

Contemporary Themes

Day hospital rehabilitation—effectiveness and cost in the elderly: a randomised controlled trial

M A TUCKER, J G DAVISON, S J OGLE

Abstract

The effectiveness and cost of day hospital care in rehabilitation were studied in a randomised controlled trial in 120 elderly patients who were assessed at referral and six weeks and five months later in activities of daily living skills and mood. Day hospital patients were compared with a control group, who were managed as they would have been before the availability of day hospital care. Day hospital patients showed a significant improvement in performance of activities of daily living at six weeks but not at five months; however, they had a sustained improvement in mood. The cost of day hospital rehabilitation was one third greater than that of rehabilitation by alternative means.

In its current form the geriatric day hospital is not a cheap alternative to other means of rehabilitation. Expensive components of the day hospital should be critically re-examined and renewed emphasis placed on sufficient inpatient beds, domiciliary services, and day care centres.

Introduction

Though day hospital care for the elderly has been extensively described, controlled evaluations of its effectiveness in rehabilitation have been rare despite a rapid increase in the number of geriatric day hospitals from the 1950s onwards.¹ In a recent review Johnston *et al* have highlighted the need for improved design in trials attempting to assess the cost benefits of medical rehabilitation.² Hodkinson has commented on "the paucity of any serious attempt at critical evaluation"³ and Brocklehurst on the need for more objective evaluation of the effectiveness of day hospital treatment by randomised controlled trials.⁴

A recent American randomised controlled study of day hospital rehabilitation found that it was cost effective provided that a high occupancy rate was maintained.⁵ That day hospital described differs from ours, which is based on the British model and provides what the American authors term "transitional rehabilitation."

The opening in 1981 of a 10 bed day hospital attached to the geriatric unit of Auckland Hospital provided the opportunity to set up a randomised controlled trial of its effectiveness in rehabilitating elderly patients compared with existing services. The study has

attempted to define the degree and duration of improvement of mental, physical, and social functioning in the individual patient and the cost effectiveness of the day hospital in the geriatric service.

Method

The trial was limited to patients aged over 55 who were living in the catchment area of the geriatric unit (population 17 000 aged over 65) and required assessment and rehabilitation but not 24 hour institutional care. Referrals were from two sources: the hospital—medical, surgical, and geriatric wards (40%)—and general practitioners in the community (60%). Referrals were not accepted for patients with dementia as a primary problem or for those in whom the main need was for social day care or family relief. All patients were examined by a member of the geriatric unit before inclusion in the trial. One hundred and twenty patients were suitable for day hospital rehabilitation and were referred for assessment and randomisation into day hospital and control groups. Patients with and without strokes were randomised separately into day hospital and control groups with standard tables of random numbers. Patients were randomised at the time of the first assessment of activities of daily living and in the order of attendance. The first patient in the trial was admitted to the day hospital on 1 July 1981 and the last one on 31 July 1982.

DAY HOSPITAL GROUP

Trial patients attended on two or three days per week, Monday to Friday, from 0830 to 1400. The day hospital provided intensive physiotherapy, occupational therapy, speech therapy, and medical and nursing assessment and supervision over six to eight weeks. A social worker was attached to the day hospital. Ambulance transport was used as relatives were rarely able to help with transport regularly.

Only patients included in the trial were admitted to the day hospital during the period in which patients were accepted for assessment and randomisation. Nevertheless, during the first eight weeks patients admitted before the trial began were still attending the day hospital and during the five months' follow up other patients were admitted to the day hospital while patients in the trial were completing their courses of treatment. The last follow up assessment was completed on 21 December 1982.

CONTROL GROUP

Control patients were managed as they would have been before the opening of the day hospital—that is, by admission to hospital or continued inpatient management; by outpatient follow up with or without outpatient physiotherapy; by referral to the extramural hospital for domiciliary services; by referral to the sole care of their general practitioner; or by referral to a day care centre, as decided before randomisation.

