Original Research

Clarification of Factors Determining Discharge Destination Among Elderly Patients After Stroke With Low Levels of Independence in Activities of Daily Living: A Retrospective Study

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Abstract *Objective:* To determine factors influencing discharge destination of elderly patients after stroke with low levels of independence in activities of daily living (ADL).
Design: Cross-sectional study.
Setting: A community-based public hospital in a rural area in Japan.
Participants: A total of 67 patients with low daily function among 205 elderly patients with stroke screened for eligibility (N=67).
Interventions: Not applicable.
Main Outcome Measures: Motor component of functional independence measure (M-FIM) at discharge and discharge destination—home or long-term care facility (LCF).
Results: Among the 205 eligible patients, 147 were discharged home and 58 were discharged to LCFs. Patients with an M-FIM score of ≤30 at discharge were defined as patients deemed difficult to discharge home because of low independence levels in ADL. Of the 147 patients discharged home, 24 (16.3%) had M-FIM scores of ≤30. Of the 58 patients discharged to LCFs, 43 (74.1%) had

M-FIM scores of ≤30. Patients with an M-FIM score of ≤30 at discharge significantly tended to be discharged home if they obtained oral intake vs tube feeding as a nutritional method (*P*=.047) and higher cognitive component of FIM scores at discharge (*P*=.002). All six patients who lived alone among patients with an M-FIM score of ≤30 were discharged to LCFs. Two patients on tube feeding were discharged home.

Conclusions: Nutritional method, cognitive function at discharge, and the prestroke living situation with or without household caregivers are important factors of discharge among elderly patients after stroke with low independence levels in ADL. However, only a small number of severely disabled patients were successfully discharged home.

Given the aging population in Japan,[1] there has been an increase in the number of elderly people requiring assistance in performing activities of daily living (ADL).[2] Recently, stroke as a cause of death decreased in Japan[3]; however, critical importance remains because stroke tends to occur in elderly people with frailty. Stroke often affects the motor and cognitive functions of patients, resulting in loss of independent living. Generally, stroke comprised 17% of all beneficiaries designated by nursing-care insurance in Japan, the second leading cause after dementia.[4] Stroke at the acute phase offers integrated therapy such as operation or catheter intervention. Although early rehabilitation with acute-phase therapy is administered to patients hospitalized for stroke recently in Japan, 30%-50% of patients continue to experience moderate or severe disability at discharge.[5] Consequently, patients are transferred to units providing inpatient rehabilitation.[5] Multidisciplinary rehabilitation continues to reduce disabilities after transference; however, some patients remain in low daily function and may require permanent admission to long-term care. Sequels of stroke influence the quality of life (QOL) of the suffering individuals and also affect the families who act as caregivers.[6] Several previous studies have confirmed that functional independence is strongly associated with discharge destination.[7-11] Marital status is a significant predictor of discharge destination.[8,9,12,13] Remarkably, caregiver availability affects discharge destination.[13,14] Many studies showed that older patients tended to be discharged to long-term care facilities (LCFs).[10,11,13,14] Most studies concluded sex was not a significant factor of discharge determination.[15] However, medical treatments such as care of pressure ulcer or sputum suction were not previously considered as determining factors of discharge destination. Severely disabled patients often need these managements, which may increase the burden of caregivers.

However, the number of patients with severe disabilities who returned to their previous living situation was small based on our experiences. Therefore, this study aimed to determine the factors influencing discharge disposition of elderly patients after stroke with low levels of independence in ADL. The results will help persons with severe disability and their families to return to their homes and help the staff who struggle with the difficult task regarding discharge destination of severely disabled patients with stroke.

Methods

Design and setting

This was a retrospective observational study, with data collected from Minamiuonuma City Hospital (MCH). Initially, patients suffering from acute stroke in this region are mainly admitted to two hospitals with neurosurgeons or neurologists. After the initial treatment, patients requiring further rehabilitation are referred to secondary hospitals near their residence, including MCH as inpatient rehabilitation. MCH is a community-based public hospital with 140 beds and a rehabilitation department. A credentialed rehabilitation doctor takes charge of all referred patients with stroke, and a multidisciplinary rehabilitation approach is provided. Essentially, families of patients referred to MCH are informed before admission that rehabilitation should be set at home discharge through an integrated rehabilitation approach. Ethical approval for this study was obtained from research ethics committees at the International University of Health and Welfare. Research ethics committees approved a waiver of informed consent to participants, because the data of participants were ensured anonymity. The study was carried out in accordance with the Declaration of Helsinki.

