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Original Article

Actual situation of nutritional management and factors related to activities of daily living ability at discharge in convalescent rehabilitation ward

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ABSTRACT
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Objective: In this study, we aimed to investigate changes in the Geriatric Nutritional Risk Index (GNRI), a nutrition-related prognostic indicator, in our convalescent rehabilitation ward and determine how this index relates to activities of daily living (ADL) ability at discharge.
Methods: We retrospectively analyzed data of 107 patients admitted to our convalescent rehabilitation ward between April and September 2023. We used the GNRI as the nutritional risk index and Functional Independence Measure (FIM) as the ADL index.
Results: The patients' mean age was 80.0 ± 10.3 years; 38 were males and 69 females. The patients' mean body weight at admission was 51.2 ± 10.2 kg, which significantly decreased to 50.2 ± 9.4 kg at discharge (p = 0.0006). Their mean body mass index (BMI) also significantly decreased from 21.4 ± 3.4 at admission to 20.0 ± 8.2 at discharge (p = 0.002). The mean GNRI significantly decreased from 93.1 ± 8.6 at admission to 91.7 ± 8.4 at discharge (p = 0.023). The mean body weight decreased until the fourth month after admission; however, no decreasing trend after the fifth month was observed. The mean monthly energy intake gradually increased after admission and reached the calculated energy requirement of 1,415 ± 22 kcal at the fifth month. Multivariate analysis demonstrated that at discharge, the GNRI score was positively associated with the FIM score (β = 0.21, p = 0.0008).
Conclusion: Body weight and GNRI scores decreased after admission but stopped decreasing after the fifth month due to a gradual increase in energy intake. At discharge, the FIM score was positively associated with the GNRI score. We expected that active nutritional therapy from the beginning of hospitalization would increase the GNRI by the time of discharge and eventually improve ADL ability at discharge.
Key words: undernutrition, GNRI, convalescent rehabilitation, FIM, rehabilitative nutrition

Introduction

According to a 2019 report by the Japanese Comprehensive Rehabilitation Ward Association, the average body weight and body mass index (BMI) of patients in convalescent rehabilitation wards decreased from 52.5 kg and 21.6 kg/m^2 at admission to 51.7 kg and 21.3 kg/m^2, respectively, at discharge [1]. A patient's ability to perform activities of daily living (ADL) improves when their nutritional status increases and their body weight and BMI are maintained during comprehensive rehabilitation [2−4]. However, undernutrition is often observed in patients requiring rehabilitation, accounting for approximately 50% of cases [5, 6]. Thus, appropriate nutritional management is required in rehabilitation medicine [7]. Recently, the Geriatric Nutritional Risk Index (GNRI) was introduced as a predictor of nutrition-related prognosis and has been used in various fields because of its

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established reliability and ease of calculation [8−10].

In this study, we primarily aimed to investigate changes in GNRI as a predictor of nutrition-related prognosis in our convalescent rehabilitation ward. Additionally, we aimed to investigate how the GNRI was related to ADL ability and outcome at discharge.

Subjects and Methods

1. Participants

In this single-center, retrospective study, we analyzed the data of 107 of 116 patients admitted to our convalescent rehabilitation ward between April and September 2023 for whom there was at least 2 months of data available. This study was conducted in accordance with the Declaration of Helsinki and Japanese ethical guidelines for clinical research. The newly established Ethics Committee of our hospital reviewed and approved this study. Owing to the retrospective study design, we provided an information disclosure document including the purpose of the study to eligible patients on our hospital's website.

2. Variables

Information was collected from electronic medical records. Basic characteristics such as age, sex, height, weight, number of medications, tube feeding, diagnosis at admission, number of days in the ward, and outcome at discharge were collected. We ascertained whether the patients had previously been diagnosed with hypertension, atrial fibrillation, congestive heart failure, diabetes mellitus, dyslipidemia, chronic kidney disease, or dementia. Functional Independence Measure (FIM) values measured by our rehabilitation staff were used to evaluate ADL ability. Patients who received tube feeding referred to those who were tube-fed at least once during their ward stay.

