Clinical Rehabilitation 2000; **14**: 563–569

The effectiveness of community-based rehabilitation for stroke patients who remain at home: a pilot randomized trial

Charles DA Wolfe, Kate Tilling Division of Public Health Sciences and **Anthony G Rudd** Department of Care of the Elderly, Guy's and St Thomas' Hospital, St Thomas' Hospital, London, UK

Received 1st April 2000; returned for revisions 1st May 2000; revised manuscript accepted 28th July 2000.

Objective: To assess the effectiveness of community-based rehabilitation for stroke patients who were not admitted to hospital in South London.
Design: Randomized controlled trial.
Setting: Patients' homes in South London.
Subjects: Stroke patients not admitted to hospital after a stroke.
Intervention: Rehabilitation at home by rehabilitation team for up to three months or usual care.
Main outcome measures: The primary outcome measure was the Barthel score. Secondary measures included the Motricity Index, Rivermead ADL, Hospital Anxiety and Depression score and Nottingham Health Profile.
Results: Forty-three patients who remained at home were randomized to rehabilitation team (23) or 'usual' care (20). The mean number of physiotherapy sessions was three (range 1–14) for the rehabilitation team group and two for the usual care group. Patients (with a deficit) in the rehabilitation arm of the trial were more likely to receive occupational, physical and speech therapy than those in the control arm ($p = 0.03$, 0.01 and 0.008, respectively). For those patients actually receiving therapy, there was no evidence that the amount received differed between the groups. However, the number of patients in each of these comparisons was very small. The outcome for patients in the rehabilitation team arm of the trial was nonsignificantly higher ($0.05 < p < 0.2$) than for those in the control arm for the areas of Nottingham Health Profile, anxiety, depression, caregiver strain and the proportion of patients living at home. Based on the data observed here, a trial with approximately 150 patients in each arm would be needed to have adequate power to detect a 33% difference between intervention and control groups in these outcomes.
Conclusion: Community therapy support for patients not admitted to hospital is feasible but to determine whether it is cost- or clinically effective would require trials of adequate size.

Address for correspondence: Charles Wolfe, Department of Public Health Medicine, Capital House, 42 Weston Street, London SE1 3QD, UK. e-mail: charles.wolfe@kcl.ac.uk

0269–2155(00)CR362OA

Introduction

Provision of rehabilitation to stroke patients never admitted to hospital has been evaluated in little detail, although between 15 and 40% of stroke patients are estimated to remain at home.[1] Wade and colleagues[2] in a nonrandomized controlled trial of a home-care service for acute stroke patients involved a therapy team plus social worker and a district nurse. The use of hospital beds was not reduced and there appeared to be no advantage to the scheme. In the UK there have been several randomized controlled trials of domiciliary occupational therapy for stroke patients who remain at home which indicate that this option is feasible and effective.[3–5]

Wolfe *et al.*[1] showed that for stroke patients requiring rehabilitation, those not admitted to hospital were significantly less likely to receive rehabilitation than those admitted. In an attempt to redress this situation we wished to assess the effectiveness of providing rehabilitation to non-admitted stroke patients in a pilot trial. This study was part of a larger evaluation of early discharge to a community-based rehabilitation team of which the early discharge to the community-based rehabilitation team results have been reported.[6]

Methods

A community-based register using multiple sources of notification was maintained in South London for all strokes occurring between January 1993 and July 1995.[1] All patients who remained at home after their stroke were eligible for inclusion in the pilot trial of community-based rehabilitation team support.

Patients were randomized to receive either usual community care or home treatment by a rehabilitation team. Outpatient resources available in the district included a hospital-based stroke clinic, geriatric day hospital, generic domiciliary physiotherapy and speech and language therapy, hospital outpatient physiotherapy, and the usual community resources. The maximum level of home care available in the study area to all patients was three 1-hour visits daily by a home help for personal care, meals on wheels, and community nurse visits for specific tasks. The community rehabilitation team comprised a senior physiotherapist grade 1 with neurological training, a senior occupational therapist grade 1, a half-time speech and language therapist with adult neurological training, and a full-time therapy aide. There was no nurse or clinical psychologist attached to the team. A consultant (AGR) coordinated the team and chaired the weekly clinical meeting. The patients were assessed at home for rehabilitation needs and objectives set for a planned course of therapy (maximum one daily visit from each therapist). Patients received care from the team for a maximum of three months. After the trial period patients were referred to conventional rehabilitation services when appropriate. All other services apart from therapy were as described for the usual care group. There was no augmentation of social services' resources.

