

Predictors of the Functional Abilities in Individuals with Stroke after Home Physical Therapy Program

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Background: Community stroke rehabilitation has been reported to be beneficial. Evidences of factors influencing the functional outcomes of home based treatment were limited.

Objective: To identify the predictors of the activities of daily living (ADL) function of individuals with stroke after obtaining treatment program at home.

Material and Method: Three hundred sixty five individuals with stroke that participated in the home rehabilitation program were included in the present study. The patients received six months of physical therapy treatment program at home according to the results of evaluations. Personal characteristics and clinical outcomes including Gasglow coma, Barthel index (BI), Postural Assessment Scale for Stroke Patients (PASS), and Stroke Rehabilitation Assessment of Movement (STREAM) were recorded.

Results: At discharge, five variables were identified as the predictors of Barthel index scores and explained 90.5% of variances. The PASS maintaining position was the strongest predictors contributing 86.0%. The STREAM, PASS changing position, Gasglow coma score and age then added 4.5% of variances explanation of the BI score.

Conclusion: The ability to perform ADL in stroke patients was greatly explained by the ability to maintain positions at the time of discharging from the rehabilitation program at home. Other outcomes contributed in the different manners compared to the time of starting rehabilitation program.

Keywords: Stroke, Barthel index, Predictor, Physical therapy, Home rehabilitation

J Med Assoc Thai 2016; 99 (10): 1147-52

Full text. e-Journal: <http://www.jmatonline.com>

There have been consistent reports worldwide that stroke is the primary cause of disability and activity of daily living (ADL) dependency. The rates of stroke in the elderly in Thailand were 4% in male and 3% in female⁽¹⁾. The disability adjusted life year (DALY), burdens of disease in Thai stroke elderly patients were 12.4% for female and 11.4% for male⁽²⁾. After acute phase, physical therapy plays major role to facilitate the patients for ADL and ambulation independence.

Several factors have been identified as the predictors of ADL performance in stroke during subacute phase. Critical and systematic reviews⁽³⁻⁵⁾ reported that the predictors for functional recovery after stroke included age, gender, previous stroke, urinary continence, impaired swallowing, dysarthria, consciousness at onset, severity of paralysis, sitting

balance, admission ADL score, level of social support and metabolic rate of glucose outside the infarct area in hypertensive patients. The trunk performance has also been reported to be an important predictor of functional outcome after stroke⁽⁶⁻¹¹⁾. Two studies reported that trunk performance was the best predictor of the Barthel Index (BI) score at six months after stroke^(7,10).

In Thailand, the community physical therapy was reported to be beneficial for patients with stroke⁽¹²⁾. The predictors of ADL performance in patients received services in the clinical settings were reported, if these same predictors would determine the functional performance at home or not is needed to be attested. The objective of the present study was to identify predictors influencing the ADL performances of individuals with stroke received physical therapy program at home.

Material and Method

The participants of the present study were individuals with stroke who joining the Stroke Care in

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Community project provided by the Faculty of Physical Therapy, Mahidol University. They were registered in the program between September 2011 and October 2012. The program started after the patients were discharged from hospital and returned home. At the home of each patient, the community physical therapists evaluated, set goals, and prescribed home program to the patients and caregivers as appropriated. The treatment focused on therapeutic exercises and activities of daily living training. Proper environmental adjustment and assistive devices were also provided as needed. In regular cases, there was six to 12 visits in six to nine months. The therapists could adjust the visit frequency and program according to the goal attainment of each patient.

The physical examination and functional evaluation were performed and recorded regularly for treatment planning. The Glasgow Coma Scale (GCS), the Postural Assessment Scale for Stroke Patients (PASS) comprised two sections of PASS-maintaining position and PASS-changing position, the Stroke Rehabilitation Assessment of Movement (STREAM), and the Barthel index (BI) were used as the progression markers.

The selected clinical outcomes in the present study were the GCS, PASS, STREAM and BI.

The GCS is a common tool used for assessing conscious level in patients with traumatic brain injury. The scoring is based on the responses of eye, verbal, and motor⁽¹³⁾. This scale has good face validity and was reported to have good predictive validity in traumatic coma, when combined with age and brainstem reflexes, with 79 to 97% sensitivity and 84 to 97% specificity. The reliability for trained users was high with the ICC of 0.8 to 1⁽¹⁴⁾.