Participants

All patients with stroke referred to MCH, discharged from January 2016 to December 2020, were screened for eligibility to be included in the study. Inclusion criteria were ≥60 years old defined as elderly patients, living in the region including MCH regulated as one comprehensiveness unit by administering and diagnosing stroke, including cerebral infarction, intracerebral hemorrhage, and subarachnoid hemorrhage. Patients who died and nursing home residents were excluded.

Data collection

Demographic data including sex, age, prestroke, and poststroke residence (home or LCFs) were obtained from the medical charts. LCFs were defined as nursing homes and long-term care beds. Type of stroke, duration from onset to transfer to MCH, and length of stay in rehabilitation were also collected from the medical records.

We designed a group work that aimed to extract the factors contributing to discharge destination of elderly patients after stroke with low levels of independence in ADL. The members of the group consisted of the study researcher and two social workers who were in charge of all participants. We gathered all possible factors regarding discharge destination and classified them into several groups with similar characteristics thorough a discussion. Finally, thre domains including individual, family, and environmental factors which affect discharge destination were identified, detailed as follows: (1) Individual factors: independence level of daily living, cognitive function, emotional symptoms such as agitation or irritability, nutritional method (oral intake or tube feeding), and necessary medical treatments (care of pressure ulcer and sputum suction); (2) Family factors: living with families or not, the status of households as a caregiver (age, sex, health condition, and experience of care), and the relationship between patients and households; (3) Environmental factors: outside stairs to the entrance and house structure (wheelchair availability and of using stairs for transfer).

The motor component of functional independence measure (M-FIM) was used to evaluate the daily living function and was proven as a significant determining factor of discharge destination.[8,13,16,17] The rehabilitation staff measured FIM scores of all patients with stroke referred from other hospitals at admission and discharge. Both FIM scores were collected. Considering the results of the group work and previous studies, data of nutritional method (oral intake, nasal tube feeding, or percutaneous endoscopic gastrostomy tube feeding), necessary medical treatments (daily care of pressure ulcer and regularly sputum suction), prescribed medicines at discharge to control insomnia and emotional symptoms such as agitation or irritability, and prestroke living arrangement (living alone or with households) among participants with low levels of independence of daily living determined using the M-FIM score at discharge. Data of primary caregivers (sex and relationship between the main caregiver and patient) and postdischarge

medical follow-up (outpatients or home-care practice) were also collected from medical records among participants with low levels of independence in ADL who were discharged home.

Data analysis

Continuous variables of characteristics of all recruited eligible patients were calculated as means and standard deviation, and categorical variables were calculated as frequencies or proportions. Characteristics of participants with low M-FIM scores were divided into home- and LCF-discharged groups. Data of both groups were calculated the same as all eligible patients. Continuous variables of the two groups were compared using unpaired t tests, and categorical variables were compared using Pearson chi-square or Fisher's exact tests selected by statistical regulation. The P values of the analyzed results were also shown. IBM SPSS Statistics ver. 27 (IBM, New York, USA) was used for all analyses.

Results

A total of 218 elderly patients with stroke were referred to MCH: 8 died, 4 lived in nursing homes before the onset of stroke, and 1 who developed stroke while temporarily staying were excluded. Finally, 205 patients were screened for eligibility, comprising 147 (72%) who were discharged home and 58 (28%) discharged to LCFs (figure 1). Three patients were referred to other general hospitals because of status epilepticus, severe infectious pressure ulcer, and operation of tracheoesophageal diversion to prevent aspiration. They all returned to MCH, restarted rehabilitation, and were discharged home. They were included as eligible patients. The demographic data of recruited eligible patients are described in table 1.

