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[Case report]

Outpatient rehabilitation for an older couple in a repopulated village 10 years after the Fukushima nuclear disaster : An embedded case study

Yuta Saito[1)], Sora Sato[2)], Yoshitaka Nishikawa[3,4,5)], Fumiya Oguro[3)], Nobuaki Moriyama[6)], Keiichiro Sato[7)], Yurie Kobashi[3,8)], Toyoaki Sawano[8,9)], Akihiko Ozaki[10)], Takeo Nakayama[5)], Masaharu Tsubokura[3,8)], Seiji Yasumura[6)] and Shohei Sakai[2)]

[1)]Department of Rehabilitation, Hirata Central Hospital, Fukushima, Japan, [2)]Hirata Rehabilitation Care Center, Fukushima, Japan, [3)]Department of Internal Medicine, Hirata Central Hospital, Fukushima, Japan, [4)]Department of Internal Medicine, Kawauchi Village National Health Insurance Clinic, Fukushima, Japan, [5)]Department of Health Informatics, Kyoto University School of Public Health, Kyoto, Japan, [6)]Department of Public Health, Fukushima Medical University School of Medicine, Fukushima, Japan, [7)]Seireikai Home Nursing Station Hirata, Fukushima, Japan, [8)]Department of Radiation Health Management, Fukushima Medical University School of Medicine, Fukushima, Japan, [9)]Department of Surgery, Jyoban Hospital of Tokiwa Foundation, Fukushima, Japan, [10)]Department of Breast and Thyroid Surgery, Jyoban Hospital of Tokiwa Foundation, Fukushima, Japan

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Abstract

Background

Little information is available on the role of community-based rehabilitation after a nuclear disaster. Here, we report the case of an older couple living in an area repopulated after the Fukushima nuclear disaster of 2011 who received outpatient rehabilitation.

Case presentation

An 84-year-old woman underwent total hip arthroplasty (THA) after she fell and sustained a trochanteric fracture while caring for her husband with Alzheimer's disease. The 85-year-old husband experienced worsening behavioral and psychological symptoms of dementia (BPSD) following his wife's hospitalization. The couple received rehabilitation at an outpatient facility in a nearby village using a shuttle service. The woman's postoperative anxiety was relieved and her physical function improved. Moreover, the husband's BPSD symptoms decreased.

Conclusion

A wife and husband showed improvement in physical function after THA and alleviation of BPSD, respectively, following rehabilitation. In post-disaster, resource-scarce areas, older adults may benefit from utilizing the outpatient rehabilitation services available in the surrounding area.

Key words : Fukushima Nuclear Disaster, embedded case study, community dwelling, community healthcare, outpatient rehabilitation, older adults.

Introduction

Community-based rehabilitation (CBR) aims to enable older adults with disabilities and their families to continue living in their own homes[1)]. CBR is categorized into home-visit rehabilitation, in which therapists visit patients, and outpatient rehabilitation, in which patients visit facilities for treatment[2)]. Adequate access to rehabilitative treatment is important for preventive care, maintenance of

Corresponding author : Yoshitaka Nishikawa, MD, PhD E-mail : ynishikawa-tky@umin.ac.jp

physical and mental functions, and enabling patients to live in their preferred community.

Both patient-related and circumstantial factors affect access to CBR. Patient-related factors, including the aging process itself, fracture, and dementia, commonly cause increased long-term care needs[3]. Additionally, circumstances related to geographical distance and lack of healthcare resources in rural areas affect rehabilitation access[4–6].

Nuclear disasters significantly complicate CBR access. In addition to circumstantial difficulties, evacuation and repopulation contribute to the aging of the area's population and reduced social interaction[7,8]. Several studies have reported on medical care provision in communities after nuclear disasters[9–14]. Although few, these reports have emphasized the importance of securing CBR in resource-scarce areas.

In 2011, the Great East Japan Earthquake and resulting tsunami caused the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident. Examining CBR in the resource-scarce areas repopulated following this disaster is essential. Kawauchi Village in Fukushima Prefecture is a rural, mountainous area located 10–30 kilometers southwest of the FDNPP and was an evacuation zone after the accident (Figure 1)[15]. After 10 years, approximately 2000 of the 2800 former residents have already repopulated the village. However, there are still post-disaster effects due to the prolonged nuclear disaster circumstances, such as a lack of social resources and changes in the family structure and neighborhoods. Although the area has one clinic, there are no rehabilitation facilities. Despite some residents seeking rehabilitation care, securing specialized medical personnel to provide treatment in rural and remote areas is difficult[5].

Given these circumstances, various efforts have been made to deliver CBR to Kawauchi Village, including those of Healthcare Corporation Seireikai in Hirata Village, which provides home-visit rehabilitation care[16]. However, little information is available on facility-based rehabilitation services for people in the former evacuation zone.

