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Lessons from a meal service training at a nursing home in Japan under post-disaster utility disruption scenarios

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ABSTRACT *Background and purpose.* Elderly people, especially long-term care facility residents, are vulnerable to disasters. Although meal provision is crucial during disasters, few Japanese nursing homes have provided meal service training. To identify disaster preparedness issues related to meal service we conducted a meal service training course at an elderly nursing home in Osaka Prefecture, Japan, on August 23, 2022. *Methods.* The training course included the transportation of stockpiled supplies, meal preparation, and meal services, assuming disruptions in electricity, tap water, and gas supplies. We analyzed 15 post-training questionnaires completed by the trainees and observers (response rate: 93.8%). Using the KJ method, we summarized one opinion on each card and categorized it with cards with similar opinions. *Results.* Of the 31 cards regarding transportation of stockpiled supplies, 17 were included in the main category of "transportation should be done in daylight hours or with lights." The top two main categories related to meal preparation (67 cards) were "cooking processes need improvement" (26 cards), "hygiene must be taken into consideration" (14 cards). Of the 31 cards on meal service, 22 concerned "there were problems with eating," with specific comments such as "porridge jelly was hard and caused a lot of choking." *Conclusion.* The training revealed issues regarding lighting, cooking processes, hygiene management, and the food served. Particularly, inadequate sanitation and foods that are unsuitable for impaired chewing and swallowing can threaten residents' health and increase the risk of aspiration pneumonia. Furthermore, it is important to assess the suitability of the stockpiled food for cooking and feeding.
Key words: Disaster preparedness, Food service, Nursing home, Natural disaster, Training

INTRODUCTION

Japan is an aging society, with the proportion of the population aged 65 years and over at 29.0% in 2021 [1]. Indeed, global aging trends project an increase in the elderly population worldwide from 2022 to 2050 [2]. During this period, the world is likely to experience the increasing impacts of climate change; indeed, it has increased the scale and frequency of natural disasters [3]. Elderly people are particularly vulnerable to disasters, with people over 60 years accounting for over half the fatalities from the Great Hanshin-Awaji Earthquake and Great East Japan Earthquake [4]. Notably, individuals over 66 years accounted for 88.6% of earthquake-related deaths from the Great East Japan Earthquake [5]. Such disasters can particularly disrupt elderly care facilities. As long-term care facility (LTCF) residents depend heavily on these facilities for their daily lives and healthcare, difficulties in providing services to residents during a disaster can directly affect their lives, health, and well-being [6]. Given that elderly care facilities constitute an essential social infrastructure, promoting disaster preparedness is crucial for building a resilient society.

Malnutrition affects the immunocompetence of the elderly [7]. Therefore, meal provision must continue even during disasters [6]. In Japan, all caregiving service providers will be required to establish a Business Continuity Plan (BCP) and conduct training sessions and drills beginning FY2024 [8]. However, even among nursing homes in disaster-prone areas in Japan, only a minority (36.6%) have conducted meal service trainings [9].

Studies of meal preparation and eating in disaster-like situations have shown that people recognize the need to improve the quality of their stockpiles and the importance of lifelines, such as lighting and water [10-12]. However, these studies focused on young and working-age adults. To the best of our knowledge, no study has examined meal service drills in nursing homes, where dietary considerations are important. This study used meal service training to identify disaster preparedness issues related to meal services in an elderly nursing home. Our findings provide

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valuable insights into disaster preparedness for meal provision in long-term care facilities.

MATERIALS AND METHODS

On August 23, 2022, meal service training was conducted at the Special Elderly Nursing Home A (hereafter, Nursing Home A) in Osaka Prefecture. Free descriptions in the post-questionnaire were analyzed using the KJ method to determine the feasibility and validity of the facility's BCP.

2.1 Training outline

The training comprised four components: BCP initial response training (hereafter, BCP training), meal preparation training, meal service training, and reflection session. The following reports particularly focused on meal preparation and meal service training. Table 1 shows the training outline and the participants. Fig 1 presents the overall flow and preparation methods for each menu item during training sessions. During these sessions, the trainees prepared dinner, whereas electricity, gas, and tap water were unavailable in the post-earthquake scenario. Cassette stoves could be used for cooking because the facility stockpiled them. In the reflection session, trainees and observers gave their impressions of the training. The second and fourth authors mentioned both the positive aspects and challenges observed during training (Table 2). .

