

Day hospital and home physiotherapy for stroke patients: a comparative cost-effectiveness study

ABSTRACT—The financial cost of stroke rehabilitation is considerable but few cost-effectiveness studies are available to guide clinical practice. The Bradford community stroke trial was a randomised trial comparing day hospital attendance with home physiotherapy for elderly stroke patients leaving hospital. The outcome measurements used indicated a consistent modest advantage in favour of home physiotherapy. This advantage is now re-examined in conjunction with the quantified costs of the rehabilitation services and community support received by the two patient groups. The results show that the median cost for the day hospital patients over the first eight weeks was £620.00 (interquartile range £555.00–£730.00) and £385.00 for the home physiotherapy group (interquartile range £240.00–£510.00). These costs were significantly different (median difference £265.00, 95% confidence interval £190.00–£340.00; $p < 0.01$). There were no significant differences between the two groups for the indirect costs. This cost-effectiveness study supports the clinical trial result that home physiotherapy should be the treatment of choice for stroke aftercare.

As health care becomes more expensive, it becomes important to price the different forms of treatments that are available. Few attempts have so far been made to cost alternative methods of rehabilitation treatment [1].

This is unfortunate considering how common disability is [2], and how much money the NHS spends on it. Stroke disease is a prime example. Approximately 100,000 new cases of stroke occur each year in England and Wales [3]. An average health district will contain 1,375 stroke survivors, including 340 severely disabled [4]. Stroke care accounts for approximately 4% of NHS expenditure [3].

Various rehabilitation strategies for stroke patients have emerged. They have developed in an empirical and pragmatic manner [5] with few randomised clinical

and financial appraisals to guide selection. The Bradford community stroke trial [6–8] provided an opportunity to examine some of these aspects, and this paper reports the findings of a comparative cost-effectiveness study of two commonly practised methods of providing community stroke rehabilitation.

The Bradford community stroke trial

The Bradford community stroke trial was a randomised trial comparing day hospital care and home physiotherapy for elderly patients leaving hospital after a new stroke. The methods and results of that trial have been fully reported elsewhere [7,8]. Patients in both treatment groups showed a significant improvement in physical ability over eight weeks and six months, but with some advantages in favour of home treatment. The home treated patients were more able on stairs, and walking outside, and were slightly more socially active. However, as the differences in outcome between the two treatment groups were modest, the cost-effectiveness analysis reported here is essentially one of 'cost minimisation'; to determine which treatment incurs the least cost [9].

Method

A cost-effectiveness analysis involves comparing the costs of a particular health-care programme with the outputs. In this study the health-care benefits are reflected by the measurements of the Bradford community stroke trial. The costs include direct monetary costs of a service as well as indirect costs such as patient and carer distress. To quantify the direct costs, comprehensive prospective records were kept of all rehabilitation treatments and community support services given to the patients in our trial. The direct costs of each form of rehabilitation were then calculated by drawing together the component costs for the services each individual patient received during the first eight weeks of the trial. Day hospital expenditure was calculated at cost per attendance, and home physiotherapy at cost per visit.

The indirect costs incurred are more difficult to quantify. The patients' 'perceived health' was measured by the Nottingham health profile [7,8], and carer stress by the general health questionnaire [7,8]. The main carers also completed the Frenchay activities index [7,8] before the patient's discharge from hospital.

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tal and again at eight weeks to indicate any social restrictions that may have occurred.

For simplicity, the cost-effectiveness analysis has been limited to those patients receiving the hospital and community physiotherapy services provided by the Bradford Health Authority and the community services provided by the Bradford Metropolitan Council. We have not included patients whose rehabilitation was provided by the adjacent Airedale Health Authority. Patients were recruited to the trial between January 1988 and September 1989, and the cost calculations relate to the financial year 1988/89.

Day hospital costs

The method and results of an extensive costing exercise for the two day hospitals in the Bradford Health Authority, including ambulance costs, have been described in detail elsewhere [10]. At the larger hospital during the year under review, 289 new patients were referred and there were 6,848 attendances, with a daily average of 28 patients referred. At the smaller day hospital there were 153 new patients and 3,036 attendances, with an average daily attendance of 12. The component costs for the two day hospitals are shown in Table 1. The average cost per patient attendance was £35.00, for the larger day hospital, and £49.00 for the smaller.