ASSESSMENT PROCEDURE

Patients were assessed in the skills of activities of daily living, mood, mental state, and extent of social support by a research occupational

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therapist at referral, six weeks, and five months. In an attempt to preserve blindness of assessment she was not concerned in the rehabilitation of these patients and worked in another occupational therapy department.

Activities of daily living

Activities of daily living skills were assessed with an abbreviated form of the Northwick Park activities of daily living index⁶; we reduced the number of factors scored from 17 to 12. This abbreviated index was introduced in an attempt to shorten the assessment procedure for the trial, in which a battery of tests was used in assessing an easily fatigued group of patients. Items deleted were grooming, use of taps, and cooking (6, 9, and 10), the last two being included in the assessment of making tea. Up and down stairs (items 13 and 14) were combined. In the shortened index the possible scores range from 12 to 36, lower scores indicating greater independence. Thirty dual assessments showed a high correlation between the original and abbreviated indices.

Mood

Mood was assessed by the 20 question Zung depression index,⁷ which is of value in both depressed and non-depressed patients. Scores range from 0-25 to 1-00, the higher scores indicating depression. Cognitive function was assessed by the 10 question abbreviated mental test,⁸ initial scores being above 7/10 in all cases.

Domiciliary services

For each patient the use of domiciliary services (physiotherapy, occupational therapy, district nursing, social work, meals on wheels, home aid, speech therapy) was documented from the records of the extramural hospital—a community arm of the Auckland Hospital Board. The amount of occupational therapy and physiotherapy in each case was calculated with weighted units (one unit equals about one minute of individual therapy time).^{9,10} The weighting compensates for the difference between individual and group therapy.

STATISTICAL ANALYSIS

The statistical significance of the difference between baseline values, six week assessments, and five month assessments in the day hospital and control groups was estimated in each case with the Wilcoxon rank sum test.

COSTING

Average costings were used throughout, in New Zealand dollars.

Day hospital group

The cost of running the day hospital during the 78 weeks of the trial was estimated under three headings: staffing, transport, and overheads (table I). The cost of transport was based on the average distance of a return ambulance trip in the hospital catchment area (14 km) and the cost per kilometre per patient charged by the St John Ambulance Association (\$1.30 per km per patient, irrespective of the number of patients transported in one trip). No patients used private transport regularly. The cost of overheads (use of facilities, heating, and cleaning) was calculated from a hospital board estimate of \$96.31 per sq m per annum for an area with low technology usage. Investigations were costed separately. The cost of the midday meal was derived from a hospital board estimate of \$1.86 per patient per meal.

During the 78 weeks of the study 93 new patients (59 in the trial and 34 not in the trial) attended the day hospital. The total number of attendances in this period was 2176 (mean number of attendances per patient 23.4). Patients not included in the trial attending the day hospital during this 78 week period were included in estimates of cost. This minimised the effect of low occupancy rates in the early stages of the trial.

Running costs for the day hospital were also estimated for a 35 week period (during which only patients included in the trial were attending the day hospital), for a recent six month period with higher occupancy rates, and for theoretical 100% occupancy. The overall cost of rehabilitation for each patient's five month assessment period included the cost of inpatient care for patients in hospital (\$100 per patient per day in a geriatric unit) and the cost

of domiciliary services provided by the extramural hospital (\$17 per visit for services other than meals on wheels and home aid, which were individually costed).

Control group

The cost of inpatient care, \$100 per day in a geriatric unit, was derived from Auckland Hospital Board estimates and confirmed on our own costings. The cost of outpatient review was estimated for an average half hour consultation on the basis of the cost of staffing (medical and nursing), return ambulance transport, and overheads for the outpatient clinic. The cost of outpatient physiotherapy was estimated from the number of units of physiotherapy in each case. Overheads were estimated and ambulance transport was costed. The overall cost of rehabilitation for each patient's five month assessment included the cost of domiciliary services provided by the extramural hospital (\$17 per visit for services other than meals on wheels and home aid, which were individually costed).

Social costs

The costs of maintaining the day hospital and control groups of patients in the community during this trial period are thought to be similar, but no attempt has been made to estimate these social costs in each case.

