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Gloucester Hospital-at-Home: A Randomized Controlled Trial

IAN P. DONALD, R. NEIL BALDWIN, MIRA BANNERJEE

Summary

Hospital-at-Home schemes have been claimed to hasten the discharge of elderly orthopaedic patients, and are becoming increasingly popular with health service managers. In an attempt to measure the benefits of such a scheme when applied to elderly medical patients, we prospectively randomized 60 consecutive referrals of patients approaching discharge either to the Hospital-at-Home (HAH) rehabilitation team, or to conventional discharge (CD) preparation and domiciliary support. Patients allocated to HAH were discharged on average 5 days earlier than CD, while 64% of each group remained at home during 6 months follow-up. Improvements in independence were modest, and similar in the two groups, though a trend favoured HAH.

Introduction

Hospital-at-home schemes are being developed across the country for a number of reasons, and in a variety of clinical settings. The increasing number of elderly people admitted to hospital, some needing prolonged hospitalization to enable a period of rehabilitation, represent one large group. The high-technology care of the acute district general hospital (DGH) required for the initial phase of their illness is often no longer needed during the rehabilitative phase. In view of the considerable cost of inpatient stay, there is pressure to find lower cost alternatives which still provide adequate rehabilitation but achieve earlier discharge into the community. This is in keeping with a policy to shift health expenditure from hospital to community services. At least some elderly patients are glad to leave hospital as soon as possible. However, there is also concern that earlier discharge should not be achieved at the cost of increased burden on families, primary care services and local social services. There is also the possibility that rehabilitation is more effective if given in the patients' own homes although research in stroke rehabilitation, for example [1], has not supported this.

For such reasons, a Hospital-at-Home (HAH) scheme was introduced in Gloucester in 1992, focused on elderly people discharged from medical wards. The scheme was designed to discharge patients earlier than would have been possible with conventional discharge arrangements, to provide intensive domiciliary rehabilitation as required over a maximum period of 4 weeks, and to provide support and training to carers. The scheme also had the task of liaison with professional and voluntary carers to set up a package of care at the end of the scheme, and accomplish a smooth transition to such care.

When the scheme had been running for 9 months, a protocol was agreed to enable evaluation by randomizing referrals to the scheme or to conventional discharge (CD) arrangements. The study aimed to measure the success of the scheme in terms of earlier discharge, improved rehabilitation, and prolonged independence at home with less use of hospital and nursing home care.

Method

The hospital-at-home scheme comprised a full-time nurse manager/co-ordinator, physiotherapist and occupational therapist, and three part-time rehabilitation assistants/support workers. The team continued rehabilitation, settled the patient back into the routine at home, gave support, advice and training to the carers, and established the support network the patient would require at the end of the scheme. Basic care was given by the rehabilitation assistants under the direction of the trained staff, and was handed over to the family and/or the home care service at the end of the scheme. Nursing care required was usually given by the local district nurse. However the trained staff in the team provided an on-call service to support the rehabilitation assistants. While the scheme normally provided support for up to 4 weeks, considerable flexibility allowed withdrawal at an earlier stage if progress was rapid, or occasionally continued treatment up to 6 weeks. Overall responsibility for the patient while under the care of HAH remained with the consultant, although the general practitioner provided routine and emergency medical care. It was understood that the patient could be readmitted at any time at the instigation of the nurse co-ordinator or the GP.

Patients admitted acutely under the care of the Elderly Care Physicians were eligible for inclusion in the study if they lived within Gloucester City. Consultants referred patients who could be expected to benefit from multidisciplinary rehabilitation, were keen to be discharged home, and whose carers were ready to consider discharge. The informal criteria used for referral were the same as those used during the first 9

months of the scheme. During the 5-month period of recruitment to the trial, all referrals to HAH were randomized. Following receipt of the referral, the HAH office allocated the patient to a treatment group using a series of previously randomized sealed envelopes. If the patient was allocated to conventional discharge (CD), the ward was informed that HAH was not available. If the patient was allocated to HAH, the scheme co-ordinator would visit the patient and begin the process of assessment and interview with patient and carers. A home visit by the occupational therapist would also be arranged.