Table 1. Course outline and participants in each training session[a]

		Meal preparation training	Meal service training
Time		16:00–17:40	17:40–18:30
Content		Gathering materials from storage Preparing stockpiled foods Setting out dishes Table setting	Thicken the water and miso soup Meal assistance
Participants	Trainees	(*n* = 4) Care staff (manager), care staff (head of a unit), general care staff, and maintenance staff	(*n* = 8) Director, assistant director, registered dietitian, care staff member, two managerial staff members from Corporation B, and two crisis management committee members from Corporation B
	Observers	(*n* = 7) Care staff (manager), care staff (head of a unit), and five general care staff members	(*n* = 7) Director, assistant director, registered dietitian, a care staff member, managerial staff member from Corporation B, and two crisis management committee members from Corporation B

[a] Training sessions were conducted on August 23, 2022. The BCP initial response training was conducted prior to the meal preparation training (14:00–15:30). Reflection was also held after the meal service training (19:00–20:00).

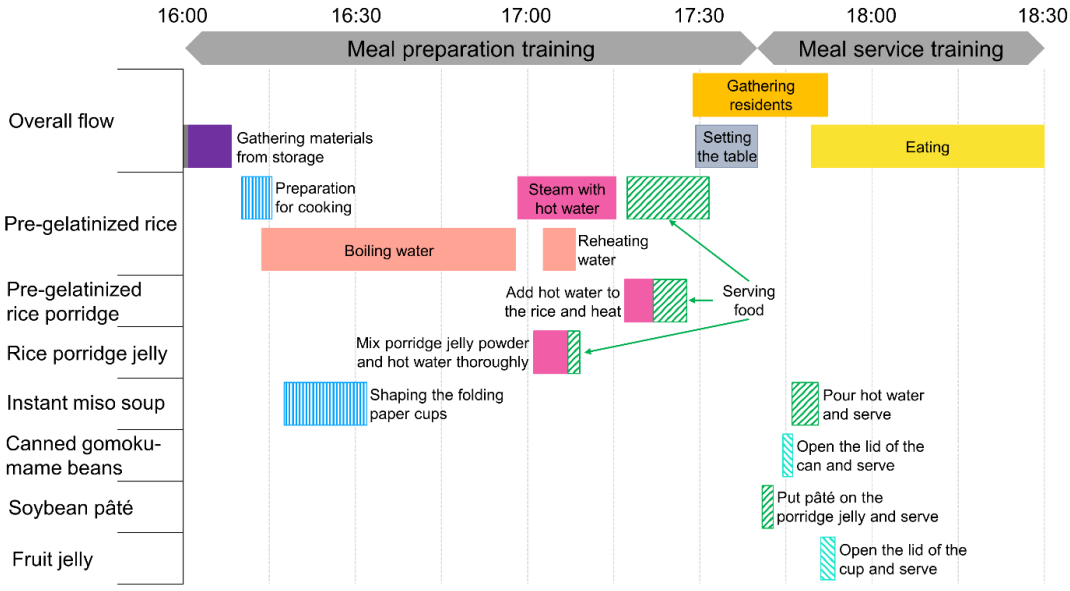

Fig 1. Overall flow and the preparation methods of each menu in meal preparation and meal service training.

Table 2. Comments by the authors regarding meal preparation and meal service during the reflection session.

Contents	Comments by the authors
Preparing stockpiled foods	[Hygiene] ・ Trainees should have sanitized the worktable using alcohol and wet tissues before cooking. ・ Cardboard is unclean; therefore, it is better to avoid placing it on the worktable. ・ Glove usage lacked hygiene. ・ Several operations were done without gloves. Gloves should be changed every time the process changes. ・ Miso soup and pre-gelatinized rice were uncovered until water was added. They should have been wrapped to prevent dust. [Cooking process] ・ The boiling pot lacked lids. They would save fuel and prevent temperature rise. [Safety] ・ Pay attention to fire when using cassette stoves. Alcohol disinfectant was sprayed near the fire, and the hem of the bib was about to touch the stove. ・ A cassette stove was on a caster-equipped stand, which was dangerous because of the possibility of hot water spilling. [Garbage] ・ Waste was not disposed separately.
Setting out dishes	・ The containers of pre-gelatinized rice had lids; hence, they could be stacked and carried efficiently.
Meal assistance	・ Residents were familiar with miso soup cups.

