing routine care (nurses, public health nurses, and care managers) conducted interviews with 53 home-care patients using the Checklist. In cases where the home-care patients were unable to understand and respond to the questions, the interviews were conducted with family caregivers. To minimize the influence of differences in caregiver occupations and interviewing methods, a briefing was held on the survey method and interviewer administrators were provided with a survey manual. In addition, this study established a system whereby the researchers were available to answer survey administrators' questions via telephone or e-mail at all times. The data were collected in May 2015–February 2016.

Development of the checklist

Following literature reviews of Japanese and foreign sources, a draft version of the Checklist was developed. This study modelled the Checklist on a previous survey, which asked recipients of medical care how they perceived their disaster preparedness based on their own physical conditions (Nakai & Morishita, 2014). The Checklist was then piloted in five groups of home-care patients who used artificial ventilation devices, as well as their family caregivers. Based on the feedback received from the patients, family caregivers, and care attendants (e.g., nurses, managers), who participated in those pilot administrations, we completed the final Checklist.

Overview of the survey

The Checklist covered the following items: participants' personal attributes, need for assistance with activities of daily living (ADLs), medical procedures required, medications used, aspects of preparedness and evacuation support systems (outlined below), and intentions with regard to evacuation in an emergency.

Current state of preparedness

Participants were required to choose between two options (*prepared* or *not prepared*) on each of 23 items, including water, food, clothing, household medicines, emergency medical equipment, sanitary articles, disaster equipment, information tools, and home furnishings. With regard to disaster knowledge, the participants were required to choose among three options (*know about, know something about*, or *do not know about*) for five items: disaster properties and vulnerability of the local area, evacuation sites, evacuation route, daytime evacuation method, and nighttime evacuation method. The participants were also asked to state whether they had consulted with their evacuation assistant about each of these five items. In addition, participants were asked about preparedness-related items that they intended to address with their evacuation assistants and items that required support from the municipal or national government.

Evacuation support systems

Participants were required to choose between two options (*available* or *unavailable*) regarding support from their family, neighbors, managers, public health nurses, visiting nurses, attending physician, medical equipment provider, or any other source.

Evacuation intentions

Participants were asked to consider what they would do in the event that an evacuation advisory or an evacuation order was issued. They were required to select one of the following four options for each of those two events: (a) *definitely want to evacuate*, (b) *want to evacuate if support is available*, (c) *have abandoned the prospect of evacuating*, and (d) *do not want to evacuate*.

Analysis

To analyze the factors affecting evacuation intentions, this study divided participants into two groups: those who selected evacuation intention (a) or (b) listed in the previous section (i.e., *definitely want to evacuate* or *want to evacuate if support is available*); and those selecting the other two options (i.e., those not expecting to evacuate). Univariate analyses using Fisher's exact test were conducted to examine the associations among participants' attributes, ADLs, use of medication, medical procedures, material preparations, preparation of sanitary articles, disaster equipment, information tools, home furnishings, disaster knowledge, consultation with evacuation assistants, and evacuation support systems. Using the two evacuation intention groups as dependent variables, binomial logistic regression analyses were performed using the stepwise method. Variables for which a significant statistical association was observed in the univariate analysis or that were expected to influence evacuation intentions were entered as independent variables after testing for multicollinearity (variance inflation factor ≥ 10). The SPSS software (version 23) was used for all data management and analyses, and the level of statistical significance at $p < 0.05$.

Ethical considerations

The study was approved by the Ethics Committee at Kanazawa University (no. 594). The home-care patients, family caregivers, and other care assistants gave their written, informed consent to participate in the study after receiving verbal and written explanations about its purpose, their freedom to choose whether to participate, their right to withdraw, the protection of anonymity and privacy, and considerations regarding the physical and mental burden of participation. When consent could not be obtained from the patient, written informed consent was received from the family caregiver after review of verbal and written explanations of the study.

Results

Background information

Eight (15.1%) of the 53 home-care patients were aged under 15 years, and 45 (84.9%) were aged 15 and over. Table 1 provides demographic and health status information of the study participants. The sample included 32 men (60.4%) and 21 women (39.6%); 43 patients lived with family members (81.8%), and 10 lived alone (18.9%). Regarding their primary illness, 20 participants (37.7%) had incurable diseases, and 33 (62.3%) were suffering from other conditions. With regard to ADLs, 36 participants (67.9%) needed help with communication, and more than 80% needed help with each of the other ADLs.