The STREAM was designed specifically for evaluating individuals with stroke to reflect the motor function. It included 10 items of each subscales of upper-limb movements, lower-limb movements, and basic mobility. The satisfactory psychometric properties of the STREAM were reported^(15,16).

The PASS is also intended to use specifically in stroke patients for grading the difficulty in maintaining or changing posture. The scale contains 12 items. Five items measure the ability to maintain posture i.e., sitting with and without support, standing without support, standing on non-paretic and paretic leg. Seven items assess the ability to change posture i.e., supine to side lying on affected and unaffected side, supine to sit, sitting at a table, sit to stand, stand to sit, and picking up a pencil from standing. The validity and reliability of the PASS were reported as

acceptable^(17,18).

The Barthel Index has 10 items evaluating the ability to perform basic ADL functions: feeding, transferring, grooming, toileting, bathing, ambulation, stair climbing, dressing, and bowel and bladder control. This scale was reported to have acceptable reliability and validity in persons with stroke^(19,20). The Thai version of the BI was also reported to be reliable⁽²¹⁾.

In the present study, the data from the physical therapy records were analyzed. Patients with bilateral hemiplegia, hemorrhagic stroke, and other debilitating underlying diseases, as well as ones with recurrent stroke were excluded. All participants or their proxy gave the informed consent. The study procedure was approved by the Ethical Committee of the Mahidol University Institutional Review Board.

Data analysis were initially determining the descriptive statistics of the characteristics and clinical outcomes. The correlation coefficients of Barthel index score at discharge and other outcomes were calculated. The stepwise regression with forward entering method was then performed to determine predictors of the BI using the outcomes which had significant correlation with the BI. All analysis was performed using SPSS version 17.0 with significance set at $p < 0.05$ level.

Results

Table 1 showed the characteristics and the clinical outcomes, pretreatment and at discharge, of subjects in the present study. Three hundred sixty nine individuals with stroke met the inclusion criteria to participate in the program. At discharge, the average BI was 67.51 ± 33.8 . In terms of mobility performance according to the BI assessment, almost half of the patients (47.3%) could walk independently. However, half of all patients (51.2%) were still unable to manage the stair at discharge.

Six outcomes were significantly correlated with BI scores at time of discharge from the home physical therapy program as shown in Table 2. The scores of PASS and STREAM scales were highly correlated to the BI. The Gasglow Coma Score was moderately correlated, while age and duration of stroke before getting home rehabilitation were negatively correlated with the BI.

The result of stepwise regression analysis was presented in Table 3. The model 5 showed that the predictors determining the BI at discharge contributing 90.5% of variances. The strongest predictor was PASS-maintain positions which explaining 86.0% of variances. Other predictors respectively selected into the model

Table 1. The characteristics and the clinical outcomes pretreatment and at discharge of subjects (n = 369)

	n (%)
Side	
Right	199 (53.9)
Left	170 (46.1)
Gender	
Male	201 (54.5)
Female	168 (45.5)
Dyslipidemia	
Yes	166 (45.0)
No	185 (50.1)
No data	18 (4.9)
Diabetes mellitus	
Yes	127 (34.4)
No	225 (61.0)
No data	17 (4.6)
Hypertension	
Yes	300 (81.3)
No	51 (13.8)
No data	18 (4.9)
Age, mean (SD), (years)	64.7 (12.6)
Duration of stroke before getting rehabilitation, mean (SD), (months)	2.5 (2.1)
Visit number, mean (SD)	7.7 (3.7)
Treatment duration, mean (SD), (months)	6.1 (2.9)
Barthel index score pretreatment, mean (SD)	64.3 (33.6)
Barthel index score at discharge, mean (SD)	67.5 (33.8)
Gasglow coma score pretreatment, mean (SD)	14.1 (2.4)
Gasglow coma score at discharge, mean (SD)	14.2 (2.3)
PASS total pretreatment, mean (SD)	22.2 (11.9)
PASS total at discharge, mean (SD)	24.5 (11.6)
PASS maintain pretreatment, mean (SD)	8.2 (5.3)
PASS maintain at discharge, mean (SD)	9.3 (5.2)
PASS change pretreatment, mean (SD)	14.0 (6.9)
PASS change at discharge, mean (SD)	15.2 (6.5)
STREAM pretreatment, mean (SD)	32.7 (22.4)
STREAM at discharge, mean (SD)	38.0 (27.9)

