Randomized Controlled Trial of an Early Discharge Rehabilitation Service

The Belfast Community Stroke Trial

Michael Donnelly, PhD; Michael Power, FRCP; Mary Russell, MSc; Ken Fullerton, FRCP

Background and Purpose—To compare a community-based multidisciplinary stroke team (CST) approach with hospital-based rehabilitation in terms of hospital stay, functioning, quality of life, and service use and costs.

Methods—Stroke patients who met pre-agreed criteria were allocated randomly to the CST service (n=59) or to usual inpatient rehabilitation and follow-up care (n=54). Assessments were completed at randomization and 12 months later. Caregiver strain and satisfaction (n=55) were also assessed. Cost data were collected for a subsample of 38 patients.

Results—Almost 80% of surviving patients (n=691) were discharged home and a small number (n=55) were readmitted. Approximately 17% (113/649) were randomized. There were no statistically significant differences in hospital duration, costs, or outcome measures at baseline and 12 months except for higher satisfaction reported by CST patients. Overall, both groups recorded improvement in most domains over time. Carers reported a high level of satisfaction although the level of strain among carers is cause for concern. The community group (n=18) cost less than the hospital group (n=20).

Conclusions—A mixed model of hospital-based and community-based rehabilitation services is likely to lead to increased patient choice and satisfaction and a potential reduction in bed pressures for less severe stroke patients. **(*Stroke*. 2004; 35:127-133.)**

Key Words: evaluation ■ patient discharge ■ rehabilitation

Stroke is 1 of the 3 main causes of death and a major cause of long-term disability.[1] The high incidence and serious consequences of stroke make rehabilitation one of the most important challenges faced by services. The extent to which early discharge to home-based rehabilitation and community care is more appropriate for stroke patients than hospital-based rehabilitation (HR) and care is unclear.

Interest is growing in the role of early discharge schemes as a possible substitute for inpatient care. A survey of UK commissioning authorities has shown that most areas are providing schemes designed to accelerate discharge, avoid hospital admission, or both.[2] However, only a few trials have tested the effectiveness of community stroke rehabilitation services,[3] and there have been none conducted in the island of Ireland. In particular, there is uncertainty about the match between different stroke patients and the various ways of organizing and delivering rehabilitation. The latest issue of the Cochrane Review lists only 9 trials of early supported discharge for stroke patients. Currently there are primary outcome data for only 4 trials (Akershus, London, Newcastle, Stockholm). According to the review, the relative risks and benefits of early supported discharge services for stroke patients remain unclear.[3]

Subjects and Methods

Research nurses in collaboration with hospital staff identified patients in Belfast City Hospital and the nearby Ulster Hospital who met selection criteria. A consultant in stroke rehabilitation explained to each patient how the study and the randomization procedure operated and about the unconditional option of withdrawing from the trial. As far as we are aware, no patient was removed from the trial. The stroke clinicians agreed upon the selection criteria before the trial started and applied these clinically in the context of a multidisciplinary meeting. A patient was eligible for the service if he or she (1) experienced a stroke during the 4 weeks preceding admission; (2) had the potential to benefit from further rehabilitation; (3) was not a resident in a nursing or residential home; and (4) had no preexisting physical or mental disability that was judged to make further rehabilitation inappropriate.

Research nurses were not involved in providing patient care and were blind at baseline to the particular group to which a patient was assigned. A patient was interviewed by a research nurse when he or she consented to participate and prior to randomization. A list of computer-generated randomly assigned care options was prepared by a statistician and administered solely by a named secretary. No research team member or hospital staff had access to this list.

The community-based multidisciplinary stroke team (CST) service consisted of a team comprising 0.33 coordinator, 1 occupational therapist, 1.5 physiotherapists, 1 speech and language therapist, and 2 rehabilitation assistants. On average the number of home visits (each lasting 45 minutes) over a 3-month period was 2.5 per week. Multidisciplinary meetings were held to discuss the assessment of

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From the Department of Epidemiology and Public Health (M.D., M.R.), Queen's University Belfast; the Stroke Unit (M.P.), Ulster Hospital; and the Stroke Unit (K.F.), Belfast City Hospital, Belfast, UK.

