

# Nutritional status is associated with the return home in a long-term care health facility

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## Abstract

**Background:** The purpose of this study was to determine the association between nutritional status and the return home of older people living in a long-term care health facility (LCHF).

**Methods:** A nested case control study was performed in 116 people  $\geq 65$  years of age in a single LCHF. Nutritional status was assessed using the Mini Nutritional Assessment Short Form (MNA-SF) and activities of daily living by the Functional Independence Measure (FIM). The return home, duration of rehabilitation, and the family wanting the patient to return home were obtained from clinical records. Multivariate logistic regression analysis was used to assess whether malnutrition had independent effects on the return home.

**Results:** The participants included 36 males and 80 females with a mean age of 82 years. Thirty-seven people returned home while 79 did not. The MNA-SF showed that 80 subjects were malnourished. Sixty-six of the participants received rehabilitation for longer than 1 hour per week, while 50 received rehabilitation for  $< 1$  hour. The proportion of subjects with malnutrition who returned home was significantly lower ( $P = .003$ ) than in participants who did not return home. Multivariate logistic regression analysis showed that malnutrition (adjusted odds ratio [AOR], 0.23; 95% confidence interval [CI], 0.08-0.65;  $P = .006$ ), total FIM score (AOR, 1.03; 95% CI, 1.01-1.06;  $P = .012$ ), and the family wanting the patient to return home (AOR, 9.46; 95% CI, 3.19-28.12;  $P < .001$ ) were independently associated with the return home.

**Conclusions:** Nutritional status is associated with the return home in older people living in LCHF.

## KEYWORDS

activities of daily living, long-term care, nutrition, patient discharge, rehabilitation

## 1 | INTRODUCTION

Malnutrition is common in older people receiving long-term care, with a prevalence of between 12% and 54%.<sup>1</sup> Malnutrition is defined as "a state resulting from lack of uptake or intake of nutrition leading to altered body composition (decreased fat-free mass) and body cell mass leading to diminished physical and mental function and impaired

clinical outcome from disease."<sup>2</sup> This condition is primarily caused by nutritional deficit and/or acute/chronic disease and leads to low functional capacity. In fact, malnutrition is often found among patients in long-term care facilities, and it is associated with functional decline as well as increased morbidity and mortality.<sup>3</sup> Therefore, nutritional assessment and nutrition care should be considered in older adults of decreased function.

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More than 25% of the population in Japan is older than 65 years. In an aged society like Japan, a paradigm shift to community-oriented medical care is required in order to provide comprehensive nursing care and welfare supported by the available medical and nursing resources.<sup>4</sup> Therefore, a higher home return rate is desired in long-term care health facilities (LCHFs). It has been reported that the characteristics of the facilities—including size, occupancy, ownership, average length of stay, proportion of Medicare and Medicaid residents, and the proportion of residents admitted from acute care facilities—are associated with discharge from nursing homes.<sup>5</sup> The following factors affect whether or not a patient will return home from a LCHF: The family wanted the subject to return home, subjects admitted to LCHF from their home, good ability to walk, families consulted the subject about the destination following discharge, the cost of staying at the LCHF was covered by the subjects' pension, and subjects could take medications by themselves.<sup>6</sup> Additionally, nutritional status may affect the return home from a subacute care facility and rehabilitation hospital in older people and stroke patients.<sup>7-10</sup> Malnutrition affects physical and cognitive functions, and is considered to inhibit home return unless nutrition is stabilized and managed.

The purpose of Japanese LCHFs is to support the independence of older people with disabilities who need care and to provide rehabilitation that will enable them to return to their homes. Rehabilitation and nutritional management are provided under medical supervision by doctors and nurses. Medical doctors, registered dietitians, dentists, dental hygienists, nurses, care workers, medical social workers, and geriatric care managers work out programs designed around the activities of daily living (ADLs). Multidisciplinary teams conduct comprehensive care such as care management, nutrition management, and rehabilitation activities. Older people with limited ability to perform ADLs, males, and those admitted from other institutions are more likely not to return home.<sup>11</sup> When nutritional status was assessed, energy balance has also been shown to be significantly positive among subjects from homes compared with that in frail older adults living in LCHFs.<sup>12</sup> Although it has been shown that nutritional intervention is effective for improving the physical function of older adults living in nursing homes,<sup>13</sup> the direct impacts of nutritional status when assessed in LCHFs have not been evaluated.

Therefore, the aim of this study was to investigate the association between nutritional status and return home in older people living in a LCHF.