[a] Reflection session was held after the training sessions (19:00–20:00). Thirteen people participated: the director, assistant director, registered dietitian, trainee of BCP initial response training, two trainees of meal preparation training and meal service training, two managerial staff members from Corporation B (to which the target facility belonged), two crisis management committee members from Corporation B, and three authors. Other content of the reflection included BCP initial response training (home oxygen therapy, sputum suction, and emergency toilet installation), gathering materials from storage, impressions of the meals provided, oral care, and comments from observers.

Table 3. Menus and corresponding cooking methods during the training

Food	Meal type	Cooking methods during the training
Pre-gelatinized rice	Normal Porridge	1. Sprinkled dried ingredients for gomoku gohan (mixed vegetable rice) on top of pre-gelatinized rice. 2. Poured 8 L of hot water and steamed for 15 minutes. 3. For making porridge, took some of the rice, added the hot water, and heated.
Instant miso soup	Normal Porridge	1. Shaping the folding paper cups and added powdered miso inside. 2. Poured 150 mL of boiling water into the cup and mixed well.
Canned gomoku-mame beans (Simmered soybeans with vegetables)	Normal Porridge	Opened the lid of the can and served.
Rice porridge jelly	Paste	1. Added 30 g of porridge jelly powder and 180 mL of hot water in a bowl. 2. Mixed thoroughly using a whisk until the mixture was uniform.
Soybean pâté	Paste	Served on top of rice porridge jelly.
Fruit jelly	Normal Porridge Paste	Opened the lid of the cup and served.

In the meal preparation training, three care staff members (two male and one female) transported stockpiled supplies from the third floor to the kitchen on the second floor using stairs, as the elevators were assumed to be inaccessible because of a power outage. At Nursing Home A, a two-day supply of long-shelf-life food and disposable tableware was stored on the third floor, while seasonings and cooking utensils used daily were stored in the kitchen on the second floor. Subsequently, the trainees prepared menus of

stockpiled foods with long shelf lives that the facility had already planned to serve after the disaster. Table 3 lists the foods served, meal types, and cooking methods used during the training. A total of 41 meals (31 residents and 10 staff) of three meal types (normal, porridge, and paste) were prepared.

During meal service training, one lantern was placed on each table, where five or six residents were seated. The trainees thickened the water and miso soup for residents with difficulty swallowing. The residents ate either with assistance from staff or by themselves using disposable plastic spoons. Fig 2 shows the meals served and the eating scene during the training.