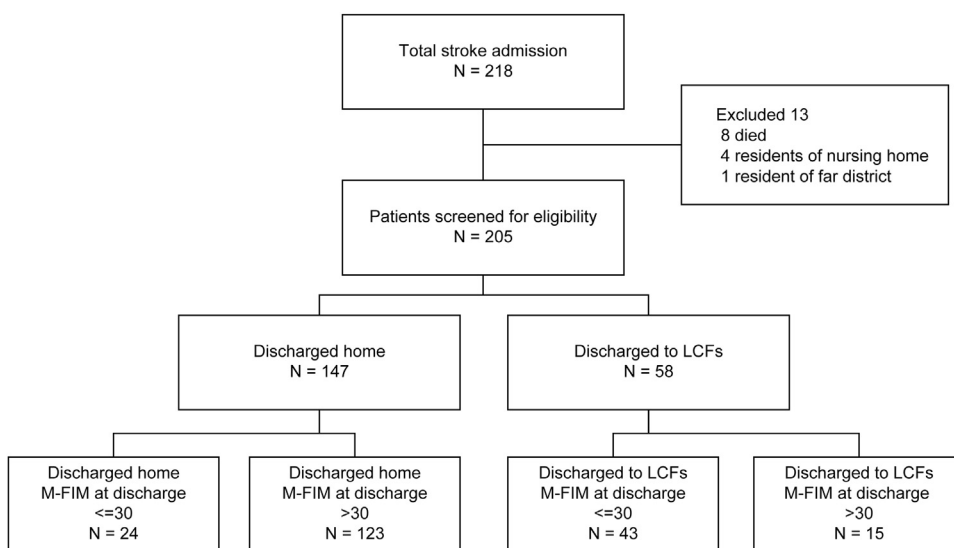Distribution of the number of patients every 10 points of M-FIM scores at discharge showed that M-FIM scores of ≤30

Fig 1 Study sample.

Table 1 Characteristics of recruited eligible patients

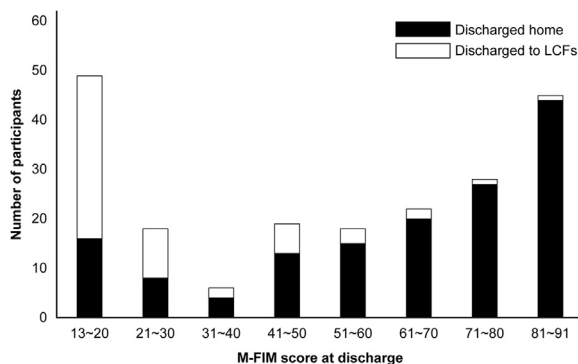| Characteristic	n	(%)	Mean ± SD
Age (y)	205		76.8±8.8
Sex (male)	123	(60.0)	
Type of stroke	205		
Cerebral infarction	134	(65.4)	
Intracerebral hemorrhage	60	(29.3)	
Subarachnoid hemorrhage	11	(5.4)	
Stroke onset to transferred to rehabilitation (day)	205		40.1±18.7
Length of stay in rehabilitation (day)	205		70.9±35.4
Poststroke residence			
Home	147	(71.7)	
Long-term care faculties	58	(28.3)	
M-FIM at admission	205		36.9±22.1
C-FIM at admission	205		21.6±9.9
T-FIM at admission	205		58.5±29.8
M-FIM at discharge	205		52.3±27.5
C-FIM at discharge	205		23.7±9.7
T-FIM at discharge	205		76.0±35.5

at discharge in patients who were discharged to LCFs were higher than those who were discharged home (figure 2). Therefore, patients with an low M-FIM score of ≤30 at discharge were set as having difficulties discharging home. Among the 147 patients who were discharged home, 123 (83.7%) patients had M-FIM scores of >30 and 24 (16.3%) had ≤30. Of the 58 patients discharged to LCFs, 15 (25.9%) had M-FIM scores of >30 and 43 (74.1%) had ≤30 (figure 1).

Comparison of the characteristics of participants discharged home and to LCFs with an M-FIM score of ≤30 is shown in table 2. The results showed that those who returned home had significantly better cognitive components of FIM (C-FIM) scores and oral intake (vs tube feeding) among severely disabled patients with stroke. The mean C-FIM score of patients who were discharged home with an M-FIM score of ≤30 is 17.6 (1SD is 8.6). All six patients living alone were discharged to LCFs. Moreover, patients who needed regular sputum suction were more likely to be discharged to LCFs.

For the home-discharged patients, primary caregivers consisted of 15 women and 7 men (table 2). Two participants were excluded because one main caregiver could not be identified. After home discharge, 15 patients were followed up through home-care practice and 9 as outpatients (table 2).

We identified three important contributing factors that affect discharge destination among severely disabled patients with stroke, namely, nutritional method, cognitive function at discharge, and the prestroke living situation with or without household caregivers. Figure 3 presents a mosaic plot displaying LCF-discharged participants divided by three important factors. We seta mean C-FIM score at discharge of 18 as the score that can be further divided into the higher and lower C-FIM score, because the mean C-FIM score of home-discharged patients among the participants with an M-FIM score of ≤30 at discharge was 17.6. Of all the 43 LCF-discharged patients, 6 regained oral intake and had a C-FIM score of >18 at discharge, but they could not be discharged home. Figure 4 presents a mosaic plot showing home-discharged patients divided by two affecting factors: nutritional method and cognitive function at discharge, as all home-discharged patients lived with one or more home members. Of all the 23 home-discharged patients, 9 regained oral intake but retained low C-FIM scores (<18) and 2 patients required tube feeding at discharge.

