The Process of Rehabilitation and Discharge Planning in Stroke

A Controlled Comparison Between Stroke Units

Mehool Patel, MRCP; Jonathan Potter, DM, FRCP; Inigo Perez, MRCP; Lalit Kalra, PhD, MD, FRCP

Background and Purpose—Stroke units improve outcome for stroke patients. Comparative controlled studies between stroke units are required to determine which components of stroke unit rehabilitation influence outcome and which may be investigated further in randomized controlled trials. This study compares 2 stroke units with regard to the effect differences in practice have on functional recovery (Barthel Index score) and discharge planning (length of stay).

Methods—Stroke unit patients with moderate disability (Barthel score of 4 to 10 at week 1) admitted over 18 months were studied. Barthel measurements were obtained weekly from week 1 to discharge. Details of stroke unit function were recorded. The core features of stroke units were in place in both units. Rehabilitation was impairment focused (theoretically driven) on one unit and disability oriented (pragmatic) on the other.

Results—Numbers of patients were comparable (85 versus 99). Median Barthel score at week 1 (6 versus 6), time to maximal Barthel score (14 versus 14 weeks), discharge Barthel score (14 versus 14), and institutionalization (32% versus 28%) were similar in both units. Median lengths of stay differed (68 versus 49 days; P<0.001).

Conclusions—Comparisons with regard to the rehabilitation process can be made between stroke units. Differences in rehabilitation process between 2 units showed no effect on the rate of functional recovery. Length of stay was significantly different between units, an effect that cannot be attributed to functional recovery and therefore reflects differences in discharge planning, including postdischarge support. (Stroke. 1998;29:2484-2487.)

Key Words: activities of daily living ■ outcome ■ rehabilitation ■ stroke units

Stroke is the most common cause of physical dependency in the Western world, and its treatment accounts for 10% of the district bed-per-day costs in Great Britain.1,2 In Great Britain alone, the direct costs of stroke, excluding costs to patients, caregivers, and loss in production, are estimated at £550 million per year.2

In the last decade, it has been widely accepted that specialist units for stroke rehabilitation are one of the key elements to successful and effective stroke care.3-5 The impact of specialist stroke services has been the limitation of disability after stroke by facilitating adaptive recovery. This recovery has emphasized disability and functional aspects rather than impairment after stroke.

The core components of all stroke units include specialized medical and nursing expertise, coordinated multidisciplinary rehabilitation, and education and training in stroke.6 Despite these common aspects, stroke units differ in the structure and process of rehabilitation and type of patients who are treated on these units. This makes comparisons between stroke units difficult. Nevertheless, a recent systematic review of stroke units emphasizes the need to compare these units.7 Such comparisons are essential to determine which factors in stroke units are important.8

It has been previously reported that standardized assessments can be used for nonrandomized comparisons between mainstream stroke rehabilitation units, and they may help to identify potentially effective practices suitable for further investigation in randomized controlled trials.9

In the present study a direct comparison between rates and patterns of functional recovery and their relationship to length of stay and discharge destination has been undertaken.

Subjects and Methods

Data for this study were collected from 2 nonadjacent districts over a 2-year period. The 2 districts were comparable for population, age structure, and socioeconomic status. The World Health Organization definition of stroke was used for the study. Although the diagnosis of stroke was based on history and examination, CT scanning was undertaken to confirm the diagnosis and pathology of stroke. More than 90% of patients were scanned in both districts.

Stroke patients were admitted to general medical wards during the acute phase of their illness for initial management, investigation, and stabilization. Patients who were considered appropriate for stroke unit rehabilitation were included in the study on day 7 after the acute episode. The 7-day period was considered necessary to allow time for stabilization of the medical condition; to eliminate the confounding influence of fluctuations in consciousness, impairment, and
disability in the immediate poststroke period; and to reduce bias due to early mortality.

Both units had a well-coordinated and integrated multidisciplinary team (Table 1). The main difference in the structure and process of rehabilitation in the 2 units was that Unit A had an impairment-focused approach based on repetitive remedial intervention, whereas Unit B had a disability-focused approach aimed at restoration of normal function (Table 1).

Impairment focus was directed toward correction of impairment prevalent in each individual patient, eg, correction of tone and posture. This would indirectly result in improvement of the associated disability. This approach would thus be based on repetitive remedies aimed at restoration of physiological activity.

Disability focus mainly emphasized restoration of function through a full awareness of the physiology of the relevant muscle groups. The aim was therefore to restore normal function.