## 2 | MATERIALS AND METHODS

### 2.1 | Participant

A nested case-control study was performed in older Japanese people aged  $\geq 65$  years living in a LCHF between January 2012 and April 2015. The participants were recruited from a LCHF in Osaka. In Japan, long-term care services are provided through the social insurance system established under the Long-term Care Insurance Act. All participants were inpatients who needed rehabilitation, care, and nursing. However, because their general conditions were stable, they did not need to be admitted to hospital. The disease considered to be the main

disease was described in the Patient Referral Document. Individuals at least 65 years of age who had been admitted to the LCHF for longer than 1 month were enrolled consecutively in the study.

### 2.2 | Measurements

A registered dietitian assessed nutritional status and calculated total energy requirement at admission. Basic energy expenditure was calculated using the formula of Harris-Benedict.<sup>14</sup> Total energy expenditure was calculated by Long's formula<sup>15</sup> as basic energy expenditure, gross activity factor, and gross injury factor. Nutritional intake was estimated by the dietitian based on the average of daily meals for 7 days after admission.

Nutritional status was assessed by the Mini Nutritional Assessment Short-Form (MNA-SF) in the first week after admission.<sup>16-18</sup> The MNA-SF is comprised of six questions that address (i) the decline in food intake over the past 3 months, (ii) weight loss over the past 3 months, (iii) mobility, (iv) psychological stress or acute disease in the past 3 months, (v) neuropsychological problems, and (vi) body mass index. ADLs were evaluated by the Functional Independence Measure (FIM).<sup>19</sup> The FIM contains 18 items composed of 13 motor tasks: eating, grooming, bathing, upper body dressing, lower body dressing, toileting, bladder management, bowel management, bed-to-chair transfer, toilet transfer, shower transfer, locomotion (ambulatory or wheelchair level), and negotiating stairs; and 5 cognitive tasks: cognitive comprehension, expression, social interaction, problem-solving, and memory. The tasks are rated on a 7 point ordinal scale that ranges from total assistance to complete independence. Scores range from 18 (lowest) to 126 (highest) independent of the functional level of the patient. The survey was carried out in the residents within 1 week. Nurses assessed the swallowing function using the modified water swallowing test (MWST)<sup>20,21</sup> at the time of admission. The patient is given 3 mL of cold water in the oral vestibule and then instructed to swallow the water. Evaluation has five stages: (i) failed to swallow with choking and/or changes in breathing; (ii) swallowed successfully without choking, but with changes in breathing or wet hoarseness; (iii) swallowed successfully, but with choking and/or wet hoarseness; (iv) swallowed successfully with no choking or wet hoarseness; and (v) Criteria #4, plus, 2 successful swallowing within 30 seconds. Scores of 1-3 indicate problems with the swallowing function and those of 4-5 indicate no problems with the swallowing function. The dental hygienist assessed oral function within 1 week after admission. They evaluated the condition of teeth and dentures.

The return home and duration of rehabilitation, and the family wanting the patient to return home following admission were obtained from clinical records. All older people living in the LCHF received rehabilitation at least twice a week, with each session lasting 20 minutes. Number of rehabilitation was stipulated by the Long-Term Care Insurance Act. Short rehabilitation comprised 2 rehabilitation sessions per week, whereas long rehabilitation comprised  $\geq 3$  rehabilitation sessions per week. A conference was held to implement a team care plan according to the condition of the individual. Attending physicians, rehabilitation staff, nurses, care workers, registered dietitians, medical

social workers, and the facility director participated in the conference. The duration of rehabilitation and the return home were determined at the conference. People who returned home were designated as cases. People who did not return home were classified as controls.

### 2.3 | Statistical methods

Sample size was calculated using data from a previous study on discharge rate in stroke patients in rehabilitation wards.<sup>22</sup> We hypothesized a 25% difference between the return and the not-return home rates. The calculation of sample size used >80% power and an alpha error of 0.05. Using these criteria, at least 84 subjects were needed to provide the study with sufficient statistical power.

The statistical analyses were performed using the IBM Statistical Package for the Social Sciences (SPSS) version 21 software (IBM Japan, Tokyo, Japan). Parametric data were expressed as the mean  $\pm$  standard deviation (SD) and nonparametric data as the median and interquartile range. Fisher's exact test, *t* test, and Mann-Whitney *U* test were used to analyze the differences between males and females, while multivariate logistic regression analysis was used to assess whether malnutrition had independent effects on the return home. The variables in the analyses included age, gender, duration of rehabilitation, nutritional status, FIM score, and the family wanting the patient to return home. Because only a small number of cases returned home, we used multivariable modeling and the propensity score to adjust for each of the above factors. A *P*-value <.05 was considered statistically significant.

