

# A study to determine post discharge functional improvements in patients with stroke

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## ABSTRACT

**Purpose:** Patients with stroke in South Africa are discharged from hospital with low functional status (particularly in terms of mobility). Early discharge of stroke patients to a wheelchair-bound existence results in less physical challenges which are necessary to evoke a neuroplastic response which could lead to improved mobility i.e. in addition to putting extra strain on the family, the patient gets less opportunity for recovery of function. The aim of this study was to establish the degree of functional independence of patients with stroke at discharge and more than six weeks post discharge. The study also sought to establish the effect of hospital length of stay on functional outcome.

**Method:** The study utilised a descriptive cross sectional design with a convenience sample being derived from four stroke outpatient public health facilities in the Gauteng Province of South Africa where they received occupational therapy and physiotherapy services at these outpatient facilities. The Barthel Index was used to establish the level of functional independence at the time of discharge and more than six weeks post discharge.

**Results:** Ninety three percent of patients studied were functionally independent more than six weeks post discharge compared to 47% at discharge. Most patients had a hospital stay of less than two weeks (47%). Patients who stayed in hospital for two to six weeks had recovery rates that were slower than those who stayed between one day to two weeks and those who stayed six to twelve weeks. The percentage of patients who improved in activities of daily living as measured by the Barthel Index was the greatest in ability to transfer independently (53%) and independent mobility (51%). The least improvement was in bowel continence (27%).

**Conclusion:** Patients who had a stroke had limited functional independence at discharge from the hospital but functional levels improved post discharge. A hospital stay of up to two weeks and of more than six weeks increased the probability of attaining functional independence.

**Key words:** Stroke, Activities of Daily Living, Length of hospital stay, Functional ability

## Introduction

A study on the prevalence of stroke survivors in rural South Africa by the SASPI Project Team<sup>1</sup> revealed that the prevalence of stroke was 300 out of 100 000 in 2004. There is no accurate incidence or prevalence data available on stroke in South Africa as a whole; however Steyn et al.<sup>2</sup> established that stroke is the highest cause of death due to chronic diseases of lifestyle in South Africa. Green et al.<sup>3</sup> established that patients admitted to hospital due to stroke in South African private rehabilitation units are discharged from hospital with a low functional status. The functional independence measure (FIM) was used to determine functional independence of stroke patients in Green et al's<sup>3</sup> study but they did not look at the treatment these patients were receiving.

The amount of time spent in hospital is one of the determinants of functional status post stroke. Green et al.<sup>3</sup> established that South African stroke patients in private hospitals had a hospital stay of 30-34 days. The length of hospital stay following stroke at the Chris Hani Baragwanath hospital, which is a government hospital in South Africa, was found to be an average of 12 days<sup>4</sup>. These two studies indicate that patients from both private and government hospitals are discharged relatively early inferring that maybe they are discharged before they are functionally independent. Though

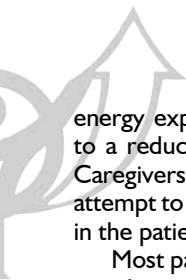
functional independence of patients at discharge from South African government hospitals is implied from the short hospital stay, the functional independence has not been established in any South African study.

Functional independence cannot always be attributed to the duration of hospital stay. However it was established that immediate availability of intensive rehabilitation during the acute care of patients post stroke can reduce the hospital length of stay while yielding better functional outcomes at discharge<sup>5, 6, 7, 8</sup>.

Functional recovery from stroke is determined by the stroke survivor's ability to carry out activities of daily living and continue tasks at home<sup>9</sup>. Studies reviewed by Trombly<sup>9</sup> demonstrated that stroke survivors can have improved function in activities of daily living after three months post acute stroke with rehabilitation. Duncan and Min Lai<sup>10</sup> reviewed several studies of stroke recovery and concluded that improvement may occur as far as 6-12 months after stroke with the most marked recovery occurring in the first 30 days.

Residual neurological deficits following stroke often predispose patients to poor functional capacity and a consequent sedentary lifestyle<sup>11</sup>. This sedentary lifestyle coupled with residual primary neurological deficits such as spasticity, poor balance, increased





energy expenditure in walking and motor weakness often leads to a reduction in the individual's activities of daily living (ADL). Caregivers who overprotect and over care for the patient, in an attempt to alleviate feelings of guilt contribute to further reduction in the patient's ability to function<sup>12</sup>.

