STROKE REHABILITATION IN A GERIATRIC DAY HOSPITAL: FUNCTIONAL GAIN, ITS MAINTENANCE AT 6 MONTHS POST-DISCHARGE

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Summary
Rehabilitation at Geriatrics Day Hospital (GDH) has been shown to improve functional outcome among stroke patients, yet whether the improvement can be maintained by 6 months after discharge is unknown. A prospective study was performed to examine the functional outcome of stroke patients rehabilitated at GDH and again at 6 months post discharge. 50 elderly were included prospectively. There was a gain of 8.5 points on total Functional Independent Measurement (FIM) score over a median period of 12 weeks. The gain in FIM correlated positively with number of attendance (r=0.49, p<0.001) and length of stay (r=0.42, p=0.002). There was a non-significant drop of FIM score by 1.4 at 6 months. Patients who were cognitively impaired (AMT ≤ 6) did similar with their cognitively normal (AMT > 6) counterparts. We concluded that functional outcome is maintained with stroke rehabilitation at GDH at 6 months and cognitive impairment should not be a hindrance to the access of the service.

Keywords: stroke rehabilitation, geriatric day hospital, cognitive impairment

Introduction:
Geriatric day hospital has different roles in an elderly health service as defined by Brocklehurst and Tucker. Rehabilitation is one of the important objectives stated. As reported by Leung et al, geriatric day hospital in Hong Kong played an important role in stroke rehabilitation. However, controversies about the effectiveness of stroke rehabilitation in a day hospital setting still exist. Young et al found that home physiotherapy seemed to be slightly more effective and more resource efficient than day hospital attendance. They suggested that home physiotherapy should be the preferred rehabilitation method for aftercare of stroke patients. On the other hand, Gladman et al showed no difference in the effectiveness of the domiciliary and hospital-based services, and some frail elderly patients might have benefited from training in a day hospital setting. Furthermore, Hui et al reported a prospective randomised study that revealed functional improvement being greater in the group managed by geriatricians with day hospital facility compared with the conventional inpatient group at 3 month.

There is only limited data on the maintenance of the functional gain after stroke rehabilitation. Garraway et al found that the improvement in functional outcome at the time of discharge from hospital would disappear by one year. Within an increasingly cost-conscious society, it would be very undesirable if the scarce resources invested only resulted in a transient improvement in the patients and the effect would soon disappear after the cessation of treatment.

Therefore we conducted a prospective study to: (1) determine the functional gain and more importantly, its maintenance six months after the completion of the rehabilitation program for patients with a primary diagnosis of cerebral vascular accident who underwent rehabilitation in a geriatric day hospital; and (2) to investigate factors affecting the maintenance of functional independence.

Methods
Elderly patients aged ≥65 who were referred to GDH for rehabilitation with the principle diagnosis of stroke during the period June 1996 to Jan 1998 were recruited. They were either patients who were discharged from an inpatient geriatric unit, or patients referred from the geriatric specialist outpatient clinic. Their demographic data, number of medical diagnoses, abbreviated mental test (AMT) scores and social backgrounds were recorded.

Multi-disciplinary assessment was carried out for each patient and functional problems were identified. Case conferences were held where
treatment plan would be formulated. Patients would be discharged from the day hospital if their functional problems were solved, pre-set aims achieved, or if their performance reached a plateau. They were arranged to have a multi-disciplinary assessment six months after discharge.

Physiotherapist, occupational therapist and nurse used the Functional Independence Measure (FIM) to measure their function at admission, discharge and six months post-discharge. The study institution participated in the Uniform Data Service for Medical Rehabilitation, and its staff had received the required training to ensure the proper use of FIM. The FIM score was developed as a measure of a person's disability and of the progress made in the rehabilitation program, and its validity and reliability had been documented previously. The FIM score is a composite of six subsections dealing with self-care, mobility, sphincter, locomotion, communication and social cognition. The score for each item was added to make the subset scores, and these were added for the total FIM score. FIM was chosen because it is more sensitive to changes. In comparison, other assessment tool such as Barthel Index was known to have marked flooring and ceiling effect.

Data were analysed by statistic computer software, SPSS (version 7.5). Descriptive statistics were used to summarise data. Between-group comparisons were made with the student’s t test or ANOVA for continuous variables. Paired t test was used to analyse paired data. Correlation was calculated according to Spearman rank correlation method. Tests were two-tailed, with results considered significant at P<0.05.