In Unit A, rehabilitation was monitored on a subjective basis, whereby the progress of patients was assessed on the perception of progress held by the caregivers, therapists, and the patients themselves. Rehabilitation in Unit B was assessed more objectively with well-validated assessment tools. Both units had similar levels of support services available to them on discharge, and neither had any specialist support rehabilitation teams on discharge.

Patients in the middle group of initial disability, as defined by a Barthel Index (BI) score of 4 to 10, were included in the study. The analysis was limited to this group because it has been shown to be most sensitive to stroke unit intervention in previous studies. The study excluded patients who died during admission (Unit A, 5 patients; Unit B, 6 patients; P=NS).

Baseline assessments were undertaken at the commencement of the study and included patient demography, stroke characteristics, and assessment of disability in self-care. Patients were assessed at weekly intervals, and their BI score was recorded by trained observers who were not aware of the possibility of use of this data for the study. The BI was used because it is a well-validated and an easily communicable tool with good interrater reliability.

Outcome measures included discharge destination, length of stay, and discharge BI. Data were analyzed for the median discharge BI score and median scores at 0, 1, 2, 3, 4, 6, 8, 10, 12, 14, 16, 18, and 20 weeks after the acute episode in both units. The weekly median BI score and duration of hospital length of stay were plotted against time for the 2 units.

Data were analyzed with descriptive statistics, including 95% CIs. Data were compared with the t test, χ² test, Mann-Whitney test, and 2-way ANOVA as appropriate.

Results

Patients were comparable for demographic and stroke characteristics (Table 2). There were comparable numbers of patients in the group with moderate disability (BI score, 4 to 10 at week 1) in the 2 units (ie, 85 versus 99). The times from onset of stroke to transfer to the stroke units were also comparable. There were similar levels of disability at the start of the rehabilitation program (median BI score of 6 at week 1 in both units). The weekly median BI score for this group when plotted against time showed a sigmoid relationship (Figure). There was no significant difference in the rate of functional recovery between the 2 units. The maximum level of functional recovery in both groups was not only similar (BI score, 14 versus 14) but was also achieved after the same duration of rehabilitation (14 weeks). The median change in BI score and duration of hospital length of stay were plotted against time for the 2 units.

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Table 1. Structure and Process of Stroke Rehabilitation in Units A and B

<table>
<thead>
<tr>
<th>Structure</th>
<th>Unit A</th>
<th>Unit B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of stroke unit</td>
<td>Rehabilitation</td>
<td>Rehabilitation</td>
</tr>
<tr>
<td>Year of opening</td>
<td>October 1988</td>
<td>November 1989</td>
</tr>
<tr>
<td>Number of beds</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>“Off-site” to acute district hospital</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Medical input (sessions; all grades)</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Nursing input (whole time equivalents)</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Physiotherapists (senior)</td>
<td>1 + 1 (reserve)</td>
<td>1 + 1 (rotational)</td>
</tr>
<tr>
<td>Occupational therapists</td>
<td>2 + 1 (reserve)</td>
<td>1 + 1 (rotational)</td>
</tr>
<tr>
<td>Speech therapists</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>Social workers (care managers)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Family support worker</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Process

Rehabilitation philosophy     | Impairment focused | Disability focused |
Type of rehabilitation        | Remedial            | Functional          |
Monitoring of rehabilitation   | Subjective          | Objective           |
Formal multidisciplinary review| Weekly              | Weekly              |
Interdisciplinary interaction  | Weekly              | Daily               |
Goal setting at beginning of rehabilitation | Yes               | Yes                  |
Patient/caregiver involvement in goal setting | Yes               | Yes                  |
“Hands-on” training for caregivers | Yes               | Yes                  |
Formal staff training courses | Yes                  | Yes                  |

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of stay: median length of stay in unit A was 68 days, whereas it was 49 days in unit B.

There was no significant difference in the rate of institutionalization between the 2 units, with a 32% rate in Unit A versus 28% in Unit B.

**Discussion**

The results of this nonrandomized but controlled comparison show that functional outcome (in terms of activities of daily living) and discharge destinations are comparable between the 2 units, regardless of an impairment-focused (theoretically driven) or disability-oriented (pragmatic) approach to stroke rehabilitation. There also were no significant differences between the rate of recovery between the 2 units despite differences in approach (Figure). However, there was a significant difference in the length of stay. This difference in the length of stay cannot be attributed to differences in recovery or rehabilitation processes between the 2 units and is likely due to differences in discharge processes between the 2 units.