A research nurse was employed during the study to interview patients referred for randomization within 7 days, and also interview carers when involved. The structured interview schedule included Barthel score [2], mental test score (I/O Cape survey version [3]), categorization of mobility and continence on descriptive scales of 0–8 and 0–4 respectively, Philadelphia Geriatric Center Morale score [4], and a description of dependency in six ADL tasks. Carers were asked to give their opinion of their ability to care for their dependant, and their ability to cope with the task. Interviews were repeated at 4, 12, and 26 weeks after the date of randomization regardless of patient's location or date of hospital discharge.

Analysis for the principal end-points of length of hospital stay, success in remaining at home and use of hospital and nursing home was on an intention-to-treat basis. Analysis of any differences in independence was both by intention-to-treat analysis, and also by comparing the subgroups actually discharged and remaining at home through 6 months. Statistical analysis was by Mann–Whitney tests and Fisher's exact tests.

Results

Thirty patients were allocated to HAH and 30 to CD. At the time of randomization, patients had spent an average of 3 weeks in hospital. The baseline characteristics of the two groups are shown in Table I and show no significant difference. Three patients in each group had a Barthel score less than 12; five in each group had a mental test score less than 9. Thirteen of each group were incapable of walking with an aid. The principal diagnoses are shown in Table II and show a wide range, but the frequency of strokes was similar in the groups.

Treatment under Hospital-at-Home: The HAH team visited patients for an average of 20.6 days (range 1–42), and the treatment given was on average 8.8 h physiotherapy (range 0–35), 8.5 h occupational therapy (range 0–31), 49 assistant visits (range 1–159) and three visits from the co-ordinator (range 0–5). The patient's community nurse was involved with the care as judged necessary for specific nursing problems but this was not documented. Day hospital care was started after completion of HAH for ten patients, and for 13 CD patients on discharge from hospital. General practitioner visits during the scheme were a mean and median of two visits per patient (range 0–10).

Table I. Baseline description of groups

	HAH (n = 30)	Control (n = 30)
Age (years): mean (SD)	81.6 (5.4)	84 (6.0)
Men	8	7
Women	22	23
Living alone	17	24
Hospital stay in days until entry: mean (SD)	21.3 (20.8)	24.9 (20)

Table II. Principal diagnoses

	Number of patients	
Diagnosis	HAH	Control
Stroke	8	6
Arthropathy	5	6
Ischaemic heart disease	4	7
Respiratory disease	2	4
Gastrointestinal disease	4	0
Non-respiratory infection	2	4
Malignancy	1	0
Amputation	1	0
Miscellaneous	3	3

The nature of treatment given by the scheme varied considerably, and was tailored to the patient's rehabilitation potential and the patient's and carer's wishes. Five styles of intervention emerged: (i) intensive rehabilitation over a prolonged period as progress was made; (ii) a short period of rehabilitation with the provision of, and education with, appropriate aids; (iii) counselling and encouragement to regain confidence at home; (iv) little rehabilitation possible as motivation was low, or carer was content; (v) monitoring health, and continuing close links with hospital. A combination of several of these was used in many patients' treatment programmes, and it was difficult to categorize the patients retrospectively. However eight received intensive rehabilitation, seven short rehabilitation, and seven principally support and encouragement. Two patients had little desire for rehabilitation, and three were primarily monitored, with two of these readmitted. Successful outcome in terms of remaining at home during follow-up was achieved by 6, 4, 6, 2, and 1 patient respectively in each category.