Correspondence to Michael Donnelly, PhD, Queen's University Belfast, Dept of Epidemiology and Public Health, Mulhouse Bldg, Grosvenor Road, Belfast, BT12 6BJ, UK. E-mail m.donnell@qub.ac.uk

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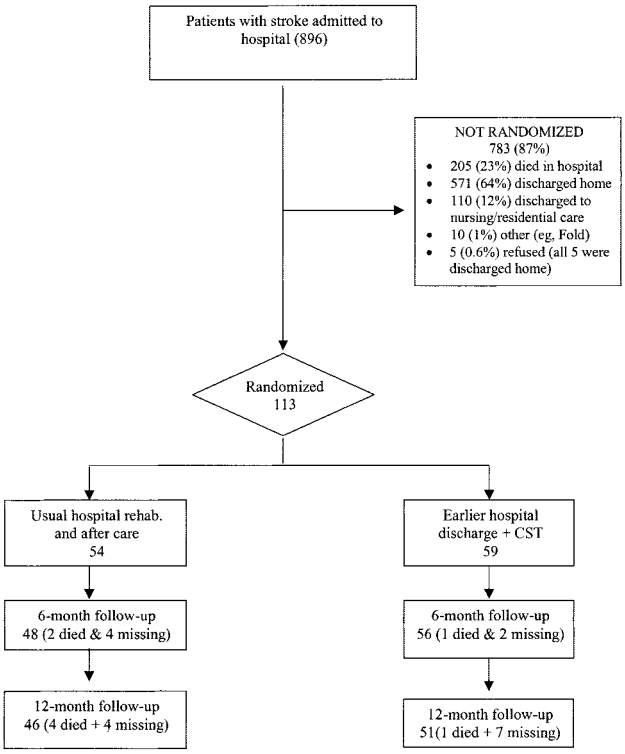

Flow chart showing process of randomization and follow-up.

patients and progress toward rehabilitation goals that had been set jointly between therapists and each patient and their closest relative. Patients who were randomized to the CST service were to be discharged as soon as the liaison therapist had assessed their home and ensured that any necessary aids and equipment were in place. Discharge and after care for patients who were randomized to hospital rehabilitation were arranged in the usual way by the hospital-based multidisciplinary team. This comprised inpatient rehabilitation in a stroke unit and follow-up rehabilitation in a day hospital.

A range of outcomes were assessed at randomization and 12 months later including the Barthel Index,[4] the Nottingham ADL measure,[5] the Short-Form 36,[6] a quality of life assessment,[7] patient and carer satisfaction,[8,9] and the Carer Strain Index.[10] A Service Use Questionnaire[11] was completed at 6 and 12 months. Financial accounts were used to cost hospital care while the Service Use Questionnaire and Unit Costs of Health and Social Care[11] provided the basis for calculating home-based rehabilitation and community health and social services. Information about service use and costs was not collected until a later stage (and no information was gathered about costs to patients or carers).

Research nurses collected baseline data and a Barthel score at 6 months for every stroke admission. A sample size of approximately 110 was calculated using a power of 80% at the 5% level of detection for a 2.5- to 3-point difference in Barthel based on an SD value of 4. The Figure shows the process of randomization and follow-up. It is not possible now to find the 11 people who were lost to follow-up. However, this small group did not differ significantly from patients who were followed-up successfully at 1 year in terms of baseline characteristics. The Queen's University Belfast ethical committee approved the trial.

Results

A total of 896 patients with stroke were admitted to hospital over 2 years. Approximately 57% were female; mean (SD) age was 75 (8.2) years and 15% were <65 years old; 41% were married while 36% were widowed. One quarter (205/896) died in hospital. Fifty-four percent (481/896) spent between 1 and 29 days in hospital; 23% (200/896) had a duration of 30 to 59 days; 12% (107/896) stayed 60 to 89 days; and 11% (101/896) were inpatients for ≥90 days. Approximately 83% (571/691) of surviving patients were discharged home. Most of the remaining group of patients (110/691) were admitted to a nursing or residential home. Eight percent of surviving stroke patients were readmitted during the first 6 months after they had had their stroke.

Approximately 16% of surviving stroke admissions (113/691) were eligible for the study (5 patients declined to participate). Patients who were included in the study compared with excluded patients tended to score in the moderate- to higher-functioning Barthel categories. Only 10% scored ≤9 compared with approximately 55% of excluded or ineligible patients. Study group members were more likely to be younger ($P=0.001$) and less likely to single or widowed ($P=0.001$).

There were no statistically significant group differences at baseline in terms of sex or age (median age, 68 versus 71). Mean (and median) hospital stay was 42 (31) days for the CST group versus 50 (32) days for the HR group. Seven HR patients and 6 CST patients were readmitted, and 5 (2 CST patients) died.

Overall, the 2 groups did not differ at baseline (Table 1), or 12 months later (Table 2) with respect to assessments of dependency, activities of daily living, mobility, and quality of life. Scores on most outcome measures for both groups improved, particularly regarding activities of daily living and mobility. Overall, there was a similar improvement in quality of life for both groups. The only statistically significant difference was in terms of higher satisfaction with services experienced by CST patients ($P=0.01$).

