RESEARCH
Original Research: Brief

Nutritional Improvement Correlates with Recovery of Activities of Daily Living among Malnourished Elderly Stroke Patients in the Convalescent Stage: A Cross-Sectional Study

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ARTICLE INFORMATION

Article history:
Submitted 31 March 2015
Accepted 10 September 2015

Keywords:
Elderly stroke patients
Nutritional improvement
Convalescent rehabilitation stage
Recovery of activities of daily living
Cross-sectional study

http://dx.doi.org/10.1016/j.jand.2015.09.014

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ABSTRACT

Background Whether nutritional improvement correlates with functional recovery in convalescent stroke patients is unclear.

Objective This study was conducted to examine the relationship between nutritional improvement and recovery of activities of daily living among malnourished elderly stroke patients in the convalescent stage.

Design This study used a cross-sectional study design.

Participants/setting One hundred seventy-eight malnourished stroke patients aged 65 years and older from convalescent rehabilitation wards in Japan between April 2012 and December 2014 were included in the analyses.

Main outcome measures The participants were classified into three groups according to the Mini Nutritional Assessment Short-Form (MNA-SF) score at discharge (0 to 7 as no improvement, 8 to 11 as lesser improvement, and 12 to 14 as greater improvement). The primary outcome was functional independence measure (FIM) efficiency (FIM gain/length of hospital stay). The secondary outcomes were FIM gain and discharge outcome.

Statistical analysis One-way analysis of variance, χ^2 test, and Kruskal-Wallis test were performed for univariate analysis. Linear regression analysis was used to adjust for covariates such as age, sex, length of hospital stay, FIM (motor and cognitive) on admission, and lower-order items of MNA-SF. Binomial logistic analysis for discharge outcome (home/others) was performed to adjust for covariates such as age, sex, and FIM.

Results Study participants included 85 men and 93 women with a mean age of 77 years. Based on MNA-SF, 16 were classified as no improvement, 113 as lesser improvement, and 49 as greater improvement. The median FIM efficiency and length of hospital stay were 0.27 points/day and 151.5 days, respectively. The greater improvement group had significantly higher FIM efficiency than the other groups ($P<0.001$). Home discharge rate was also higher in the GI group ($P=0.014$). Linear regression analysis for FIM efficiency indicated that mobility, neuropsychological problems, and weight loss, which were lower-order items of MNA-SF at discharge, were independent explanatory variables ($R^2=0.373$; $P<0.001$).

Conclusions These findings suggest that nutritional improvement such as maintenance of body weight is associated with the efficient recovery of activities of daily living among malnourished elderly convalescent stroke patients.
J Acad Nutr Diet. 2016;116:837-843.

MALNUTRITION IS COMMON IN HOSPITALIZED patients. Previous studies have indicated that the prevalence of malnutrition is 20% to 45% in hospital settings.[1-4] In the same way, stroke patients may also experience malnutrition,[5] which can be due to dysphagia, stress response, or surgical procedures. Stroke patients who were malnourished showed higher mortality,[6-8] poorer functional outcomes,[7-9] higher complication rates,[7,9] and tended to experience swallowing disorders more frequently.[10] Furthermore, the malnutrition rate among stroke patients was higher after a few weeks of stroke onset than at the time of onset.[9,11] Therefore, the early identification of malnutrition and implementation of nutritional support therapy are important for stroke patients. According to previous studies, the results on outcomes regarding nutrition intervention for acute stroke patients are inconsistent.[12,13] Moreover, according to a recent systematic review,[14] the effectiveness of nutrition intervention on minimizing negative outcomes for acute stroke patients is still unclear.

Several previous studies investigated the relationship between nutritional status and stroke outcome in a convalescent rehabilitation setting. In 2010, Kaiser and colleagues[15] reported that the patients in a rehabilitation setting were more malnourished than those in an acute setting. Similarly, in 2009, Foley and colleagues[10] reported that stroke patients in a rehabilitation setting were at a higher risk for dysphagia compared with those in a hospital setting. Furthermore, in 2008, Jönsson and colleagues[16] found that stroke patients who had weight loss 4 months after stroke onset experienced more difficulties with activities of daily living (ADLs) compared with those without weight loss, whereas another study reported that weight change more than 2 years after stroke onset was negatively correlated with physical function.[17]

In Japan, convalescent stroke patients receive rehabilitation mainly in convalescent rehabilitation wards, which are covered by public health insurance.[18] We previously reported that approximately 40% of stroke patients were malnourished and that the degree of malnutrition on admission was related to ADLs at discharge and rate of home discharge.[19] Therefore, undernutrition among elderly convalescent stroke patients could be important similar to acute stroke patients.