Informed consent was obtained from the patients. Randomization of patients was carried out using opaque, sealed envelopes, with no stratification being performed.

Baseline data on demography and severity of stroke were collected within 48 hours of randomization. Two research associates conducted all assessments at two, four and six months. A third research associate conducted the assessment at 12 months by interview, usually in the patient's home, and she was blind to the treatment group, although occasionally the patient did make clear which group they had been in.

A range of standardized outcome assessments was used to measure aspects of impairment, disability and handicap and could be completed in most cases in 45 minutes. The measures included Motricity Index,[7] Mini-Mental State Examination,[8] Albert Test,[9] Frenchay Aphasia Screening Test (FAST),[10] modified Barthel Index,[11] Rivermead Activities of Daily Living score,[12] Hospital Anxiety and Depression Scale,[13] 5-metre timed walk,[14] Nottingham Health Profile (NHP)[15] and Caregiver Strain Index.[16] Speech was assessed by three questions: has the patient any speech disturbance as a result of stroke; is the patient dysphasic; and is dysarthria present? The primary outcome of interest was the Barthel Index score.

To evaluate the differences in utilization of services between the arms of the trial the following

resource use data were recorded at two, four, six and twelve months after the stroke: use of diagnostic tests, hospital outpatient and inpatient episodes, use of primary care (general practitioner (GP) visits, community nursing) and social services (meals on wheels). The total number of inpatient and outpatient therapy sessions was also recorded (number of therapy sessions (occupational (OT), physio (PT) and speech and language (ST)), with one unit being defined as a 20-minute session per therapist.

Statistical analyses

The trial was analysed by intention to treat. The associations between continuous outcome variables and treatment group were assessed using the Mann–Whitney test, as none of the variables were normally distributed. Bootstrap confidence intervals (using 100 replications) were calculated for the differences between medians. The chi-squared test was used to investigate the associations between dichotomous outcome variables and treatment group. Confidence intervals were calculated for the differences between proportions.

Results

Figure 1 outlines the flow diagram for the trial. There were a total of 43 patients who remained at home. Of these 23 were randomized to receiving support from the rehabilitation team and 20 received usual care. Thirty-two (74%) were followed up at one year; five (12%) had died, two (6%) were lost to follow-up and 4 (9%) refused to participate.

Table 1 describes the casemix of the patients, split by arm of trial.

There was an indication that patients who were in touch with the rehabilitation team had more computerized tomography (CT) scans (12 (52%)) compared with the conventional arm (7 (35%) ($p = 0.26$). Overall less than a third of patients in either group were investigated with, for example, chest X-ray, electrocardiogram or blood tests and there were no significant differences between the groups. There were also no significant differences between the groups with regard to use of services other than rehabilitation. Less than 20% of either group received meals on wheels or district nursing and under half received home help services.

Table 2 shows the nature and amount of therapy received for those patients with a physi-