Both groups remained under the overall supervision of their general practitioners. In New Zealand 80% or more of the cost of a consultation is paid by the patient. This cost was not estimated in the trial but we suspect that general practitioners' services were used with equal frequency in both groups.

Day care centres in New Zealand are staffed by volunteers, who also provide transport. A nominal charge of roughly \$3 is made in some cases for a midday meal.

Results

Of 120 patients referred for assessment, 62 were randomised into the day hospital group and 58 into the control group. Adequate data for analysis were available in 109 patients, 11 patients, all from the non-stroke group, being excluded from the final analysis. Of the three women from the day hospital group, two after two or three sporadic attendances refused to attend day hospital (baseline activities of daily living scores were 12—non-compliant in all areas—and 31, in retrospect too handicapped for day hospital rehabilitation). The third was inadvertently not reassessed (baseline activities of daily living score 15). Of the eight patients in the control group (six women and two men), two died before the six week review (baseline activities of daily living scores 13 and 17). Two depressed patients refused to attend for the six week assessment (baseline activities of daily living scores 13 and 22). One was too ill to cope with the six week review and was in retrospect too ill for inclusion in the trial (baseline activities of daily living score 24) and two further patients were excluded on the basis of incomplete or inaccurate data (baseline activities of daily living scores 12 and 12).

Table II compares the main characteristics of the patients in each group at

TABLE I—Day hospital running costs over 78 weeks

Item	Method of costing	Total cost for 78 weeks (%) (NZ\$)
Staffing	Based on hours of employment and hourly rates of pay of staff	108 251.24 (57.4)
Transport	Average return trip = 14 km	
	2176 trips = 30 464 km	39 603.20 (21)
	Cost/km/patient = \$1.30	
Overheads	Facilities, etc:	
	Day hospital area = 219.57 m ²	
	Cost @ \$96.31/m ² /year = \$21 147.22 per annum	40 783.73 (21.6)
	Cost for 78 weeks = \$31 720.88	
	Meals:	
2176 meals @ \$1.86/meal = \$4076.36		
Investigations:	Cost/patient = \$53.93	
	For 93 patients = \$5015.49	
Total		188 638.17
Cost per patient	No of new patients attending over 78 weeks = 93	\$2028.37
Cost per patient per day	Average no of days attendance per patient = 23.4	\$86.69

TABLE II—Characteristics of trial patients (n=120)

	Day hospital patients (n=62)	Control patients (n=58)
Patients excluded	3	8
Patients included in trial	59	50
Stroke (%)	31 (52.5)	34 (68)
Non-stroke (%)	28 (47.5)	16 (32)
Men (%)	27 (46)	25 (50)
Women (%)	32 (54)	25 (50)
Mean age (years) (range)	72.5 (55-92)	71.5 (55-86)
Mean baseline activities of daily living scores (range)	17.64 (12-31)	16.30 (12-25)
Mean baseline Zung scores (range)	0.58 (0.35-0.90)	0.56 (0.29-0.81)

The differences between the baseline activities of daily living and Zung scores in the day hospital and control groups were not significant.

baseline assessment. The differences between the two groups in baseline activities of daily living and Zung scores, age distribution, and sex ratios were not statistically significant. The data from the patients with and without strokes were analysed separately and showed a similar pattern to the overall results.

Table III shows the overall changes in activities of daily living scores and mood at follow up assessments. The difference between changes in activities of daily living scores in the day hospital and control groups was significant at six weeks but not at five months. There was an improvement in mood, as measured by the Zung index, in the day hospital group over that seen in the control group. This failed to reach statistical significance at six weeks but became significant at five months.

TABLE III—Mean improvement in activities of daily living scores and Zung index

	Day hospital		Control	
	6 weeks	5 months	6 weeks	5 months
Mean improvement in activities of daily living scores	1.78	0.63	-0.20	-0.64
Mean improvement in Zung index	0.05	0.04	0.01	-0.01

Overall difference: day hospital vs control group: activities of daily living scores 6 weeks $p=0.002$, 5 months $p=0.12$. Zung index, 6 weeks $p=0.052$, 5 months $p=0.011$.