Table 2 presents the participants' medical and durable equipment needs. Fifty-two participants (98.1%) took internal medicine, and three received insulin. With regard to necessary medical procedures, 43 participants (81.1%) required aspiration on a continuous or intermittent basis; 38 (71.7%) required artificial ventilation or aspiration on a continuous basis; 10 (18.9%) required invasive artificial ventilation; and 10 (18.9%) required non-invasive artificial ventilation. A gastrostomy had been performed for

Table 1. Attributes and ADLs by evacuation intention (n = 53).

			Evacuation Intentions		No. of People (%)
Item	Category	Overall	Want to Evacuate, Want to Evacuate if Support is Available	Abandoned Prospect of Evacuating, Do Not Want to Evacuate	Fisher's Exact Test, p Value
Attributes					
Age	Younger than 15 years	8 (15.1)	6 (19.4)	2 (9.1)	0.445
	15 years and older	45 (84.9)	25 (80.6)	20 (90.9)	
Gender	Male	32 (60.4)	20 (64.5)	12 (54.5)	0.572
	Female	21 (39.6)	11 (35.5)	10 (45.5)	
Family structure	Lives with family member	43 (81.1)	26 (83.9)	17 (77.3)	0.724
	Lives alone	10 (18.9)	5 (16.1)	5 (22.7)	
Main condition	Incurable disease	20 (37.7)	10 (32.3)	10 (45.5)	0.395
	Other	33 (62.3)	21 (67.7)	12 (54.5)	
ADL					
Eating	Requires help	46 (86.8)	27 (87.1)	19 (86.4)	1.000
	Independent	7 (13.2)	4 (12.9)	3 (13.6)	
Toileting	Requires help	46 (86.8)	27 (87.1)	19 (86.4)	1.000
	Independent	7 (13.2)	4 (12.9)	3 (13.6)	
Dressing	Requires help	48 (90.6)	29 (93.5)	19 (86.4)	0.638
	Independent	5 (9.4)	2 (6.5)	3 (13.6)	
Transferring	Requires help	49 (92.5)	28 (90.3)	21 (95.5)	0.633
	Independent	4 (7.5)	3 (9.7)	1 (4.5)	
Walking/moving	Requires help	49 (92.5)	29 (93.5)	20 (90.9)	1.000
	Independent	4 (7.5)	2 (6.5)	2 (9.1)	
Bathing/showering	Requires help	52 (98.1)	31 (100.0)	21 (95.5)	0.415
	Independent	1 (1.9)	0 (0.0)	1 (4.5)	
Communication	Requires help	36 (67.9)	20 (64.5)	16 (72.7)	0.566
	Independent	17 (32.1)	11 (35.5)	6 (27.3)	

Table 2. Use of medication, medical procedures, and welfare equipment by evacuation intention (n = 53).