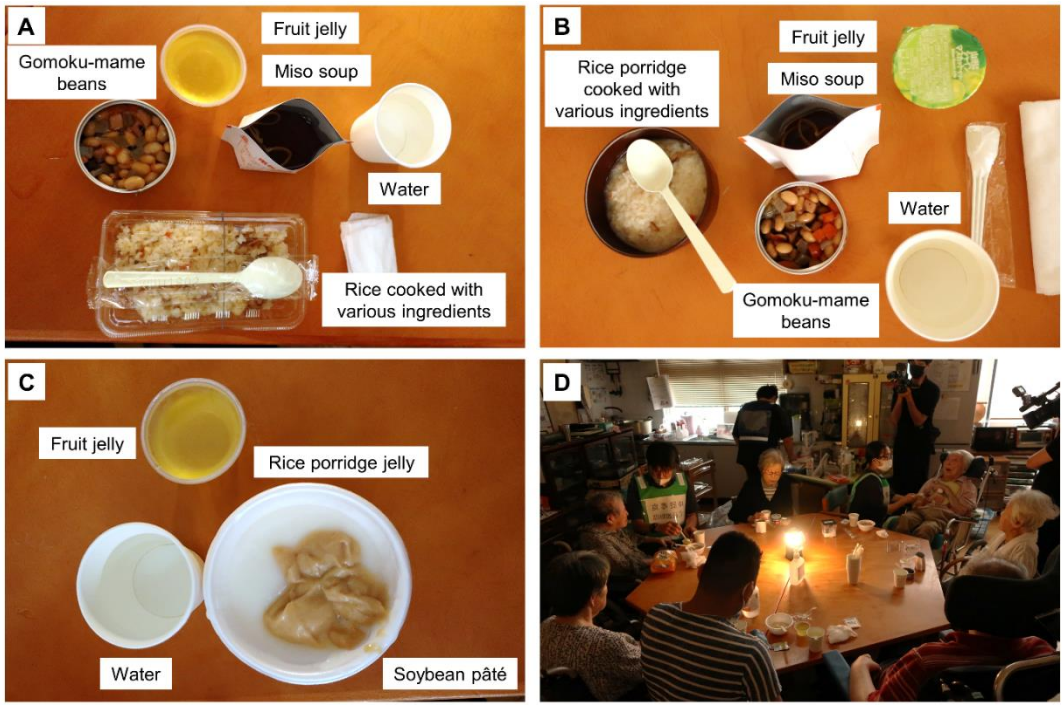

Fig 2. Served meals and eating scene during training. (A) Normal meal. (B) Porridge meal. (C) Paste meal. (D) Eating scene.

2.2 Setting and Participants

2.2.1 Setting

The training course was conducted in Nursing Home A. The facility has a capacity for 35 residents, including 5 short-stay users with an average age of 85 years. Residents' living spaces were divided into three units, and meals were prepared and served per unit.

Special elderly nursing homes in Japan provide general nursing care services for the elderly who require 24-hour care and are difficult to care for at home [13]. In Japan, elderly individuals in need of nursing care are classified into five levels (care needs levels 1–5) based on their health condition and the time required for nursing care [14]. Each level corresponds to the degree of care needed, with higher levels indicating greater care requirements. To make services more focused and efficient, users of special elderly nursing homes are restricted to seniors whose care needs are level 3 or higher [15]. Since elderly people with level 3 care needs require assistance in their daily lives, the disaster response strategies of special elderly nursing homes directly impact the residents' quality of meals and their overall well-being.

Regarding disaster preparedness, Nursing Home A established a BCP and manual for meal services during emergencies in January 2022 and conducted BCP simulation drills while serving pregelatinized rice in March 2022. However, the staff members never prepared or served the entire disaster menu.

2.2.2 Participants

The total number of participants was 16, of whom 12 attended meal preparation training, 14 attended meal service training, and 10 attended both. Participants were divided into trainees and observers; all trainees were Nursing Home A employees. In the meal preparation training, four trainees prepared meals: a care staff member (manager) in their 40s, another care staff member (head of a unit) in their 40s, a general care staff member in their 20s, and a maintenance staff member in their 70s, all of whom routinely prepare meals for residents. In meal service training, seven care staff members were trainees (three were also trainees in meal preparation training). All of them assisted residents with their meals.

The observers were the director, assistant director, dietitian, and nursing staff of Nursing Home A as well

as administrators and disaster prevention staff from other facilities of Social Welfare Corporation B to which Nursing Home A belonged.

2.3 Data collection

On the day of the training session, questionnaires were distributed to all the participants (n = 16), and 15 days after the training date (September 7, 2022), 15 questionnaires were returned (response rate: 93.8%). In instances where the responses were unclear, follow-up emails were sent to the participants and their responses were received on September 28. The questionnaire comprised 38 questions categorized into five sections: toilet training (a part of BCP training), meal preparation training, meal service training, reflection, and an overall assessment of the training program. In this study, responses to five open-ended questions regarding (1) transportation of stockpiled supplies, (2) meal preparation, and (3) meal service were analyzed.

(1) Transportation of stockpiles

・Please write your thoughts and insights regarding retrieval of stockpiled supplies from storage.

・Please write your thoughts and insights regarding the transportation of supplies using the stairs.