### 2.4 | Ethical considerations

The ethics committee of the Yokohama City University Medical Center approved the study (approval number: D1503013). The committee decided obtaining informed consent from the patients was not required because the study was a retrospective observational study without invasion and recorded only anonymized data. The study was conducted according to the principles expressed in the Declaration of Helsinki.

## 3 | RESULTS

During the study period, 122 older people were admitted to the LCHF at for longer than 1 month. Five people younger than 65 years and 1 older person whose data were missing were excluded from the study. The remaining 116 patients including 36 men and 80 women with a mean age of 82.1 years were enrolled in the study. Common diseases in the study cohort included Alzheimer's disease, cerebrovascular disorders, psychological disorders, fractures, and chronic heart diseases.

Table 1 summarizes the data for return home, nutritional status, and duration of rehabilitation. Thirty-seven older people returned home and 79 did not. Of 79 people who did not return home, 23 had in hospitalization due to changes in physical condition, 30 had behavioral and psychological symptoms of dementia (BPSD), 15 were transferred to a facility because the patients and their families were concerned about living independently after returning home, and 11

**TABLE 1** Demographics of the participants

|   | Statistical analysis  |
|---|-----------------------|
| Age (y), mean $\pm$ SD                                    | 82.1 $\pm$ 7.7        |
| Gender: male/female, number (%)                           | 36 (31.0%)/80 (69.0%) |
| Length of stay (d), median (interquartile range)          | 210 (103.5-362.5)     |
| Return home, number (%)                                   | 37 (31.9%)            |
| No return home, number (%)                                | 79 (68.1%)            |
| BPSD  | 30 (38.0%)            |
| Hospitalized for changes in physical condition            | 23 (29.1%)            |
| Concerned about living independently after returning home | 15 (19.0%)            |
| Severe nursing care was required                          | 11 (13.9%)            |
| Diagnosis of diseases, number (%)                         |                       |
| Alzheimer's disease                                       | 32 (27.6%)            |
| Cerebrovascular disorders                                 | 24 (20.7%)            |
| Psychological disorders                                   | 18 (15.5%)            |
| Fractures   | 14 (12.1%)            |
| Heart diseases  | 13 (11.2%)            |
| Other diseases  | 15 (12.9%)            |
| Nutritional status, number (%)                            |                       |
| Normal  | 7 (6.0%)              |
| At risk of malnutrition                                   | 29 (26.6%)            |
| Malnourished  | 80 (73.4%)            |
| Duration of rehabilitation, number (%)                    |                       |
| Longer than 1 h/wk  | 66 (56.9%)            |
| Shorter than 1 h/wk                                       | 50 (43.1%)            |
| Energy intake at admission (kcal), mean $\pm$ SD          | 1334 $\pm$ 261        |
| Protein intake at admission (g), mean $\pm$ SD            | 55.2 $\pm$ 11.0       |
| Body mass index (kg/m <sup>2</sup> ), mean $\pm$ SD       | 19.5 $\pm$ 4.0        |
| Total FIM score, median (interquartile range)             | 63 (44-87.5)          |
| Motor FIM score, median (interquartile range)             | 40 (24-67.25)         |
| Cognition FIM score, median (interquartile range)         | 22 (17-28.25)         |
| Problem with swallowing condition, number (%)             | 16 (13.8%)            |
| Dental factors, number (%)                                |                       |
| Residual root teeth                                       | 8 (6.9%)              |
| Permanent teeth   | 32 (27.6%)            |
| Denture   | 76 (65.5%)            |
| Upper denture   | 15 (19.7%)            |
| Lower denture   | 3 (3.9%)              |
| Full denture  | 58 (76.3%)            |
| Dental treatment, number (%)                              | 26 (22.4%)            |

FIM, Functional Independence Measure; BPSD, behavioral and psychological symptoms of dementia.

were transferred to a facility because they required severe nursing care. The MNA-SF showed that 80 people were malnourished, 29 were at risk of malnutrition, and 7 had normal nutritional status. Sixty-six older people received rehabilitation longer than 1 hour per week, while 50 received rehabilitation for <1 hour per week. While 28 families wanted the older people to return home, 88 families did not.