Results

63 elderly patients were recruited during the 20-month period. 52 patients had a six months post-discharge follow-up assessment while 11 patients defaulted. Two of the patients suffered from another episode of stroke within the six-month period after their discharge from GDH and were excluded from the data analysis. Therefore a total of 50 subjects were analysed. There were no significant statistical difference between the 50 subjects and the defaulters in their age, AMT score, number of medical diagnoses and duration of day hospital rehabilitation training. Their FIM scores upon admission and discharge from GDH were also of no significant statistical difference. (Table 1)

Among 50 subjects, 17 of them were female while 33 were male. The mean age of the subjects was 76.1±1(SEM) with a range of 65 to 90. Their mean and median AMT score was 7.7±0.3 and 8 respectively. Their mean number of medical diagnoses was 3.3 diagnoses per patient. The median length of stay (LOS) in day hospital was 12 weeks (range 5 - 30). Their mean total number of attendance was 22.8 (range 7 - 56). Half of the subjects were living in an institutional care setting (either private old age home or government subvented care and attention home), while the other 25 subjects were living at home.

The total FIM scores upon admission and discharge were 85.2±3.2 and 93.1±3.1 respectively. The total FIM scores at discharge were significantly higher than that of upon admission (p<0.001). There was a gain of 8.5±1.2 in the total score. The gain in

Table 1: Characteristics in subjects & defaulters

<table>
<thead>
<tr>
<th></th>
<th>Subject (N=50)</th>
<th>Defaulter (N=11)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>76.1</td>
<td>78.6</td>
<td>0.25</td>
</tr>
<tr>
<td>AMT score</td>
<td>7.7</td>
<td>8.3</td>
<td>0.43</td>
</tr>
<tr>
<td>No. of diagnosis</td>
<td>3.3</td>
<td>2.7</td>
<td>0.17</td>
</tr>
<tr>
<td>Length of stay (weeks)</td>
<td>12.8</td>
<td>12.0</td>
<td>0.62</td>
</tr>
<tr>
<td>No. of attendance</td>
<td>22.8</td>
<td>19.5</td>
<td>0.28</td>
</tr>
<tr>
<td>Mean total FIM score (admission)</td>
<td>85.2</td>
<td>78.7</td>
<td>0.42</td>
</tr>
<tr>
<td>Mean total FIM score (discharge)</td>
<td>93.1</td>
<td>90.0</td>
<td>0.69</td>
</tr>
<tr>
<td>Mean difference in total FIM score (between admission &amp; discharge)</td>
<td>7.9</td>
<td>11.3</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Table 2: Differences according to AMT scoring subgroup

<table>
<thead>
<tr>
<th></th>
<th>AMT ≤6 (N = 15)</th>
<th>AMT &gt;6 (N = 32)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>74.7</td>
<td>76.0</td>
<td>0.54</td>
</tr>
<tr>
<td>No. of diagnosis</td>
<td>3.07</td>
<td>3.41</td>
<td>0.41</td>
</tr>
<tr>
<td>Length of stay (week)</td>
<td>13.7</td>
<td>12.7</td>
<td>0.56</td>
</tr>
<tr>
<td>No. of attendance</td>
<td>23.6</td>
<td>23.1</td>
<td>0.86</td>
</tr>
<tr>
<td>Mean total FIM score (admission)</td>
<td>75.9</td>
<td>92.7</td>
<td>0.005</td>
</tr>
<tr>
<td>Mean total FIM score (discharge)</td>
<td>85.7</td>
<td>99.8</td>
<td>0.016</td>
</tr>
<tr>
<td>Mean total FIM score (6 months post-discharge)</td>
<td>82.2</td>
<td>99.9</td>
<td>0.009</td>
</tr>
<tr>
<td>Difference in total FIM score (between admission &amp; discharge)</td>
<td>9.9</td>
<td>7.1</td>
<td>0.35</td>
</tr>
<tr>
<td>Difference in total FIM score (between discharge &amp; 6 months post-discharge)</td>
<td>-3.5</td>
<td>0</td>
<td>0.18</td>
</tr>
</tbody>
</table>
FIM score was positively correlated with the number of attendance \( (r = 0.49, p<0.001) \) (Figure 1), length of stay \( (r = 0.42, p = 0.002) \) (Figure 2) and negatively with FIM score upon admission \( (r = -0.38, p = 0.006) \) (Figure 3). However, there was no statistic correlation between gain in the total FIM score and age, gender, AMT score or number of medical diagnosis.