Table 2. Correlation between Barthel Index Scores and other variables

Variables	r	p-value
PASS change	0.930**	<0.001
PASS maintain	0.920**	<0.001
STREAM	0.703**	<0.001
Gasglow coma score	0.557**	<0.001
Age	-0.379**	<0.001
Duration before rehabilitation	-0.267**	<0.001

** Correlation is significant at the 0.01 level (2-tailed)

were STREAM, PASS-changing positions, GCS, and age which of all added only 4.5% more to explain the

variances of the BI score.

Discussion

The improved BI score of 3.2 points comparing from times of starting and ending of home physical therapy program was found in the present study. This changed score was rather low compared to previous studies or considering the reported minimal detectable change score. Van Bennekom et al reported the overall changed score of the BI in a stroke group living at home to be 34.5±28.7 points over 26 weeks⁽²²⁾. However, the patients in their study were very high function measured by BI with mean score of 96.2±6.1, while the participants of the present study had averaging low function and high range of disability level (BI scores

Table 3. Stepwise regression analysis β coefficients and R²

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	-5.893 (1.960)	-5.275 (1.760)	-1.493 (1.897)	-16.025 (4.133)	-3.380 (2.326)
PASS maintain	4.793 (0.115)	4.129 (0.131)	2.836 (0.313)	2.358 (0.329)	2.326 (0.323)
STREAM	-	0.240 (0.029)	0.180 (0.031)	0.163 (0.031)	0.173 (0.030)
PASS change	-	-	1.931 (0.428)	2.299 (0.428)	2.156 (0.423)
Glasgow	-	-	-	1.346 (0.342)	1.328 (0.337)
AGE	-	-	-	-	-0.168 (0.052)
R ²	0.861	0.888	0.895	0.900	0.903
Adjusted R ²	0.860	0.887	0.896	0.901	0.905
<i>p</i> -value	<0.001	<0.001	<0.001	<0.001	<0.001

Reported as b (SE)

ranged 0 to 100 for both starting and discharge stages). Hsieh et al reported the minimal detectable change of 1.85 points (from the original 20 point BI scale) for the patients to perceive as important change in chronic stroke treating in the inpatient setting⁽²³⁾.

In the present study, the functional performance measured by the Barthel index was significantly correlated to PASS changing position score, PASS-maintaining position score, STREAM score, GCS score, age, and duration before rehabilitation. The BI score has been reported to be correlated with age, conscious level, sitting balance, and stroke clinical impairments in three reviews⁽³⁻⁵⁾. In the previous report of this same batch of subjects at the time of starting rehabilitation program i.e., less than three months of stroke, the BI was also found to correlate with the same set of variables with different levels of correlation⁽¹¹⁾.

The regression analysis showed the predictors of the BI scores at discharge. Overall, five variables including PASS maintaining position, STREAM, PASS changing position, GCS, and age could explain up to 90.5% of variances of the BI score in the model 5. The PASS maintaining position alone took 86.1% of variance explaining the ADL performance although other outcomes i.e. PASS changing position and STREAM were also highly correlated with the ADL. The trunk control at an early stage was found to be highly correlated with ADL function in patients six months after stroke^(7,10). The PASS-maintaining position score was accounted for 45% of the variance in predicting comprehensive ADL function in a report by Hsieh et al⁽⁷⁾. Another study⁽¹⁰⁾ used the Trunk Impairment Scale (TIS) to assess trunk performance found that total TIS on admission explained 52% of variances while the static sitting balance subscale score explained 50% of the BI score at six months.

Compared with the previous report⁽¹¹⁾ of same subject group, the most important predictor at time of starting home rehabilitation program was the PASS maintaining position which was not changed over time through the discharging from rehabilitation program. The variances explained by the trunk performance for the BI score was increased (81.6% at starting to 86.0% at discharge)⁽¹¹⁾.