(2) Meal preparation

・Please write your observations and impressions of cooking stockpiled foods.

・How did you feel about preparing meals when the water supply was not available?

(3) Meal service

・Please write your thoughts and insights on meal assistance.

2.4 Data analysis

Responses from the trainees and observers were collected for these five questions. The “KJ method,” a bottom-up qualitative method developed by Japanese ethnologist Jiro Kawakita [16], was employed to analyze the descriptions. The first author carefully reviewed the descriptions and summarized them into approximately 40 characters on one card per opinion. Subcategories were created by gathering cards with similar content, and sentences were posted to express the content of each subcategory. Finally, the main categories were developed from these subcategories and a sentence was posted to express the content of each main category. Categorizations were checked by the first, second, and third authors and discussed until a consensus was reached. The analysis was performed using KJ method software (Chohassoho Ultra Presen (ITEC, Minato, Tokyo, Japan)).

2.5 Ethical considerations

This study was approved by the Humanities and Social Sciences Research Ethics Committee of Ochanomizu University (Notification No. 2021-56). Prior to the training, we explained its contents and how the data would be handled to the facility manager. Subsequently, we requested the manager to communicate this information to the nursing staff and residents. Consent was obtained from the facility through a consent form signed by the president of Corporation B.

RESULTS

3.1 Transportation of stockpiled supplies

Table 4 lists the results of transportation of stockpiled supplies. A total of 31 cards from eight respondents were divided into four main categories (numbers in parentheses are the number of cards for each category): “transports should be done in daylight hours or with lights” (17 cards), “carrying went smoothly during the training” (9), “transportation during a disaster would be more difficult” (3), and “worried about carrying supplies” (2). Notably, problems with lighting during transportation were mentioned frequently, as highlighted by “difficult to carry supplies in the dark” (8) and “lights are a must when transporting safely” (5). Furthermore, regarding smooth transportation, “male staff can carry supplies smoothly” (4) and “organization helps smooth retrieval” (4) were mentioned.

3.2 Meal preparation

Table 5 lists the results for meal preparation. A total of 67 cards from 11 respondents were divided into the following seven main categories: “cooking processes need improvement” (26 cards), “hygiene must be taken into consideration” (14), “water is important” (11), “need to actually cook and know the cooking process” (4), “presence of residents makes the tasks more challenging” (3), “good communication among staff” (2), and “others” (7). Further categorization within the “cooking process challenges” revealed “caution is required for the installation and handling of the cassette stoves” (10) as the most frequent, followed by “poor arrangement for boiling water” (5) and “miso soup should be made in batches” (3). All comments categorized under “hygiene must be taken into consideration” were mentioned by observers. Comments about cooking without tap water emphasized the importance of water, with some cards such as “need to reduce water use” (5) and “inconvenient when water is not available” (4).

Table 4. Thoughts and insights regarding transportation of stockpiled supplies[a]

Main category	Subcategory	Examples of cards
Transports should be done during daylight hours or with lights (17)[b]	Difficult to carry supplies in the dark (8)	・ It is difficult to smoothly carry supplies in the darkness without light [2].[c] ・ It is difficult to see your feet in the dark, which may lead to accidents, etc. ・ Finding supplies in the dark is challenging. ・ I am not confident in accurately and quickly retrieving necessary items during hours of darkness. ・ Going up and down stairs during a blackout is dangerous.
	Lights are a must for transporting safely (5)	・ It would be safer if one person carried supplies while another lit the way. ・ It is possible to take out the items with a flashlight or lantern. ・ Headlights allowed the trainees to use both hands while carrying the items.
	It was bright during the training (3)	・ During the training, surroundings were visible due to sunlight.
	Supplies should be transported in daylight (1)	・ It is better to take one day's worth of supplies during daylight.
Carrying went smoothly during the training (9)	Male staff can carry supplies smoothly (4)	・ It was easy to carry out because there were no heavy items. ・ It went smoothly with male staff. ・ It would require more effort and time with only female or elderly employees [2].
	Organization helps smooth retrieval (4)	・ Supplies stored with a clear sign on cardboard were easy to take out. ・ With a post-disaster menu set in advance, the trainees took out the supplies without confusion.
	It went smoothly (1)	・ It went smoothly.
Transportation during a disaster would be more difficult (3)		・ It would take more time [2]. ・ There would be various obstacles such as falling objects in an actual disaster.
Worried about carrying supplies (2)		・ Transporting stored water is difficult. ・ I am not sure if I can safely go up and down the stairs while carrying supplies.

