Factors Associated with Functional Improvement at Discharge in Stroke Rehabilitation

Piyapat Dajpratham, M.D.*, Suthipol Udompanturak, M.Sc., Jantra Karawek, B.Sc.***

**Department of Rehabilitation Medicine, **Clinical Epidemiology Unit, Office for Research and Development, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.*

ABSTRACT

Objective: To study the factors associated with the functional improvement at discharge in stroke patients receiving inpatient rehabilitation.

Methods: Retrospective review of the medical records of all the stroke patients admitted to inpatient rehabilitation, Department of Rehabilitation Medicine, Siriraj Hospital from January 2005 to December 2005.

Results: There were sixty-one stroke patients, 39 males and 22 females, with a mean age 62.5 years old. Most of them lived with their spouses (61%) and had cerebral infarction (61%). The risk factors of stroke reported were hypertension (86.9%), dyslipidemia (63.9%), diabetes mellitus (34.4%), previous stroke (31.1%), heart disease (18%), smoking (8.2%) and regular alcoholic drinking (3.3%) respectively. The right and left side weakness were equally reported. The median duration of stroke before admission was 62 days. The disabilities at admission were urinary incontinence (39.3%), dysphagia (32.8%), and aphasia (26.2%). During the hospital stay, the complications which occurred were shoulder problems (41%), other musculoskeletal pain (34.4%), depression (26.2%), shoulder hand syndrome (13.1%), urinary tract infection (6.6%), and pneumonia (4.9%) respectively. Forty-seven patients (77%) gained functional improvement at discharge. The Chi-Square and Independent Sample T tests revealed the association between the functional improvement at discharge and urinary continence on admission (p=0.011), and duration of stroke within 3 months before admission to rehabilitation (p=0.011) with the odds ratio 5.9 and 5.3 respectively.

Conclusions: The functional improvement after the process of inpatient stroke rehabilitation was associated with the duration of stroke within 3 months before rehabilitation admission and urinary continence on admission.

Keywords: Discharge; factor; functional improvement; rehabilitation; stroke

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The goals of rehabilitation management after stroke are to restore optimal physical and psycho-social-vocational function to enable the patient to become a productive participant in the community. Among these goals, optimum physical function which means the ability to walk and perform the normal self-care tasks is very meaningful to the stroke patients as well as their families. The motor and functional recovery are crucial for the functional improvement. Naturally, the motor recovery usually happens within the first 3-6 months after stroke[1]. Meanwhile, there is established evidence that stroke rehabilitation improves functional outcome by reducing disability in individual patients[2]. However, the functional recovery in every individual is different and is hardly predicted. There have been a number of studies exploring the predictive factors for functional improvement in various stages of stroke. For example; in the acute phase, the postadmission Barthel Index score was found to be the best predictor of hospital length of stay, hospital charge, discharge destination[3], and three years functional outcome after a stroke[4]. The urinary incontinence was the poor prognostic factor in the subacute phase for ambulation and activities of daily living at six months to one year after stroke[5].

The inpatient rehabilitation of the Department of Rehabilitation Medicine admitted the stroke patients in both acute and subacute phases. The stroke rehabilitation process is a goal-directed treatment which focuses on achieving specific objectives. Therefore, studying the factors that might affect the functional improvement in this group of patients would help the rehabilitation professionals select the more potential candidates, formulate the realistic and feasible goals, timely prepare for the discharge planning, and inform the patients and their families regarding the continuing care program.

Correspondence to: Piyapat Dajpratham
E-mail: siptb@mahidol.ac.th

Objectives

To study the factors which were associated with the functional improvement at discharge from inpatient rehabilitation among stroke patients.

MATERIALS AND METHODS

The retrospective review of the medical records was conducted in stroke patients who were admitted to inpatient rehabilitation during the period of January 2005 to December 2005. The inclusion criteria was all the admissions aiming to improve function.

The demographic data including age, gender, marital status, risk factors of stroke, duration of the stroke, the pathology of the stroke, the anatomy of circulation involved, the affected side, and the length of hospital stay were extracted. On admission the disabilities such as aphasia, dysphagia and urinary incontinence were obtained. The cognitive status was retrieved from the score of the Thai Mental State Examination (TMSE). The complications which occurred during the hospitalization including shoulder problems either shoulder pain and / or subluxation, shoulder hand syndrome, depression, urinary tract infection, pneumonia and musculoskeletal pain at other sites were also collected. The Barthel Index scores on admission and at discharge were recorded.