The limitations of undertaking nonrandomized comparisons and the extreme caution required in interpreting results are acknowledged. Such results, however, will provide an important indication for further research with randomized controlled trials. However, since most geographic areas are likely to have a single specialist stroke service, it may not always be possible to undertake randomized studies because of ethical and logistic considerations. Additional problems in randomization are posed by distance, patient choice, and contracted health and social care delivery arrangements, which cannot be ignored in practice-based research. There is also the possibility of bias influencing outcome because of preferred rehabilitation strategy and the prevailing philosophy among therapists, if such studies were to be undertaken on a single unit. Previous studies suggest that it may be possible to undertake comparisons within a standardized framework that can adjust for some of the confounding variables such as case mix, stroke severity, and functional disability at the start of rehabilitation, as has been used in this study. The possibility of bias was further reduced by defining the framework and the domains for comparison before undertaking the study, using objective measures for

**TABLE 2. Patient Characteristics and Outcome in Patients With Barthel Index Score of 4 to 10 2 Stroke Units**

<table>
<thead>
<tr>
<th></th>
<th>Unit A</th>
<th>Unit B</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>85</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Mean age, y (SD)</td>
<td>76.3 (7.38)</td>
<td>78.9 (7.3)</td>
<td>NS</td>
</tr>
<tr>
<td>Women</td>
<td>48 (56%)</td>
<td>61 (62%)</td>
<td>NS</td>
</tr>
<tr>
<td>Right hemiplegia</td>
<td>39 (46%)</td>
<td>46 (46%)</td>
<td>NS</td>
</tr>
<tr>
<td>Barthel Index at discharge</td>
<td>14</td>
<td>14</td>
<td>NS</td>
</tr>
<tr>
<td>Range</td>
<td>2–19</td>
<td>4–20</td>
<td></td>
</tr>
<tr>
<td>Change in Barthel Index</td>
<td>7</td>
<td>8</td>
<td>NS</td>
</tr>
<tr>
<td>Discharge destination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>58 (68%)</td>
<td>71 (72%)</td>
<td>NS</td>
</tr>
<tr>
<td>Institutions</td>
<td>27 (32%)</td>
<td>28 (28%)</td>
<td>NS</td>
</tr>
<tr>
<td>Length of stay, d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>72.3</td>
<td>53.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Median</td>
<td>68.0</td>
<td>49.0</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>6–185</td>
<td>17–139</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 2A. Functional Recovery and Discharge (Dis) Percentage of Group with Barthel Index Score (bi) of 4 to 10 in the 2 Stroke Units**

Functional recovery and discharge (Dis) percentage of group with Barthel Index score (bi) of 4 to 10 in the 2 stroke units.
patients' grouping, and collecting data prospectively to prevent structure, process, or case mix data from being influenced by outcome.

In this study there were recognized differences between the units in some aspects of the rehabilitation process and differing relationships between professional groups in terms of day-to-day therapy and discharge planning. These differences may have contributed to the observed differences in the length of stay between the 2 units. It is clear from the study that this was not due to differences in the rate or extent of functional recovery but was related to mechanisms to expedite discharge from such units once rehabilitation had been completed.

Factors that contribute to such mechanisms include communication and coordination between different agencies, the timing of the decision-making process in relation to stages of recovery, services and facilities available to support disabled people in the community, and patient expectations. This emphasizes the importance of interagency coordination and administration as an integral part of good rehabilitation practice in achieving favorable outcome. Since several of the factors that determine length of stay on rehabilitation units (as opposed to the rate of functional recovery) are outside the control of the rehabilitation team, the study highlights the pitfalls of using length of hospital stay as a measure for effectiveness of rehabilitation. It was of interest that significant improvement in personal activities of daily living skills was seen up to 14 weeks on both units, which is longer than is commonly believed. In addition, the strategy of rehabilitation, whether based on disability or impairment, did not significantly influence functional outcome in patients with moderate disability after stroke. However, there is a possibility that the type of rehabilitation may be important in patients with severe stroke (in whom a disability-focus approach may be beneficial) or for functional activities other than personal activities of daily living skills (in which an impairment-focused approach may have greater impact). Differences in approach also may be significant in the long-term outcome (e.g., at 1 year), which was not measured in the study. Investigations into these aspects offer areas for future research in defining the impact of rehabilitation on recovery. Finally, the type of rehabilitation may be important for domains other than functional recovery, e.g., motor recovery, levels of tone in the affected limb, development of spasticity, and long-term complications after stroke. Although functional recovery in stroke patients remains the most important determinant of the ability to return home and to attain life satisfaction, it would be of interest to investigate more radical differences in therapy approach to evaluate their influence on other aspects of recovery from stroke.

References

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