Item	Category	Overall	Evacuation Intentions		No. of People (%)
			Want to Evacuate, Want to Evacuate if Support is Available	Abandoned Prospect of Evacuating, Do Not Want to Evacuate	Fisher's Exact Test, p Value
Medication					
Internal medicine	Yes	52 (98.1)	31 (100.0)	21 (95.5)	0.415
	No	1 (1.9)	0 (0.0)	1 (4.5)	
Insulin injections	Yes	3 (5.7)	2 (6.5)	1 (4.5)	1.000
	No	50 (94.3)	29 (93.5)	21 (95.5)	
Medical procedures					
Aspiration	Yes	43 (81.1)	25 (80.6)	18 (81.8)	1.000
	No	10 (18.9)	6 (19.4)	4 (18.2)	
Continuous use of artificial ventilation or aspiration	Yes	38 (71.7)	19 (61.3)	19 (86.4)	0.065
	No	15 (28.3)	12 (38.7)	3 (13.6)	
Gastrostomy	Yes	28 (52.8)	16 (51.6)	12 (54.5)	1.000
	No	25 (47.2)	15 (48.4)	10 (45.5)	
Wound treatment	Yes	24 (45.3)	13 (41.9)	11 (50.0)	0.588
	No	29 (54.7)	18 (58.1)	11 (50.0)	
Oxygen	Yes	13 (24.5)	8 (25.8)	5 (22.7)	1.000
	No	40 (75.5)	23 (74.2)	17 (77.3)	
Foley catheter	Yes	11 (20.8)	8 (25.8)	3 (13.6)	0.327
	No	42 (79.2)	23 (74.2)	19 (86.4)	
Invasive artificial ventilation	Yes	10 (18.9)	6 (19.4)	4 (18.2)	1.000
	No	43 (81.1)	25 (80.6)	18 (81.8)	
Non-invasive artificial ventilation	Yes	10 (18.9)	5 (16.1)	5 (22.7)	0.724
	No	43 (81.1)	26 (83.9)	17 (77.3)	
Nasotracheal tube	Yes	8 (15.1)	4 (12.9)	4 (18.2)	0.705
	No	45 (84.9)	27 (87.1)	18 (81.8)	
Central venous catheter	Yes	5 (9.4)	3 (9.7)	2 (9.1)	1.000
	No	48 (90.6)	28 (90.3)	20 (90.9)	
Oxygen inhalation	Yes	3 (5.7)	2 (6.5)	1 (4.5)	1.000
	No	50 (94.3)	29 (93.5)	21 (95.5)	
Artificial anus	Yes	2 (3.8)	0 (0.0)	2 (9.1)	0.168
	No	51 (96.2)	31 (100.0)	20 (90.9)	
Infusion pump	Yes	2 (3.8)	1 (3.2)	1 (4.5)	0.663
	No	51 (96.2)	30 (96.8)	21 (95.5)	
Welfare equipment					
Electric bed	Yes	41 (77.4)	25 (80.6)	16 (72.7)	0.524
	No	12 (22.6)	6 (19.4)	6 (27.3)	
Air mattress	Yes	20 (37.8)	13 (41.9)	7 (31.8)	0.569
	No	33 (62.2)	18 (58.1)	15 (68.2)	
Electro lifter	Yes	14 (26.4)	10 (32.3)	4 (18.2)	0.348
	No	39 (73.6)	21 (67.7)	18 (81.8)	

28 participants (52.8%); 24 (45.3%) were being treated for a wound; 13 (24.5%) received oxygen inhalation therapy; and 11 (20.8%) used a Foley catheter. Moreover, 41 participants (77.4%) used electric beds; 20 participants (37.8%) used air mattresses; and 14 participants (26.4%) used electric lifters (Table 2).

Disaster preparedness

Table 3 shows the number of participants who had taken various disaster preparedness measures. Thirty-nine participants (73.6%) had arranged water for a disaster; 38 (71.7%) had prepared household medicines; and 37 (69.8%) had arranged food. In addition, 38 participants (71.7%) had prepared diapers or sanitary items, and 33 (62.3%) had arranged tissues or toilet paper. Further, 37 participants (69.8%) had prepared flashlights, and 33 (62.3%) had arranged radios. Finally, 41 participants (77.4%) had prepared cell phones for use as an information tool following a disaster;

Table 3. Disaster preparedness by evacuation intention (n = 53).