Other variables including in the model at starting were PASS changing position, GCS, STREAM, and age respectively⁽¹¹⁾, while the variables included into the model at discharge were STREAM, PASS changing position, GCS, and age with different percentages of variances explanation. At discharge, the STREAM score which reflected the voluntary movement of the extremities and mobility seemed to play more important role in the ADL performance of stroke patients in community compared to the earlier stage.

Conclusion

The results of the present study confirmed that the trunk control was the major predictor of functional ability throughout the rehabilitation phase of the individuals with stroke in community. Physical therapists and other health care providers should emphasize on trunk the control training in the rehabilitation plan.

However, the patients of the present study seemed to have very little progression in term of ADL function measured by the BI scale. This might relate to the attribute of this specific group of participants which had quite low socioeconomic status. This might potentially cause them to have less accessibility to health care service, more comorbidity, as well as the issues of their caretakers. Further studies are needed

to investigate about these factors. Also, since the patients were assessed at home, some of the medical history was not accessible which limited the potential variables which were reported in the literature.

What is already known on this topic?

Several factors would determine the ability to recover in subacute phase of stroke.

What this study adds?

The trunk control is the crucial factors determining the ADL ability in stroke patients throughout the rehabilitation period. Training of trunk is encouraged in these patients.

Acknowledgements

The authors thank all participants for their cooperation. The great effort of data collection by the community physical therapists is appreciated. The monetary support for the physical therapy home care was provided by the National Health Security Office, Bangkok Branch, Thailand.

Potential conflict of interest

None.

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ตัวทำนายความสามารถด้านการทำงานของผู้ป่วยโรคหลอดเลือดสมองหลังโปรแกรมกายภาพบำบัดที่บ้าน

มัทนา วงศ์ศิริวัฒน์, วิมลวรรณ เทียงแก้ว

วัตถุประสงค์: มีรายงานสนับสนุนประโยชน์ของการฟื้นฟูผู้ป่วยโรคหลอดเลือดสมองในชุมชน แต่หลักฐานของปัจจัยที่มีอิทธิพลต่อผลลัพธ์ ด้านการทำงานของ การรักษาที่บ้านยังคงมีจำกัด การศึกษานี้มีวัตถุประสงค์เพื่อหาปัจจัยที่ทำนายการทำกิจวัตรประจำวันในผู้ป่วยโรคหลอดเลือดสมอง หลังได้รับโปรแกรม การรักษาที่บ้าน

วัสดุและวิธีการ: ผู้เข้าร่วมการศึกษานี้ได้แก่ผู้ป่วยโรคหลอดเลือดสมองที่ได้รับโปรแกรมการฟื้นฟูที่บ้าน 365 คน ผู้ป่วยได้รับโปรแกรมกายภาพบำบัดที่บ้านนาน 6 เดือนตามผลการประเมินข้อมูลส่วนบุคคล และผลลัพธ์ทางคลินิกที่บันทึกได้แก่ Gasglow Coma Score, Barthel Index Score, Postural Assessment Scale for Stroke Patients (PASS), และ Stroke Rehabilitation Assessment of Movement (STREAM)

ผลการศึกษา: เมื่อจำหน้าออกจากโปรแกรมการฟื้นฟู มีตัวแปรห้าตัวที่สามารถทำนาย Barthel Index Scores และอธิบายความแปรปรวนร้อยละ 90.5 โดย PASS maintaining position เป็นตัวทำนายที่สำคัญที่สุดถึงร้อยละ 86.0 ส่วน STREAM, PASS changing position, Gasglow Coma Score และอายุ เพิ่มการอธิบายความแปรปรวนของ Barthel Index Score อีกร้อยละ 4.5

สรุป: ในผู้ป่วยโรคหลอดเลือดสมองหลังโปรแกรมการฟื้นฟูที่บ้าน ความสามารถในการทำกิจวัตรประจำวันขึ้นอยู่กับความสามารถในการคงท่าอย่างมา กส่วนตัวแปรอื่นๆ มีส่วนต่อการทำกิจวัตรประจำวันแตกต่างจากช่วงเริ่มโปรแกรม