Most patients who have had a stroke are able to walk on average three months after stroke<sup>13</sup> with rehabilitation. This implies that when stroke patients are discharged, they are still dependent on a carer and this may increase the strain on the family. When patients are not functional at the time of discharge there could be less physical challenge to evoke a neuroplastic response<sup>14</sup>. Thus in addition to putting extra strain on the family, the patient could also get fewer opportunities for recovery of function<sup>14</sup>. Stineman et al.<sup>15</sup> established that patients who lived alone before having a stroke had a likelihood of improved functional independence as they are more likely to engage in physically challenging activities due to the knowledge that they are unlikely to receive assistance.

Patients who have had a stroke complained mainly about decreased hand function, general functional deterioration and difficulty walking during follow-up examinations, and 58% of these complaints were resolved through community rehabilitation services<sup>16</sup> such as occupational therapy and physiotherapy. However, it has been established that 66% of stroke survivors need help with at least one activity of daily living post discharge<sup>1</sup>. These results suggest that patients need continuation of rehabilitation post discharge. Post discharge rehabilitation, especially home-based rehabilitation, results in more functional recovery after stroke<sup>17</sup>. But according to Whitelaw et al<sup>18</sup>, patients in a South African setting find it difficult to access rehabilitation services post discharge due to difficulties with transport. This indicates the need to either discharge patients when they have attained functional independence or provide a good community based rehabilitation programme.

Based on the available literature it can be concluded that patients generally do not have functional independence at discharge from hospital but the relationship between functional independence and time spent in hospital has yet to be established. Specific levels of function at the time of discharge and post discharge have not been documented in South African government rehabilitation/hospital settings.

The aim of this study was thus to establish the level of function of stroke patients at discharge and at more than six weeks post discharge. This study also sought to establish the effect of hospital length of stay on functional outcome. It is hoped that information gained from this study could be used to plan the patient's length of hospital stay, and to provide baseline information on the level of function of stroke patients.

## Methodology

A convenience sample of 68 patients was derived from patients with stroke who were discharged from the hospital, and were at least six weeks and less than two years post discharge, and were between the age of 18 and 75 years. Level of function and age were not criteria for selection, there was thus a considerable variation between

the patients level of function. Those with expressive aphasia had to have a caregiver who could respond to the questionnaire on their behalf. Patients were excluded if they were dependent in activities of daily living before the stroke. The patients were attending a stroke class at any of the four public health facilities, namely: Alexandra, Chiawelo & Mofolo clinics and Chris Hani Baragwanath hospital outpatient department, in SOWETO, Johannesburg, South Africa. Five patients (7%) were seen in their homes as they were receiving home visits from the clinic physiotherapists and occupational therapists, due to their inability to access transport to the health facility. Activities that the Occupational therapists and Physiotherapists carried out with the patient included upper limb strengthening, reaching and grasping activities; lower limb strengthening; training in activities of daily living and walking activities. These activities were not changed by the researchers as the primary goal of this research was not intervention. The treatment they were getting was similar across the centres except that the five patients who were seen at home received individual input instead of group activity.

The Barthel Index (BI) was used to measure the patient's functioning in ten activities of daily living and these activities are feeding, grooming, bathing, dressing, bowel care, bladder care, and toilet use; as well as mobility; transfers and stair climbing<sup>19</sup>. The BI is considered to be an observer-rated, multi-item, summing rating scale to evaluate disability in terms of dependency<sup>20</sup> and is reliable when using any of the four different methods of obtaining the score (i.e. self reporting, asking a trained nurse, and separate testing by two skilled observers)<sup>21</sup>.

## Ethical considerations

Ethical clearance was granted by the University of the Witwatersrand Human Research Ethics Committee. Participation in the study was voluntary, and an information and consent letter were given to the patients to sign before participating in the study. Information received from the patients was treated confidentially and each patient was allocated a code to ensure anonymity of collected data.

## Procedure

The researcher and three trained research assistants interviewed patients who had a stroke, and consented to take part in the study, and who met the inclusion criteria. The research assistants assumed the same role as the researcher. Caregivers were interviewed in cases of patients with receptive aphasia. The physical presence of the patient with stroke was required to confirm their current functional ability in order to minimise the effect of incorrect reporting by the caregiver.