Item	Category	Overall	Evacuation Intentions		No. of People (%)
			Want to Evacuate, Want to Evacuate if Support is Available	Abandoned Prospect of Evacuating, Do Not Want to Evacuate	Fisher's Exact Test, p Value
Material preparedness					
Water	Prepared	39 (73.6)	23 (74.2)	16 (72.7)	1.000
	Not prepared	14 (26.4)	8 (25.8)	6 (27.3)	
Household medicine	Prepared	38 (71.7)	24 (77.4)	14 (63.6)	0.357
	Not prepared	15 (28.3)	7 (22.6)	8 (36.4)	
Food	Prepared	37 (69.8)	15 (68.2)	22 (71.0)	1.000
	Not prepared	16 (30.2)	7 (31.8)	9 (29.0)	
Clothing	Prepared	26 (49.1)	15 (48.4)	11 (50.0)	1.000
	Not prepared	27 (50.9)	16 (51.6)	11 (50.0)	
Emergency medical equipment	Prepared	25 (47.2)	20 (64.5)	5 (22.7)	0.005**
	Not prepared	28 (52.8)	11 (35.5)	17 (77.3)	
Sanitary articles					
Diapers/physiological articles	Prepared	38 (71.7)	17 (77.3)	21 (67.7)	0.544
	Not prepared	15 (28.3)	5 (22.7)	10 (32.3)	
Tissues/toilet paper	Prepared	33 (62.3)	19 (61.3)	14 (63.6)	1.000
	Not prepared	20 (37.7)	12 (38.7)	8 (36.4)	
Surgical masks	Prepared	24 (45.3)	13 (41.9)	11 (50.0)	0.588
	Not prepared	29 (54.7)	18 (58.1)	11 (50.0)	
General first-aid kit	Prepared	11 (20.8)	8 (25.8)	3 (13.6)	0.327
	Not prepared	42 (79.2)	23 (74.2)	19 (86.4)	
Disaster equipment					
Flashlight	Prepared	37 (69.8)	21 (67.7)	16 (72.7)	0.768
	Not prepared	16 (30.2)	10 (32.3)	6 (27.3)	
Radio	Prepared	33 (62.3)	21 (67.7)	12 (54.5)	0.395
	Not prepared	20 (37.7)	10 (32.3)	10 (45.5)	
Gloves	Prepared	24 (45.3)	13 (41.9)	11 (50.0)	0.588
	Not prepared	29 (54.7)	18 (58.1)	11 (50.0)	
Cold weather clothing	Prepared	17(32.1)	8 (25.8)	9 (40.9)	0.371
	Not prepared	36 (67.9)	23 (74.2)	13 (59.1)	
Helmet	Prepared	8 (15.1)	4 (12.9)	4 (18.2)	0.705
	Not prepared	45 (84.9)	27 (87.1)	18 (81.8)	
Information tools					
Cell phone	Prepared	41 (77.4)	25 (80.6)	16 (72.7)	0.524
	Not prepared	12 (22.6)	6 (19.4)	6 (27.3)	
Rescue whistle	Prepared	9 (17)	4 (12.9)	5 (22.7)	0.464
	Not prepared	44 (83.0)	27 (87.1)	17 (77.3)	
Home furnishings					
Anti-seismic measures (home)	Taken	12 (22.6)	8 (25.8)	4 (18.2)	0.740
	Not taken	41 (77.4)	23 (74.2)	18 (81.8)	
Measures to secure furniture	Taken	8 (15.1)	5 (16.1)	3 (13.6)	1.000
	Not taken	45 (84.9)	26 (83.9)	19 (86.4)	
Power generation	Taken	6 (11.3)	4 (12.9)	2 (9.1)	1.000
	Not taken	47 (88.7)	27 (87.1)	20 (90.9)	

*p < .05; **p < .01.

12 (22.6%) participants had taken anti-seismic measures to improve the safety of their home; eight (15.1%) had safeguarded their furniture, and six (11.3%) had prepared generators.

Disaster knowledge, consultations with evacuation assistants, and support systems

Table 4 provides details of the participants' knowledge of various evacuation-related issues. As evident in the table, 38 (71.7%) participants knew the location of the evacuation site; 33 (62.3%) knew the disaster properties and vulnerability of their local area; and 34 (64.1%) knew the evacuation route. Further, 14 participants (26.4%) had discussed the daytime evacuation method with their evacuation assistants; 14 (26.4%) had discussed the nighttime evacuation method. Moreover,

Table 4. Disaster knowledge, consultation with evacuation assistants, and support systems by evacuation intention (n = 53).