Discussion

This study focused on factors influencing discharge destination of elderly patients after stroke with low levels of independence in ADL. Several previous studies have tried to identify these factors based on their status at admission.[7-9,11,14,16] If factors affecting discharge destination are recognized at the start of rehabilitation, appropriate early approaches to achieving home discharge will be surely expected to provide to the patients and their families. However, accurately predicting the functional status at discharge at the time of hospitalization may be difficult. In this study, M-FIM scores of 20% of all recruited eligible patients increased by 30 points from admission to discharge. This study showed some severely disabled

Fig 2 Distribution of M-FIM scores at discharge among recruited eligible patients discharged home and to LCFs.

Table 2 Characteristics of participants discharged home and to LCFs with an M-FIM score of ≤30 at discharge

| Variable	Home (n = 24)	(%)	LCF (n = 43)	(%)	P Value
Age (y)	80.3±10.3		81.5±7.6		0.615
Sex (male)	12	(50.0)	18	(41.9)	0.521
Type of stroke					
Cerebral infarction	15	(62.5)	25	(58.1)	
Cerebral hemorrhage	8	(33.3)	14	(32.6)	
Subarachnoid hemorrhage	1	(4.2)	4	(9.3)	
Prestroke living arrangement					
Alone	0	(0.0)	6	(14.0)	0.081
Living with 1 or more households	24	(100)	37	(86.0)	
Living with 1 household	5	(20.8)	11	(25.6)	
Living with 2 or more households	19	(79.1)	26	(60.5)	
Medicines prescribed for emotional symptoms	4	(16.7)	6	(14.0)	0.737
Medicines prescribed for insomnia	9	(37.5)	8	(18.6)	0.088
M-FIM at discharge	19.7±6.3		17.3±5.2		0.099
C-FIM at discharge	17.6±8.6		11.4±6.8		0.002
T-FIM at discharge	37.3±13.1		28.7±10.8		0.006
Nutritional method*					
Oral intake	21	(91.3)	30	(69.8)	0.047
Tube feeding	2	(8.7)	13	(30.2)	
Nasal tube feeding	1	(4.3)	5	(11.6)	
Percutaneous endoscopic gastrostomy	1	(4.3)	8	(18.6)	
Necessary medical treatments					
Daily care of pressure ulcer	3	(12.5)	6	(14.0)	1.000
Regularly sputum suction	2	(8.3)	8	(18.6)	0.258
Sex of primary caregiver†					
Female	15	(68.2)			
Male	7	(31.8)			
Postdischarge medical follow-up					
Home-care practice	15	(62.5)			
Outpatient	9	(37.5)			

NOTE. Values are mean ± SD or n (%).

* One participant discharged home with only little subcutaneous drip infusion as the nutritional method was excluded.