Table IV shows details of physiotherapy and occupational therapy received by each group of patients, as well as details of the use of public hospital facilities (inpatient and day hospital). The mean occupancy of inpatient beds in the control group was twice that of the day hospital group but, because patients attended day hospital for an average of 23 days, the combined use of hospital facilities (inpatient and day hospital) for the day hospital group was twice that of the control group.

TABLE IV—Treatment and use of public hospital facilities

	Day hospital	Control
Treatment from all sources		
Physiotherapy (units in minutes of individual therapy)		
Mean	521	341
Median (25th-75th percentile)	398 (210-617)	103 (0-565)
Occupational therapy (units in minutes of individual therapy)		
Mean	634	143
Median (25th-75th percentile)	543 (362-773)	20 (0-173)
Use of public hospital facilities		
Inpatient stay (days)		
Mean	8	16
Median (25th-75th percentile)	0 (0-4.5)	6.5 (0-21)
Day hospital attendance (days)		
Mean	23	0
Median (25th-75th percentile)	21 (15-26.5)	0

During the trial 33 patients from the day hospital group and 14 from the control group received no public hospital inpatient care. There was no significant difference between the two groups in the long term use of private hospital and residential care beds, and at the final assessment 88% of the day hospital group and 86% of the control group remained in their own homes.

During the 78 weeks of the study, with the day hospital running at 59% capacity, the average day hospital attendance rate was 23.4 days per patient (table IV) and the cost of day hospital rehabilitation was \$86.69 per patient per day (table I). This compares with the cost of an inpatient bed in this geriatric unit of \$100 per day. Nevertheless, over a five month period the overall cost of rehabilitation for the day hospital group was greater than the overall cost of rehabilitation for the control group (table V).

TABLE V—Average cost per five months' assessment period per patient

	Day hospital (NZ\$)	Control (NZ\$)
Hospital services		
Day hospital	2028	0
Inpatient	789	1598
Outpatient follow ups	0	22
Outpatient physiotherapy	0	54
Total domiciliary services	235	409
Total	3052	2083

During an eight month period in which only patients included in the trial attended the day hospital, the occupancy rate was 58% and the cost per patient per day was \$88.24. In a six month period after the trial, during which the day hospital ran at 72% capacity, the cost per patient per day was \$86.15 and the mean attendance was 18.9 days per patient.

Discussion

In one of the few randomised controlled trials of day hospital rehabilitation of the elderly we found that it is effective, at least in the short term, but may be more costly than rehabilitation by alternative means.

When compared with the control group, the significant improvement in activities of daily living scores seen in day hospital patients at six weeks was probably due to the more intensive rehabilitation received by the latter and supports the findings in a previous study of the effect of various intensities of therapy in patients with strokes.¹¹ The fact that this improvement was not maintained at the five month assessment and that day hospital and control groups showed no significant overall change from the original assessment of activities of daily living at referral suggests that in this age group the improvement in function achieved by more intensive rehabilitation is short lived. Two other studies, one of rehabilitation of patients with stroke¹² and one American study of day hospital rehabilitation (in which patients attended five days a week over three months as an alternative to hospital admission⁵) initially showed an advantage in the treatment group but later showed equal activities of daily living scores at follow up. In both of these studies this was due to functional gains made by the control group after discharge rather than to the functional losses in the treatment group shown in this trial. An improvement in mood in patients attending the day hospital, when compared with the control group, was sustained and significant at the five month assessment, supporting the findings of an early day hospital study which suggested that the main benefit of the day hospital lay in improvement of mood.¹³ This improvement may reflect continuing social interaction, including social day care, organised by the day hospital. By contrast, in the American study there was no improvement in mood.⁵

The cost of day hospital rehabilitation during the five month trial period proved greater than rehabilitation by alternative means. Two British studies^{14,15} have shown that the cost per day of day hospital rehabilitation was marginally less than that of inpatient rehabilitation, and one suggested that it was possible for the combination of the cost of day hospital care and domiciliary support services to exceed that of inpatient rehabilitation.¹⁵ A more recent survey estimated that the cost of day hospital attendance is much higher than had been thought but is still cheaper per day than the cost of inpatient care.¹⁶ The cost of domiciliary support services was thought unlikely to make the cost of attendance at day hospital more expensive than the cost of inpatient care.