As shown in Table 2, the group of older people who returned home comprised a significantly lower proportion of people with malnutrition ( $P = .003$ ) and a significantly higher proportion of people who received longer rehabilitation ( $P = .001$ ), and those whose families wanted them to return home after admission ( $P < .001$ ). Age, length of stay, motor FIM score, and cognition FIM score were significantly different between older people who returned home and those who did not. MWST revealed that 16 people had swallowing problems, which were not associated with returning home ( $P = .091$ ). Dental factors revealed that 8 people had residual root teeth, 32 had permanent teeth, and 76 had dentures, with 15 people having upper dentures, 3 having lower dentures, and 58 having full dentures. Twenty-six people underwent dental treatment owing to faults or breakage of dentures. Returning home was not associated with dental factors ( $P = .251$ ) and dental treatments ( $P = .454$ ). The duration of rehabilitation and the family's hope for the patient to return home were significantly associated ( $P \leq .001$ ).

The multivariate analysis demonstrated malnutrition (adjusted odds ratio [AOR], 0.23; 95% confidence interval [CI], 0.08-0.65;  $P = .006$ ), total FIM score (AOR, 1.03; 95% CI, 1.01-1.06;  $P = .012$ ), and the family wanting the patient to return home (AOR, 9.46; 95% CI, 3.19-28.12;  $P < .001$ ) all associated independently with the return home factor (Table 3).

## 4 | DISCUSSION

This study examined the association between nutritional status and return home in older people living in a LCHF. The presence of malnutrition on admission was associated with return to home in these people. The longer duration of rehabilitation was associated with the return home only in the univariate analysis.

Malnutrition was associated with the return home in older people living in a LCHF after adjustment for age, gender, duration of rehabilitation, FIM score, and the family wanting the patient to return home. There is evidence that malnutrition is associated with a poorer rehabilitation outcome and physical function in patients with stroke, hip fracture, hospital-associated deconditioning, and a variety of other diseases.<sup>23</sup> The MNA-SF score, serum albumin level, and cachexia status have also shown to be significantly associated with ADLs in older inpatients with hospital-associated deconditioning.<sup>24</sup> Appropriate nutrition care management is necessary because about 70% of older people living in LCHF are malnourished, and nutritional status can be improved in some of these people. Similarly, nutritional intervention added to resistance training during convalescent rehabilitation can improve skeletal muscle mass and ADLs in older patients.<sup>25</sup>

The longer duration of rehabilitation was associated with the return home only in the univariate analysis. The family's hope for the

**TABLE 2** Analysis of the return home using the *t* test, chi-square test, and Mann-Whitney *U* test, Fisher's test

|   | No return home<br>n = 79 | Return home<br>n = 37 | P-value            |
|---|--------------------------|-----------------------|--------------------|
| Age (y), mean $\pm$ SD                                | 83.3 $\pm$ 8.1           | 79.5 $\pm$ 5.9        | .012 <sup>a</sup>  |
| Gender, n (%)   |                          |                       | .057 <sup>b</sup>  |
| Male  | 20 (25.3%)               | 16 (43.2%)            |                    |
| Female  | 59 (74.7%)               | 21 (56.8%)            |                    |
| Length of stay, median (interquartile range)          | 241 (148.5-372.5)        | 125 (75-234)          | .001 <sup>c</sup>  |
| Nutritional status, number (%)                        |                          |                       | .003 <sup>c</sup>  |
| Normal nutritional status                             | 4 (5.1%)                 | 3 (8.1%)              |                    |
| At risk of malnutrition                               | 13 (16.5%)               | 16 (43.20%)           |                    |
| Malnourished  | 62 (78.5%)               | 18 (48.6%)            |                    |
| Duration of rehabilitation, number (%)                |                          |                       | .001 <sup>b</sup>  |
| Longer than 1 h/wk                                    | 37 (46.8%)               | 29 (78.4%)            |                    |
| Shorter than 1 h/wk                                   | 42 (53.2%)               | 8 (21.6%)             |                    |
| Total FIM score, median (interquartile range)         | 54 (40.5-74.5)           | 84 (64-102)           | <.001 <sup>c</sup> |
| Motor FIM score, median (interquartile range)         | 34 (21-50)               | 59 (41-76)            | <.001 <sup>c</sup> |
| Cognition FIM score, median (interquartile range)     | 20 (13.5-27.5)           | 24.5 (21-29)          | .010 <sup>c</sup>  |
| Family wanting the patient to return home, number (%) | 7 (8.9%)                 | 21 (56.8%)            | <.001 <sup>b</sup> |
| Swallowing function, number (%)                       |                          |                       | .091 <sup>d</sup>  |
| Problem   | 14 (17.7%)               | 2 (5.4%)              |                    |
| No problem  | 65 (82.3%)               | 35 (82.3%)            |                    |
| Dental factors, number (%)                            |                          |                       | .251 <sup>c</sup>  |
| Residual root teeth                                   | 7 (8.9%)                 | 1 (2.7%)              |                    |
| Permanent teeth                                       | 20 (25.3%)               | 12 (32.4%)            |                    |
| Denture   | 52 (65.8%)               | 24 (64.9%)            |                    |
| Dental treatment, number (%)                          |                          |                       | .454 <sup>b</sup>  |
| Receive treatment                                     | 17 (21.5%)               | 9 (24.3%)             |                    |
| Not receive treatment                                 | 62 (78.5%)               | 28 (75.7%)            |                    |

FIM, Functional Independence Measure.