[a] The responses to the following two questions were analyzed using the KJ method: 'Please write your thoughts and insights regarding retrieval of stockpiled supplies from storage,' and 'Please write your thoughts and insights regarding the transportation of supplies using the stairs. ' Eight respondents (two trainees and six observers) answered and 31 cards were used. The opinions of the trainees are underlined.
[b] Number of cards in each category.
[c] Number of specific examples of cards with similar content.

Table 5. Thoughts and insights regarding meal preparation[a]

Main category	Subcategory	Examples of cards
Cooking processes need improvement (26)[b]	Caution is required in the installation and handling of the cassette stoves (10)	・ It made me think about how to set up the cassette stove, considering both staff workflow and safety. ・ It would be better to put the cassette stoves in one place. ・ Placing cassette stoves in various locations may pose fire or injury risks. ・ Putting all the cassette stoves in one place can help people recognize it as a "fire zone" and cook with care. ・ Inadequate installation and handling of cassette stoves could result in fires and injuries. ・ Spraying alcohol disinfectant near the fire was concerning.
	Poor arrangement for boiling water (5)	・ I noticed that boiling a substantial amount of water took significantly longer than expected. ・ I could not figure out why they used a pot without a lid. ・ Maintaining the warmth of hot water resulted in unnecessary gas consumption.
	Kettles are suitable for heating water (3)	・ Using a kettle saves time and gas. ・ Kettle usage minimizes scalding risk when pouring hot water.
	Miso soup should be made in batches (3)	・ Preparing miso soup packets individually was time-consuming.

		・ Implementing batch preparation of miso soup in a pot seemed beneficial. ・ Making miso soup one by one is time-consuming.
	Need to think about the workflow before starting work (3)	・ They seemed a bit confused overall because they started the task without reading the manual.
	Need to be creative in workspace layout (2)	・ Streamlining and simplifying the workflow can lead to more efficient cooking processes. ・ Distinct areas for cooking, serving, and dining could have been delineated to enhance efficiency.
Hygiene must be considered (14)	Hygiene is an issue (8)	・ Trainees touched the food with their hands that had touched cardboard. ・ One trainee took off her mask to taste the food and continued cooking while talking. ・ I was uncomfortable with the trainees stacking and putting down packaged food items.
	During water shortages, consideration for hygiene is necessary (3)	・ Since hands and utensils cannot be washed, special attention must be paid to hygiene. ・ It is important to consider hygiene. ・ To what extent can hygiene be maintained?
	Alcohol disinfection is essential during water disruption (3)	・ We have to do the best we can with alcohol. ・ Alcohol disinfection is essential due to the inability to wash with water.
Water is important (11)	Need to reduce water use (5)	・ Need to prepare meals with as few utensils as possible. ・ Reducing the amount of dishwashing is important.
	Inconvenient when water is not available (4)	・ It is inconvenient because we cannot wash dishes dropped on the floor. ・ I thought it was hard that we were not able to wash hands and cooking utensils.
	Need much water for cooking (2)	・ I realized that we needed to stockpile more water for cooking than we had expected. ・ I have learned that cooking requires a significant amount of water.
Need to actually cook and know the cooking process (4)		・ Cooking stockpiled food was time-consuming due to unfamiliarity. ・ It was difficult to understand the setup without actually having cooked.
The presence of residents makes the tasks more challenging (3)		・ Enough cooking space was available because there were no residents nearby. ・ It would be more difficult to secure space if there were residents. ・ When there are residents, more things need attention.
Good communication among staff (2)		・ Communication among staff was good. ・ A generous attitude is required in times of disaster, when people tend to be tense.
Others (7)	・ Due to the inability to wash, there were many more disposable containers and much other waste than expected. ・ I felt the necessity of considering the placement of garbage disposal areas. ・ I found it easy to prepare. ・ Roles need to be shared to prevent food poisoning. ・ Need someone who can give directions. ・ It was uncomfortable to work in the absence of sounds that are usually taken for granted (e.g., the sound of the TV). ・ I thought that in times of disaster, just having a radio or other sound would be calming.	