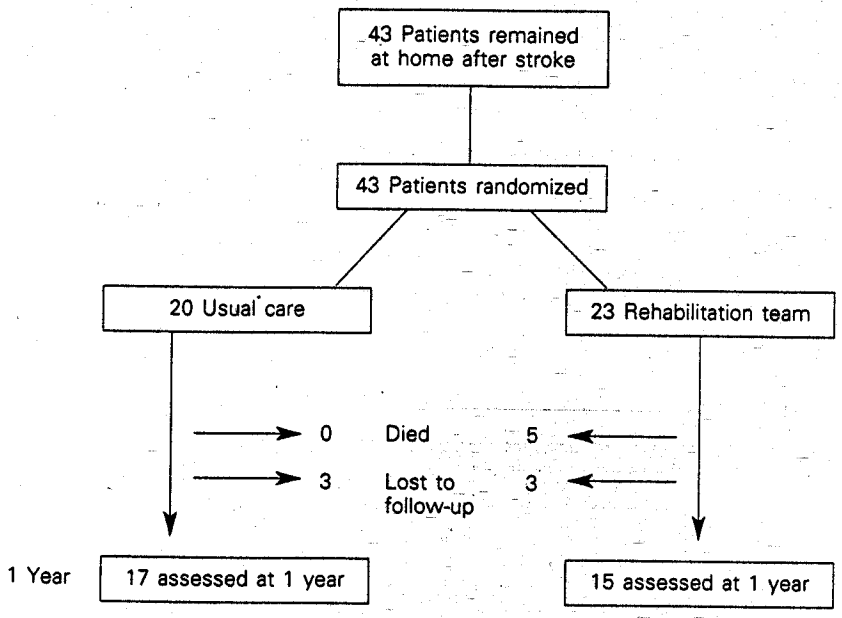

Figure 1 Flow diagram for the trial.

cal or speech deficit. Patients (with a deficit) in the rehabilitation team of the trial were more likely to receive occupational, physical and speech therapy than those in the usual care arm ($p = 0.03$, 0.01 and 0.008, respectively). For those patients actually receiving therapy, there was no evidence that the amount received differed between the groups. However, the number of patients in each of these comparisons was very small.

The outcomes for patients in the trial at one year are shown in Table 3.

Based on the data obtained from the control arm, we estimated the size of trial needed to detect a 33% improvement in each of the continuous outcomes mentioned above with a power

Table 1 Demographic and casemix details of patients at baseline

Variable	Rehabilitation team ($n = 23$)		Usual care ($n = 20$)	
	n	%	*n*	%
Previous stroke	3	14	1	5
Living alone	21	91	17	85
Male	10	43	8	40
Age (mean (SD))	72	12	76	7.04
Previous handicap	5	22	1	5
Prior Barthel score (median (min, max))	19	9, 20	20	11, 20
Speech disturbance	12	52	10	53
Dysphasia	7	30	7	35
Dysarthria	6	26	7	35
Swallowing disturbance	5	22	6	30
Incontinent	4	17	1	5
Fully conscious	23	100	20	100
Paralysis/weakness	20	87	16	80
Data at randomization				
NHP (median (min, max))	12	0, 28	11	0, 29
Motricity (median (min, max))	88	61, 100	88	59, 100
Mini-Mental (median (min, max))	24	16, 30	24	13, 30
Anxiety (median (min, max))	2	0, 15	5	0, 14
Depression (median (min, max))	6	1, 14	6	0, 17
FAST (median (min, max))	22	0, 30	24	12, 30
Barthel (median (min, max))	17	7, 20	17	8, 20
5-m walk (median (min, max))	10	4, 35	8	4, 20

NHP, Nottingham Health Profile; FAST, Frenchay Aphasia Screening Test.
Numbers are *n* and percentage unless stated otherwise.

Table 2 Therapy inputs post stroke

Variable	Rehabilitation team	Usual care	Differences in % (95% CI)	*p*-value
Had deficit	20	16		
Had OT	11 (55%)	3 (19%)	36% (7%, 65%)	0.03
Units OT (median (min, max))	7 (4, 33)	24 (4, 27)	−17 (−22, 4)	0.48
Had PT	9 (45%)	1 (6%)	39% (14%, 64%)	0.01
Units PT (median (min, max))	3 (1, 14)	2		
Had speech deficit	15	11		
Had ST	9 (60%)	1 (9%)	51% (21%, 81%)	0.008
Units ST (median (min, max))	12 (2, 108)	6		

OT, occupational therapy; PT, physiotherapy; ST, speech therapy.
Numbers are *n* and percentage unless stated otherwise.