TABLE 1. The association of functional improvement and demographic characteristics.

Characteristics		FI	NFI	p value
Gender	Male	31 (79.5%)	8 (20.5%)	0.775
	Female	16 (72.7%)	6 (27.3%)	
Age (yr)	≤ 60	19 (82.6%)	4 (17.4%)	0.537
	> 60	28 (73.7%)	10 (26.3%)	
Marital status	Living with spouses	30 (81.1%)	7 (18.9%)	0.54
	Living alone	17 (71.9%)	7 (29.1%)	
Risk factors	Hypertension	42(79.2%)	11 (20.8%)	0.369
	Dyslipidemia	28 (71.8%)	11 (28.2%)	0.225
	Diabetes Mellitus	16 (76.2%)	5 (23.8%)	1.0
	Previous Stroke	15 (78.9%)	4 (21.1%)	1.0
	Heart Disease	7 (63.6%)	4 (36.4%)	0.256
	Smoking	4 (80%)	1 (20%)	1.0
	Alcoholic drinking	2 (100%)	0 (0%)	1.0
Pathology	Infarction	41 (80.4%)	8 (21.6%)	1.0
	Hemorrhage	6 (60%)	6 (25%)	
Circulation	Anterior	41 (80.4%)	10 (19.6%)	0.217
	Posterior	6 (60%)	4 (40%)	
Affected side	Right	26 (88.5%)	6 (11.5%)	NA
	Left	21 (72.4%)	8 (27.6%)	
Duration of stroke	Within 3 months	35 (87.5%)	5 (12.5%)	0.011*
	More than 3 months	12 (57.1%)	9 (42.9%)	
Mean TMSE score		19.3 ± 7.9	19.4 ± 6.9	0.98
Mean Barthel Index score on admission		39.1 ± 22.3	37.5 ± 30.7	0.818

*significant at p value < 0.05

The statistical analysis

The patients were divided into 2 groups namely functional improvement (FI) and no functional improvement groups (NFI). Functional improvement meant the change of Barthel Index (BI) score which was calculated from the difference between the BI score at discharge and on admission.

The demographic data, the disabilities, and the complications were reported as the percentage of the total subjects of each group. The scores from the measurement of both the TMSE and the Barthel Index were reported as the mean score.

The Chi- Square test was used to analyze the association between the stroke patients with functional improvement (FI group) and the demographic data including age, gender, marital status, risk factors, pathology, circulation involved, affected side, duration of stroke, TMSE score, the disabilities and the complications. The Independent Sample T test was used to compare the Barthel Index score on admission between the two groups. The Logistic Regression analysis was used to compare the factors associated with functional improvement. A p value less than 0.05 was considered statistically significant.

RESULTS

There were 63 stroke patients admitted to the inpatient rehabilitation ward at the the Department of Rehabilitation Medicine during the period of January 2005 to December 2005. Two of them were excluded from the study because they were admitted to receive acupuncture treatment in spite of having full function.

Most of the patients were males with a mean age 62.5 years old and still living with their spouses. Hypertension, dyslipidemia, diabetes mellitus, previous stroke, heart disease, smoking, and alcoholic drinking were risk factors reported among the patients respectively. All of them had the brain imaging study. The cerebral infarction affecting anterior circulation was the major radiological diagnosis. The right and left side weakness were almost equally reported.

Forty-seven patients had functional improvement at discharge whereas 14 patients had stable BI score. There were no associations between functional improvement and the following factors namely gender, age, marital status, risk factors, pathology, circulation involved, affected side, mean TMSE score, and mean BI score on admission. However, the duration of stroke within 3 months before admission to rehabilitation was statistically significant associated with the functional improvement (Table 1). The mean score of improvement was 28.9 ± 22.6 (Min-Max = 2-93).

The most common disability found on admission was urinary incontinence. The most common complication found during the hospital stay was shoulder problems. Urinary continence on admission was significantly associated with the functional improvement (Table 2).

The odds ratio of functional improvement at discharge was 5.9 and 5.3 for urinary continence and duration of stroke within 3 months before admission to rehabilitation respectively. (Table 3)

DISCUSSION

There were a number of factors that we were able to gather from the medical records having potential to affect the functional improvement after the process of inpatient stroke rehabilitation. From our study, age was not associated with functional improvement. The factor of age on functional outcome has been explored and revealed that the elderly had a comparable improvement in stroke rehabilitation[6].