[a] Responses to the following two questions were analyzed using the KJ method: 'Please write your observations and impressions of cooking stockpiled foods' and 'How did you feel about preparing meals when water was not available?' There were 11 respondents (3 trainees and 8 observers), and 67 cards were extracted. The opinions of the trainees are underlined.
[b] The number of cards in each category.

3.3 Meal service

Table 6 lists the results for meal service. A total of 31 cards from 14 respondents were divided into three main categories: "there were problems with eating" (22 cards), "there were no problems with eating" (6), and "others" (3). The subcategory "served meals were difficult to eat" received the most responses (12), with comments such as "porridge jelly was hard and caused a lot of choking" and "powdered miso was not dissolved perfectly." Challenges also included

unfamiliar tableware usage and low lighting, such as "residents seemed to struggle to use disposable tableware," "it was hard to see whether there was water in the paper cups," and "meals eaten in the dark were less tasty." However, a few comments indicated no problems with eating. Suggestions for improvement included "more lanterns should be used" and "miso soup should be served in usual paper cups."

DISCUSSION

This study identified disaster preparedness issues related to meal service in elderly care facilities through practical training conducted in a special elderly nursing home. This is the first study to report findings on meal service training in an elderly care facility. Various challenges related to darkness, cooking processes, hygiene management, and menu composition were identified.

4.1 Dealing with the electricity outage

Our findings highlight the significance of adequate lighting for the smooth transportation of supplies and well-lit conditions for assisting with eating and fully appreciating the taste of meals. These findings are consistent with those of Tachibana and Sudo [12], who emphasized the necessity of lightning for hazard prevention, seasoning, and food hygiene. They noted that insufficient lighting could diminish the appeal of the food and hinder stain detection when cleaning utensils and tables. To address issues during electricity outages, lighting sources such as headlights and lanterns should be stored and emergency supplies should be placed in rooms with daylight for easy retrieval [17]. Furthermore, supply transportation and meal consumption should be planned during daylight hours.

Table 6. Comments on meal service[a]

Main category	Subcategory	Examples of cards
There were problems with eating (22)[b]	Served meals were difficult to eat (12)	・ Porridge jelly was hard [3].[c] ・ Porridge jelly was hard and caused a lot of choking. ・ The porridge jelly was not suitable for those with difficulty chewing or swallowing. ・ Porridge jelly provision was called off. ・ The canned beans looked hard. ・ Adjusting the hardness of the porridge jelly seemed challenging. ・ Powdered miso was not dissolved completely.
	Supplied disposable tableware was hard to use (6)	・ It was difficult to scoop the miso soup from the bottom of the suppled cup when thickening. ・ When residents ate by themselves, they seemed to struggle to use tableware. ・ Due to the miso soup cup's tendency to become flexible, residents seemed to struggle with handling it [2].
	Difficult to eat because of darkness (4)	・ For visually impaired residents, I believe eating was particularly difficult. ・ I thought it was hard to perceive taste when eating in the dark. ・ It was hard to see whether there was water in the paper cups. ・ It seemed difficult to see foods and residents' mouth.
There were no problems with eating (6)	Residents seemed to eat well (2)	・ I was surprised at the feedback regarding the taste. ・ It was reassuring to see residents eating well.
	Eating was as usual (2)	・ There appeared to be minimal differences from the usual.
	Residents used disposable tableware well (2)	・ Initially, residents looked curiously at their meals and tableware, but gradually became accustomed to them. ・ Residents used disposable tableware well.
Others (3)	・ More lanterns should be placed. ・ Paste meals were prepared smoothly since they usually make them.	

[a] The responses to 'please write your thoughts and insights of meal assistance' were analyzed using the KJ method. There were 14 respondents (7 trainees and 7 observers), and 31 cards were extracted. The opinions of the trainees are underlined.

[b] Number of cards in each category.