Home physiotherapy costs

A domiciliary physiotherapy service for stroke patients was established in Bradford Health Authority in October 1986. It is staffed by two Senior 1 physiotherapists and based in a health centre. The non-pay costs (telephone, postage, and stationery) have been estimated. The health centre costs have been calculated in a similar way to those for the day hospitals [10], with fuel, rates, and cleaning costs allocated *pro rata* according to office floor area used. Travel costs are based on the

actual mileage recorded by the two physiotherapists during the year under review (8,990 miles) at standard user rate per mile plus a monthly allowance.

The two physiotherapists undertook 1,723 treatments with 171 new stroke referrals. The total cost incurred was £33,800.00, with an average cost per treatment of £20.00 (Table 1).

Other health authority services

The day hospital patients received speech therapy if necessary, and this cost is included in the unit cost per day hospital attendance. A domiciliary speech therapist treated the home rehabilitation patients as required, and this was costed in accordance with information obtained from Bradford Health Authority finance department at £13.60 per contact. Several patients (day hospital = 3; home physiotherapy = 5) were admitted to hospital for short periods during the trial and a standard cost of £80.00 per inpatient day was charged. Occupational therapy was costed at £23.00 per contact for the three patients in the home rehabilitation group who received this service. These latter costs have been obtained from information supplied by Yorkshire Regional Health Authority.

The district nursing service

Calculating the costs of the district nursing services is difficult for several reasons. A patient may be visited by staff of different grades; the costing of the service must account for material costs, travel costs, and office overheads; each hour of contact with a patient produces additional non-contact time for documentation and administration. The cost per hour of direct patient contact has therefore to be uplifted by an appropriate weighting factor to ensure that these components are included.

The weighting factors were calculated using information obtained from a computerised management

Table 1. Cost of providing the day hospital and home physiotherapy services during 1988/89. Unit cost is the cost per patient attendance (day hospital) or per home visit (home physiotherapy)

	30-place day hospital		15-place day hospital		Home physiotherapy	
	£	(% of total cost)	£		£	
Salaries:	143,390	(59%)	85,865	(58%)	28,600	(85%)
Non-pay:	17,155	(7%)	12,300	(8%)	1,100	(3%)
Estate:	36,130	(15%)	23,470	(16%)	500	(1%)
Ambulance/ travel:	45,675	(19%)	26,280	(18%)	3,600	(11%)
Total cost	£242,350		£147,915		£33,800	
Unit cost	£35.00		£49.00		£20.00	

system which uses daily diary sheets to partition the time spent by the district nurses in direct patient contact and on 'other activities'. The *pro rata* overhead costs of the service, clinic accommodation, nurse management and equipment have also been included.

The costs of the district nursing service were calculated for each patient based on the number and duration of treatments received during the eight weeks of the trial, and uplifted by the weighting factor and apportionment of overhead costs. Staff are paid extra for working weekends and bank holidays. These costs were calculated when applicable for an individual patient.

The home care service

The home care service has been costed according to time spent with each patient during the eight weeks. An hourly cost of £4.60 has been produced by the Chartered Institute of Public Finance and Accountancy [11], and includes a percentage for management and overhead costs. Clients pay a proportion of the costs of hot or frozen meals and this reduces the cost to the local authority to 40p per meal. Frozen meals are delivered by the home care service. Where applicable, home care assistance to heat and serve the meal was included when calculating the overall time spent with the patient.

Other local authority services

Four patients attended a day centre. Information from the finance department of Bradford Metropolitan Council gave an average cost of £13.40 per daily attendance. The sitter service (used by only one patient) was charged at £4.00 per hour.

Results

Patients

The 95 patients in this study were residents in the Bradford Health Authority; 43 were randomly allocated to attend the day hospital group and 52 to receive home physiotherapy. The two groups were well matched for disability and did not differ significantly for sex, side of stroke, or presence of a main carer (Table 2).