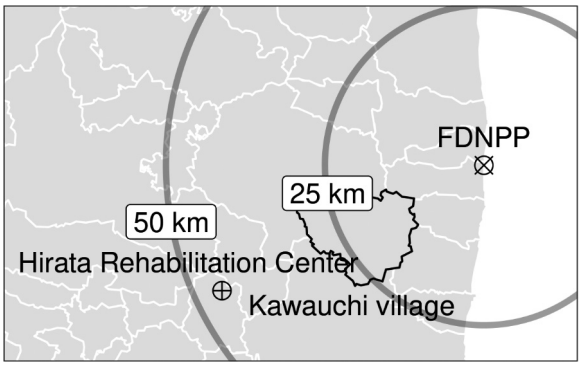

Fig. 1. Geographical locations of Kawauchi Village, Hirata Rehabilitation Care Center, and Fukushima Daiichi Nuclear Power Plant (FDNPP).

Herein, we present an older couple living in Kawauchi Village who required rehabilitation care. This case report may provide insight into the post-disaster provision of CBR in resource-scarce areas.

Case report

Setting

Kawauchi Village in Fukushima Prefecture was designated as an evacuation zone after the FDNPP accident in March 2011, and residents started returning in April 2012 after the repopulation declaration in January 2012. The village has one medical clinic[9] with a day and home-care service, a group home for older adults with dementia, and a long-term care facility[17]; however, there are no rehabilitation services. Healthcare Corporation Seireikai in Hirata Village, Fukushima Prefecture, signed an agreement with Kawauchi Village to strengthen cooperation between the two in the medical and nursing care fields. The Hirata Rehabilitation Care Center of Healthcare Corporation Seireikai provides half-day outpatient rehabilitation. The center provides shuttle services to and from the patient's home. Similar to typical outpatient rehabilitation in Japan, the facility offers the use of training machines, manual therapy, and group health exercise in a spacious room. In addition to therapists, caregivers and nurses who provide physical condition management work together to help the patients live independently.

A couple living in Kawauchi Village

An 86-year-old man developed Alzheimer's disease during the evacuation period following the Fukushima nuclear disaster. He and his wife returned to their home in Kawauchi Village a year after his diagnosis. His wife was his primary caregiver.

In April 2021, the man's 84-year-old wife with a history of rheumatoid arthritis sustained a fall at home while caring for him. She was diagnosed with a right femoral trochanteric fracture and underwent total hip arthroplasty (THA).

During the woman's hospitalization, nevertheless the use of day care services, her husband

showed worsening behavioral symptoms, such as wandering, due to anxiety caused by her absence. Thus, the woman gave up the option of transferring to a rehabilitation hospital and chose to return home after one month. This might have helped alleviate her husband's behavioral symptoms. However, he later exhibited sleep disturbances with day-night reversals ; specifically, he experienced lethargy during the day and wandered at night, which exhausted his wife.

After discharge, the woman was unable to receive rehabilitation care and lived a reclusive life with poor physical recovery. Although she still desired rehabilitation, there was no suitable facility in the village.

Outpatient rehabilitation at The Hirata Rehabilitation Care Center

If the woman had used the outpatient rehabilitation service in Hirata Village on her own, she would have had to leave her husband alone at home. The husband also needed care due to dementia. Consequently, their care manager suggested that they receive rehabilitation care together.

From July 2021, the couple was able to attend the Hirata Rehabilitation Care Center using a shuttle service for 3-4 hours of rehabilitation twice a week.

Outpatient rehabilitation of the woman

On her first visit in July 2021, the woman showed low activity levels and dynamic balance ability (Table 1). Rehabilitation was initiated, which included 10 minutes of machine training (leg press, NuStep[18], and leg extension), use of a bicycle ergometer at 40% heart rate reserve, manual therapy for joint range-of-motion exercises, and daily activities of living. Through these rehabilitation programs under the guidance of her therapist, the woman gradually gained muscle strength.

As of March 2022, she showed improvement in physical function (Table 1) and was able to provide care for her husband.

Outpatient rehabilitation of the man

When initiating rehabilitation, the man was able to perform daily activities (Table 1). However, he required a large amount of care due to decreased cognitive function. His Revised Hasegawa's Dementia Scale (HDS-R) score was 15/30 points, indicating moderate dementia. Additionally, he scored 10/52 points on the 13-item Dementia Behavior Disturbance Scale[19] (DBD13) and exhibited symptoms of sleep disturbance and apathy. A therapist oversaw rehabilitation programs including aerobic exercise, group exercises, and interaction with others.

From March 2022, the man's BPSD had improved. His DBD13 score had decreased to 6/52, his sleep disorder had improved, and his behavioral symptoms, such as nighttime wandering, were no longer observed. He also demonstrated the ability to carry out daily activities. Finally, his HDS-R score was maintained at 16/30 points.

The couple continues to receive outpatient rehabilitation care together using the shuttle service.

Ethical considerations

The two patients provided written informed consent for the publication of this case report.