The baseline Barthel Index (BI) data was collected retrospectively to establish the patient's functional independence at discharge from the hospital/rehabilitation unit. The discharge and six weeks post discharge BI score was established by the researcher within one interview. A BI score of 12 (60%) was the crucial score by which patients progressed from dependence to assisted independence; a score greater than 12 (60%) meant that patients were independent for vital care, such as moving around unassisted, sphincter control, personal toileting and eating<sup>19</sup>.

Descriptive data were summarised using frequency distributions and percentages. The influence of observed factors was established by using a logistic regression. Odds ratios were also calculated. Significance was set at  $p=0.05$ .

## Results

Of the sixty eight patients the oldest were between the ages of 65-75 years (16%), and the youngest were those between 18-34 years (13%) (Table 1). There were more female patients with stroke (60%) than males. Younger patients were more functional in activities of daily living than older patients at

Factors	At Discharge		Likelihood-ratio Chi Square p value	More than weeks Post discharge	
	BI <12 n (%)	BI >12 n (%)		BI <12 n (%) p value	BI >12 n (%)
<b>Age (years)</b>			<b>0.05</b>		
18-34	1 (2%)	8 (12%)		0 (0%)	9 (13%)
35-44	8 (12%)	3 (4%)		1 (2%)	10 (15%)
45-54	11 (16%)	9 (13%)		2 (3%)	18 (26%)
55-64	9 (13%)	8 (12%)		0 (0%)	17 (25%)
65-75	7 (10%)	4 (6%)		2 (3%)	9 (13%)
<b>Gender</b>			<b>0.88</b>		
Male	14 (21%)	13 (19%)		2 (3%)	25 (37%)
Female	22 (32%)	19 (28%)		3 (4%)	38 (56%)

Table 1: Influence of demographic factors on functional independence (N=68)



the time of discharge ( $p = 0.05$ ); however there was no difference in functional independence between the older and younger patients at six weeks or more post discharge. There was no significant difference in functional independence between male and female patients both at discharge and at six weeks or more after discharge ( $p = 0.88$ ). Most patients (85%) had caregivers, however patients without caregivers had an increased likelihood of being functionally independent ( $p = 0.02$ ). Seventy eight percent of the patients had untrained caregivers who were family members. Having a trained versus an untrained caregiver did not have an influence on the patient's functional independence ( $p = 0.07$ ).

Ninety three percent of the patients were functionally independent (i.e. had a BI score of  $\geq 12$ ) more than six weeks post discharge, compared to 47% at discharge (Table II). Most patients achieved ability to transfer and mobilise independently (53% and 51% respectively). The least improvement was reported in bowel continence (27%) (Table III). Most patients had a hospital stay of less than two weeks (47%), and the smallest group was those with a hospital stay of between six and twelve weeks (17%). Although not showing statistical significance, patients who stayed more than six weeks were eight times more likely to be functionally independent at the time of discharge than those who stayed less than two weeks in hospital, and patients who stayed less than two weeks were likely to be more functional than those who stayed less than six weeks (Odds ratio: 1) (Table IV).

BI Score	No. of patients at discharge		No. of patients post discharge	
	N	%	n	%
<12	36	53%	5	7%
>12	32	47%	63	93%

Table II: BI scores at discharge and post discharge (N = 68)

	At Discharge	Post Discharge	% of patients who improvement
	n (%)	n (%)	
Bowel continence	43 (63%)	61 (90%)	27%
Bladder continence	40 (59%)	61 (90%)	31%
Independent grooming	24 (35%)	54 (79%)	44%
Independent toilet use	24 (35%)	57 (84%)	49%
Independent feeding	32 (47%)	51 (75%)	28%
Independent transfer	21 (31%)	57 (84%)	53%
Independent mobility	21 (31%)	56 (82%)	51%
Independent dressing	13 (19%)	39 (57%)	38%
Independent stair climbing	13 (19%)	43 (63%)	44%
Independent bathing	21 (31%)	40 (59%)	28%

Table III: Barthel Index scores at discharge and post discharge (N = 68)

Score	Odds ratio	95% Confidence interval	
<b>Duration of hospital stay</b>			
1 day – 2 wks	1.0000		
>2wks – 6wks	0.6313	0.0891	4.4697
>6wks – 12wks	8.1651	0.8909	74.8263

Table IV: The influence of duration of hospital stay on functional independence (N = 68)

## Discussion

This study established that younger patients are more likely to be functionally independent at the time of discharge than older patients. This can be attributed to the fact that when younger patients have a stroke, they are relatively strong and able to relearn new skills faster than older patients. There were more female than male stroke patients in this study. This is in line with Kelly-Hayes et al's<sup>22</sup> study

which established that more women than men experience initial stroke. Patients who had caregivers were less likely to be functionally independent than those without caregivers. Stineman et al<sup>15</sup> and Anderson et al<sup>12</sup> also had the same findings and attribute this to the fact that patients who had caregivers tended to be dependent on their caregivers for ADL's instead of engaging in physical activities to evoke a neuroplastic response.