Mean FIM score at the six-month post-discharge follow-up assessment was 91.7±3.5. When compared to the FIM score on discharge, there was a drop of 1.4±1.1 in total FIM score but was of no statistical significance \( (p = 0.59) \). The change of total FIM score and its subsets at six-month post-discharge was not correlated with age, gender, number of attendance, number of medical diagnoses and living environment (staying at home or institutional care). However, the change in total FIM score at the follow-up assessment correlated positively with the change in the total FIM score between admission and discharge \( (r = 0.29, p = 0.04) \) (Figure 4).

Concerning cognition, the subjects were subdivided into two groups according to their AMT score (≤6 and >6). There were statistical significant difference in the mean total FIM score upon admission and discharge (Table 2). Nevertheless, the group with lower AMT score had a comparable gain in the total FIM score after the rehabilitation program (i.e. the difference in the total FIM score between admission and discharge), though with a similar length of stay or number of attendance as compared to the group with higher AMT score.

At the six months post-discharge assessment, subject with a lower AMT score (≤6) did not show any statistical difference in term of change of total FIM score from the time of discharge to six months after the completion of the rehabilitation program in GDH as compared to their counterpart. When the FIM scores were analysed according to their subsets, there was a statistically significant drop

**Table 3: Difference in FIM score (between discharge & 6 months post-discharge) in different subsets**

<table>
<thead>
<tr>
<th>AMT ≤6 (N = 15)</th>
<th>AMT &gt;6 (N = 32)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>-0.5</td>
<td>0</td>
</tr>
<tr>
<td>Locomotion</td>
<td>-0.7</td>
<td>-0.2</td>
</tr>
<tr>
<td>Mobility</td>
<td>-1.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Social cognition</td>
<td>-0.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Self-care</td>
<td>-0.7</td>
<td>-0.1</td>
</tr>
<tr>
<td>Sphincter control</td>
<td>-0.3</td>
<td>-0.4</td>
</tr>
</tbody>
</table>

Figure 1 Correlation between FIM gain and number of attendance \( (r=0.85, p<0.01) \)

Figure 2 Correlation between FIM gain and duration of stay at GDH \( (r=0.42, p=0.02) \)

Figure 3 Correlation between FIM gain and initial FIM score \( (r=-0.38, p=0.006) \)

Figure 4. Correlation between changes of FIM 6 months post discharge and initial FIM gain during rehabilitation \( (r=0.29, p=0.04) \)
in the score in their mobility subset for patient with lower AMT score (Table 3).

At the six months post-discharge assessment, subject with a lower AMT score (<6) did not show any statistical difference in term of change of total FIM score from the time of discharge to six months after the completion of the rehabilitation program in GDH as compared to their counterpart (Figure 5). When the FIM scores were analysed according to their subsets, there was a statistically significant drop in the score in their mobility subset for patient with lower AMT score (Table 3).

Discussion

In this prospective study, we have demonstrated that elderly stroke patients improved in their functional independence after rehabilitation in a geriatric day hospital setting. More importantly, the gain in functional independence could be maintained six months after the completion of the rehabilitation program.

One may argue that the gain in the functional independence during and six months after the rehabilitation program may just reflect the natural course of the disease in the early post stroke period. It is well known that neurological and functional recovery is most rapid in the first 3 months, though some patients continue to progress beyond that time. After 6 months from the acute event, most patients would be considered to have passed the point that any spontaneous neural recovery would occur. However, as a whole group, the natural history of recovery from stroke after 3 months is mixed with some patients improving, some remaining stable and some demonstrating functional decline. Dombovy et al, demonstrated that without outpatient therapy there was improvement in functional status in only 22% of patients, while the other would either remained no change or showed functional deterioration. Davidoff et al also found those patients who did not receive physical and occupational therapy in the post-acute period remained unchanged at 12-month follow up. Furthermore, Smith et al showed that those stroke survivors who did not receive any therapy showed a substantial decrement in their functional capacity at 12-month post-discharge.