3. Nutritional assessment

Blood testing and weighing were performed at the time of ward admission and then performed approximately every month until the patient was discharged from the ward.

The GNRI, which we used as a nutrition-related prognostic indicator, was calculated using the following formula [10]:

$$\text{GNRI} = [1.489 \times \text{serum albumin level (g/L)}] + [41.7 \times (\text{actual body weight/ideal body weight})].$$

If the actual body weight exceeded the ideal body weight, the ratio of the actual body weight/ideal body weight was assigned a value of 1. In the original source, ideal body weight according to Lorenz's formula was used to calculate the GNRI; however, since using ideal body weight calculated using 22.0 kg/m^2 does not pose an issue [11], we calculated the GNRI using the latter ideal body weight, which is widely used in the population.

To calculate the energy requirement, the basal energy expenditure (BEE) was calculated using the Harris–Benedict equation and then multiplied by the activity and stress coefficients appropriate for the patient's condition.

The amount of energy provided was calculated based on the amount of energy for each set of meals specified in our hospital's dietary prescription (such as regular meal No.1 1,600 kcal and porridge meal No.1 1,200 kcal), considering any adjustments such as changes in portion size.

Energy intake was estimated by visually assessing the amount of food intake on a 10-point scale and multiplying the percentage by the energy provided. Monthly energy intake was calculated based on the day of each monthly blood test. The average of 3 days before and after the day of the blood test was used to adjust for energy intake fluctuations due to physical conditions and preferences.

4. Statistical analysis

All analyses were performed using Statcel5 software (OMS Publications, Tokyo, Japan). To compare admission and discharge values, a paired *t*-test and the Wilcoxon signed rank test were used for normally and non-normally distributed variables, respectively. Multivariate analysis was performed using the GNRI and FIM at discharge as objective variables to assess ADL ability. Because FIM is a continuous variable, multiple regression analysis was used for the multivariate analysis. In addition, logistic regression analysis was performed for the outcome "discharge home" for the multivariate analysis using variables including GNRI. Before performing these analyses, a single regression analysis was conducted for each variable to narrow down the relevant variables. Since the total FIM, including cognitive FIM, might be affected by the variable "dementia," only motor FIM instead of total FIM was used for the analyses. The statistical significance level was set at $p < 0.05$.

Results

1. Basic characteristics and main endpoints

The patients' mean age was 80.0 ± 10.3 years; 38 were males and 69 females (Table 1). The most

Table 1. Profiles of patients at admission (*n* = 107).

Age	80.0±10.3
Sex	M38/F69
Hypertension	72(67.3%)
Atrial fibrillation	18(16.8%)
Congestive heart failure	13(12.1%)
Diabetes mellitus	26(24.3%)
Dyslipidemia	28(26.2%)
Chronic kidney disease	31(29.0%)
Dementia	20(18.7%)
Tube feeding	7(6.5%)
Number of medications	7(5–9)

M, male; F, female. The median and interquartile range are shown for the number of medications.

common diseases that led to admission were fractures of the extremities and pelvis (n = 42, 39%), cranial nerve disease (n = 35, 33%), spinal disease (n = 27, 25%), and other diseases (n = 3, 3%).

The patients' mean body weight at admission was 51.2 ± 10.2 kg, which significantly decreased to 50.2 ± 9.4 kg at discharge (p = 0.0006) (Table 2). Their mean BMI also significantly decreased from 21.4 ± 3.4 at admission to 20.0 ± 8.2 at discharge (p = 0.002). The mean GNRI significantly decreased from 93.1 ± 8.6 at admission to 91.7 ± 8.4 at discharge (p = 0.023). Moreover, the median FIM score significantly increased from 54 at admission to 96 at discharge (p < 0.0001). Similar results were obtained for the motor FIM scores. The median length of stay (first and third quartiles) was 81 days (60, 95); 61 (57%) patients were discharged to home and 31 (29%) to elderly care facilities, whereas 15 (14%) were transferred to another hospital or ward.