Hospital discharge following randomization: Seven days after randomization to HAH or CD, 18 of 30 HAH patients and only eight of 30 CD patients had been discharged home (Figure 1). Five of HAH suffered a deterioration in health and discharge was delayed, five were discharged in the second week, and the remaining three in the third and fourth weeks when judged ready for care at home; thus 27 of 30 HAH patients were discharged home. Two weeks after randomization, 19 of 30 CD subjects had been discharged home; five had deteriorated and discharge was not possible, and the remaining six were discharged over the ensuing 3 weeks. Discharge home was significantly earlier by

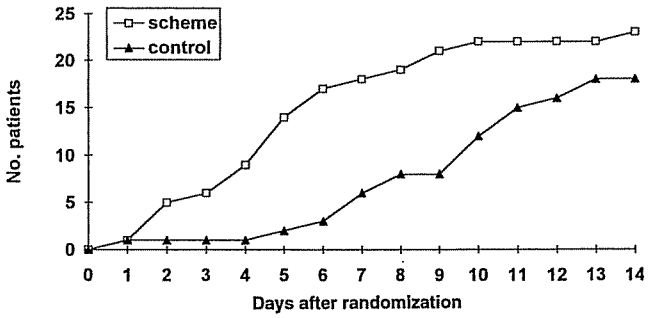

Figure 1. Time between study entry and hospital discharge.

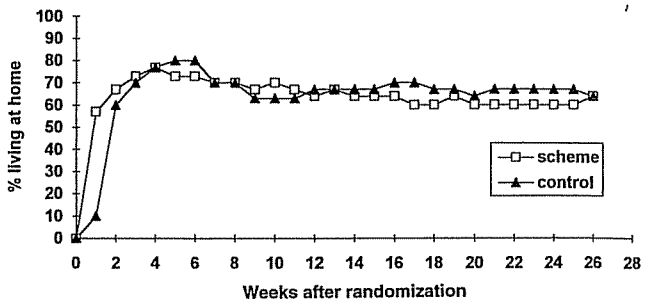

Figure 2. Percentage of patients remaining at home during 6 months follow-up.

HAH (median 5 days vs. 11 days, difference 5 days, 95% confidence interval 2–8, p = 0.002).

Use of hospital and nursing homes: During the 6-month follow-up period, nine of HAH reached the end-point of no longer managing at home. For three patients this was during the scheme, while the other six failed after a mean of 55 days (range 10–93). Six of the nine were readmitted to hospital because of illness, and the other three were admitted to hospital or nursing home because the carer was not coping. Five CD subjects reached the same end-point after a mean of 52 days at home (range 27–117), one through illness requiring readmission and four through the carer no longer coping. Over 6 months, more HAH patients died (9 HAH vs. 5 CD), while more CD patients were admitted to nursing homes (5 CD vs. 2 HAH). The number of subjects in each group remaining at home at 6 months was 19 (Figure 2 and Table IV). The overall days spent in hospital or nursing home care during the 6 months was less for HAH than CD (820 days vs. 1414 days), which was equivalent to 16% of days alive against 26% for CD subjects (NS, Mann–Witney).

Functional independence: Data on functional independence were collected on all subjects regardless of their current location. Changes in mobility, continence, mean Barthel score and mean morale score are shown in Table V. Differences in the latter two scores did not achieve statistical significance. Four of eight HAH strokes and two of six CD strokes improved by at least 2 points in Barthel score. Six HAH patients and five CD patients achieved a functional gait over 26 weeks.

Six HAH and seven CD patients had an initial Barthel score below 15: four HAH and five CD patients were able to try at home, although one in each group required readmission. Barthel score at 6 months had improved in all those remaining at home (three HAH and four CD) but in none of the others.

Data on the subgroups discharged home and remaining at home during follow-up was complete for 18 of the 19 HAH, and for all 19 of the CD subgroup (Table VI). Mobility, Barthel scores and morale scores at 12 weeks showed minor improvements favouring HAH (Barthel, HAH +1.6, CD +0.7; morale, HAH +1.1, CD −0.4; statistical comparisons inappropriate). The prevalence of incontinence decreased a little in both groups.

