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Brief Report

Evaluation of Functional Independence Measure item scores for predicting home discharge after acute stroke rehabilitation

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ABSTRACT
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Objective: To determine whether certain Functional Independence Measure (FIM) items assessed early during acute-stage rehabilitation are predictive of home discharge for patients with stroke following intervention.
Methods: Medical record data were retrospectively compiled and analyzed for 103 patients with stroke admitted to our hospital between December 2016 and March 2017. Patients were either discharged to their own homes (n=41) or transferred to another facility (n=62) after acute-phase rehabilitation. Fisher's exact test was used to compare characteristics between the home and transfer groups. Stepwise multiple logistic regression analysis was also performed to identify FIM items predictive of patients' discharge destination.
Results: Significant differences between the home and transfer groups were observed for all FIM items, except for shower/tub transfer and stairs. Eating and social interaction were identified as significant predictors of the post-rehabilitation destination in multiple logistic regression analysis (p=0.001, odds ratio [OR]: 10.956, 95% confidence interval [CI]: 0.638–1.755; p=0.008, OR: 4.273, CI: 0.182–1.269, respectively).
Conclusion: In some cases, early assessment of FIM items, particularly eating and social interaction, after a stroke can help predict a patient's discharge destination after rehabilitation.
Key words: acute phase, stroke, outcome

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Introduction

Recent developments in stroke medicine have reduced the length of patient stay in acute-care hospitals; these include streamlining systems that rapidly transport patients to a hospital after a stroke and regional medical collaboration during the acute, recovery, and maintenance phases via a "community medical partnership path" [1]. In tandem, efforts have been made to achieve shorter hospital stays for rehabilitation.

Multiple studies have claimed that certain instruments, such as the National Institute of Health Stroke Scale and Functional Independence Measure (FIM), which are administered when a patient first arrives at a stroke rehabilitation center, can significantly predict the outcome of time spent in recovery before discharge/transfer [2–7]. However, no studies have examined FIM item scores collected during the acute phase of a stroke as potential predictive factors. One reason for this is the restriction placed on activities of daily living (ADLs) for patients with acute stroke because of treatment policies, which limit the number of FIM items that can be assessed.

However, it is the responsibility of physical therapists and occupational therapists involved in acute care to start rehabilitation as early as possible after stroke onset based on a series of assessments, and to make decisions to recommend home discharge or transfer to another medical facility for further care [8]. FIM items that could predict the potential for home discharge at a patient's first rehabilitation session would serve as a helpful reference for clinical efforts.

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This study aimed to identify specific FIM items whose scores are predictive of a stroke patient's discharge destination after acute-phase rehabilitation.

Methods

Ethical statement

This study received approval from the Research Ethics Committee of our facility (July 10, 2017; approval number 17T7015).

Patients and study design

The subjects consisted of 138 patients with stroke who were admitted to our hospital between December 2016 and March 2017. Patients were excluded if they met any of the following criteria:

(1) rehabilitation did not start within 3 days of stroke onset,
(2) clearly insufficient data; e.g., multiple missing values, and
(3) FIM not assessed/unavailable.

Ultimately, data from the medical records of 103 patients were retrospectively analyzed.

These patients were divided into two groups according to whether they were discharged to their own home (home group: n=41) or transferred to another hospital (transfer group: n=62) after acute rehabilitation.

FIM assessment

FIM assessments were performed within 7 days of stroke onset. The variables of interest were respective scores of each of the 18 items of the FIM: eating, grooming, bathing, upper body dressing, lower body dressing, toileting, bladder management, bowel management, bed/chair/wheelchair transfer, toilet transfer, shower/tub transfer, locomotion (walk/wheelchair), stairs, comprehension, expression, social interaction, problem solving, and memory. Each item was analyzed in terms of a binary, dummy variable (independent/dependent) to characterize the degree of functional independence/dependence: dependent, ≤5 points; independent: ≥6 points. These cut-offs correspond to established FIM criteria for requiring a helper or not (no helper: ≥6 points; helper: ≤5 points) [9].

Statistical analysis

Fisher's exact test was used to compare characteristics between the home and transfer groups. Predictors of the discharge destination were identified using stepwise multiple logistic regression analysis while controlling for multicollinearity by examining correlations between FIM items. The post-rehabilitation destination (home versus transfer) was the dependent variable, and FIM item scores were the independent variables. Statistical software JMP version 13 (SAS Institute Inc., Cary, NC, USA) was used to perform all analyses. The significance level was set at 5%.

Results

Characteristics of the stroke patients are shown in Table 1. Significant differences were found in all FIM items, except for shower/tub transfer and stairs, between the home and transfer groups (Table 2). Notably, eating and social interaction were identified as significant predictors of post-rehabilitation destination in a multiple logistic regression analysis (p=0.001, odds ratio [OR]: 10.956, 95% confidence interval [CI]: 0.638−1.755; p=0.008, OR: 4.273, CI: 0.182−1.269, respectively; Table 3). The correct classification rate was 80.6%.

Discussion

This study showed that certain FIM items, when assessed soon after a stroke patient begins acute-stage rehabilitation, were predictive of home discharge.

Ischemic stroke accounted for a high percentage of the study population (66.0%). This rate was comparable to national estimates of acute stroke in Japan [10].