The patients' mean body weight was 51.2 kg at admission, which decreased until the fourth month and showed no decreasing tendency after the fifth month (Figure 1). Similar changes were observed for the GNRI scores (Figure 2). Upon comparing the GNRI scores of patients with and without tube feeding (Figure 3), the scores of patients with tube feeding were significantly lower than those of patients without tube feeding (85.8 vs. 93.6 at the first month of admission; p = 0.02). Additionally, the decreasing GNRI trend after admission was less significant in patients with tube feeding than in those without tube feeding.

The mean energy intake during the first month of hospitalization was 1,078 ± 435 kcal (Figure 4), which

Table 2. Primary outcomes (n = 107).

	At admission	At discharge	P
Body weight (kg)	51.2±10.2	50.2±9.4	0.0006
BMI (kg/m^2)	21.4±3.4	20.0±8.2	0.002
GNRI	93.1±8.6	91.7±8.4	0.023
FIM	54 (38.5–73)	96 (63.5–115)	<0.0001
Motor FIM	30 (21.5–45)	70 (46–81.5)	<0.0001

Data are presented as mean ± SD or median (quartile range).
BMI, Body Mass Index; FIM, Functional Independence Measure; GNRI, Geriatric Nutritional Risk index.

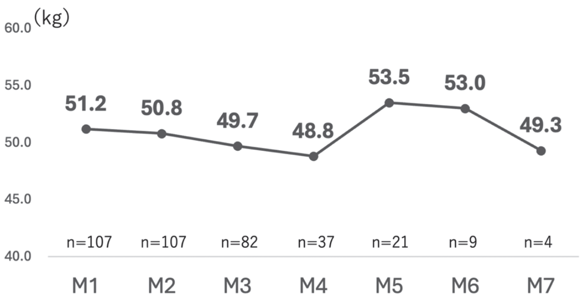

Figure 1. Body weight change during hospitalization.
M1 indicates the first month in the ward.

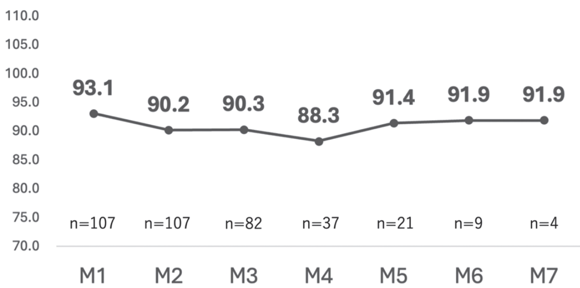

Figure 2. GNRI change during hospitalization.
M1 indicates the first month in the ward.
GNRI: Geriatric Nutritional Risk Index

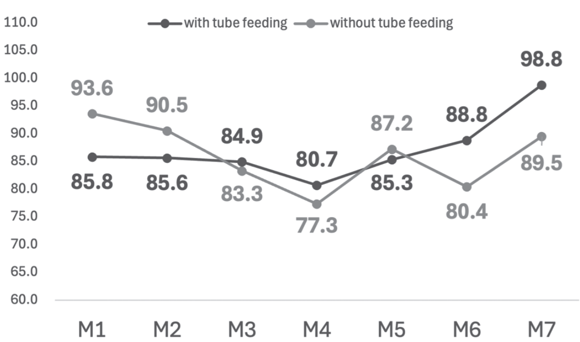

Figure 3. Changes in GNRI during hospitalization, divided by whether tube feeding was used or not.
M1 indicates the first month in the ward.

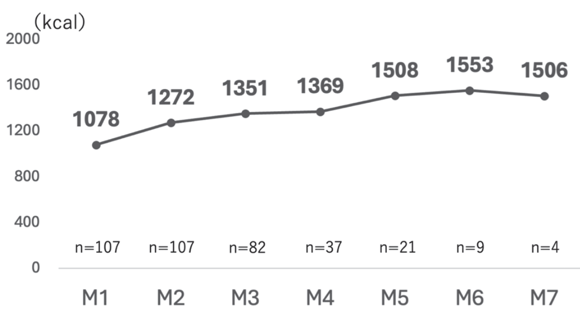

Figure 4. Energy intake change during hospitalization.
M1 indicates the first month in the ward.

was significantly less than the energy requirement (1,415 ± 225 kcal; $p < 0.0001$) and actual energy provided (1,511 ± 246 kcal; $p < 0.0001$). The mean monthly energy intake increased gradually after admission and reached the energy requirement in the fifth month.