Carers of HR patients had a higher level of strain at baseline (Table 1), which decreased for both groups at the 12-month point, although not significantly (Table 2). The majority of carers in both groups at each time point were satisfied with services.

There was an 8-day difference in mean inpatient stay ($P=0.304$), although the median difference was 0.5 days ($P=0.823$). Overall, the CST group spent 202 fewer inpatient days than the HR group.

There were not any differences between the characteristics of the subgroup of 38 patients (for whom information about service use and costs were collected) and the rest of the study group. CST patients received, on average, more contact with the following services: occupational therapy ($P=0.001$), physiotherapy ($P=0.064$), speech therapy ($P=0.065$), social work ($P=0.045$), rehabilitation assistants ($P=0.001$), and Meals-on-Wheels ($P=0.097$). Both groups had a similar level of contact with general practitioners and hospital outpatients. Approximately one half in each group attended the outpatients department and half met their general practitioner usually once during the first 6 months. Day hospital was the only service that HR patients used significantly more than the CST group ($P=0.009$), although a higher nonsignificant level of utilization by the HR group was recorded for district and community nursing, privately provided home help, and day center care. There were no significant differences in the

TABLE 1. Baseline Assessments of Key Outcomes

Assessment*	Hospital Rehabilitation (n=54)	Community Rehabilitation (n=59)	Significance†	95% CI
Barthel ADL			*P*=0.977	−1.62 to 1.13
Mean (SD)	13.89 (3.93)	14.14 (3.38)		
Median	15.00	14.00		
Range	16	13		
Potential range: 0–20				
Nottingham ADL			*P*=0.293	−2.38 to 4.02
Mean (SD)	5.77 (4.79)	4.95 (5.39)		
Median	4.00	3.00		
Range	18	16		
Missing	32	39		
Potential range: 0–21				
10-m timed walk, sec			*P*=0.921	−3.91 to 7.75
Mean (SD)	20.95 (16.72)	19.03 (8.02)		
Median	17.50	18.15		
Range	104	38		
Missing	14	15		
EuroQol			*P*=0.612	−9.01 to 6.40
Mean (SD)	59.17 (16.15)	60.48 (18.00)		
Median	59.00	60.00		
Range	74	70		
Missing	18	17		
Potential range: 0–100				
SF-36 Physical Functioning			*P*=0.906	−2.55 to 3.17
Mean (SD)	35.35 (7.20)	35.04 (7.72)		
Median	34.41	35.16		
Range	29.66	35.42		
Missing	3	3		
Potential range: 0–100				
SF-36 Mental Health			*P*=0.324	−2.23 to 5.74
Mean (SD)	47.52 (10.59)	45.76 (10.15)		
Median	47.20	44.95		
Range	43.68	41.47		
Potential range: 0–100				
Quality of life			*P*=0.167	−2.89 to 0.62
Mean (SD)	16.53 (3.65)	17.67 (4.14)		
Median	16.89	17.85		
Range	14	19		
Missing	18	17		
Potential range: 4–27				
Overall satisfaction			*P*=0.896	−4.62 to 3.99
Mean (SD)	37.86 (8.49)	38.17 (10.32)		
Median	35.50	37.00		
Range	35	41		
Potential range: 18–72				
Carer Strain	n=25	n=27	*P*=0.174	−0.70 to 3.24
Mean (SD)	6.55 (3.67)	5.07 (3.10)		
Median	6.50	5.00		
Range	13	11		
Potential range: 0–13				

*Higher scores indicate better outcomes except for carer strain.
†Mann-Whitney *U* test.