Table 3 Outcome measures at one year post randomization

Outcome	Rehabilitation team	Usual care	Difference (95% CI)	*p*-value
Living alone	15 (100%)	15 (88%)	12% (–4%, 27%)	0.17
Recurrence	0 (0%)	2 (12%)	–12% (–27%, 4%)	0.17
Speech disturbance	2 (13%)	1 (6%)	7% (–13%, 28%)	0.47
Dysphasia	2 (14%)	1 (6%)	8% (–13%, 30%)	0.43
Dysarthria	0	0		
Swallowing disturbance	2 (13%)	0 (0%)	13% (–4%, 31%)	0.13
Incontinence	2 (13%)	0 (0%)	13% (–4%, 31%)	0.13
Paralysis/weakness	7 (47%)	10 (59%)	–12% (–47%, 22%)	0.49
NHP (median (min, max))	5 (0, 28)	12 (0, 26)	–7 (–15, 1)	0.16
Motricity (median (min, max))	96 (84, 100)	94 (74, 100)	2 (–6, 13)	0.84
Mini-Mental (median (min, max))	29 (22, 30)	27.5 (15, 30)	1.5 (–1, 6)	0.27
Anxiety (median (min, max))	1 (0, 18)	3 (0, 18)	–2 (–6.5, 2.5)	0.08
Depression (median (min, max))	4 (0, 11)	6 (0, 15)	–2 (–5.5, 1.5)	0.18
FAST (median (min, max))	30 (17, 30)	28 (14, 30)	2 (1, 11)	0.06
Barthel score (median (min, max))	18 (8, 20)	20 (16, 20)	–2 (–4, 2)	0.50
5-m walk (median (min, max))	8 (7, 20)	8 (7, 15)	0 (–1, 2.5)	0.86
Albert Test (median (min, max))	7 (5, 7)	7 (0, 7)	0 (0, 0)	0.85
Rankin > 3	8 (53%)	7 (41%)	12% (–22%, 46%)	0.49
Caregiver Strain[a] (median (min, max))	0 (0, 6)	4 (0, 10)	–4 (–6, 1)	0.19

[a] $n = 10$ (rehabilitation team) and 9 (usual care).
NHP, Nottingham Health Profile; FAST, Frenchay Aphasia Screening Test.

Table 4 Sample sizes needed to detect differences in outcome[a]

Outcome	Control value[b]	Minimum detectable difference	*n* per group
NHP	12.12 (8.73)	4	71
Anxiety	6 (6.42)	2	162
Depression	6.5 (4.4)	2.2	63
Caregiver Strain	3.6 (3.4)	1.2	127
% living at home	88%	10%	121

[a]The sample sizes (assuming normality of the distributions) are based on detecting a 33% difference in continuous outcomes or a difference of 10% between two proportions.
[b]The value is mean (SD) unless stated otherwise.
NHP, Nottingham Health Profile.

of 80% (Table 4). We also estimated the size of trial needed to have 80% power to detect a 10% difference in the proportion of patients living alone at one year poststroke (Table 4). These calculations show that a trial with approximately 150 patients per arm would be needed to have adequate power to detect most of the differences between intervention and control.

Discussion

This study has assessed the feasibility of providing domiciliary rehabilitation to stroke patients never admitted to hospital. Although the rehabilitation trial was only a feasibility study, we consider that it provides useful information for future trials in this area. While the data are specific to the study area, there are no other contemporary data describing management of stroke patients at home for all rehabilitation services. Unlike other trials, this study evaluates the provision of occupational, physical and speech therapy rather than single modality rehabilitation. The team did not provide nurse and clinical psychology support which perhaps should be considered in any package for patients who will not be seen in a hospital setting.

Clinical messages

- The effectiveness of early supported discharge to a community rehabilitation team has been shown to be cost-effective.
- For stroke patients who remain at home after their stroke, domiciliary rehabilitation is feasible but has not been shown to be effective.
- A multicentre randomized controlled trial of at least 300 patients would be required to assess the cost-effectiveness of domiciliary rehabilitation for stroke patients not admitted to hospital.

The weakness of the study reported here is that it involved only 43 patients, although this represents all the community cases notified to the stroke register over a two and a half year period who did not die soon after their stroke. To assess the effectiveness of the rehabilitation team in the community with usual care would require a trial with 150 patients per arm to have adequate power to detect clinically relevant differences in measures such as living alone, anxiety, depression, Nottingham Health Profile, Caregiver Strain. Such a study is likely to require several centres if recruitment were to last only a year or two.