Item	Category	Overall	Evacuation Intentions		No. of People (%)
			Want to Evacuate, Want to Evacuate if Support is Available	Abandoned Prospect of Evacuating, Don't Want to Evacuate	Fisher's Exact Test, p Value
Disaster knowledge					
Evacuation sites	Knows about	38 (71.7)	20 (64.5)	18 (81.8)	0.223
	Does not know about	15 (28.3)	11 (35.5)	4 (18.2)	
Disaster properties and vulnerability of local area	Knows about	33 (62.3)	21 (67.7)	12 (54.5)	0.395
	Does not know about	20 (37.7)	10 (32.3)	10 (45.5)	
Evacuation routes	Knows about	34 (64.1)	19 (61.3)	15 (68.2)	0.773
	Does not know about	19 (35.9)	12 (38.7)	7 (31.8)	
Daytime evacuation method	Knows about	27 (50.9)	15 (48.4)	12 (54.5)	0.782
	Does not know about	26 (49.1)	16 (51.6)	10 (45.5)	
Nighttime evacuation method	Knows about	24 (45.3)	15 (48.4)	9 (40.9)	0.780
	Does not know about	29 (54.7)	16 (51.6)	13 (59.1)	
Consultations with evacuation assistant					
Daytime evacuation method	Yes	14 (26.4)	10 (32.3)	4 (18.2)	0.348
	No	39 (73.6)	21 (67.7)	18 (81.8)	
Nighttime evacuation method	Yes	14 (26.4)	9 (29.0)	5 (22.7)	0.755
	No	39 (73.6)	22 (71.0)	17 (77.3)	
Evacuation sites	Yes	13 (24.5)	9 (29.0)	4 (18.2)	0.520
	No	40 (75.5)	22 (71.0)	18 (81.8)	
Evacuation routes	Yes	10 (18.9)	9 (29.0)	1 (4.5)	0.033*
	No	43 (81.1)	22 (71.0)	21 (95.5)	
Disaster properties and vulnerability of local area	Yes	10 (18.9)	7 (22.6)	3 (13.6)	0.494
	No	43 (81.1)	24 (77.4)	19 (86.4)	
Disaster support systems					
Support from visiting nurses	Available	38 (71.7)	23 (74.2)	15 (68.2)	0.759
	Unavailable	15 (28.3)	8 (25.8)	7 (31.8)	
Support from family	Available	35 (66.0)	20 (64.5)	15 (68.2)	1.000
	Unavailable	18 (34.0)	11 (35.5)	7 (31.8)	
Support from care manager	Available	31 (58.5)	20 (64.5)	11 (50.0)	0.398
	Unavailable	22 (41.5)	11 (35.5)	11 (50.0)	
Support from attending physician	Available	31 (58.5)	20 (64.5)	11 (50.0)	0.398
	Unavailable	22 (41.5)	11 (35.5)	11 (50.0)	
Support from medical equipment provider	Available	15 (28.3)	10 (32.3)	5 (22.7)	0.544
	Unavailable	38 (71.7)	21 (67.7)	17 (77.3)	
Support from neighbors	Available	14 (26.4)	10 (32.3)	4 (18.2)	0.348
	Unavailable	39 (73.6)	21 (67.7)	18 (81.8)	
Support from public health nurses	Available	4 (7.5)	3 (9.7)	1 (4.5)	0.633
	Unavailable	49 (92.5)	28 (90.3)	21 (95.5)	

*p < .05; **p < .01.

38 (71.7%) participants considered that support would be available from visiting nurses; 31 (58.5%) thought that support would be available from the care manager or attending physician.

Evacuation intentions in event of evacuation advisory or evacuation order

In the case of an evacuation advisory (Table 5), 10 participants (18.9%) stated that they would definitely want to evacuate; 17 (32.1%) stated that they would want to evacuate if support was available. However, 13 participants (24.5%) responded that they had abandoned the prospect of evaluating; another 13

Table 5. Evacuation intentions in the event of an evacuation advisory and evacuation order.

	Evacuation Intentions							
	Definitely Want to Evacuate		Want to Evacuate if Support is Available		Abandoned Prospect of Evacuating		Do Not Want to Evacuate	
	No.	%	No.	%	No.	%	No.	%
Evacuation advisory	10	18.9	17	32.1	13	24.5	13	24.5
Evacuation order	12	22.6	18	34.0	12	22.6	11	20.8

Table 6. Binomial logistic regression analyses with evacuation intention in the event of an evacuation order as the dependent variable (1: "definitely want to evacuate and want to evacuate if support is available," 0: "abandoned the prospect of evacuating and do not want to evacuate"; $n = 53$).

Independent Variable	Comparison Category Base Category	B	Odds Ratio	Odds Ratio at 95% Confidence Interval		*p*
Continuous use of artificial ventilation or aspiration	0: No 1: Yes	−1.688	0.186	0.038	0.902	0.037*
Emergency medical equipment	0: Not prepared 1: Prepared	1.747	5.735	1.451	22.663	0.013*
Consultations with evacuation assistant	0: Not taken 1: Taken	1.667	5.296	0.534	52.487	0.154
Constant		0.622	1.863			0.378

Note. Contribution (R^2 value): 0.373 Accuracy: 75.5 Using Hosmer and Lemeshow test $\chi^2 = 1.365$ (p = 0.714, df = 3). Independent variable not contained in the table. Age (0: under 16 years, 1: 16 years and older); knowledge of disaster properties and vulnerability of local area (0: does not know, 1: knows); support from neighbors (0: unavailable, 1: Available).
*$p < .05$.

(24.5%) stated that they did not want to evacuate. In the case of an evacuation order, 12 participants (22.6%) stated that they would definitely want to evacuate; 18 (34.0%) indicated that they would want to evacuate if support was available; 12 participants (22.6%) stated that they did not think that evacuating would be possible; and 11 (20.8%) declared that they did not want to evacuate.