2. Variables associated with FIM at discharge

Before conducting the multivariate analysis, univariate analysis was performed to examine the factors that may be related to FIM at discharge (Table 3). Candidates for the independent variables were age, number of days in the ward, body weight at discharge, GNRI score at admission, GNRI score at discharge, FIM score at admission, dementia, and tube feeding. Spearman's rank correlation coefficient test for these variables revealed a correlation between the GNRI scores at admission and those at discharge ($rs = 0.63$). Therefore, to avoid multicollinearity in the multivariate analysis, we divided the analysis into two models: Model A, which included GNRI scores at admission but not those at discharge, and Model B, which included GNRI scores at discharge but not those at admission. Body weight was not used as a variable in either model as it was included as a factor in the GNRI. In Model A (Table 4A), the FIM score at admission was positively and significantly associated with the FIM score at discharge ($\beta = 0.60$, $p < 0.0001$), whereas dementia was negatively associated ($\beta = -0.26$, $p < 0.0001$). In contrast, in Model B (Table 4B), the FIM score at admission ($\beta = 0.57$, $p < 0.0001$) and GNRI score at discharge ($\beta = 0.21$, $p = 0.0008$) were positively associated with the FIM score at discharge, whereas dementia was negatively associated ($\beta = -0.23$, $p = 0.0002$). When motor FIM was used instead of total FIM, the results were similar to those obtained using the total FIM in both univariate and multivariate analyses (tables omitted because of the limit on the number of figures).

3. Variables associated with discharge home

Before performing multivariate analysis, univariate

Table 3. Associations with FIM at discharge - Univariate analysis.

variates	β	t	95%CI	P	variates	β	t	95%CI	P
Age	−0.24	−2.55	−1.35/−0.17	0.012	FIM at admission	0.76	11.89	0.92/1.29	<0.0001
Female sex	−0.07	−0.75	−17.96/8.06	0.45	Atrial fibrillation	−0.13	−1.31	−27.48/5.64	0.19
Number of days in the ward	−0.29	−3.06	−0.40/−0.08	0.003	Congestive heart failure	−0.08	−0.83	−27.03/11.07	0.41
Body weight at admission	0.17	1.74	−0.07/1.13	0.08	Hypertension	−0.05	−0.53	−16.81/9.77	0.60
Body weight at discharge	0.22	2.28	0.10/1.40	0.025	Diabetes mellitus	0.03	0.29	−12.44/16.67	0.77
BMI at admission	0.09	0.97	−0.93/2.70	0.34	Chronic kidney disease	−0.02	−0.19	−15.06/12.46	0.85
BMI at discharge	0.14	1.43	−0.53/3.30	0.15	Dyslipidemia	0.13	1.29	−4.91/23.28	0.20
GNRI at admission	0.35	3.87	0.65/2.01	0.0002	Dementia	−0.51	−6.14	−56.30/−28.83	<0.0001
GNRI at discharge	0.47	5.43	1.15/2.48	<0.0001	Number of medications	−0.06	−0.64	−2.21/1.13	0.52
					Tube feeding	−0.35	−3.89	−69.9/−22.7	0.0002

CI, Confidence Interval; BMI, Body Mass Index; FIM, Functional Independence Measure; GNRI, Geriatric Nutritional Risk Index.

Table 4. Associations with FIM at discharge -Multivariate analysis.