Table III. Baseline health characteristics of groups

	HAH (n = 30)	Control (n = 30)
Barthel Index (0–20)		
Mean	15.9	15.7
Interquartile range	15–17	15–17
I/O Mental score (0–12)		
Mean	10.0	9.8
Interquartile range	10–12	9–12
Morale score (0–17)		
Mean	11.7	12.1
Interquartile range	11–15	9–15
Mobility		
No functional gait (no.)	13	13
Independent gait (no.)	7	7
Continence		
Daytime urinary (no.)	22	24
Nocturnal urinary (no.)	25	23
Faecal (no.)	29	28

Table IV. Principal outcomes at 6 months

Outcome	HAH	Control
Living at home	19	19
Hospital	0	0
Institution	2	5
Dead	9	5
Moved to family	0	1
Episodes of readmission to hospital	9	6
Total days in hospital after study entry		
Mean	22.5	20.2
Interquartile range	5–30	8–27
Total days in institution		
Mean	4.8	26.9
Total days at home		
Mean	117	114
Interquartile range	50–177	37–172

Table V. Changes in dependency

	Hospital-at-Home				Control			
Weeks:	0	4	12	26	0	4	12	26
Number:	29	26	23	21	30	29	26	25
Functional gait (no.)	16	18	18	19	17	20	17	16
Urinary continence (no.)	22	19	19	18	24	24	20	19
Barthel Index (mean)	15.9	15.1	16.1	16.4	15.7	15.7	15.3	15.0
Morale score (mean)	11.7	11.1	11.4	12.4	12.1	11.9	12.0	12.1

HAH patients received less Home Care than CD patients (7 vs. 10 in receipt of Home Care at 4 weeks; 9 vs. 13 at 26 weeks), and less frequent Home Care (average of two visits per week through the 6 months vs. four visits per week). Of the six domestic tasks assessed, patients required some help (from HAH, Home Care, or carer) for an average of 2.9 tasks in HAH, and 3.5 tasks in CD at 4 weeks (Table VI). This small difference persisted at 12 weeks and was lost at 26 weeks.

Carers: There were 13 HAH carers and seven CD carers, all of whom were interviewed at each assessment. A large majority of carers were happy with the timing of discharge. Questions rating the carer's opinion of how good they were at the caring role, and how well they were coping, were answered similarly, with two HAH carers and one CD carer admitting difficulties in coping. No clear differences between the groups emerged, but the numbers were small.

Discussion

Randomized controlled trials in rehabilitation of elderly people are difficult to sustain, and the best known hospital-at-home scheme in England was unable to gain local support for such a trial [5]. It was appreciated at the outset that the magnitude of benefit that may be provided by HAH would probably require a larger study than we could achieve, as we were constrained by the speed of recruitment of suitable subjects, the size of the HAH scheme, and the period of time that the HAH team were willing to co-operate with this constraint on their preferred style of practice.

The design of this study determined that patients were referred and randomized to a treatment group before a member of the team had had an opportunity to assess how suitable the patient would be for the HAH. This design was used for a number of reasons: (i) to ensure a high recruitment rate, and full deployment of the HAH, whose referrals were exclusively within this study during the recruitment period; (ii) to avoid any selection bias by the HAH team towards cases expected to do well; (iii) to avoid ethical difficulties that might be associated with discussing a possible service with a patient or family, identifying their suitability, and then not providing the service. The major drawback of this design was that not all referrals were considered to be suitable for HAH, yet the team was expected to offer treatment. This differed from the usual process by which the HAH interviews the patient and family prior to a decision about early discharge with HAH. In consequence some patients were not ideally suited to HAH treatment at the time of their discharge. In normal practice, the HAH would not take on such patients.

