

Walking, balance, and functional status: Comparison between perceived and actual assessments among ambulating persons post stroke in the community

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ABSTRACT

Introduction: Patients with stroke often perceive difficulty in walking, balance, and function which may hinder their recovery. This study was done to compare perception of patients with their true actual abilities. **Materials and Methods:** A total of 105 patients with new onset of stroke, attending outpatient clinics, participated in this study. Patients were given a self-administered questionnaire measuring perception of their abilities in walking, balance and functional health status. The actual walking capacity, balance, and functional health status of patients were measured by 10 metres walking test, Tandem Balance Test, and the Barthel index respectively. **Result:** Most of the patients had good perception towards their walking abilities. Good perception of balance and functional status were found in 68% and 56% of patients respectively. We also observed moderate agreement in walking ($k: 0.497, p < 0.001$) and balance ($k: 0.537, p < 0.001$), but poor agreement in functional status ($k: 0.144, p: 0.004$). **Conclusion:** Poor perception of functional status among stroke patients might be related to the aging and deterioration of other co-morbidities leading to the negative outlook in persons post stroke. Further research need to be undertaken to justify this finding.

Keywords: Walking, ambulation, balance, persons post stroke, community

INTRODUCTION

People with stroke often face difficulties with ambulation, which if left unchecked can affect

the quality of life, hampers participation in social and community activities, and in severe cases can lead to social isolation and depression.¹⁻³ One in three persons with stroke suffers various degree of ambulation problems, ranging from balance instability to weakness of the lower limbs.⁴ Problems with ambula-

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tion often manifests itself during the acute phase of stroke, and in some cases persists longer than six months after a stroke, with a majority of survivors only regaining their walking abilities with or without assistance at six months to a year later after a stroke.⁵

The definitions of 'walking', 'ambulation', and 'mobility' are often used interchangeably, but in principal these terminologies mainly refer to the act of purposeful movement from one place to another, in which the body vaults over the stiff limb or limbs with each moving step.⁶ In stroke patients, the ability to walk refers to the ability to mobilise in one's own environment independently, with or without assistive devices.⁶ It is acknowledged that the mobility spectrum for stroke patients is mainly divided into three phases; bed mobility, the transfer skills, and the travel skills; which reflects the stepwise functional improvements after a stroke.⁷ For those with ambulation problems, the walking speed may reduce to the range of 0.3 to 0.8 m/s as compared to walking speed for normal older persons, which is 1.3 m/s.⁸⁻¹⁰

Successful walking also depends on the patients' own perceptions of their abilities to ambulate. These include perception of balance, walking, and overall functional abilities.^{11, 12} Talkowski *et al.* demonstrated a significant positive correlation between perception of health and balance to the actual walking performance among older stroke patients residing in the community.¹² Those with higher perception scores were able to walk better. Investigations on the relationship between physical health and risk of falling have shown direct correlation between number of falls and the total functional scores, demonstrating

that those who repeatedly fell after stroke had greater mobility deficits and reduction in functional scores.^{13, 14} However, most studies had been done using questionnaire assessments, lacking in objective assessments between perception and the actual act of mobilisation.

Patients' perception of walking, balance, and functional health status are commonly presumed to reflect patients' actual performance among stroke patients. However this is not true. This study compares post stroke patients' perception with their actual performance of walking, balance, and functional health status. The finding would be useful to strategise more effective rehabilitation programme for stroke patients at home in the future.

MATERIALS AND METHODS

One hundred and five persons with first stroke who were attending outpatient follow-up in clinics (primary care, neurology, and rehabilitation) in the National University Medical Centre (UKM MC) were invited to participate in the study. The criteria for participation were: stroke according to WHO criteria, able to ambulate, last episode of stroke at least three months earlier, and age less than 75 years. Those who were unable to walk, wheelchair bound or bedridden, had neurological disorders with permanent damage, and did not consent to the study, were excluded from the study. This study was approved by the Ethics and Industry Research Committee of the hospital (UKM MC) and the participants gave their informed, written consent.