A. Model A

variates	β	t	95%CI	P
FIM at admission	0.60	8.31	0.67/1.09	<0.0001
Number of days in the ward	−0.02	−0.34	−0.13/0.09	0.73
Age	−0.08	−1.27	−0.66/0.14	0.21
Dementia	−0.26	−4.06	−31.79/−10.91	<0.0001
Tube feeding	−0.05	−0.79	−22.93/9.92	0.43
GNRI at admission	0.08	1.23	−0.18/0.78	0.22

B. Model B

variates	β	t	95%CI	P
FIM at admission	0.57	8.13	0.63/1.03	<0.0001
Number of days in the ward	−0.02	−0.36	−0.12/0.09	0.72
Age	−0.04	−0.73	−0.52/0.24	0.47
Dementia	−0.23	−3.83	−29.36/−9.32	0.0002
Tube feeding	−0.07	−1.22	−25.08/5.99	0.23
GNRI at discharge	0.21	3.45	0.35/1.30	0.0008

CI, Confidence Interval; FIM, Functional Independence Measure; GNRI, Geriatric Nutritional Risk Index.

analysis was conducted to examine the variables that may be associated with discharge home (Table 5). Candidates for the independent variables were the number of days in the ward, GNRI score at discharge, FIM score at admission, FIM score at discharge, dementia, and tube feeding. Spearman's rank correlation coefficient test showed a strong correlation between the FIM scores at admission and those at discharge (*rs* = 0.78). Therefore, multivariate analysis was conducted separately using Model C, which included FIM scores at admission but not those at discharge, and Model D, which included FIM scores at discharge but not those at admission. In Model C (Table 6A), the FIM score at admission was positively associated with discharge home ($\beta = 0.07$, $p = 0.0002$), whereas in Model D (Table 6B), the FIM score at discharge was positively associated with discharge home ($\beta = 0.06$, $p < 0.0001$). When motor FIM was used instead of total FIM, Spearman's rank correlation coefficient test also showed a correlation between motor FIM scores at admission and those at discharge (*rs* = 0.63). Accordingly, multivariate analyses were conducted separately for Model E, which included motor FIM scores at admission but not those at discharge, and Model F, which included motor FIM scores at discharge but not those at admission (tables omitted because of the limit on the number of figures). In Model E, motor FIM score at admission was positively associated with discharge home ($\beta = 0.08$, $p = 0.001$), and dementia was negatively associated ($\beta = -1.58$, $p = 0.02$). In Model F, motor FIM score at discharge was positively associated with discharge home ($\beta = 0.08$, $p < 0.0001$).

Discussion

In this study, we evaluated and reported detailed changes in body weight, nutritional risk status, and energy intake during the hospitalization of more than 100 convalescent rehabilitation patients. To the best of our knowledge, no other studies have reported such details. Multivariate analysis revealed that the GNRI score at discharge, but not body weight, BMI, or GNRI score at admission, was significantly and positively

Table 5. Associations with discharge home - Univariate analysis.

variates	*B*	*P*	Odds ratio	95%CI	variates	*B*	*P*	Odds ratio	95%CI
Age	−0.03	0.11	0.97	0.93/1.01	FIM at admission	0.09	<0.0001	1.09	1.05/1.13
Female sex	−0.22	0.59	0.80	0.36/1.79	FIM at discharge	0.08	<0.0001	1.08	1.05/1.12
Number of days in the ward	−0.01	0.04	0.99	0.98/0.99	Atrial fibrillation	−0.34	0.51	0.71	0.26/1.96
Body weight at admission	−0.004	0.85	1.00	0.96/1.03	Congestive heart failure	−0.86	0.16	0.42	0.13/1.40
Body weight at discharge	0.01	0.78	1.01	0.97/1.05	Hypertension	−0.54	0.21	0.58	0.25/1.35
GNRI at admission	0.02	0.37	1.02	0.98/1.07	Diabetes mellitus	−0.37	0.41	0.69	0.28/1.67
GNRI at discharge	0.08	0.003	1.08	1.03/1.14	Chronic kidney disease	−0.12	0.77	0.88	0.38/2.05
BMI at admission	−0.01	0.82	0.99	0.88/1.10	Dyslipidemia	0.30	0.51	1.35	0.55/3.32
BMI at discharge	0.02	0.79	1.02	0.90/1.15	Dementia	−2.03	0.0008	0.13	0.04/0.43
Motor FIM at admission	0.08	<0.0001	1.08	1.05/1.12	Number of medications	−0.07	0.17	0.93	0.84/1.03
Motor FIM at discharge	0.06	<0.0001	1.07	1.04/1.09	Tube feeding	−2.20	0.046	0.11	0.01/0.96

CI, Confidence Interval; BMI, Body Mass Index; FIM, Functional Independence Measure; GNRI, Geriatric Nutritional Risk Index.