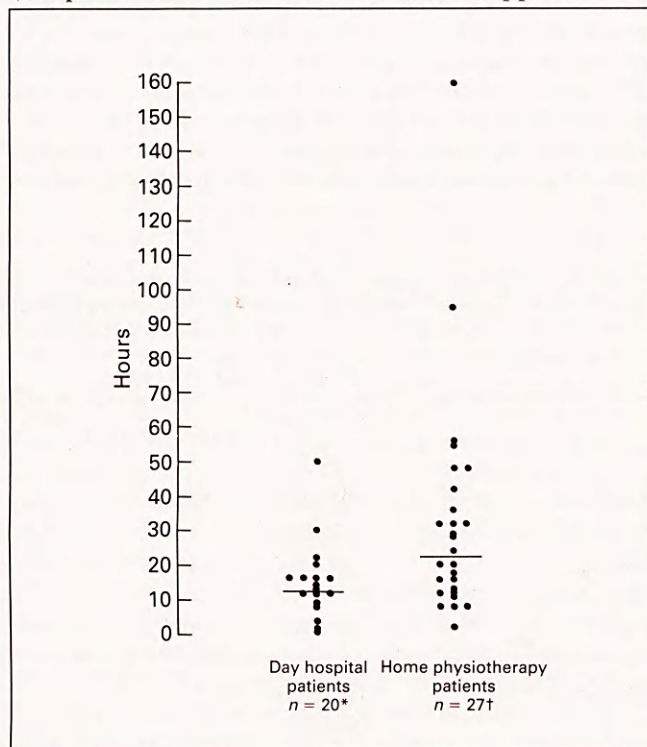
Community support

The intensity of home care and district nursing provided by the community services is shown in Figures 1 and 2. Twenty-five patients in the home physiotherapy group and 23 patients in the day hospital group did not receive assistance from the home care service; this included two patients in each group who refused the offered support. Seven patients in each group were not visited by the district nursing service. Although

Table 2. Clinical features of the two groups of stroke patients

	Day hospital patients		Home physiotherapy patients	
	n = 43	(%)	n = 52	(%)
Male	23	(54)	30	(58)
Female	20	(46)	22	(42)
Right hemiplegia	16	(37)	22	(42)
Left hemiplegia	24	(56)	28	(54)
Other types of stroke	3	(7)	2	(4)
Lived alone	9	(21)	16	(31)
Median age	70		69	
(range)	(60-88)		(60-89)	
Median discharge	15		16	
Barthel index	(4-19)		(8-19)	
(range)				
Stroke-discharge interval				
< 4 weeks	9	(21)	12	(23)
4-7 weeks	15	(35)	20	(38)
8-11 weeks	9	(21)	9	(17)
> 12 weeks	10	(23)	11	(21)

Fig 1. Home care support (in hours) given to the two groups of patients. Median values are shown by the horizontal line
 * 23 patients did not receive home care support
 † 25 patients did not receive home care support



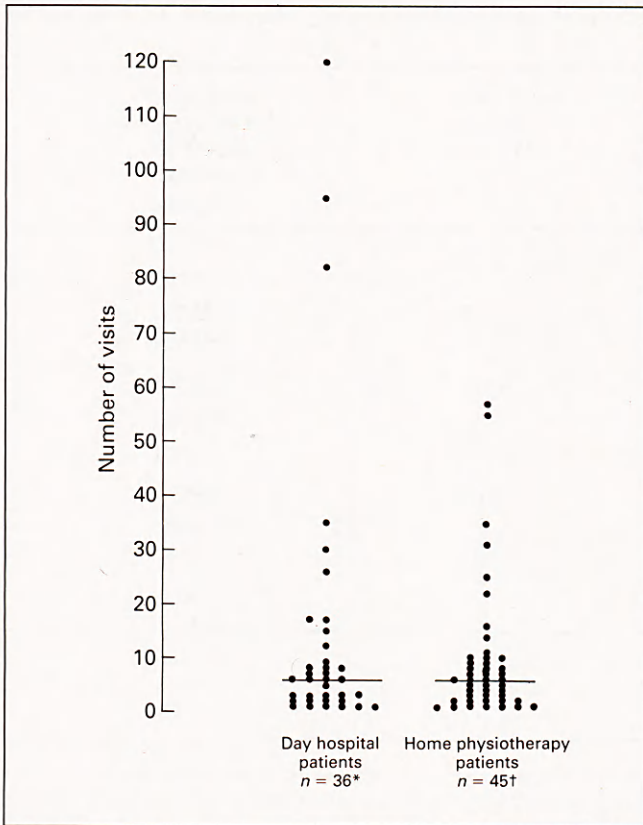


Fig 2. The number of district nursing visits to the two groups of patients. Median values are shown by a horizontal line