Factors affecting evacuation intentions

Binomial logistic regression analyses (Table 6) were conducted using the stepwise method with evacuation intentions in the case of an evacuation order as the dependent variable (0:23 participants who did not want to evacuate or did not think it was possible; 1:30 participants who definitely wanted to evacuate or said they would want to do so if support was available). Six independent variables were included in the model: They included emergency medical equipment, age, continuous use of artificial ventilation or aspiration, consultation with assistants about the evacuation route, knowledge of disaster properties and vulnerability, and support from neighbors.

The model yielding the highest contribution contained continuous use of artificial ventilation or aspiration, emergency medical equipment, and consultations with the assistant on the evacuation route (37.3%). Continuous use of artificial ventilation or aspiration correlated significantly with not wanting or expecting to evacuate ($B = -1.688$, $P = 0.037$, odds ratio: 0.186). Having emergency medical equipment was found to correlate with a desire to evacuate ($B = 1.747$, $P = 0.013$, odds ratio: 5.735).

Discussion

Disaster preparedness among power-dependent home-care patients

This study examined the state of disaster preparedness among power-dependent home-care patients and their family caregivers. Previous research has focused on the disaster preparedness of vulnerable

seniors within a community (Tsukasaki et al., 2016), awareness and presence of disaster preparedness steps among home-care or elderly patients who depend on various medical treatments or medications (Bhalla, Burgess, Frey, & Hardy, 2015), and disaster preparedness among children reliant on electrically powered medical equipment and their families (Nakayama et al., 2014; Sakashita et al., 2013). However, no studies have explored the preparedness of power-dependent home-care patients and their families or comprehensively analyzed the factors affecting patients' evacuation intentions in the event of an evacuation order from the local government. The findings of this study should be valuable in providing evacuation support measures based on patients' specific conditions.

With the exception of communication, over 80% of the power-dependent home-care patients needed help with all ADLs, including eating, toileting, and walking. In terms of power-dependent medical procedures, more than 80% of the participants received aspiration treatment, and over 70% required either artificial ventilation or aspiration on a continuous basis. These findings reveal that a power outage would pose a threat to many patients' lives unless a caregiver or health professional were present to perform manual ventilation or aspiration. Even if a caregiver were present, that person would find it difficult to handle the situation alone in the confusion attending a disaster. Moreover, even for patients with intermittent dependence (including those receiving artificial ventilation only at night or aspiration as needed), an interruption in medical treatment could have an irreversible effect on the patient's physical and mental state and could worsen their medical condition.

National governments and organizations that provide support for home-care patients encourage medical equipment users to make their own disaster preparations by discussing their needs with neighbors and others involved in their support (American Red Cross, 2008; Cabinet Office, Government of Japan, 2013). However, power-dependent home-care patients suffer from a wide range of physical and mental conditions, and such factors as age and disease complications can produce different manifestations of the same disease. In addition to artificial ventilation and aspiration, some study participants used inhalation devices and infusion pumps. Other electrically powered forms of medical equipment included electric beds (used by over 70% of participants), air mattresses, and electro lifters. Gastrostomy had been performed on more than 80% of participants.

Given these requirements, asking home-care patients to prepare independently for and act swiftly following a disaster places too heavy a burden on those patients and their families and neighbors. This highlights the need for public assistance that responds to the physical and mental needs of individual patients. Furthermore, previous reports have suggested that even if households with special needs are informed by the government or other authorities about the need to prepare, they are unlikely to make more demanding types of necessary preparation, such as buying water and food or implementing disaster countermeasures (Uscher-Pines et al., 2009). Previous studies have also indicated that patients are unable to rely on their neighbors owing to the paucity of communication among older individuals (Nakai, 2015). Accordingly, power-dependent home-care patients and their families may be unable to prepare fully for a disaster without outside support.

Our finding that over 70% of participants had made arrangements for food can be attributed to the fact that 68.6% of them were fed through a tube. Enteral nutrients are regularly prescribed by physicians and sent directly to patients, and the same applies to internal medicines. Having provisions for water and sanitary articles, such as diapers, can be attributed to the fact that these items are used on a daily basis and can be easily arranged by the patient. Only 30% of participants had made provisions for cold-weather clothing, helmets, and rescue whistles; these items do not directly involve health professionals and are used infrequently in non-disaster times.