[c] Number of specific examples of cards with similar content.

4.2 Improvement of the cooking process

Regarding meal preparation, the most frequent comment (n = 26, 39%) was that cooking processes need improvement, with specific concerns about the installation and handling of cassette stoves and the poor arrangement of boiling water (Table 5). Adequate spacing is required when setting up multiple cassette stoves to prevent fires [17]. However, even national guidelines that present cassette stoves as alternative heat sources [6, 18] do not describe safety precautions for their use. The participants' awareness of the importance of careful handling of cassette stoves was a valuable training outcome. Furthermore, judicious gas use is paramount because it is essential for improving meal quality [19] and for heating foods such as cold rice and bread [18].Selecting appropriately sized pots [17] and using lidded pots is recommended.

Observers also mentioned that preparing individually packaged miso soup was time-consuming and labor-intensive (Table 5). While individual packaging simplifies distribution [20], during our training, miso soup was prepared for all residents in the kitchen, resulting in an increased workload, such as opening the bag and adding miso powder. For mass food preparation, individual packaging may not always be convenient. Hence, it is essential to use the items and assess the effort and time required to cook before selecting stockpiles.

4.3 Hygienic cooking during water interruption

The second most common comment regarding meal preparation was related to hygiene (n = 14, 21%). The participants found it difficult to maintain hygiene during water supply interruptions. Tokuda et al. also reported difficulties in maintaining the hygiene of food and hands of cooks at evacuation centers without a water supply [21]. Because older adults have reduced infection resistance capabilities [7], particular attention to hygiene management is required in long-term care facilities. Therefore, stockpiles of alcohol sanitizers, wet tissue, and disposable gloves are required to ensure hygienic cooking and eating even when the water supply is cut off [17].

Interestingly, all comments on hygiene were made by the observers. Previous research have noted that food handlers tend to overestimate their food safety practices [22, 23]. Observers may be more likely than trainees to notice hygiene problems during cooking. Hence, feedback from observers and objective reviews of video recordings of training sessions can be effective in enhancing hygiene practices.

4.4 Menu improvement

During training, rice porridge jelly was not offered because of its hardness, which poses a risk of choking (Table 6). This underscores the importance of verifying the suitability of the stockpiled food for residents through training. Yamazoe and Naito reported a real-life case in which an elderly woman with poor masticatory function choked on a rice ball, nearly resulting in fatality [24]. Although access to appropriate forms of food was essential for protecting the lives of the elderly, in earthquake-affected areas, adjusting the form of the food was difficult because machines were unusable owing to power outages. Consequently, there was a greater need for appropriate food for people who have difficulties in swallowing and chewing [25]. However, large quantities of special dietary foods are difficult to obtain after a disaster because they are made-to-order and manufacturers typically do not maintain stock [26]. Therefore, it is essential to select food items that match residents' chewing and swallowing abilities and stockpile a two-week supply in advance.

4.5 Considering the storage space for the garbage

Through training, the participants realized the importance of waste storage and the unexpectedly high volume of waste (Table 5). This is consistent with the findings of previous training on preparing and eating emergency food [10]. Waste accumulation has been a persistent issue during past disasters. For example, after Typhoon Haiyan, waste remained uncollected in evacuation centers even two weeks after the disaster, leading to health concerns [27]. Moreover, the quantity of garbage in disaster-affected areas and fly density were positively related, which can be attributed to the accumulation of organic waste and large-scale food supply [28]. Indeed, some guidelines have emphasized the necessity of securing waste storage spaces and implementing pest control measures [6, 17]. However, only a quarter of the nursing homes in disaster-prone areas of Japan have such plans [9]. Disseminating case studies of training exercises, such as in this research, is crucial for promoting awareness of the importance of considering waste storage.

4.6 Limitations

The findings have limited generalizability as this study reported a single training session at a single facility. Because BCPs should be tailored to the situation of each facility [6], the suggested improvements may not necessarily apply to other facilities. However, because many facilities experienced water, electricity, or gas supply interruptions after the Great East Japan Earthquake [29], the difficulties caused by their unavailability, as considered in this study, may also apply to other facilities.

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