Upon enrolment into the study, the subjects were given a set of questionnaires to

complete. The questionnaire contained socio-demographic characteristics, background information of their stroke status, comorbidities, and health care received in the last six months. Later the subjects were asked about their perceptions on their abilities in walking, balance, and functional health status over the last 30 days in Patient Self-Perception Questionnaire. These self-administered questionnaires were constituted based on guidelines, literature reviews^{15, 16} and expert opinions. The final components of the questionnaires are described as below:

- *Self-Perception of Health:* Health perception was assessed by asking participants the following question: "*In general, is your health - excellent/ very good/ good/ fair/ poor?*" A Likert Scale was used for the scoring (Poor - 1; Fair - 2; Good - 3; Very good - 4; Excellent - 5). The participants' self-reports of health perception then dichotomised into 2 groups: poor (poor, fair and good) and good (very good, excellent).
- *Self-Perception of Balance:* Balance perception was assessed by asking participants the following question: "*Do you think your balance is good or poor?*"
- *Self-Perception of Mobilisation:* Mobilisation was measured by asking the participants the following question: "*Overall in the last 30 days, how much difficulty did you have with moving around- none/ mild/ moderate/ severe/ extreme?*" A Likert Scale was used for the scoring (None - 1; Mild- 2; Moderate - 3; Severe - 4; Extreme -5). The participants' self-reports of mobilisation perception was then dichotomised into two groups: good mobility

(none, mild or moderate difficulty) and poor mobility (severe or extreme).

Later in the data analysis, 'Good' was represented by '1' and 'Poor' was represented by '0' in order to standardise the outcome into two big criterion which are good and poor.

During the interviews, subjects were informed that they were to answer the questions to the best of their preference, with no answer being right or wrong.

In this study the objective assessment for walking capacity was performed by using 10-Metre Walking Test.^{12, 16} Each subject was instructed to walk at their comfortable speed for 10 metres, in which the walk was timed in seconds nearest to one-hundredth second.¹⁵ The result was measured by dividing the walking distance of 10 metres by elapsed time. The measurement was reported in metres per second (m/s). The gait speed was then dichotomised into two groups: < 0.5 m/s (poor gait speed) and ≥ 0.5m/s (good gait speed).

Balance was assessed using the Tandem Balance Test (TBT) in which the patients were asked to stand between two chairs, lightly holding on to the chairs for balance. They were asked to place one foot directly in front of the other with the heel of the front foot touching the toes of the back foot. They were told then to let go of support and hold this position for 10 seconds without the aid of hands.¹⁴ The balance test was then dichotomised into two groups: able to perform test for 10 seconds (good balance test) and unable to perform test for 10 seconds (poor bal-

ance test).

In this study, functional health status was measured by using the Barthel Index (BI).^{16, 17} The 10-items questionnaire measures independence in activities of daily living (ADL), assessing bowel control, bladder control, personal hygiene, toilet transfer, bathtub transfer, feeding, dressing, bed transfer, walking, and ascending and descending stairs. The score is 0 to maximum of 100, with higher score denoting higher degree of independence. The score of 60 was used as the cut-off point, where < 60 was considered to have poor independence and ≥ 60 was considered to have good independence.¹⁸ BI was initially developed for the use of functional assessment in hospital setting. Nonetheless, there are emerging studies that looked into the suitability of this assessment as a tool for community dwelling patients. Studies have demonstrated that BI is a reliable instrument to measure both functional ability and mobility domains as yardsticks for independence limitation, with comparison with other community assessment tools demonstrated good validity measure (kappa 0.98 and agreement 0.8). BI as a community assessment tool is reliable and less subjective in assessing disability.

Weight and height were recorded and body mass index (BMI) was calculated. Other parameters recorded were the socio-demographic data as well as the stroke characteristics of patients. All these tests were done by the researcher and physiotherapists in the rehabilitation unit of UKM MC. The patients with ambulation problem were referred either to physiotherapy or occupational therapy for further evaluation.

Data analysis: Data were analysed with the SPSS version 16.0 software. The descriptive analysis was used for socio-demographic data. In order to compare agreement between patient's perception and actual performance of walking, balance, and functional health status, Kappa statistic was used. A *p* value of 0.05 was taken as significant.

RESULTS

A total of 105 patients who were recently diagnosed with stroke, attending the outpatient clinics, participated in this study. The mean age of the study subjects was 65.4 ± 10.3 years (range 40-85 years old). The median duration from stroke was 24 months (interquartile range [IQR] 12-36) and duration of attending rehabilitation was six months (IQR 2-12). Nearly three quarters of the patients were either overweight or obese, with 93.3% suffering from hypertension and 69.5% suffering from hyperlipidaemia. The socio-demographic of the patients is shown in Table 1.