TABLE 2. The association of functional improvement and disability and complications among stroke patients.

Problems		FI	NFI	p value
Disabilities				
● Urinary incontinence	yes	14 (58.3%)	10 (41.7%)	0.011*
	no	33 (89.2%)	4 (10.8%)	
● Dysphagia	yes	13 (65%)	7 (35%)	0.193
	no	34 (82.9%)	7 (17.1%)	
● Aphasia	yes	11 (68.8%)	5 (31.3%)	0.490
	no	36 (80%)	9 (20%)	
Complications				
● Shoulder problems	yes	19 (76%)	6 (24%)	1.0
	no	28 (77.8%)	8 (22.2%)	
● Other musculoskeletal pain	yes	17 (81%)	4 (19%)	0.753
	no	30 (75%)	10 (25%)	
● Depression	yes	10 (62.5%)	6 (37.5%)	0.164
	no	37 (82.2%)	8 (17.8%)	
● Shoulder hand syndrome	yes	5 (62.5%)	3 (37.5%)	0.369
	no	42 (79.2%)	11 (20.8%)	
● Urinary tract infection	yes	4 (100%)	0 (0%)	0.565
	no	43 (75.4%)	14 (24.6%)	
● Pneumonia	yes	3 (100%)	0 (0%)	1.0
	no	44 (75.9%)	14 (24.1%)	

*significant at p value < 0.05

A study reported old age was a poor predictor of functional recovery during the very early phase after stroke[7]. However, the frail aged persons had higher risk to have poorer health and be institutionalized after stroke[8]. Most of our patients were able to discharge to home and had their families taking the responsibility in continuing care of them.

Similar to other studies; gender, marital status, risk factors, pathology of stroke, and affected side showed no correlation with the functional improvement. Most of our subjects had a lesion at the anterior circulation. The incidence of anterior circulation stroke was greater than posterior circulation stroke. Moreover, stroke patients who had a lesion at the anterior circulation had a less favorable outcome than the other group[9].

The duration of stroke within 3 months before admission to rehabilitation was significantly associated with the functional improvement. The impact of early and delayed admission to rehabilitation on functional outcome has been extensively studied. Salter found that patients admitted to stroke rehabilitation within 30 days experienced greater functional gains and shorter length of stay than those whose admission to rehabilitation was delayed beyond 30 days[10]. The early admission was more beneficial to the patients regarding lessening the unwanted complications such as joint contracture, shoulder pain, shoulder hand syndrome and depression. Meanwhile, the motor recovery usually occurs in the first 3-6 months, exposure to the therapeutic intervention would enhance both the motor and functional recovery.

The rehabilitation settings in Thailand were limited. The patients with mild disability were discharged home and some of them would probably continue with an outpatient service. Most of the patients with moderate and severe disability had been admitted to the inpatient service with different goals. Therefore, in our study the mean BI score on admission of both functional improvement and no improvement groups were not different and could not predict the functional outcome following inpatient stroke rehabilitation like other studies[3,11].

The disabilities after stroke such as aphasia and unilateral neglect were associated with limited recovery[12] and poor functional outcome[13]. Medical complications during the rehabilitation program were related to patient dependency and duration after stroke[14]. Moreover, they could prolong the length of hospital stay and delayed functional improvement[15].

The urinary continence was found associated with functional improvement at discharge in our study. Post stroke urinary incontinence is a common sequelae after a stroke. Many studies have shown urinary incontinence within 10 days after onset of a stroke can predict death at 3, 6 months and 1, 2 years as well as functional disability at the same period[16-18].

The comparison of odds ratio between the two factors associated with functional improvement, showed that the urinary continence had a slightly higher odds ratio. In selecting the good candidate for inpatient stroke rehabilitation program, we should consider the stroke patients with urinary continence as the priority.

TABLE 3. The comparison between the urinary continence and the duration of stroke.

	Odds Ratio		
Factors	**Unadjusted**	**Adjusted for other covariates**	**p value**
Urinary continence	1.0	1.0	0.013*
	5.9 (1.6, 22.0)	5.9 (1.5, 23.9)	
Duration of stroke	1.0	1.0	0.018*
	5.3 (1.5, 18.8)	5.3 (1.3, 20.8)	

*significant at p value < 0.05

CONCLUSIONS

The stroke patients who had a duration of stroke within 3 months and urinary continence were more likely to have functional improvement after the process of inpatient rehabilitation.

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