* 7 patients were not visited by a district nurse.
 † 7 patients were not visited by a district nurse.

there was a trend for the home physiotherapy group to receive more assistance from the home care service, there were no significant differences in the community support provided to the two groups of patients.

Rehabilitation treatment

The trial protocol dictated a twice-weekly day hospital attendance rate but, due to bank holidays and illness, patients actually attended the day hospital a median of 15 times in eight weeks. The home-treated patients received a median of 11 visits (range 2 to 23) from the home physiotherapists during the eight weeks study.

Direct costs

The costs of rehabilitation and community care service components incurred by each patient during the first eight weeks of the trial were combined to produce a total cost. The median cost of the home physiotherapy group was £385.00 (interquartile range £240.00–£510.00) compared to a median of £620.00 (interquartile range £550.00–£730.00) for the day hospital

patients (Table 3). The total package of care, rehabilitation, and community support given to the home physiotherapy patients was significantly cheaper than the care given to the day hospital group (Mann-Whitney U test, $p < 0.001$) (Fig 3). The cost differences between the two rehabilitation treatments and their associated community care packages were maintained even when the most disabled and the least disabled patients were separately costed.

Indirect costs

There was no difference in the change in 'perceived health' between the two groups of patients as measured on the Nottingham health profile [7,8] (Mann-Whitney U test, $p = 0.43$), or in stress on carers as measured by the general health questionnaire [7,8] (Mann-Whitney U test, $p = 0.35$). Twenty-five per cent of the patients in the home physiotherapy group and 39% of the day hospital group were 'distressed' (Nottingham health profile score ≥ 30 ; $\chi^2 = 1.4$, $p = 0.23$). At least one-third of carers in both groups were 'stressed' (general health questionnaire score ≥ 5 ; day hospital group 45%; home physiotherapy group 33%; $\chi^2 = 0.47$, $p = 0.49$).

Analysis of items on the Frenchay activities index [7,8] gave an indication of the 'opportunity cost' for the carers. Both groups of carers showed a significant decrease in leisure activities (day hospital $p = 0.01$; home physiotherapy $p = 0.01$), and an increase in domestic chores (day hospital $p < 0.001$; home physiotherapy $p < 0.001$), but there were no differences between the two groups of carers.

Discussion

An economic appraisal of alternative treatment approaches should be performed in tandem with a randomised trial to enable the economic analysis to be based on objective evidence of outcome. Few previous studies in rehabilitation have done so [1,12]. A randomised trial of day hospital care was conducted in New Zealand in which the day hospital patients showed a short term improvement in performance of activities of daily living (ADL) and a long-term improvement in mood. However, day hospital care was one-third more expensive than the variety of approaches (inpatient treatment, outpatient treatment, general practitioner care, referral to a day centre) received by the control group [13]. In a cost-effectiveness analysis in America [14], day hospital care was slightly cheaper than inpatient care at 90% occupancy rates for a selected group of patients. The different styles of day hospital care practised in these two studies make comparison with the British model difficult. Other studies have attempted to cost home physiotherapy [15,16] and community care [17], but there is no previous study with which our own may be directly compared.

Table 3. A comparison of the median costs and interquartile ranges (IQR) of rehabilitation and community care received by the two groups of patients

	Day hospital patients <i>n</i> = 43	Home physiotherapy patients <i>n</i> = 52	<i>p</i> value (Mann-Whitney)	Median of the differences with 95% confidence intervals
	£	£		
Home care				
Median	0*	26**	0.14	0
IQR	0-70	0-138		-40-0
District nurse				
Median	40†	55††	0.76	-2
IQR	12-100	25-95		-25-15
Rehabilitation treatments				
Median	530	205	< 0.001	320
IQR	495-565	115-295		270-370
Other+				
Median	0	0		
IQR	0-0	0-22		
Total				
Median	620	385	< 0.001	265
IQR	550-730	240-510		190-340

* 23 patients did not receive home care support.