<sup>a</sup>*t* test.

<sup>b</sup>Chi-square test.

<sup>c</sup>Mann-Whitney *U* test.

<sup>d</sup>Fisher's test.

patient to return home affected the results of the multivariate analysis, and it also influenced the duration of rehabilitation. The family's hope for the patient to return home and the patient's physical

**TABLE 3** Association between nutritional status, family wanting the patient to return home, duration of rehabilitation, and return home

| Factor  | Unadjusted OR (95% CI) | P-value | Adjusted OR (95% CI) | P-value |
|---|------------------------|---------|----------------------|---------|
| Nutritional status                                | 0.26 (0.11-0.60)       | .002    | 0.23(0.08-0.65)      | .006    |
| Malnutrition                                      |                        |         |                      |         |
| Duration of rehabilitation longer than 1 h/wk     | 4.12 (1.68-10.11)      | .002    | 2.30 (0.823-6.44)    | .112    |
| Age   | 0.93 (0.88-0.99)       | .015    | 0.95 (0.88-1.01)     | .117    |
| Female  | 0.45 (0.20-1.02)       | .054    | 0.48 (0.18-1.01)     | .141    |
| Total FIM score                                   | 1.03 (1.02-1.05)       | <.001   | 1.03 (1.01-1.06)     | .012    |
| Motor FIM score                                   | 1.04 (1.02-1.06)       | <.001   | 1.03 (1.00-1.06)     | .052    |
| Cognition FIM score                               | 1.09 (1.02-1.15)       | .006    | 1.06 (0.97-1.15)     | .199    |
| Family wanting the patient to return home, number | 13.5 (4.91-37.16)      | <.001   | 9.46 (3.19-28.12)    | <.001   |

CI, confidence interval; OR, odds ratio; FIM, Functional Independence Measure.

The adjusted odds ratios were derived from the multivariable logistic regression. The propensity score was used as the adjustment covariate for each factor, derived separately as a function of the other candidate factors.

function level have been reported as the factors affecting the patient's return to home.<sup>26,27</sup> A Cochrane Database Systematic Review<sup>28</sup> reported that physical rehabilitation for long-term care residents may be effective as it reduces disability with few adverse events, although these effects are quite small and may not be useful for all subjects. Therefore, a longer duration of rehabilitation should be provided in LCHF because one of the key roles of these facilities is to help older people to return home. However, the family wanting the patient to return is more important than the duration of rehabilitation.

Rehabilitation nutrition is a combination of both rehabilitation and nutrition care management that maximizes functionality in people with disabilities.<sup>14</sup> The current study showed rehabilitation nutrition is an important consideration for older people living in LCHF because all residents need rehabilitation, and about 70% were malnourished.

This study had several limitations. Firstly, we did not assess social factors such as family and economic situation, or dementia, which may affect the return home.<sup>6</sup> Secondly, the influence of different diseases on the return home was not analyzed because of the relatively small number of participants in the study. Third, in the present study, laboratory data, such as albumin, hemoglobin, and cholesterol levels, were not analyzed. These biomarkers may be associated with returning home. Finally, we cannot conclude that there was an association between the duration of rehabilitation and the return home because both were decided by the same multidisciplinary conference. Further studies investigating nutritional status, duration of rehabilitation, and the return home should evaluate social factors in older people with specific diseases as well as evaluate the association between duration of rehabilitation and the return home.

## 5 | CONCLUSION

Nutritional status soon after admission is associated with return to home in older people living in LCHFs. Future intervention studies

should assess the effect of nutritional intervention and long rehabilitation duration on return to home in these people.

## CONFLICTS OF INTEREST

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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**How to cite this article:** Nishida Y, Wakabayashi H, Maeda K, Nishioka S. Nutritional status is associated with the return home in a long-term care health facility. *J Gen Fam Med*. 2018;19:9–14. <https://doi.org/10.1002/jgf2.142>