More patients were transferred to another facility for further care than discharged to their own homes (60.1% versus 39.8%). One study exhibited the same trend [7], although another study reported that home discharge accounted for the majority of patients [2]. These discrepancies may be attributable to regional differences in disease prevalence or in the number of hospitals available.

In some cases, FIM items assessed early after a stroke can significantly correlate with a patient's next destination after discharge from rehabilitation; scores for eating and social interaction were especially

Table 1. Characteristics of the stroke patients (n=103).

Age (y)	67.1±12.9
Duration from stroke onset to start of rehabilitation (d)	1.1±0.6
Duration of hospital stay (d)	22.8±13.2
FIM	
Total score	60.9±34.0
Motor score	38.4±24.3
Cognitive score	22.3±11.9
Sex	
Male	64 (62.1%)
Female	39 (37.8%)
Type of stroke	
Ischemic stroke	68 (66.0%)
Hemorrhagic stroke	31 (30.1%)
Subarachnoid hemorrhage	4 (3.8%)

FIM, Functional Independence Measure.
Data are presented as mean±standard deviation or number and percentage.

Table 2. Scores for each FIM item in the home and transfer groups.

FIM (18 items)	Home group, *n*=41	Transfer group, *n*=62	*p*-Value
Eating			
Independent	27	6	<0.001*
Dependent	14	56	
Grooming			
Independent	17	2	<0.001*
Dependent	24	60	
Bathing			
Independent	9	2	0.006*
Dependent	32	60	
Upper body dressing			
Independent	12	3	<0.001*
Dependent	29	59	
Lower body dressing			
Independent	16	2	<0.001*
Dependent	25	60	
Toileting			
Independent	18	2	<0.001*
Dependent	23	60	
Bladder management			
Independent	23	7	<0.001*
Dependent	18	55	
Bowel management			
Independent	22	7	<0.001*
Dependent	19	55	
Bed/Chair/ Wheelchair transfer			
Independent	14	2	<0.001*
Dependent	27	60	
Toilet transfer			
Independent	14	2	<0.001*
Dependent	27	60	
Shower/Tub transfer			
Independent	6	2	0.056
Dependent	35	60	
Locomotion (walk/wheelchair)			
Independent	12	2	<0.001*
Dependent	29	60	
Stairs			
Independent	4	1	0.08
Dependent	37	61	
Comprehension			
Independent	29	17	<0.001*
Dependent	12	45	
Expression			
Independent	28	16	<0.001*
Dependent	13	46	
Social Interaction			
Independent	34	22	<0.001*
Dependent	7	40	
Problem Solving			
Independent	27	13	<0.001*
Dependent	14	49	
Memory			
Independent	27	17	<0.001*
Dependent	14	45	

*: $p<0.05$, Fisher's exact test.

predictive. The model achieved a correct classification rate of 80.6%, which is a high value comparable to the performance of the models in other studies on acute-phase stroke [4, 5].

Several factors account for the predictive power of the FIM item eating in the model. The ability to eat independently can be impeded by various factors, ranging from physical ones (e.g., restrictions on joint range of motion, dyscoordination, and chewing/swallowing disorders) to mental ones (higher-order impairment and cognitive or volitional dysfunction) [11]. Patients who score highly on eating, by extension, can be presumed to lack serious problems in any of these dimensions. Indeed, Okabayashi et al. previously demonstrated that the duration of fasting after a stroke affects clinical outcomes [12]. Additionally, Okamoto et al. stated that combined with aging, excessive fasting in acute stroke patients can not only facilitate disuse syndrome, but also have lasting effects on patients' ADL performance [13]. Patients with only mild stroke would likely not go without food for long intervals during hospitalization, which would improve their hope for home discharge; this may help explain the importance of eating in the model.

The second predictive FIM item identified was social interaction. Ezure et al. previously demonstrated the need to assess cognitive ADLs in patients with stroke [14]. Similarly, Inoue found that a relatively high score on social interaction assessed early in a patient's hospital stay was predictive of greater increases in the levels of several activities [15]. Thus, stroke patients who are able to re-acquire ADL abilities faster are more independent when admitted to hospital following the stroke episode.

A limitation of the present study is the risk of bias inherent in the analysis of data due to the retrospective study design. Our next task will be to prospectively collect data for predefined variables based on the aforementioned findings.

Clinicians may have no choice but to limit ADL assessments of patients with acute stroke to those items that can be performed at rest; guidelines stipulate bed rest for 1 to 3 days after a stroke because of the risk of exacerbation of the patient's condition. Fortunately, eating and social interaction are two FIM items that can be easily evaluated at rest, supporting their feasibility as clinical indicators of rehabilitation outcomes. Our recommendations for clinicians are: 1) to focus on a patient's degree of independence in terms of eating and social interaction when conducting the FIM early after a stroke episode, even when they are confined to bed rest; and 2) to support the patient's path to independence through interprofessional collaboration.

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Table 3. Predictors of patients' post-rehabilitation destination.

	B (SD)	*p*-Value	Odds ratio	95% CI	
				Lower	Upper
Eating	1.196	0.001*	10.956	0.638	1.755
Social Interaction	0.726	0.008*	4.273	0.182	1.269

*: p=0.05, logistic regression analysis.
Correct classification rate: 80.6%.
SD, standard deviation; CI, confidence interval.

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