† Two participants were excluded because no main caregiver could be identified.
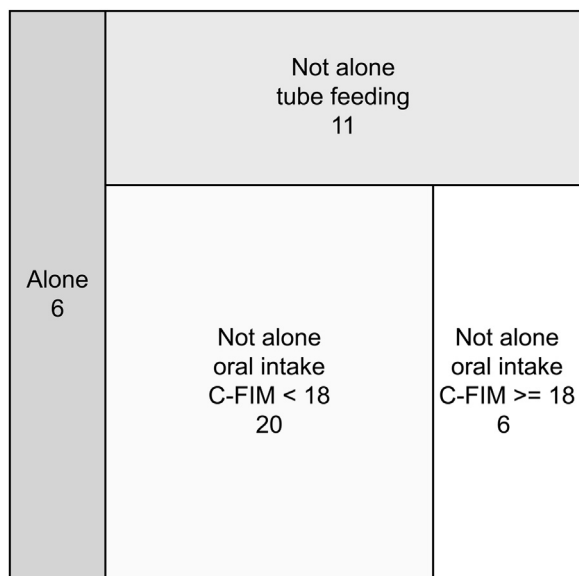
Fig 3 Mosaic plot showing LCF-discharged participants with M-FIM scores of ≤30 at discharge divided by affecting discharge determining factors (n=43).
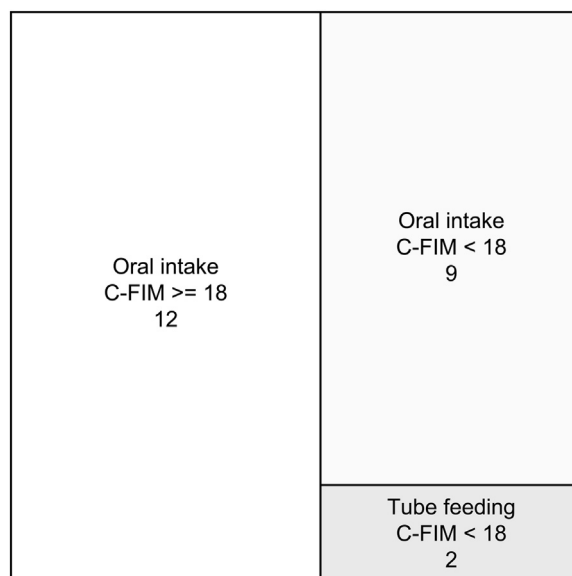
Fig 4 Mosaic plot showing home-discharged participants with M-FIM scores of ≤30 at discharge divided by affecting discharge determining factors (n=23).

patients with stroke at admission remarkably improved at discharge. Taken together, we focused on the status at discharge as determining factors of discharge destination.

Most previous studies did not stratify patients according to the level of independence of daily function to identify discharge determining factors. Regarding discharge destination, independent patients usually experience less difficulties compared with patients requiring assistance in daily living. Therefore, patients should be stratified by the stroke severity and analyzed to identify precise contributing factors. We defined an M-FIM score of ≤30 at discharge as a low function of ADL. Pereira et al. (2014) presented factors affecting discharge destination of patients with severe stroke.[14] In this study, the mean total FIM (T-FIM) score at admission for recruited patients with severe stroke was 50.4 (1SD is 11.4). Nguyen et al. (2007) also analyzed discharge destination of patients after stroke with low FIM scores at admission.[9] They set ≤40 as a very low FIM score at admission. In our study, the mean T-FIM score at discharge of the home-discharged patients with M-FIM scores of ≤30 was 37.3 (1SD is 13.1) and that of the LCF-discharged patients was 28.7 (1SD is 10.8). Our study samples presented more disabled patients compared with similar previous studies. However, it is emphasized that about one-third of patients with M-FIM scores of ≤30 could return home in our study.

Several studies presented cut-off scores between home and other living situations based on the receiver operating characteristic curve.[18-20] Reistetter et al. (2010) reported that the T-FIM score of 78 at discharge rating was the cut-off score.[18] We did not applya receiver operating characteristic curve; however, another method must be used to stratify patients into the home- and LCF-discharged group.

Dysphagia commonly occurs at the acute phase of stroke.[21] Severe dysphagia causes persistent enteral feeding, such as nasal tube feeding or percutaneous endoscopic gastrostomy tube feeding. Maeshima et al. (2011) reported that among 409 patients with acute stroke, 96 resulted in enteral feeding at discharge.[22] Dysphagia has a severe effect on clinical outcome, mortality, institutionalization,[23] and QOL[24] of patients with stroke. The present study shows that tube feeding markedly influences discharge destination. A total of 15 patients with low daily function required tube feeding at discharge, and 13 of them were discharged to LCFs. Rehabilitation to obtain oral intake is of great importance for patients with dysphagia after stroke.

The existence of household caregivers is necessary for severely disabled patients to discharge home and maintain their daily living. In our study, all severely disabled patients living alone were discharged to LCFs. Home-care services are provided to those who require assistance in daily living through nursing-care insurance among elderly people in Japan. However, formal services cover only a limited part of daily living. Therefore, informal caregivers care for their disabled families. The burden of caregivers is a serious and unavoidable problem. Low independence in ADL of persons with stroke yielded an increased risk of burnout among caregivers, and ≥40% of persons with stroke need a secondary caregiver at three months poststroke.[25] QOL of caregivers was adversely affected by the level of the patient's disability.[26] QOL of persons with stroke and caregivers covaried and emphasized the dyadic approach.[27]

Medical treatments such as daily care of pressure ulcer or regular sputum suction were not considered as contributing factors regarding discharge destination. These treatments require nursing skills; therefore, caregivers may experience difficulties and have less confidence while performing these tasks. These tasks must increase the burden of caregivers physically and mentally. The present study showed that the proportion of regular sputum suctioning in the LCF-discharged group was four times higher than that of the home-discharged group though not shown significant. We assume that sustainable medical treatments are unmissable barriers to return home.