Table VI. Changes in dependence by those remaining at home

	Hospital-at-Home (n = 19)				Conventional discharge (n = 19)			
Weeks:	0	4	12	26	0	4	12	26
Functional gait (no.)	14	16	18	19	12	13	14	14
Urinary continence	13	14	15	15	14	17	16	15
Barthel (mean)	15.8	16.8	17.4	17.2	16.5	17.5	17.2	17.2
Morale score	11.2	11.4	12.3	12.7	12.7	11.2	12.3	12.7
Receives home care (no.)		7	9	9		10	12	13
Domestic tasks, out of 6 (mean)								
Independent		3.1	3.9	3.6		2.5	3.2	3.5
Depends on home care		0.6	1.2	1.5		1.9	1.5	1.4

Table VII. Simple cost analysis of Hospital-at-Home scheme

(a) Cost per week (£)		
Hospital-at-Home:		
Staff	284	
Training	43	
Travelling	23	
Other expenses	17	
Total Hospital-at-Home	367	
Rehabilitation Ward, DGH	784	
(b) Balance of costs for inclusion within scheme		
	Cost per patient (£)	Saving per patient (£)
3 weeks on Hospital-at-Home	1101	
5 days less DGH care		560
Additional cost to hospital	541	
Difference in Home Care		364
Overall extra cost of HAH	177	

Another problem from this design was that some patients referred to the study deteriorated prior to discharge, delaying or preventing discharge. Around 30% of patients in each group were not discharged, and this further reduced the power of the study to demonstrate differences between the groups.

The more rapid discharge of elderly care patients by the HAH scheme measured during this study was probably achieved by a combination of factors. Intensive discharge planning by a team geared to early discharge, with the immediate availability of an occupational therapist for a home visit, was beneficial, as was the ability to avoid the common delay following referral to home care service or to the care manager. Speed of discharge planning could be improved by other means, though at the risk of impairing quality, and alternative investment could be made in occupational therapy. The move to care management has meant for many hospitals a slowing down of the discharge process, while with this service the transition to a care-managed package of care can be made at leisure during the period of the hospital-at-home scheme.

A thorough cost analysis was not intended in the study design. It may be commented that the scheme currently costs around £110 000 per year, to support three trained staff, three part-time assistants, travelling expenses and clerical support (Table VII). The scheme supports 100 patients per year, thus giving an average cost of £1,100 per patient supported for the average period of 3 weeks, or £52 per day on the scheme. This appears to compare favourably with the present inpatient costs on a rehabilitation ward at our DGH of £112 per day. The present study found that patients within the scheme were discharged 5 days earlier, a saving of £560 per patient for DGH costs. Balancing this against the cost of being on the scheme, the net cost to the hospital service during the trial was approximately an additional £540 per patient on the HAH (Table VII). The study also suggests possible savings for the Home Care service of an average of two visits per week, which over 6 months is equivalent to £364, with no increased costs in readmission or admission to nursing home.

Patient satisfaction data were not collected systematically, but the scheme was almost unanimously well received and appreciated by patient and family. This is hardly surprising as free, intensive care and support was given with up to six visits daily, with personalized therapy.

There has only been one previous controlled trial of HAH [6]. That differed from the current study as it did not employ professional rehabilitation staff, although the care staff did receive training in rehabilitation skills. Early readmission rate was reduced by the HAH, and more patients remained at home during 6 months follow-up. The intervention provided was less intense than in our scheme, but unfortunately the level of support given to the control group was not described for comparison. Our study was conducted at the introduction of the Community Care Act, and control patients were all assessed for domestic and personal needs, and care was provided as appropriate.

Whether the additional therapy given by HAH in this study was effective remains uncertain. The global picture of the proportion of patients remaining at home during follow-up has shown no difference between the groups. The difference in mortality (favouring CD) was balanced by the difference in admissions to nursing homes (favouring HAH), neither of which was significant, and hence days spent at home were similar. Dependency measures and morale scores failed to show a significant benefit for HAH, although each measure showed a trend favouring HAH. Subgroup analysis was difficult because of the small numbers in the trial: there was a possible benefit favouring HAH for the stroke patients, while the subgroup with initial Barthel score below 15 showed no differences.

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Authors' address
Elderly Care Unit,
Gloucestershire Royal Hospital NHS Trust,
Great Western Road, Gloucester G1 3NN

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