Patients with a stroke are not all functionally independent at discharge but their level of function has been shown to improve over time. These findings are in line with what was established by Green et al.<sup>3</sup> i.e. that patients with stroke are discharged from hospital with a low functional status for several aspects of ADL. It was found in another study that most patients in SOWETO who had a stroke were able to walk and were independent in activities of daily living at three months post discharge<sup>23</sup>. Mayo et al<sup>17</sup> also established that patients regained the ability to walk independently more than three months after stroke onset. This confirms this study's findings that stroke patients have the ability to regain functional independence over time.

Patients with stroke generally have a short hospital stay and this negatively impacts on their level of function at discharge<sup>4</sup>. However it was shown in the literature that if these patients received post discharge rehabilitation, they were more likely to regain their functional independence<sup>16</sup>. The benefits of post discharge rehabilitation were also documented in a study, which established that post discharge rehabilitation, especially home based rehabilitation, resulted in more functional recovery and included reintegration into the home and community<sup>17</sup>. Ninety three percent of patients in our study were attending a stroke group where they received rehabilitation and the remaining 7% also received rehabilitation from therapists doing home visits. The rehabilitation they received included regular exercises and ADL training which probably resulted in improved functional independence post stroke.

In this study, the duration of hospital stay did have an influence on functional independence at the time of discharge from the hospital. It is possible that those who stayed one day to two weeks did not have severe loss of functional ability or had more intense rehabilitation within a short period, and hence the early discharge and better functional ability than those with a two to six weeks' hospital stay. Previous research has shown that patients who start rehabilitation within one week of having a stroke have been found to have better functional outcomes<sup>24</sup>, and thus this can be another explanation for better recovery in the less than two weeks group. It has also been established in literature that high therapy intensities yield greater gains in functional independence and that therapy intensity is related to a shorter length of hospital stay<sup>6,7,8,25</sup>.

In this study patients who stayed in hospital six to twelve weeks had better functional ability and it was assumed that they were more likely to have had more rehabilitation prior to discharge. It is also possible that patients were given an opportunity to stay longer in hospital due to anticipated functional recovery. This would be in line with Wilson et al's<sup>26</sup> study that established that there is a tendency to keep the patients who seem to have more promise of functioning successfully at home, in hospital for a longer period<sup>26</sup>.

## Conclusion

Patients who have had a stroke have limited functional independence at discharge from hospital but the functional level improves post discharge. The hospital stay of more than six weeks increases the probability of attaining functional independence.

## References:

- Connor MD, Thorogood M, Casserly B, Dobson C, Warlow MD. Prevalence of stroke survivors in rural South Africa: Results from

the Southern Africa stroke prevention initiative (SASPI) Agincourt field site. *Stroke* 2004; 35: 627 – 632