Discussion

In this case, a couple living in a repopulated

Table 1. Changes in activities of daily living, instrumental activities of daily living, and physical and cognitive function in the two rehabilitation patients

Case 1 (wife)		July 2021	March 2022
Activities of daily living	Barthel Index (points)	80/100	100/100
Instrumental activities of daily living	Frenchay Activities Index (points)	15/45	23/45
Physical function	Grip Strength (Kg) (Rt/Lt)	15.7/12.5	14.2/13.1
	10-Meter Walk Test (s)	25.44	15.5
	Timed Up & Go Test (s)	25.31	16.6
Case 2 (husband)			
Activities of daily living	Barthel Index (points)	90/100	90/100
	Functional Independence Measure (points)	90/126	98/126
Cognitive function	Revised Hasegawa's Dementia Scale (points)	15/30	16/30
	The 13-item Dementia Behavior Disturbance Scale (points)	10/52	6/52
Physical function	Timed Up & Go Test (s)	9.0	12.5

area after the FDNPP accident was able to attend outpatient rehabilitation provided in the surrounding area together using a shuttle service. To the best of our knowledge, this is the first case report of an older couple being able to continue their lives through rehabilitation in a post-disaster area. Outpatient rehabilitation visits benefited each patient in different ways : the woman's postoperative anxiety was mitigated and her physical function improved ; and her husband's cognitive function recovered alongside reduced BPSD symptoms.

In the woman's case, alleviation of anxiety may have resulted from initial improvement in physical function following rehabilitation. Her THA-related physical recovery was similar to that in a previous study[20]. In addition, mental health and physical function in women are reportedly related to instrumental activities of daily living[21], which was in line with our observation. Regarding safety assurance, outpatient rehabilitation in a hospital, for example, would be a suitable setting to receive rehabilitation[22]. In order to receive post- operative rehabilitation, rehabilitation at the care facility was effective.

The husband may have benefitted from social interaction during outpatient rehabilitation, as well as the rehabilitation itself. Conversations with caregivers who understand the patient well, time spent with family members, and living in a familiar place also contribute to the improvement of behavioral symptoms[23]. In addition, it is important to care for couples from a cultural perspective, such as the importance of marital cooperation and the creation of new relationships[24-26]. In the present case, the man's BPSD were exacerbated after his wife's hospitalization, and the symptoms were relieved through facility rehabilitation together with her. In addition, the amount of daytime activity is reportedly related to improvement in sleep disturbance[27]. Facility rehabilitation using training machines during the day may be effective in treating sleep disorders. Importantly, by attending outpatient rehabilitation with his wife, who was his primary caregiver, he was not left alone at home and could avoid the exacerbation of behavioral symptoms.

In securing CBR in resource-scarce areas, having a shuttle service to and from a rehabilitation facility was beneficial and effective for the residents in this case, as previously reported[28-30]. A previous study suggested the importance of a shuttle service for diabetes care after a disaster[31]. Similarly, the couple in this case was able to benefit from rehabilitation by making use of the shuttle service provided by the facility. Moreover, since both members of this couple required care, it was important to receive rehabilitation together to continue their normal lives in their home village. In areas where medical resources are scarce, mutual care and independence are essential for elderly couples[24-26]. In such circumstances, a shuttle service to a rehabilitation facility would be advantageous.

This study has some limitations. First, as this is a case report of two patients in one repopulated village after the FDNPP accident, it cannot be generalized to other situations or individuals. In addition, healthcare resources are scarce in disaster-affected areas, and similar services may not always be available. Thus, methods to improve rehabilitation access in such areas should be further considered.

In conclusion, an older couple who received outpatient rehabilitation after the FDNPP accident showed improvement in physical function after THA surgery and alleviation of BPSD. This was partly because the facility provided transportation services, which enabled them to receive rehabilitation together and continue living in their village. In post-disaster resource-scarce areas, utilizing outpatient rehabilitation available in the surrounding area is a potentially effective care option.

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Conflict of Interest

Akihiko Ozaki receives personal fees from MNES Inc, and Kyowa Kirin, outside the submitted work. Takeo Nakayama receives Research grants from I&H Co., Ltd., Cocokarafine Co., Ltd., and Konica Minolta Inc. ; Consulting fees from Otsuka Pharmaceutical ; Honoraria from Pfizer Japan, Merck Sharp & Dohme, Chugai Pharmaceutical, Takeda Pharmaceutical, Janssen Pharmaceutical K.K., Boehringer Ingelheim, Eli Lilly Japan K.K., Maruho, Mitsubishi Tanabe Pharma, Novartis Pharma, Allergan Japan, Novo Nordisk Pharma, Toa Eiyo, Dentsu, and GlaxoSmithKline, Abbott ; Stock options from Bon Bon Inc. ; Donations from CancerScan and YUYAMA co ; outside the submitted work. All other authors declared no relevant conflict of inter-

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