TABLE 2. Twelve-Month Assessment of Key Outcomes

Assessment*	Hospital Rehabilitation (n=46)	Community Rehabilitation† (n=51)	Significance‡	95% CI
Barthel ADL			*P*=0.179	−2.24 to 0.58
Mean (SD)	17.15 (3.81)	17.98 (3.10)		
Median	18.00	20.00		
Range	16	15		
Potential range: 0–20				
Nottingham ADL			*P*=0.244	−4.04 to 0.91
Mean (SD)	10.43 (5.92)	12.00 (6.34)		
Median	10.50	12.00		
Range	21	21		
Potential range: 0–21				
10-m timed walk, sec			*P*=0.335	−16.50 to 18.14
Mean (SD)	28.95 (28.75)	28.13 (21.51)		
Median	20.00	21.00		
Range	93	89		
Missing	27	35		
EuroQol			*P*=0.604	−6.20 to 9.90
Mean (SD)	68.21 (20.31)	66.36 (18.45)		
Median	70.00	70.00		
Range	70	100		
Potential range: 0–100				
SF-36 Physical Functioning			*P*=0.799	−13.70 to 11.88
Mean (SD)	34.67 (32.01)	35.59 (31.32)		
Median	25.00	25.00		
Range	100	100		
Potential range: 0–100				
SF-36 Mental Health			*P*=0.680	−9.95 to 5.58
Mean (SD)	67.30 (20.07)	69.49 (18.26)		
Median	68.00	72.00		
Range	80	60		
Potential range: 0–100				
Quality of Life			*P*=0.581	−1.50 to 2.20
Mean (SD)	18.92 (4.74)	18.57 (4.29)		
Median	18.99	19.20		
Range	20	16		
Potential range: 4–27				
Patient satisfaction			*P*=0.017	−1.71 to −0.24
Mean (SD)	9.70 (2.09)	10.72 (1.44)		
Median	10.00	11.00		
Range	9	6		
Potential range: 3–12				
Overall patient satisfaction			*P*=0.001	−11.65 to −3.11
Mean (SD)	42.62 (11.19)	50.00 (9.66)		
Median	41.00	48.00		
Range	44	42		
Potential range: 18–72				
Carer Strain	n=25	n=27	*P*=0.927	−2.14 to 2.30
Mean (SD)	6.00 (4.23)	5.92 (2.86)		
Median	5.00	6.00		
Range	12	12		
Potential range: 0–13				

*Higher scores indicate better outcomes except for carer strain.

†5 patients died, 9 missing, and 2 did not participate in 12-month assessment.

‡Mann-Whitney *U* test.

TABLE 3. Costs of All Services Used by Each Group

Service	Hospital Rehabilitation (n=20)	Community Rehabilitation (n=18)	Significance*	95% CI
First 6 months				
Hospital inpatients			P=0.737	−2407.0 to 6472.5
Mean (SD)	£9864 (£8198)	£7831 (£5000)		
Median	£6826	£6485		
Range	£23 892	£18 773		
Total cost	£197 283	£140 965		
All community services			P=0.962	−2917.8 to 3292.6
Mean (SD)	£3655 (£4531)	£3468 (£4612)		
Median	£2444	£1995		
Range	£14 589	£18 521		
Total cost	£69 449	£58 952		
Combined package			P=0.916	−5035.6 to 8189.1
Mean(SD)	£13 337 (£11 182)	£11 759 (£8600)		
Median	£9802	£9663		
Range	£37 690	£32 515		
Total cost	£266 732	£199 917		
Second 6 months				
Hospital inpatients			P=0.737	−2407.0 to 6472.5
Mean (SD)	£9864 (£8198)	£7831 (£5000)		
Median	£6826	£6485		
Range	£23 892	£18 773		
Total cost	£197 282	£140 965		
All community services			P=0.702	−750.9 to 1713.5
Mean (SD)	£1350 (£2262)	£869 (£1219)		
Median	129	126		
Range	£7734	£3470		
Total cost	£25 660	£13 908		
Combined package			P=0.817	−3455.4 to 10266.9
Mean (SD)	£11 734 (£10 340)	£9680 (£7381)		
Median	£7276	£7885		
Range	£31 600	£31 422		
Total cost	£222 942	£154 873		

*Mann-Whitney U test.

average number of service contacts received by each group between 6 and 12 months. Overall, the number of service contacts decreased for both groups during the second 6-month period. The above pattern of results regarding the average number of contacts with each service was reflected in the amount of time expended by individual services on each rehabilitation group.

Mean cost of inpatient care for the CST group was lower (£7831 versus £9864; P=0.737) (Table 3). Community-based services also cost more for the HR group due to the relatively higher utilization level and the high cost of day hospitals (£2100 versus £1012; P=0.012) and of District Nursing (£323 versus £59; P=0.987). The costs of the combined "package" of inpatient care and community rehabilitation compared with the package comprising hospital rehabilitation and traditional after care was, on average, £1578 less per patient at 6-month follow-up (P=0.916). The cost of community services during the second 6-month period reduced from £3655 to £1350 for the HR group, and from £3468 to £869 for the CST group. Overall, the CST group cost less at 12 months than the HR group (£11 734 versus £9680), although the difference was not statistically significant (Table 3).

Discussion

The discharge of stroke patients to a community-based team of therapists is a safe, feasible alternative to hospital-based rehabilitation—at least for patients with less severe strokes. Overall, patients in each group improved over time. There were no statistically significant differences between the 2 groups on the outcome measures used at baseline and 12

months later. The total costs of services were less for the CST group compared with the HR group, albeit not statistically significant. Collectively, this study and the studies in the Cochrane Review provide a growing evidence base to support earlier discharge to community-based rehabilitation as a way of increasing patient choice and reducing pressures on hospital beds, particularly with respect to mild to moderate stroke patients.

