

Walking Function at 1-Year after Stroke Rehabilitation: A Multicenter Study

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Objective: To study the mobility status of stroke patients at 1-year after discharge from inpatient stroke rehabilitation. The factors associated with walking ability at 1-year were also explored.

Material and Method: A multicenter, prospective study of 327 stroke patients from the Thai Stroke Rehabilitation Registry (TSRR) were followed-up at 1-year after discharge from inpatient rehabilitation. Based on the Modified Barthel Index, the stroke patients who had mobility score either 2 or 3 were classified as ambulators. The mobility status was reported as ambulator and non-ambulator. Multivariate analysis was performed to determine any factors associated with the walking ability at 1-year.

Results: One hundred ninety two patients (58.7%) came for follow-up at 1-year. Among these, 87 (45.3%), 86 (44.8%), and 19 (9.9%) of patients had mobility skills improved, sustained, and declined respectively. Eighty-five (44.3%) patients recovered their walking ability. The stroke patients who were able to walk increased from 131 (68.2%) at discharge to 151 (78.7%) at 1-year. Meanwhile, 13 patients (6.8%) who could ambulate by walking at discharge became non-ambulators. The factors associated with the walking ability at 1-year were motor recovery of the affected leg at discharge, having no diabetes mellitus, being married, and able to change position from supine to sitting on admission.

Conclusion: After being discharged from inpatient stroke rehabilitation, the walking ability had continued to improve. At one year, 78% of stroke patients had ability to ambulate. Motor power of the affected leg at discharge, having no diabetes mellitus, married and able to change position from supine to sitting on admission were factors associated with walking ability at 1-year after discharged from inpatient stroke rehabilitation.

Keywords: Ambulation, Barthel index, Long term, Stroke, Walking

J Med Assoc Thai 2014; 97 (1): 107-12

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

After a stroke, most patients have functional disability in the form of hemiparesis. Among the functional problems, walking seems to be the most desirable functional goal for Stroke patients⁽¹⁾. From the Copenhagen Stroke Study, 95% of stroke patients achieved the best walking function within 11 weeks after onset⁽²⁾. Only approximately 20 to 66% manage to walk independently in the community again⁽³⁻⁵⁾. A qualitative study showed that loss of independent ambulation, especially outdoors, was one of the most disabling aspects for patients with stroke⁽⁶⁾. The difficulty walking in stroke patients was associated with the caregiver burden at six months⁽⁷⁾ and 1-year⁽⁸⁾. Therefore, the present study would like to explore the mobility status of stroke patients at 1-year after discharged from stroke rehabilitation. In addition, the

associated factors for being an ambulator are also addressed.

Material and Method

Data were gathered from the Thai Stroke Rehabilitation Registry Study (TSRR)⁽⁹⁾. They were prospective studies conducted among nine sites that were rehabilitation facilities from nine rehabilitation centers in Thailand. Three hundred twenty seven stroke patients from the TSRR were followed-up at 1-year after discharge from inpatient rehabilitation. Based on the Modified Barthel Index, score 0 means immobile, score 1 means wheelchair ambulators, score 2 means walking with physical assistance, and score 3 means walking independently. The stroke patients who had mobility scores of either 2 or 3 were classified as ambulators and the rest was non-ambulators. The status of walking recovery was reported as ambulators and non-ambulators. The Chi-square was used to analyze the qualitative variables namely gender, marital status, comorbid diseases, types of stroke, ability to change position from supine to

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sitting, and degree of motor weakness of arm, hand, and leg respectively. The Independent Sample T tests were used to analyze the quantitative variables namely age, cognitive score (measured by the Thai Mental State Examination), Barthel Index Score on admission and at discharge, and depression score (measured by the Hospital Anxiety and Depression Scale). The outcome measurements were detailed in the Thai Stroke Rehabilitation Registry Study (TSRR)⁽¹⁰⁾. The univariate logistic regression analysis was used to analyze the difference between the ambulators and non-ambulators. Multivariate logistic regression analysis was then performed to determine the factors associated with being ambulators at 1-year. Adjusted odds ratio and its 95% confidence interval (CI) were estimated. A p-value <0.05 was considered statistically significant.