The American study showed that the cost per day of day hospital rehabilitation (average attendance 69 days) was less than that of inpatient treatment.⁵ The overall cost of rehabilitation for each patient in the control group was US \$11 823 and for the day hospital patients US \$10 006, but this was achieved only after adjustments to provide 90% day hospital occupancy. In practice, with the day hospital having lower occupancy rates, the overall cost of day hospital rehabilitation proved greater. It should be emphasised that we costed only the five month period after referral to day hospital—that is, from the point at which the patient might be expected to

cope at home alone, or with family support, and not the overall cost of rehabilitation from the time of hospital admission or most recent illness.

Our study shows that the daily cost of day hospital care is slightly less than that of geriatric inpatient care, but, because day hospital attendance is prolonged, its cumulative cost is greater than the combined cost of inpatient and domiciliary rehabilitation. This cumulative cost is proportional to day hospital occupancy rates and to the duration of attendance. The average number of visits in British day hospitals is thought to be about 20 per patient.¹⁷ This is similar to the 23 days per patient in this study, which, together with a relatively low day hospital occupancy during the trial period (58%), gives a cost of \$86.69 per patient per day and a cumulative cost one third greater than that in the control group. The more typical occupancy of 72% and 19 attendances per patient in the six month period after the trial still gives a cumulative cost greater than that of the control group during the trial. In theory, the cumulative costs of day hospital and control groups may be calculated to reach parity only at 100% occupancy and 18 attendances per patient, at which point day hospital costs would be \$58.96 per patient per day.

The additional social cost incurred by the day hospital group because of the extra eight days spent by them in the community (table IV) is not thought to be of major importance in the context of a five month assessment period. The sustained improvement in mood of day hospital patients might be achieved just as well and certainly more cheaply by day care centres, which in New Zealand are run by volunteers.

This trial questions the economic justification of the day hospital as a means of rehabilitation in elderly patients, and suggests that rehabilitation may be achieved more economically by the combined use of inpatient care, domiciliary services, and day care centres. The day hospital has become an accepted part of the geriatric service perhaps because of practical advantages of improved staff recruitment and patient acceptability and because it follows the popular trend away from institutional care to community care.¹⁷ A few day hospital places provide an additional option of care for the elderly but this should not be seen as a "cheap" alternative to insufficient

inpatient geriatric beds; like all aspects of health care it needs critical evaluation. Cost effectiveness might be improved by concentrating on the expensive components of day hospital care, by considering, for example, more flexible staffing levels appropriate to daily occupancy, alternative forms of transport (for example, volunteer services or taxis in selected cases), and restricting the number of attendances to avoid a social day care role. Renewed emphasis on adequate numbers of inpatient beds, domiciliary services, and community day care centres is necessary.

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Lesson of the Week

Importance of neurosurgical consultation after ultrasonic diagnosis of fetal hydrocephalus

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Ultrasound examination of the fetus is being used increasingly as a routine part of prenatal care. Although the benefit of such examinations may appear to be obvious, we here draw attention to the dangers of acting on the finding of one particular fetal abnormality (hydrocephalus) without consulting the relevant specialists. We report on four infants referred to the department of neurosurgery at

To avoid the dangers of unnecessary premature delivery a neurosurgical opinion should always be sought in the management of infants in whom fetal hydrocephalus has been diagnosed ultrasonically

this hospital over the past six months; their cases have been selected specifically because of the lessons that may be drawn from them.

Case reports

Case 1—The mother of this boy was diagnosed clinically as having polyhydramnios, and an ultrasound examination at 34 weeks' gestation

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