Previous research has underscored the need to identify individuals within a community who use medical equipment and to establish disaster preparation plans and measures in collaboration with service providers and public authorities (Aldrich & Benson, 2008; DeSalvo et al., 2014; McGuire, Ford, & Okoro, 2007). Nevertheless, the information on which those recommendations are based was obtained retrospectively from analyses of behavioral risk factor surveillance system data (McGuire et al., 2007), Medicare data (DeSalvo et al., 2014), and national census data (Aldrich & Benson, 2008),

and it is not up to date. This study identified home-care patients within local communities and obtained detailed current data by having the patients themselves or their families describe the extent of their own disaster preparedness. Our findings provide a clearer sense of the experience of power-dependent home-care patients and can be applied in examining the issue of evacuation behavior.

Factors affecting evacuation intentions in event of evacuation order

In the event of an evacuation order, 43.4% of our participants stated that they would abandon any prospect of evacuating or did not want to evacuate. This lack of desire to evacuate was influenced by the ongoing need for artificial ventilation or aspiration. In terms of evacuation behavior, people with disabilities and seniors are less likely than the general population to evacuate when required to do so because of their dependence on electrically powered medical equipment and chronic diseases (Bhalla et al., 2015; Smith & Notaro, 2009). Furthermore, this study previously determined through qualitative research that when patients abandon the prospect of evacuating, it is generally due to medical care requirements and perceived powerlessness (Nakai & Morishita, 2014). The logistic regression model employed in this study enabled us to quantify and confirm those previous findings. This study found that many patients and family caregivers had concluded that it would be difficult to evacuate during a disaster while continuing their medical treatment; therefore, they had relinquished the prospect of evacuating or decided that they do not wish to do so. Moreover, home-care patients may opt not to evacuate because specific evacuation behaviors or proposed evacuation sites would not permit them to continue using their medical equipment. It is thus necessary to establish a system that affords home-care patients and their families a suitable form of evacuating following a disaster.

With regard to the factors affecting preparedness, households containing members with special transport-related needs have been shown to be more likely to locate evacuation sites and have a ready-packed bag of personal items (Uscher-Pines et al., 2009). Moreover, a greater likelihood of unpreparedness has been observed among patients who rely mainly on non-family members for support or face significant barriers to evacuation owing to medication or medical equipment requirements (Meyer, Vatcheva, Castellanos, & Reininger, 2015). This study found the preparation of emergency medical equipment, such as Ambu bags and foot-operated aspiration devices, to be positively associated with a favorable attitude toward evacuating. This is presumably because people who wish to be able to evacuate have decided to make preparations that would facilitate evacuation during a power outage. Conversely, individuals who did not prepare emergency medical equipment may have failed to do so partly because they have already forsaken any prospect of evacuating or may not want to evacuate. Thus, they may not have even regarded evacuation as an option.

The preparation of emergency medical equipment falls outside the scope of Japanese medical insurance and long-term care insurance. Accordingly, public funding for emergency medical equipment would be helpful to assist patients in making the correct decision regarding evacuation following a disaster. Furthermore, to help patients correctly use emergency medical equipment after a disaster and determine the best evacuation behavior, it is necessary to establish a system for implementing regular drills, involving health professionals and local assistants supporting home-care patients.

This study used the Kanazawa Kochi Disaster Preparedness Checklist to show the latest information about medical equipment use and disaster preparation, including necessary medical care treatment and evaluation of patients' mental and physical states. Power-dependent home-care patients and electricity-dependent children or their supporters were asked about their own preparations for life support with health professionals and family caregivers. It is possible for national medical administration systems to conduct disaster preparation for electricity-dependent home-care patients and electricity-dependent children in cooperation with supporting health professionals. Therefore, this study's findings using the Checklist can be applied to home-care patients and electricity-dependent children worldwide.

Study limitations

It may be difficult to generalize the findings of this study because the sample comprised a limited number of local areas.

Conclusions

This study highlights the dangers faced by home-care patients following a disaster: About half of the participants requiring continuous artificial ventilation or aspiration indicated that they had either abandoned the prospect of evacuating (believing it would not be possible) or did not wish to evacuate. However, having emergency medical equipment prepared for use during a power outage was associated with the desire to evacuate. It is necessary to establish a system that will enable home-care patients at immediate risk of losing their lives during a power outage to evacuate successfully after a disaster as well as to obtain the emergency medical equipment they would need and become able to use it.

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