Table 6. Associations with discharge home - Multivariate analysis.

A. Model C

variates	*B*	*P*	Odds ratio	95%CI
FIM at admission	0.07	0.0002	1.07	1.03/1.11
GNRI at discharge	0.04	0.17	1.04	0.98/1.11
Numbers of days in the ward	0.01	0.49	1.01	0.99/1.02
Dementia	−1.31	0.07	0.27	0.06/1.13
Tube feeding	−0.53	0.68	0.59	0.05/7.40

B. Model D

variates	*B*	*P*	Odds ratio	95%CI
FIM at discharge	0.06	<0.0001	1.06	1.03 / 1.09
GNRI at discharge	−0.01	0.87	0.99	0.93/1.07
Numbers of days in the ward	0.00	0.93	1.00	0.99/1.02
Dementia	−0.24	0.76	0.78	0.16/3.74
Tube feeding	−1.11	0.46	0.33	0.02/6.28

CI, Confidence Interval; BMI, Body Mass Index; FIM, Functional Independence Measure; GNRI, Geriatric Nutritional Risk Index.

associated with the FIM score at discharge.

Convalescence is the period during which patients who have recovered from the acute phase improve their physical function and gain body weight through increased muscle mass. However, in this study, body weight loss was observed for up to four months after hospital admission. For patients in convalescent rehabilitation wards undergoing active rehabilitation, muscle-strengthening exercises without adequate energy intake lead to decreased muscle mass due to the collapse of muscle proteins. It is therefore important to ensure adequate energy intake during the convalescent period; however, the patients' energy intake at admission was only two-thirds of the required energy level. The patients' energy intake gradually increased after admission and finally reached the energy requirement in the fifth month. On the other hand, the patients' body weight gradually decreased from the time of admission, and this trend stopped in the fifth month. Although the cause remains unproven, the increase in energy intake might have preceded and halted the trend of body weight loss. The GNRI followed a course similar to that of body weight. In the presence of undernutrition and sarcopenia, an energy intake of 250 kcal/day must be added to the energy requirement to gain 1 kg body weight [12, 13]. Notably, older patients have even greater nutritional needs [14]. Thus, aggressive nutritional therapy is necessary in convalescent rehabilitation wards, where many older patients suffer from malnutrition and sarcopenia [15]. Starting aggressive nutritional therapy early after admission to the convalescent rehabilitation ward and increasing energy intake early are essential to increase the GNRI as much as possible at the time of discharge.

In this study, the reason for the low energy intake upon admission to the ward was unclear. We speculate that the direct cause was not admission to the rehabilitation ward but rather the patients' persistent low energy intake since their time in the acute ward. Neurological diseases, which often cause dysphagia in the acute phase, accounted for one-third of the patients in this study. Dysphagia and nutritional disorders are interrelated and can coexist in patients with acute illnesses [16]. Tube feeding may be indicated in patients who are unable to take oral medications because of swallowing disorders. In this study, the GNRI scores of patients who were tube-fed during the first month of admission were lower than those of patients who did not require tube feeding. However, the decreasing GNRI trend after admission was less pronounced in patients who received tube feeding, possibly because of the stable energy intake. The trend in GNRI scores suggests that tube feeding is useful and should be actively administered to eligible patients. However, the number of patients who underwent tube feeding in this study was small, and so it is necessary to accumulate more cases and continue the verification in the future. Of note, we often observed that food intake is reduced because of loss of appetite, which typically occurs during the acute phase. In recent years, progress has been made in elucidating the molecular mechanism underlying this phenomenon [17, 18]. Nevertheless, interventions for decreased appetite are often difficult, and the establishment of specific countermeasures is desired.