This study also revealed C-FIM scores of the home-discharged group were significantly higher than those of the LCF-discharged group. Stroke usually deteriorates not only motor function but also cognitive function.[28] The prevalence of poststroke cognitive impairment is from 20% to 80%, which varies between countries or races.[28] Cognitive impairment related to stroke often presents emotional symptoms such as agitation or irritability.[29] We considered that insomnia and emotional symptoms related to cognitive deterioration that occurred among patients with stroke were the inhibiting factors of home return. Therefore, we tried to determine the presence of these symptoms from prescribed medicines at discharge, which were aimed to alleviate such symptoms. This study showed that there were no differences in the prescription rate of medicines for emotional symptoms between the home- and LCF-discharged groups. Moreover, one-third of home-discharged patients (9 out of 24 patients) were prescribed medicines for insomnia. The prescription rate was two times higher than that of the LCF-discharged group. This result was considered one of the influencing factors that increase the burden of household caregivers.

This study showed that sex is not a significant factor affecting discharge destination, as reported otherwise by a past systematic review.[15] However, among the main household caregivers of persons with severe disability who returned home, women were more common (15 women vs 7 men). This difference may be observed between the sex of caregivers regarding the ability to conduct housework and care for the family with sequels due to stroke. Moreover, women may be willing to live with their husbands or parents, although their families have difficulties with independent living.

We presented the determining factors influencing discharge destination of elderly patients after stroke with low levels of independence in ADL. However, the process of preparing severely disabled elderly patients to return to their previous living situation remains problematic.

In Japan, home medical care practice is provided to disabled patients having difficulties going to clinics or hospitals as outpatients.[30] It comprises regular house calls by physicians and 24-h on-call care.[30] Patients with severe disabilities who return home with their families are more likely to be anxious after discharge because they have difficulty accessing hospitals because of gait disturbances or the need for wheelchairs. However, if home medical care is prepared after discharge for such patients, it may reduce anxiety and encourage patients and their families to return home. The present study shows home medical care was provided to two-third of home-discharged participants with low daily function. We assume that home medical care practice might

contribute to severely disabled patients who were discharged home and their families.

The barrier of home discharge among severely disabled patients is multifactorial and has complexity. We identified three main factors affecting discharge destination among severely disabled elderly patients with stroke, namely, nutritional method, cognitive function at discharge, and prestroke living arrangement (living alone or not). Among all the 43 LCF-discharged patients, 6 lived with one or more household caregivers, regained oral intake, and obtained C-FIM scores of ≥ 18 at discharge. These patients might have possibilities of home discharge, and further investigation about other determining factors should be required. Although a small number, severely disabled elderly patients also achieved successful home discharge. In our study, two patients on tube feeding achieved home discharge, and nine patients with possible oral intake but remained with C-FIM scores of <18 at discharge also returned home. It is important that supporting staff do not give up home discharge and should inform patients and their families that some patients with the same situation returned home. The overall goal is for all people, including disabled individuals with stroke, to continue to live at home and in their familiar community and respecting their decision, even if they face difficulties in returning home.

Study limitations

This study targeted patients after stroke with low daily function who were discharged home and to LCFs. As expected, recruited patients were relatively scarce for comparing the characteristics of both the groups. More patients will be expected to be included in future studies to increase the statistical power. This study was performed at one institute. A multicenter study will allow more generalizable results. Principally, rehabilitation was provided to patients from 80 to 120 min per day without Sunday. However, we did not investigate the degree of rehabilitation to patients accurately. It might affect the results of rehabilitation and discharge destination. This study was conducted in a rural area in Japan; therefore, home-care services were not fulfilled as compared with the urban area. It might also affect discharge destination.

Conclusions

Our study showed nutritional method, cognitive function at discharge, and the prestroke living situation with or without household caregivers are important factors of discharge destination among elderly patients after stroke with low independence levels in ADL. Among the LCF-discharged patients, there are several patients who lived with one or more household caregivers, regained oral intake, and obtained C-FIM scores of ≥ 18 at discharge. Further investigation about other determining factors should be required. Although a small number, there are patients with tube feeding and/or C-FIM scores of <18 at discharge who were successfully discharged home.

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