Results

From the TSRR study, 327 stroke patients completed the study. One year later, eight patients had died, three patients had withdrawn from the study, 124 patients were lost to follow-up, and 192 patients (58.7%) were still able to come for follow-up. They were 113 males and 83 females with a mean age of 63 years old. The mobility status based on the Modified Barthel Index at discharge and 1-year later were reported. The mobility status of each patient at two time points was also compared between each other (Table 1). There were 87 (45.3%), 86 (45%), and 19 (9.7%) patients having improved, sustained, and declined in their mobility ability.

At 1-year, the independent ambulators have increased from 48 (25%) to 111 (58%). Noticeably, most of them were ambulators who required physical assistance at discharge. For those who were immobile and wheelchair ambulators, only a small number of them could regain independent walking ability. Most of the stroke patients who had sustained mobility

function at 1-year were independent ambulators at discharge. In addition, those who had declined in their mobility ability were ambulators requiring physical assistance at discharge.

Comparing the stroke patients who were ambulators and non-ambulators, there were several different variables between these two groups as determined by univariate analysis. Regarding physical deficit, the stroke patients who became ambulators at 1-year had less weakness in their affected hands and legs at discharge, were able to change position from supine to sitting by themselves on admission and had better cognitive score. In addition, having less depression, being married and having no diabetes mellitus were more favorable to being ambulators at 1-year (Table 2).

After multivariate logistic regression analysis, mild degree of leg weakness, ability to change position, having no diabetes mellitus, and being married were associated with being ambulators at 1-year (Table 3).

Discussion

In the present study, the authors divided the stroke patients into ambulators and non-ambulators since the independent walking is a key determinant for survival in patients with stroke⁽¹⁰⁾. Our findings revealed that the stroke patients who could walk with assistance at discharge had more likely to have either functional gain or functional decline at 1-year. In addition, lower limb weakness at discharge was found as an associated factor for becoming an ambulator at 1-year. After stroke, the loss of lower limb muscle strength had a poor influence on dynamic balance⁽¹¹⁾. In order to overcome the walking disability, recovery of balance and lower limb strength was essential for functional recovery⁽¹²⁾. Thus, after discharged from the inpatient stroke rehabilitation, the emphasis on regular gait training is very important for stroke patients who require assistance to walk. Regarding the comorbidities,

Table 1. The number of stroke patients in each score level of mobility function (based on Modified Barthel Index)

Mobility score at discharge	Mobility score at 1 year				Total (%)
	0	1	2	3	
0	14 (7.3)	2 (1.0)	11 (5.7)	10 (5.3)	37 (19.3)
1	2 (1.0)	10 (5.3)	6 (3.1)	6 (3.1)	24 (12.5)
2	6 (3.1)	6 (3.1)	19 (9.9)	52 (27.1)	83 (43.2)
3	0	1 (0.5)	4 (2.0)	43 (22.5)	48 (25.0)
Total (%)	22 (11.4)	19 (9.9)	40 (20.7)	111 (58.0)	192 (100)

Mobility score either 2 or 3 was classified as ambulators

Table 2. The demographic characteristics of the stroke patients

Variables	Ambulators (n = 151)	Non-ambulators (n = 41)	p-value
Gender			
Male	91 (60.2)	22 (53.7)	0.21
Female	60 (39.8)	19 (46.3)	
Age, mean ± SD	61.5±12.8	64.3±11.2	0.43
Marital status			
Single	39 (25.2)	19 (46.3)	0.01*
Married	116 (74.8)	22 (53.7)	
Comorbidities			
Hypertension	112 (72.3)	34 (82.9)	0.23
Dyslipidemia	81 (52.3)	24 (58.5)	0.59
Diabetes mellitus	37 (23.9)	19 (46.3)	0.008*
Heart disease	32 (20.6)	7 (17.1)	0.77
Previous stroke	17 (11.0)	9 (22.0)	0.11
Types of stroke			
Ischemic	113 (72.9)	29 (70.7)	0.94
Hemorrhagic	42 (27.1)	12 (29.3)	
Ability to change position from supine to sitting	110 (71.0)	13 (31.7)	<0.001*
Arm weakness at discharge			
Severe	78 (50.3)	29 (70.7)	0.06
Moderate	46 (29.7)	8 (19.5)	
Mild	31 (20.0)	4 (9.8)	
Hand weakness at discharge			
Severe	88 (56.8)	33 (80.5)	0.02*
Moderate	35 (22.6)	5 (12.2)	
Mild	32 (20.6)	3 (7.3)	
Leg weakness at discharge			
Severe	62 (40.0)	32 (78.0)	<0.001*
Moderate	63 (40.6)	7 (17.1)	
Mild	30 (19.4)	2 (4.9)	
Cognitive score, mean ± SD	21.6±6.6	18.1±6.7	0.005*
Barthel index, mean ± SD			
Admit	7.8±3.7	5.4±3.3	<0.001*
Discharge	14.5±3.9	9.7±4.2	<0.001*
Depression score, mean ± SD	6.4±4.2	8.3±4.7	0.02*