2. Steyn K, Fourie J, Bradshaw D. The impact of chronic diseases of lifestyle and their major risk factors on mortality in South Africa. *S Afr Med J* 1992; 82: 227 – 231
3. Green J, Valvanne-Tommila H, Loubser H, Gordon R, Paunio P, Mazzocchi JE, Richards B. Australia, Finland and South Africa – Delving into Data to Investigate Differences in Stroke Rehabilitation. *International Society of Physical and Rehabilitation Medicine–ISPRM* 2005: 37-40
4. Hale LA, Eales CJ. Recovery of walking function in stroke patients after minimal rehabilitation. *Physiotherapy Research International* 1998; 3 (3): 194 – 205
5. Ang YH, Chan DKY, Heng DMK, Shen Q. Patient outcomes and length of stay in a stroke unit offering both acute and rehabilitation services. *MJA* 2003; 178 (7): 333 – 336
6. Jette DU, Warren RL, Wirtalla C. The relationship between therapy intensity and outcomes of rehabilitation in skilled nursing facilities. *Arch Phys Med Rehabil* 2005; 86: 373 – 379
7. Teasell R W, Karla L. What's new in stroke rehabilitation: Back to basics. *Stroke* 2005; 36: 215 – 217
8. Slade A, Tennant A, Chamberlain A. A Randomised Controlled Trial to determine the effect of intensity of therapy upon length of stay in a neurological rehabilitation setting. *J Rehabil Med* 2002; 34: 260 – 266
9. Trombly CA, Randomski MV. *Occupational Therapy for Physical Dysfunction*. 5<sup>th</sup> Ed. Philadelphia: Lippincott Williams & Wilkins, 2002.
10. Duncan PW, Min Lai S. Stroke Recovery. *Topics in Stroke Rehabilitation* 1997; 4:51-58.
11. Filho I, T da Cunha, Lim, P.A.C, Huma, Q, Henson, H, Monga, T, Protas, E.J. A comparison of regular rehabilitation and regular rehabilitation with supported treadmill ambulation training for acute stroke patients. *Journal of Rehabilitation Research and Development* 2001; 38 (2): 245 - 256.
12. Anderson CS, Linto J, Stewart-Wynne ED. A Population-Based Assessment of the Impact and Burden of Caregiving for Long-term Stroke Survivors. *Stroke* 1995; 26: 843 – 849
13. Sabine P, Aurelie D, Benoit N, Jean FP, Valerie K, Phillip G. Prognostic Factors in the Recovery of the Ability to Walk After Stroke. *Journal of Stroke and Cerebrovascular Diseases* 2002; 11 (6): 330 -335
14. Jackson D, Thornton H, Turner-Stokes L. Can young severely disabled stroke patients regain the ability to walk independently more than three months post stroke? *Clinical Rehabilitation* 2000; 14: 538 – 547
15. Stineman M, Maislin G, Fielder RC, Granger CV. A Prediction Model for Function Recovery in Stroke. *Stroke* 1997; 28: 550 – 556
16. Greenberg E, Treger J, Ring H. Post-stroke follow-up in a rehabilitation center outpatient clinic. *Isr Med Assoc J* 2004; 6 (10): 603 – 606
17. Mayo NE, Wood-Dauphine S, Cote R, Gayton D, Carlton J, Buttery J, Tamblyn R. There's No Place like Home. *Stroke* 2000; 31: 1016 – 1023
18. Whitelaw DA, Meyer CJ, Bawa S, Jennings K. Post discharge follow-up of stroke patients at Groote Schuur hospital: A prospective study. *S Afr Med J* 1994; 84 (1): 11 – 13
19. Sulter G, Steen C, DeKeyser J. Use of the Barthel Index and Modified Rankin Scale in Acute Stroke Trials. *Stroke* 1999; 30: 1538-1541
20. Hobart JC, Lamping DL, Freeman JA, Langdon DW, McLellan DL, Greenwood RJ, Thompson AJ. Evidence-based measurement: Which disability scale for neurologic rehabilitation? *Neurology* 2001; 57: 639 – 644
21. Collin C, Wade DT, Davies S, Home V. The Barthel ADL Index: A reliability study. *Int Disabil Stud* 1988; 10 (2): 61 – 63
22. Kelly-Hayes M, Beiser A, Kase CS, Scaramucci A, D'Agostino RB, Wolf PA. The influence of Gender and Age on Disability following Ischaemic Stroke: the Framingham study. *A Journal of Stroke and Cerebrovascular Diseases* 2003; 12: 119 – 126
23. Hale LA, Eales CJ, Stewart A. The problems experienced by black stroke patients in SOWETO, South Africa. *SA Journal of Physiotherapy* 1999; 55 (2): 12 – 17
24. Musico M, Emberti L, Nappi G, Caltagirone C. Early and long term outcome of rehabilitation in stroke patients: the role of patient characteristics, time of initiation, and duration of interventions. *Arch Phys Med Rehabil* 2003; 84: 551 – 558
25. Quellette MM, LeBrasseur NK, Bean JF, Phillips E, Stein J, Frontiers WR, Fielding R. High intensity resistance training improves muscle strength, self reported function and disability in long-term stroke survivors. *Stroke* 2004; 35: 1404 – 1409
26. Wilson DB, Houle DM, Keith RA. Stroke rehabilitation: A model predicting return home. *West J Med* 1991; 154: 587 - 590.

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