In 2008, a randomized controlled study in the rehabilitation stage reported that malnourished stroke patients with aggressive nutritional supplementation demonstrated higher functional improvement.[20] Participants of the study did not show significant weight gain in either the intervention or control groups.[20] Therefore, it is still unclear whether nutritional improvement is correlated with the recovery of ADLs during the convalescent rehabilitation stage in malnourished stroke patients.

Could nutritional improvement be related to the recovery of ADLs among malnourished stroke patients in a convalescent setting? Which components of nutritional improvement, if any, are correlated with recovery of ADLs the most? To examine these questions, a cross-sectional study was conducted to investigate the relationship between the change in nutritional status and functional recovery among malnourished elderly stroke convalescent patients.

MATERIALS AND METHODS

Participants

We screened 399 consecutive individuals who were admitted to and discharged from convalescent rehabilitation wards for poststroke rehabilitation between April 2012 and December 2014 in Nagasaki, Japan. Inclusion criteria for study participation were individuals aged 65 years or older who scored 0 to 7 on the Mini Nutritional Assessment Short-Form (MNA-SF) on admission to the hospital (a score of 0 to 7 indicates malnutrition). Exclusion criteria included being transferred to an acute-care hospital owing to an exacerbation of clinical condition or surgical operation (eg, recurrent stroke, severe pneumonia, gastrointestinal bleeding, and gastrostomy); therefore, these patients did not complete the rehabilitation program. Individuals who were already disabled before stroke onset would be expected to have difficulties with functional recovery. Therefore, individuals who had certification for public long-term care insurance in Japan before stroke onset were also excluded. The MNA-SF includes presence of physical or mental stress within the past 3 months. Because all individuals being screened for study participation had recently experienced a stroke, the MNA-SF score would be expected to be low in individuals who were discharged from rehabilitation wards in fewer than 90 days from stroke onset. Thus, these individuals were also excluded from study participation.

Information regarding study participants' characteristics, including age, sex, primary diagnosis (eg, cerebral infarction, intracranial hemorrhage, and subarachnoid hemorrhage), history of stroke, length of hospital stay (LOS), days from stroke onset to admission to the convalescent rehabilitation wards, and discharge outcome (their own home or others, such as long-term care facilities and long-term care hospitals), were collected via medical records by the authors and the clerical staff. All participants received a detailed nutrition assessment, including anthropometry, a nutrition-focused physical assessment, a nutrition interview, and calculation of required energy needs, conducted by a registered dietitian (RD). They were also provided individualized nutritional support from a multidisciplinary team, including a rehabilitation physician, RD, nurse, physical therapist, occupational therapist, speech-language-hearing therapist, social worker, care worker, dental hygienist, and pharmacist according to the facility's protocol.

The ethics committee of the Nagasaki Rehabilitation Hospital approved this study. The ethics committee exempted the researchers from obtaining informed consent from the participants because the study analyzed only retrospective anonymous data.

Nutrition Assessment

Our study evaluated nutritional status using a revised version of the MNA-SF[21] on admission and discharge, assessed by RDs. The MNA-SF is a validated, reliable nutrition screening tool for elderly people[21-24] that includes six lower-order items such as decrease in food intake (0=severe decrease vs 2=no decrease), weight loss (0=>3 kg vs 3=no weight loss), mobility (0=bed or chair bound vs 2=goes out), presence of physical or mental stress (0=yes vs 2=no), neuropsychological problems (0=severe dementia or depression vs 2=no impairment), and body mass index (BMI) (0=<19 vs 3=≥23). If BMI was uncertain, the use of calf circumference instead of BMI was permitted. The total score for the MNA-SF ranges between 0 and 14 points. The patient's nutritional status was classified based on the MNA-SF score into the following three categories: malnourished (0 to 7 points), at risk of malnutrition (8 to 11 points), and normal nutritional status (12 to 14 points).

The participants were then divided according to the MNA-SF score at discharge into the following three groups: no improvement of nutritional status (NI) (0 to 7 points), lesser improvement (LI) (8 to 11 points), and greater improvement (GI) (12 to 14 points). The MNA-SF was assessed by an RDN. The MNA-SF includes mobility and neuropsychological problems, which are also components of the functional independence measure (FIM) and may be strongly correlated with the primary and secondary outcomes; therefore, all lower-order items of the MNA-SF were investigated for multivariable analysis.