* Significant at p-value <0.05

Table 3. The factors associated with walking ability at 1 year

Variables	Crude OR (95% CI)	Adjusted OR (95% CI)
Leg weakness at discharge		
Severe	Reference	Reference
Moderate	4.7 (1.8-12.5)	2.9 (1.2-6.7)
Mild	7.7 (1.6-50.1)	20.4 (3.9-104.2)
Ability to change position from supine to sitting	5.3 (2.4-11.9)	2.7 (1.2-6.1)
No diabetes mellitus	3.7 (1.7-8.1)	3.3 (1.4-7.7)
Marital status (married)	2.6 (1.3-5.2)	2.8 (1.2-6.5)

* Significant at p-value <0.05

diabetes mellitus was found from the present study as an unfavorable factor on walking ability at 1-year, from both univariate and multivariate analysis. Diabetes is not only a risk factor for stroke but the presence of diabetes is associated with the worse functional recovery after stroke^(13,14).

The marital status, being married, was favorable to ambulation outcome. The stroke patients who were still living with their spouses may receive social support for them. Existing evidence addressed the important social support from the patients' spouses, including instrumental help⁽¹⁵⁾, emotional encouragement, and compliance with therapeutic instructions⁽¹⁶⁾. Glass et al⁽¹⁷⁾ found that high levels of social support were associated with faster and more extensive recovery after stroke. Patients with more severe stroke and the largest amount of social support attained an average Barthel Index Score 65% higher than the group reporting the least support. However, the contribution of the three supports to the benefit from high social support is not equivalent. Instrumental and emotional support had more positive impact on functional and social outcome⁽¹⁸⁾.

The ability to change position from supine to sitting position on admission has been studied in a few studies^(19,20). In those studies, they did not measure the ability to change position per se; they used postural assessment measures, namely, the ability for basic movement and a postural assessment scale for stroke patients. The abilities of turning over in bed, sitting up, and sitting without support had been commonly measured by these two scales. Functional outcome at discharge from stroke rehabilitation^(20,21) and six months⁽¹⁹⁾ later could be predicted by the postural assessment on admission. The present study also revealed that the ability to change position from supine to sitting position on admission was favorable to being ambulators at 1-year. Therefore, postural control early after stroke could be a predictor for functional outcome in stroke patients at several time points.

The present study had some limitations. Since the data were gathered from the registry, there was no information regarding the continuation of the exercise program by each patient after having been discharged. Therefore, it could not be stated whether the motor recovery occurred naturally or was influenced by the exercise program.

Conclusion

At 1-year after inpatient rehabilitation, 45% of stroke patients have improved their mobility status.

Ambulators have increased from 68% at discharge to 78% at 1-year. The factors associated with ambulators at 1 year were motor recovery of the affected leg, having no diabetes mellitus, married, and being able to change position from supine to sitting on admission to the stroke rehabilitation program. Knowing the proportion of stroke patients as ambulators and non-ambulators as well as the associated factors would allow our management schemes to focus on strengthening exercise in the home program, as well as pay more attention to the patients who are diabetic and give support to the patients' spouses so that the stroke patients could continue to gain walking ability and reach their maximum potential.

Acknowledgement

The research grant was supported by Thai Health Promotion Foundation, Healthy Systems Research Institute, Office of the National Research Council of Thailand, Consortium of Thai Medical Schools, Clinical Research Collaborative Network and the Royal College of Physiatrist of Thailand. The authors thank Assistant Professor Jaranit Kaewkungwal and his team from Data Management Unit, Faculty of Tropical Medicine, Mahidol University for statistical analysis. Lastly, we also thank all rehabilitation staff of the nine hospitals and our stroke patients and their families for their co-operation

Potential conflicts of interest

None.