Figure 1 illustrates the perceived and actual performance in walking, balance, and functional health status. From the data in Figure 1, it is apparent that the perception of ability to walk was the highest amongst the three parameters. Interestingly, although functional health status demonstrated the lowest proportion of good perception (56.2%), the actual measurements in functional health status show otherwise, with 94.3% had good actual performance.

Table 2 presents analyses of agreements between perceived and actual performances of the patients. Moderate agreements were demonstrated in walking (*k*: 0.497, *p* <

Table 1: Sociodemographic and characteristics of patients.

Gender	Number (n)	Percentage (%)
Male	68	64.8
Female	27	35.2
Ethnicity		
Malay	36	34.3
Chinese	65	61.9
Indian	4	3.8
Educational Level		
Not schooling	9	8.6
Low	44	41.9
Medium	46	43.8
High	6	5.7
Smoking Status		
Smoker	20	25.7
Non-smoker	38	58.1
Ex-smoker	47	16.2
Working Status		
Working	20	25.7
Not working	38	58.1
Retired	47	16.2
BMI (kg/m²)		
Normal	29	27.6
Overweight	43	41.0
Obese	33	31.4
Types of Stroke		
Ischaemic	94	89.5
Haemorrhagic	11	10.5
Co-morbidities		
Diabetes mellitus	40	38.1
Hypertension	98	93.3
Hyperlipidaemia	73	69.5
IHD	22	21.0
COPD	10	9.5

IHD: Ischaemic heart disease; COPD: chronic obstructive pulmonary disease

0.001) and balance (k: 0.537, $p < 0.001$) domains. The domain of functional status demonstrated a low agreement due to the small differences between actual and perceived scores (k: 0.144, $p: 0.004$).

DISCUSSION

Our study of fairly elderly persons who are post stroke, median duration of 24 months (IQR: 12-36) showed high capabilities in walking, balance, and overall functional health status. These findings further support the fact that two-thirds of persons post stroke should regain some forms of ability to ambulate three months post stroke.¹⁸ Nearly half of our patients (41.9%) were still attending out-patient rehabilitation in the community setting, and 58.1% were on primary care follow-up. Current understanding has shown that recovery after stroke varies among individuals with prospects of functional improvement occurring even long after stroke. Hence it is important that patients continue their rehabilitation or follow up as recommended in the current consensus of overall stroke management.²⁰ The high functional status observed in this study might be the result of continuous involvement with the health services.

Comparisons between perceived and actual performance demonstrated moderate agreement in walking (k = 0.497), by which the agreement between patients' perception of walking and the actual performance of 10-

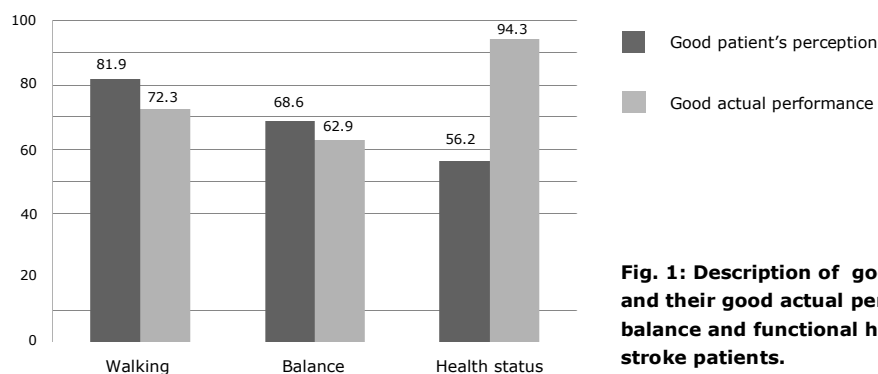


Fig. 1: Description of good patient's perception and their good actual performance of walking, balance and functional health status among the stroke patients.

Table 2: Analyses of agreements between perceived and actual performances of the patients.

	Perceived performance	Actual performance (Modified Barthel Index)		Kappa	P value		
		Poor	n (%)			Good	n (%)
Walking	Poor	15	(78.9)	4	(21.1)	0.497*	<0.001
	Good	14	(16.3)	72	(83.7)		
Balance	Poor	25	(75.8)	8	(24.2)	0.537*	<0.001
	Good	14	(19.4)	58	(80.6)		
Functional health status	Poor	6	(13)	40	(87)	0.144#	0.004
	Good	0	(0)	59	(100)		

* moderate agreement

poor agreement

metre walking scores represented approximately 50% of the potentially agreement beyond chance. This study also demonstrated a much higher percentage of actual walking performance (72.3%) than a previous study that assessed walking in first ever and acute strokes.¹⁷ These two results are significant in at least two major aspects. First, most of the respondents in this study were exposed to rehabilitation process as they were already attending rehabilitation programmes from the early stage up to a year after stroke. This in turn made them more familiarised with various exercises useful for stroke patients, resulting in positive outcomes. Second, indirectly through the effect of continuous rehabilitation, patients were made aware of the benefits of keeping active even long after the stroke events. Therefore, we can infer that providing rehabilitation may be the major factor leading to positive outlooks. Currently, there are no local or international data to compare with our study and further studies are required to establish this association.