Various indices have recently been used to predict nutrition-related prognosis. The GNRI used in this study can be easily calculated from the body weight and serum albumin levels. Because serum albumin levels are affected by inflammation and hydration, caution is required when using them as a nutritional index [19]. In this study, we found that the GNRI scores were significantly and positively associated with the FIM scores at discharge, whereas body weight and BMI were not. The GNRI may be a more sensitive predictor of nutrition-related prognosis because it includes both body weight and serum albumin levels. Even in older individuals, adequate protein intake promotes albumin synthesis in the liver and improves serum albumin levels [20]. In rehabilitation nutrition, attention should be paid not only to energy but also protein intake. Notably, the half-life of albumin is approximately 3 weeks; therefore, the energy intake reflected in the GNRI was that of 3 weeks prior.

We found that a high FIM score at discharge was associated with a high FIM score at admission, absence of dementia, and high GNRI score at discharge. Of these, only the GNRI score at discharge was improved through medical intervention during hospitalization. As mentioned previously, many patients are undernourished during the acute phase. In this study, the GNRI score at admission was not related to the FIM score at discharge, and poor nutritional status at admission did not affect ADL ability at discharge. These results indicate that increasing the GNRI scores while patients are in the ward is of utmost importance to prepare the patient for discharge. Among older stroke patients in a rehabilitation ward, those with greater improvement in nutritional status showed greater FIM improvement [2, 21]. Appropriate nutritional management tailored to individual patients reduces weight loss and improves the quality of life scores [22]. Furthermore, the presence of a registered dietitian in a rehabilitation ward is significantly associated with weight gain in patients [23]. Intervention by a rehabilitation nutrition team increases the energy intake of patients in convalescence and decreases the rate of undernutrition [24]. In our hospital, a rehabilitation nutrition team centered on rehabilitation specialists was formed in October 2023 and is currently working diligently.

Multivariate analysis revealed that the presence of dementia was negatively associated with the FIM scores at discharge. In Japan, cognitive FIM at admission is reportedly negatively associated with

FIM gain, which is consistent with the findings of the present study [25]. Another study reported that 44.6% of patients with dementia have some kind of feeding difficulties [26]. According to a recent meta-analysis, the proportion of patients with dementia who are undernourished or at risk of undernourishment combined is 80% [27]. Feeding difficulties and low nutrition observed in patients with dementia are thought to hinder the improvement of ADL ability, even in convalescent rehabilitation. In clinical practice, we often encounter high rates of delirium in patients with dementia, which makes rehabilitation difficult. When delirium occurs in patients with dementia in a rehabilitation ward, the hazard ratio for death in the first 12 months after discharge is 2.3 times higher than in patients with neither delirium nor dementia [28]. As preventing delirium in patients with dementia is generally difficult, the establishment of effective countermeasures is desirable.

Multivariate analysis showed that FIM scores at admission and discharge were significantly associated with discharge home. We found that ADL ability was more important than nutritional status or the presence of dementia in determining discharge home. However, in clinical practice, factors related to caregivers accepting the discharge of patients with dementia to their homes are also important. In addition, the degree of dementia and its primary disease may affect whether a patient can be discharged home. In this study, the number of patients with dementia was small ($n = 20$); therefore, we were unable to examine these factors in detail. In the future, we intend to accumulate more cases to further advance our research.

This study had some limitations. First, the study was limited to an overall analysis because there were insufficient cases to perform an analysis by disease group. Second, we did not include a detailed evaluation of swallowing function, which could be a cause of undernutrition. Third, the degree of cognitive decline and specific diagnosis of disease classified as dementia were not included in the analysis. In the future, we would like to examine these aspects by increasing the number of cases.

Conclusion

Body weight and GNRI scores decreased after admission but did not decrease after the fifth month due to a gradual increase in energy intake. FIM scores at discharge were positively associated with GNRI scores at discharge. We expect that active nutritional therapy from the beginning of hospitalization can increase the GNRI scores by the time of discharge and eventually improve ADL at discharge.

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