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ความสามารถในการเดินของผู้ป่วยโรคหลอดเลือดสมองที่เวลา 1 ปี ภายหลังการฟื้นฟูสมรรถภาพแบบผู้ป่วยใน: การศึกษาสหสถาบัน

ปิยะภัทร เดชพระธรรม, วิไล คุปต์นิริติศัยกุล, วันทนา พุทธกำเนิด, พัชรา ลิมอำไพ

วัตถุประสงค์: เพื่อศึกษาความสามารถในการเคลื่อนไหวและเคลื่อนที่ของผู้ป่วยโรคหลอดเลือดสมองที่เวลา 1 ปี ภายหลังการฟื้นฟูสมรรถภาพแบบผู้ป่วยใน และปัจจัยที่มีความสัมพันธ์กับความสามารถในการเดิน

รูปแบบการศึกษา: การศึกษาสหสถาบันแบบไปข้างหน้า

วัสดุและวิธีการ: ทำการติดตามผู้ป่วยโรคหลอดเลือดสมอง จำนวน 327 ราย จากการศึกษาทะเบียนโรคการฟื้นฟูผู้ป่วยโรคหลอดเลือดสมองแบบผู้ป่วยในของประเทศไทยที่เวลา 1 ปี ภายหลังการฟื้นฟูสมรรถภาพแบบผู้ป่วยใน ผู้ป่วยทุกรายได้รับการประเมินความสามารถในการเคลื่อนไหวและเคลื่อนที่ตามแบบประเมิน Barthel Index โดยแบ่งเป็นผู้ที่เดินได้และเดินไม่ได้ ผู้ที่ได้คะแนนการเคลื่อนไหวเป็น 2 หรือ 3 ถูกจัดเป็นผู้ที่เดินได้ ใช้การวิเคราะห์ทางสถิติแบบ multivariate analysis เพื่อหาปัจจัยที่มีความสัมพันธ์กับความสามารถในการเดินของผู้ป่วยโรคหลอดเลือดสมองที่เวลา 1 ปี

ผลการศึกษา: ผู้ป่วยโรคหลอดเลือดสมองจำนวน 192 ราย (ร้อยละ 58.7) มารับการตรวจติดตามที่เวลา 1 ปี พบว่าผู้ป่วยมีความสามารถในการเคลื่อนไหวที่ดีขึ้น 87 ราย (ร้อยละ 45.3) คงเดิม 86 ราย (ร้อยละ 44.8) และแย่ลง 19 ราย (ร้อยละ 9.9) ผู้ป่วย 85 ราย (ร้อยละ 44.3) มีการฟื้นฟูความสามารถในการเดิน โดยผู้ป่วยโรคหลอดเลือดสมองที่สามารถเดินได้เพิ่มขึ้นจาก 131 ราย (ร้อยละ 68.2) เมื่อจำหน่ายออกจากการฟื้นฟูสมรรถภาพแบบผู้ป่วยในเป็น 151 ราย (ร้อยละ 78.7) ที่เวลา 1 ปี ในขณะที่เดียวกัน ผู้ป่วย 13 ราย (ร้อยละ 6.8) ที่สามารถเดินได้เมื่อจำหน่ายออกจากการฟื้นฟูสมรรถภาพแบบผู้ป่วยในไม่สามารถเดินได้ที่เวลา 1 ปี ปัจจัยที่มีความสัมพันธ์กับความสามารถในการเดินที่เวลา 1 ปี ได้แก่ การมีกำลังขาต้านอ่อนแรงเมื่อจำหน่ายออกจากโรงพยาบาลไม่เป็นเบาหวาน สมรสแล้ว และมีความสามารถในการลุกจากนอนมานั่งได้เองเมื่อเข้าอยู่โรงพยาบาล

สรุป: ภายหลังการฟื้นฟูสมรรถภาพแบบผู้ป่วยใน ผู้ป่วยโรคหลอดเลือดสมองยังคงมีการฟื้นฟูความสามารถในการเดินอย่างต่อเนื่องที่เวลา 1 ปี ผู้ป่วยร้อยละ 78 สามารถเดินได้ โดยการมีกำลังขาต้านอ่อนแรง เมื่อจำหน่ายออกจากโรงพยาบาล ไม่เป็นเบาหวาน สมรสแล้ว และมีความสามารถในการลุกจากนอนมานั่งได้เอง เมื่อเข้าอยู่โรงพยาบาลเป็นปัจจัยที่มีความสัมพันธ์กับสามารถในการเดินของผู้ป่วยโรคหลอดเลือดสมองที่เวลา 1 ปี