It is important to note that only 13% of all stroke admissions during the evaluation period were considered suitable for the CST service, which was equivalent to 16% of survivors, and around 80% of surviving patients were discharged to their own homes. The proportion of eligible patients was lower than the proportion reported in other studies. For example, 45% of patients in a study in London,[12] 22% in a trial in Adelaide,[13] and 30% in a Newcastle study[14] met similar eligibility criteria and followed similar implementation procedures to those employed in this study. Unlike the few other studies of rehabilitation, this study was able to compare trial patients with ineligible patients. Nonparticipants were comparatively older and more dependent. Thus, the study group is likely to be representative of only less severe stroke patients. Generally, this finding is in keeping with existing research in that most trials recruited only a minority (30% to 45%) of stroke admissions.[3]

On average, patients in this study sample tended to be similar at baseline to patients comprising the study samples in other trials. For example, the London study[12] and this study recorded a similar average dependency level at baseline. While the study sample was not representative of all admissions, there were no significant differences at baseline between patients randomized to community rehabilitation or to hospital rehabilitation.

Overall, the CST service appeared to score nonsignificantly better outcomes. Patients in each group (similar to patients in other studies) reported a high level of satisfaction with services, although this fell slightly by the 6-month assessment and then rose again at 12 months, particularly for the community group. Previous studies have not found significant group differences in satisfaction.

Research is sparse regarding the impact on carers of new ways of organizing and delivering stroke rehabilitation services. The levels of caregiver strain were similar to levels reported in other studies,[12] and stress appears to remain fairly constant over time. This may suggest that there is a need to target service inputs specifically toward carers. For example, the Adelaide study[13] found that carers of patients receiving community-based rehabilitation had poorer mental health. Carers might benefit from increased emotional support and specific goal-setting targeted at their needs. It is important to note that the sample size in this study and in the Adelaide study was small. Carers reported a high level of overall satisfaction, and carers of patients in the CST group appeared to be more satisfied with services.

As with other studies, hospital duration was reduced by, on average, 1 week. There were a similar number of readmissions and the reason for readmission appeared to be related directly to stroke in 6 of 13 cases. The proportion of readmissions is lower than in other studies. For example, the London study[12] reported that 26% of each group were readmitted, which is higher than the proportions of HR patients (15%) and CST patients (11%) who were readmitted here.

Although CST patients spent fewer days in hospital, the median difference of only 0.5 days is disappointing when compared with existing research. The savings in hospital days reported in the other trials ranged from 6 to 9 days[12,14,15] to between 13 and 17 days.[13,16–18] Collectively, these findings demonstrate that community-based rehabilitation services play an important role in terms of releasing pressures on hospital beds. In addition, the reduction in hospital stay led to a reduction in hospital costs.

The mean duration between randomization and discharge was 18 days (median, 8.5 days). Thus the potential savings in bed days would appear to be significantly higher than the median difference of 4 days. Further improved joint working between the hospital and CST together with increased capacity are likely to lead to faster response times, higher savings in bed days, and overall lower care costs. The CST had only enough staff to provide a "hands-on" service to a limited number of patients at any given time, and in practice it is likely that patients were randomized only when they had reached a level where it was judged professionally that they could safely manage their own care if they lived alone or had access to a caregiver. In addition, it is important to emphasize that this was a pragmatic study that compared in situ, usual care and rehabilitation with a new and an unproven service in a different location from the familiar hospital setting. The fact that a relatively small number of patients took part in the research may be the result of hesitancy among staff regarding service change and the process of developing intersectoral professional trust and confidence in new ways of organizing and delivering rehabilitation as well as with eligibility criteria.

The cost of community services was lower for the CST group. Hence, the overall package of hospital discharge and community-based rehabilitation was less expensive per patient than hospital rehabilitation and usual community care. The lower costs of CST rehabilitation concur with existing research, although the London study concluded that the main benefit of early discharge was to release hospital capacity and not to realize financial savings.

The Belfast model of early discharge based on a non–consultant-led, multidisciplinary team of skill-sharing therapists appears to be as effective as hospital rehabilitation, at least for less dependent or disabled patients. The community stroke service appears to be cost-effective and acceptable to patients and carers. It seems that many patients and their carers would like to have the option of having some or all of their stroke rehabilitation at home. Further research and service development are needed to maximize the match between patient and type of rehabilitation.

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