** 25 patients did not receive home care support

† 7 patients were not visited by a district nurse

†† 7 patients were not visited by a district nurse.

+ Includes, where applicable, speech therapy, day centre attendance, inpatient days, use of the elderly sitting service, and occupational therapy.

Our main finding is that home rehabilitation is a more cost-effective alternative to day hospital care for stroke patients leaving hospital. Day hospital stroke aftercare cost 61% more than home treatment. Put another way, it would be possible to treat 16 patients by home physiotherapy for the same cost as 10 patients at the day hospital. Moreover, clinical outcome measures showed a small but consistent advantage in favour of home physiotherapy [7,8]. Since the two groups of patients received a similar amount of community support from the health authority and local authority, the principal financial difference relates to the costs of the more expensive day hospital provision compared to the cheaper home physiotherapy service. This difference in cost is further enhanced by the greater clinical efficiency of home physiotherapy. The home-treated patients received a median of 11 visits over eight weeks, compared to 15 attendances for the day hospital group. The twice-weekly day hospital attendance régime and the flexible home physiotherapy visits were selected to be in close accord with current clinical practice after a detailed review of both services [6]. Could the day hospital unit costs be brought down to a level comparable with the home physiotherapy service by reducing the attendance rate

to once weekly? Crudely, this might halve the median day hospital costs to £265.00, but this is still greater than the £205.00 for the home physiotherapy patients. However, because the fixed costs of the day hospital service were higher [10], reducing attendance rates simply increases the cost per patient unless it were possible for a new group of day hospital attenders to take up the freed places. The 30-place and the 15-place day hospitals were operating respectively at 88% and 78% of capacity, and neither had a waiting list of attenders. It is therefore difficult to see how the day hospital cost per patient could be reduced to a figure approaching that of home physiotherapy.

The principal 'indirect costs' assessed were the emotional distress of the patient and main care-giver. Although levels of distress were high, they were similar in the two groups and we found no evidence to suggest that the home-based rehabilitation programme created greater stress. Measurement of lost earnings, a commonly used indicator of indirect cost, was not relevant in this study as the majority of patients and main carers were retired. Only one main carer gave up part-time work in order to provide more care. We did not deduct the potential saving of heating and lighting costs at home for the days the patients attended the

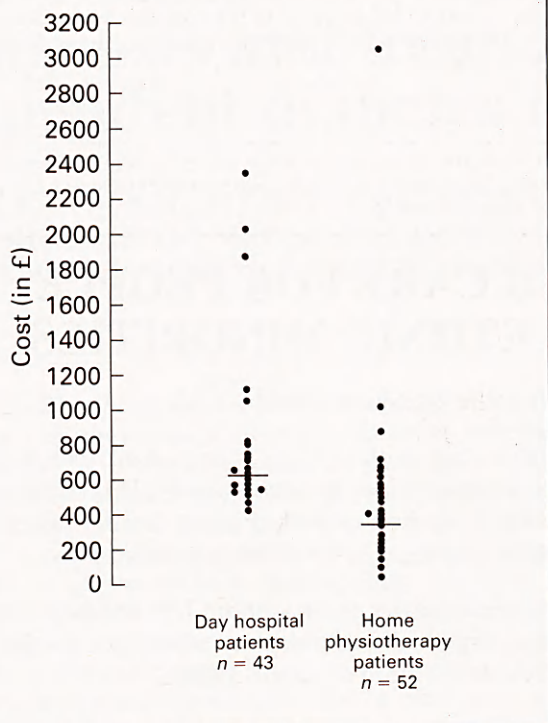


Fig 3. Total costs of rehabilitation and community care given to individual patients in the two groups during the eight weeks following hospital discharge. Median values shown by the horizontal line ($p < 0.001$)

day hospital, as most patients lived with a carer and the additional costs incurred by the home physiotherapy group would be marginal. The marked decrease in the Frenchay activity index scores for the carers in both groups is a sharp reminder of the scale of the social restrictions they experienced in their new role as caregivers.