Factors that may associate with the gain of functional independence during the rehabilitation program or the maintenance of such improvement were looked into in this study. Longer period of training in term of longer length of stay or more number of attendance were associated with larger gain in the FIM score. The gain in FIM score during the program was negatively correlated with the FIM score on admission, which may be due to the ceiling effect of the measurement. However, as noted by other investigators, subacute stroke rehabilitation program may benefit most for patients with moderate or severe stroke. Age, gender and number of medical diagnosis did not affect the gain in the total FIM score in this study.

Factors that may affect the maintenance of the functional independence in stroke patient after the rehabilitation training is another important area to be explored. Changes in total FIM score at 6 months after discharge from the GDH was shown to be positively correlated with the change of the score right after the completion of the rehabilitation in GDH. Therefore, patients who had improved in the rehabilitation program would likely to maintain their functional independence six months later. Age, gender and number of medical diagnosis did not relate to the change in the functional independence in our study. Moreover, more GDH attendance did not appear to facilitate the maintenance of the functional state. There is a belief that institutionalised elderly would deteriorate significantly after the termination of the rehabilitation training. However, we were unable to demonstrate any statistical deterioration in total FIM score or its subsets.

Cognitive impairment has been reported to be a limiting factor for functional gain in patients receiving rehabilitation. However, Diamond et al had demonstrated that in an inpatient elderly rehabilitation setting those patients with cognitive impairment showed a similar increase in functional status as measured by FIM. In our study, we were also able to demonstrate a similar degree of gain in total FIM score in patients with lower AMT score (≤6) as compare to those with higher AMT score (>6) in a day hospital setting. This functional gain was achieved with a similar length of stay and number of session attended. As noted they may have more difficulty in maintaining mobility at 6 months. Yet, total FIM score at six months post-discharge as maintained and was also comparable between these

![Figure 5. Change of total FIM based according to AMT groups.](image-url)
two groups of patients. We considered that treatment provided to a group of patients with lower AMT score would still result in a significant gain in functional independence. Moreover, this functional gain was not a transient one. Therefore, cognitive impairment should not be an exclusion criterion for the provision of rehabilitation training.

In this study, the subjects had demonstrated a statistical significant gain of functional ability as measured by the Functional Independence Measure (FIM). Granger et al.13 had demonstrated that gaining one point on the total FIM score would translate into a reduction of attendant care of approximately 2.2 min per day. Therefore, a change of 8.5 in the total FIM score in our group of patients will translate into saving 18.6 min of attendant care per day. More importantly, this gain in the functional independence could be maintained six months after the patients being discharge from geriatric day hospital. This would be particularly important in an institutional setting where one attendant may be looking after a number of elderly.

However, our study was not without limitations. Firstly, our sample size was small. This limited the power of the study to detect any clinical relevant difference that might exist, in particular during the subgroup analysis. Nevertheless, 63 elderly with an average length of stay of 12 weeks accounted for about a third of the occupancy within the study period in the GDH with a total of 25 placements. Therefore, a multi-centre study with a larger number of patients will be desirable. Stratification of the subjects with different site of the lesion or different functional problem may then be also done.

Secondly, the result was subjected to bias because of the defaulters (17% default rate). They might be a group of patients who performed poorly and unable to return for follow up six month after discharge because of significant functional deterioration. However, as demonstrated earlier the defaulters had comparable baseline characteristics with the other 50 patients and there was no objective evidence that they were outliers.

In conclusion, GDH is an effective setting for elderly stroke patients and the functional gain can be maintained at six months post-discharge. Rehabilitation outcome is correlated positively with length of stay and total number of attendance of GDH, and negatively with initial FIM score. Cognitive impairment and institutionalisation should not be a hindrance to the access of this particular rehabilitation service. However, a controlled study with a larger sample should be performed to validate the observations and the hypotheses formulated from the present study, and to provide insight in the effectiveness of the program and factors in relation to the maintenance of the functional status in a more unequivocal way.

References:

LEARNING POINTS
1. GDH is an effective setting for rehabilitation of elderly stroke patient. The functional improvement can be maintained at 6 months post discharge from GDH.
2. Rehabilitation outcome is positively correlated with initial FIM score, length of stay and total number of attendance at GDH.
3. There is no statistical difference in the functional gain among cognitively impaired (AMT ≤6) patients when compared with cognitively sound (AMT >6) patients. With the exception of mobility, functional outcome is maintained at 6 months among cognitively impaired patients.