It was feasible to deploy the rehabilitation team to the patients in their own homes. The data collected and presented in this paper demonstrate the process of care received by the patients. They do not, however, describe how the team managed this process and whether it was sustainable. The advantage of the study area was that travelling distances in London are short, although traffic congestion can cancel out the geographical advantages. The decision as to whether these patients required therapy was made at the weekly multidisciplinary meeting in the hospital and although the group generally had milder strokes they did require rehabilitation. Therapy was only given in the specified modality if agreed at the multidisciplinary meeting. Perhaps more assessment of the appropriateness of individual therapy inputs is required. The therapists' and patients' perspectives of this scheme have not been studied and these would be useful measures in future evaluations. Pound *et al.*, assessing satisfaction in an early discharge scheme from hospital, noted that satisfaction was independently associated with the receipt of therapy and the amount received.[17]

This pilot study did not set out to avoid admission of patients but merely support those patients who were not admitted to hospital. There is increasing interest in the UK in developing hospital avoidance schemes for various conditions. However, the trial data address only one element of care. Although this pilot study focused on rehabilitation, a true hospital at home scheme should also contain diagnostic and other therapeutic interventions in the package. There are no such evaluations in the literature for stroke. It is difficult to know whether such a scheme could ever be evaluated as increasingly diagnosis of the subtype of stroke is required and acute treatments available.

In conclusion, community therapy support is feasible for patients who remain at home but whether it is clinically effective or cost-effective requires trials of adequate size.

Acknowledgements

The Stroke Association, Lambeth Southwark and Lewisham Health Authority, Wandsworth Health Gain Fund, Nuffield Hospitals Provincial Trust, the Special Trustees for St Thomas' Hospital and NHS R&D Cardiovascular Disease and Stroke Programme for funding. Local primary care and hospital staff for notification of cases.

The members of the St Thomas' stroke rehabilitation trial research group were G Browning, F Bunn, H Cambell, T Collela, V Churchouse, V James, S Mackay, A Moberley, P Pound, E Richardson, P Traill, Y Toun, F Warburton, C Watson.

References

1 Wolfe CDA, Taub NA, Woodrow J *et al.* Patterns of acute stroke care in three districts in southern England. *J Epidemiol Commun Health* 1993: **47**: 144–48.

2 Wade DT, Langton-Hewer R, Skilbeck CE *et al.* Controlled trial of a home-care service for acute stroke patients. *Lancet* 1985; February 9: 323–26.

3 Walker MF, Gladman JRF, Lincoln NB *et al.* Occupational therapy for stroke patients not admitted to hospital: a randomized controlled trial. *Lancet* 1999; **354**: 278–80.
4 Logan PA, Gladman JRF, Lincoln NB. A randomized controlled trial of enhanced social service occupational therapy for stroke patients. *Clin Rehabil* 1997; **11**: 107–13.
5 Gilbertson L, Langhorne P, Walker A *et al.* Domiciliary occupational therapy for patients with stroke discharged from hospital: randomized controlled trial. *BMJ* 2000; **320**: 603–606.
6 Rudd AG, Wolfe CDA, Tilling K *et al.* Randomised controlled trial to evaluate early discharge scheme for patients with stroke. *BMJ* 1997; **315**: 1039–44.
7 Demeurisse G, Demol O, Robaye E. Motor evaluation in vascular haemiplegia. *Eur Neurol* 1980; **19**: 382–89.
8 Folstein M, Folstein S, McHugh P. 'Mini-Mental State': A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* 1975; **12**: 189–98.
9 Albert ML. A simple test of neglect. *Neurology* 1973; **23**: 658–64.
10 Enderby P, Wood V, Wade D. *Frenchay Aphasia Screening Test.* Windsor, Berks: NFER-Nelson, 1987.
11 Collins C, Wade DT, Davis S *et al.* The Barthel ADL Index: a reliability study. *Int Disabil Stud* 1988; **10**: 61–63.
12 Whiting S, Lincoln N. An ADL assessment for stroke patients. *Br J Occup Ther* 1980; February: 44–46.
13 Zigmond A, Snaith R. The Hospital Anxiety and Depression Scale. *Acta Psychiatr Scand* 1983; **67**: 361–70.
14 Collen FM, Wade DT, Bradshaw CM. Mobility after stroke: reliability of measures of impairment and disability. *Int Disabil Stud* 1990; **12**: 6–9.
15 Hunt SM, McKenna SP, Williams J. Reliability of a population survey tool for measuring perceived health problems: a study of patients with osteo-arthritis. *J Epidemiol Commun Health* 1981; **35**: 297–300.
16 Robinson B. Validation of a caregiver strain index. *J Gerontol* 1983; **38**: 344–48.
17 Pound P, Tilling K, Rudd AG *et al.* Does patient satisfaction reflect differences in care received after stroke? *Stroke* 1999; **30**: 49–55.