A cost analysis study is limited by the assumptions and estimates that need to be made. In the costing of the day hospitals and the home physiotherapy service, we calculated the costs incurred in operating the whole service rather than the costs associated with individual courses of treatment received by patients. Previous studies have used the same approach and expressed unit costs as the average costs incurred per patient attendance episode. The most recent study of day hospital costs reported costs of £38.90–£40.10 per attendance (£49.87–£51.41 at 1988/89 prices) for a 20–24 place day hospital unit [18]. These results are comparable to our own. The main limitation of this 'top down' approach is that it assumes that each patient attending the day hospital requires the same amount of staff time, but in practice, of course, some patients will require more, and some fewer rehabilitation treatments. However, as a group, disabled stroke

patients are more likely than others (such as patients with orthopaedic conditions) to require more intensive involvement of the whole multidisciplinary rehabilitation team. In this respect, therefore, the average attendance cost may represent an underestimate of the real cost and the 'top-down' method can be seen as a conservative approach. In contrast, the home physiotherapy service costed in our study is concerned only with the treatment of stroke. The 'top-down' method is therefore a fair reflection of the time and costs involved.

The Bradford community stroke trial revealed no major differences in outcome between the day hospital group of patients and the home rehabilitation group; but any small differences were in favour of the latter group. Taken in conjunction with the evidence of this cost-effective analysis it would seem that rehabilitation at home should be the preferred form of after-care for the majority of elderly stroke patients.

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References

- 1 Drummond M, Ward H. Assessing the 'value for money' from rehabilitation programmes. *Physiotherapy Practice* 1988;4:30–40.
- 2 Martin J, Meltzer H, Elliot D. The prevalence of disability amongst adults. *OPCS Surveys of disability in Great Britain: report 1*, London: HMSO, 1988.
- 3 Office of Health Economics. *Stroke*. London: Office of Health Economics, 1988.
- 4 Rose RC. *Clinical neuroepidemiology*. Tunbridge Wells: Pitman Medical, 1980.
- 5 Consensus statement. Treatment of stroke. *Br Med J* 1988;297:126–8.
- 6 Young JB, Forster A. Methodology of a stroke rehabilitation trial. *Clin Rehab* 1991;5:127–33.
- 7 Young JB, Forster A. The Bradford community stroke trial: eight week results. *Clin Rehab* 1991;5:283–92.
- 8 Young JB, Forster A. The Bradford community stroke trial: results at six months. *Br Med J* 1992;304:1085–89.
- 9 Drummond MF, Stoddart GL, Torrance GW. *Methods for the economic evaluation of health care programmes*. Oxford: Oxford University Press, 1987.
- 10 Young JB, Forster A. Cost analysis of geriatric day hospital care. *Clin Gerontol* 1991;13:247–62.
- 11 Chartered Institute of Public Finance and Accountancy. *Annual statistics based on final accounts, personal and social services 1988–89*. London: Statistical Information Service, 1990.
- 12 Donaldson C, Wright K, Maynard A. Determining value for money in day hospital care for the elderly. *Age and Ageing* 1986;15:1–7.

- 13 Tucker MA, Davison JG, Ogle SJ. Day hospital rehabilitation—effectiveness and cost in the elderly: a randomised controlled trial. *Br Med J* 1984;289:1209–12.
- 14 Cummings V, Kerner JF, Arones S, Steinbock C. Day hospital service in rehabilitation medicine: an evaluation. *Arch Phys Med Rehab* 1985;66:86–91.
- 15 Bryant NH, Candland L, Loewenstein R. Comparison of care and cost outcomes for stroke patients with and without home care. *Stroke* 1974;5:54–9.
- 16 Frazer F. Domiciliary physiotherapy—cost and benefit. *Physiotherapy* 1980;66:2–7.
- 17 Opit LJ. Domiciliary care for the elderly sick—economy or neglect? *Br Med J* 1977;1:30–3.
- 18 Gerard K. An appraisal of the cost-effectiveness of alternative day care settings for frail elderly people. *Age and Ageing* 1988;17:311–8.

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**NEW
TITLE**

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