With regards to balance, the perception and actual balance among our patients reached moderate agreement (k: 0.537), with

actual balance performance being recorded as 62.9%. Our findings are in agreement with the study by Salbach *et al.*, which showed that balance self-efficacy is invariably related to performance in walking as both skills are inter-related and is thought during the rehabilitation intervention.²¹

One unanticipated finding in our study was the poor perception of functional health status among our respondents (k: 0.144). Our contradictory result may due to the fact that many still perceived stroke as disabling with long-term sequelae and impairments, resulting in the negative outlook to one's life. Looking into the characteristics of our respondents who were mainly elderly with multiple comorbidities, this observation is not unexpected. In a qualitative study looking into perception of health status affecting recovery after stroke, Hartigan *et al.* found two emergent themes that are associated with functional health; specifically the 'fear of hopelessness' and 'inability to regain control in life'.²² This might be due to the fact that post stroke patients viewed stroke as an injury causing permanent disabilities and deterioration in physical health which eventually leads

to losing autonomy to their personal life. In stroke rehabilitation, leading a normal life is related to regaining control in three areas; personal care, everyday responsibilities, and social functioning.¹⁹ This may explain our findings which demonstrated good perceptions in walking and balance but not functional health status. Patients often perceived regaining autonomy and control is more important than self-ambulating. Furthermore, perception and the actual health status may affect the status of a post stroke persons even six months and beyond after stroke. Taken together, these results suggest several observations. The ability to ambulate is integral to any rehabilitation programme, and for it to be successful, patients need to be motivated to continue with their rehabilitation process. Understanding the patients' own perception of walking and balance is important as it provides knowledge for the health providers, including therapists, on how best to tailor rehabilitation to the needs of each individual. Although this study used different assessment tools which might not be accurate in comparing perceived and actual performances, it demonstrated the needs to assess in depth the differences between perceived and actual differences so that effective therapeutic interventions for stroke patients can be designed. There are sufficient evidence to show that comparisons between perceived and actual parameters were able to provide understanding on patients' perception of their physical health that may affect their actual improvement of physical function and other aspects of health related to quality of life.²¹

This study supports the need for more comparison studies in future, as recovery of stroke is often evaluated using standardised

benchmarks related to physical functioning and health assessments. Although these evaluations are adequate in determining the level of improvement, they lack the input and meaning from the patients' point of view. This is particularly important as patients might view recovery in terms of their everyday functioning, which in turn influences their overall quality of life. Our findings might reflect these views, as our respondents thought that functional health status as an entity separate from their abilities to ambulate. However, this observation does not support the previous finding that considers walking independently as an important indicator for general well-being, better health, and community re-integration.^{1, 20, 22} This finding needs to be interpreted with caution as these studies were heterogeneous and without direct comparisons between ambulation parameters and the other health aspect assessments. More work involving other settings and with larger stroke population are needed to determine these associations.

The results of our study may not be generalisable to the whole population or other settings due to the small sample size and also being a single centre study. Nonetheless, it provides important insights to the actual perceptions of post-stroke patients in the community. Given the fact that stroke is viewed as an unexpected insult with long-term sequelae that affects overall functioning and general well-being, understanding the perceptions of patients is an integral part in helping post stroke patients to the road of recovery. It is hoped that this study will generate an interest in obtaining an understanding of the needs of patients, helping them to set up the targets in relation to what they perceive as important in

achieving the goals towards recovery. Health practitioners, in particular therapists and primary care practitioners, can play a collaborative role in designing therapeutic interventions programmes that include assessment of the perceived status in addition to the standardising assessment tools that are being used. Lastly, these findings on the perceptions of patients and their actual performance will guide the clinicians in the development of motivational interventions to help the persons post stroke participate in physical activities to improve their general well-being; hence to reduce the burden of family carers as well as economic burden on the health system.

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