

## Does hospital-at-home make economic sense? Early discharge versus standard care for orthopaedic patients

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*J R Soc Med* 1996;**89**:548–551

SECTION OF GERIATRICS AND GERONTOLOGY, 23 JANUARY 1996

### SUMMARY

**Hospital-at-home has been promoted as a potentially effective means of replacing costly inpatient care with cheaper domiciliary care. We studied three hospital-at-home schemes in West London providing intensive home care for early discharge orthopaedic patients, comparing their costs with those of standard inpatient care.**

**Although costs per day of hospital-at-home care were lower than those of inpatient care, the schemes appeared to increase the total duration of orthopaedic episodes, so that the costs of standard care, per episode, were lower than those of hospital-at-home.**

**While hospital-at-home may offer considerable future potential, substitution of home care for inpatient care will not necessarily save resources.**

### INTRODUCTION

Growing interest in hospital-at-home in the UK has centred upon three main suggested benefits of care at home—namely, that better quality of care and health outcomes may be achieved at home; that patients may prefer to receive their care at home; and that home care may be less costly than conventional inpatient care. On the last point there is little information in the UK<sup>1</sup>, not least because of the heterogeneous nature of the many initiatives going under the banner of hospital-at-home and the potential complexities of evaluating the cost-effectiveness of such programmes. The key study of hospital-at-home costs published in Britain to date has been the analysis by Hollingworth *et al.*<sup>2</sup> of the Peterborough scheme, the country's best established and best known programme. Hollingworth's study indicated that patients receiving early discharge to hospital-at-home after hospital treatment for hip fracture incurred a lower total cost to the National Health Service (NHS) for their full episode of care than did those patients who received only a standard inpatient episode of care.

In two health authorities in West London, three hospital-at-home schemes were established in 1993–1994, the primary objective of which was to facilitate the early discharge from hospital of patients with various orthopaedic conditions. Each scheme consisted of a team of nurses and care assistants, physiotherapists and occupational therapists, under the management of the local community health care

NHS trusts. These teams were responsible for identifying inpatients in local hospitals who would be suitable for early discharge to hospital-at-home care, implementing early discharge and transfer, and providing care at home. In each case, district nurses were also involved in the delivery of care at home in the post-hospital discharge phase, allowing continuity of care once the patient was finally discharged from hospital-at-home.

Each of the schemes was the subject of a detailed evaluation of various aspects of care, including patient outcomes, satisfaction with the services amongst both patients and their carers, the costs to families of being cared for outside hospital, and the costs to the NHS of providing these services. Here we report the results of the latter economic evaluation; at the time of writing, results were still awaited from the other areas under investigation.

### METHODS

The objective of the economic evaluation was to compare the resource use and costs of early-discharge hospital-at-home care with conventional inpatient care packages for orthopaedic patients, to establish whether or not these hospital-at-home programmes should be preferred to hospital care on economic grounds, and to identify whether hospital-at-home can effectively release resources within the acute sector.

A cost analysis (or cost-minimization analysis<sup>3</sup>) was conducted, comparing each hospital-at-home scheme with the local hospital from which it drew most of its orthopaedic patients. The resources utilized by each of the hospital-at-home teams were identified and costed, including staff, travel and transport costs, communications and supplies, to

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provide a profile of total programme-specific costs; additional variable costs of district nursing care were estimated; community trust 'overhead' costs (e.g. trust administration, central services) were then apportioned to each scheme to illustrate total programme costs to the NHS. Costs of inpatient care were identified at ward specific level (i.e. nursing, supplies), and other costs (e.g. hotel services, medical cover, pharmacy and diagnostic services, central services, management costs) were then apportioned appropriately. The annualized replacement cost of an orthopaedic ward<sup>4</sup> was added to total ward costs to proxy the opportunity cost of the physical hospital capital involved. All costs were derived at 1995 prices and salaries. It should be noted that theatre costs and drugs costs were explicitly excluded from the analysis, under the simplifying assumption that there was little or no *a priori* reason to expect them to differ between groups.

Costs per day of care (i.e. per bed day or per bed day equivalent) were then calculated, total scheme or ward cost being used as the numerator and activity in terms of occupied bed days as the denominator. One year's occupied bed days (financial year 1994/1995) were used in the case of the wards. Patient days (i.e. days receiving hospital-at-home care) for the twelve months ending 30 September 1995 provided the basis for hospital-at-home activity. Growth in scheme activity throughout 1994 and 1995 suggested that the use of an earlier period might underestimate programme capacity, and hence overestimate hospital-at-home costs relative to hospital. A simple analysis of the sensitivity of costs per day to differing levels of overhead cost was undertaken, given the degree of uncertainty and limitations to data comparability which surrounded the issue of apportioning overheads and central service costs in the hospitals selected.

Detailed information on length of stay both for the hospital portion of care and for the subsequent home care was available for each hospital-at-home patient for the 12 months detailed above. To ascertain average lengths of stay in patients receiving standard inpatient care, a sample comparison group was identified prospectively by hospital-at-home staff (at or immediately after admission) over 6 weeks in July and August 1995, comprising patients who would have been eligible to receive hospital-at-home management on the basis of their clinical characteristics and home situation, but who resided outside the schemes' catchment areas. The identification of a prospective comparison group proved impossible in one of the schemes (scheme 2), and was abandoned; hence comparisons are provided below for two schemes only. Length of stay data were then combined with costs per day to provide estimates of costs per completed episode for both hospital-at-home and standard inpatient care.

**RESULTS**

Table 1 shows the total cost (including overheads and capital costs) of the three hospital-at-home programmes, and the activity undertaken by each in terms of both number of patients and number of bed days; they are contrasted with the total cost and activity levels of the respective comparison wards. It is clear that the hospital-at-home programmes operate at a level of patient activity and total cost which is substantially smaller than that seen in the inpatient wards.

The full cost (excluding drugs) to the NHS of providing one day of care for orthopaedics patients in either standard inpatient ward settings or early-discharge hospital-at-home is summarized in Table 2. In two of the schemes, a day of hospital-at-home care cost less than a day of inpatient orthopaedic care. In scheme 1, however, the level of hospital-at-home activity was less than half that undertaken by the other two programmes, which directly resulted in a cost per day for home care which exceeded the cost of an inpatient bed day locally. A sensitivity analysis was undertaken which varied the level of overhead costs apportioned within defined parameters, and the discount rate and expected lifespan used in the calculation of capital costs. Within the parameters chosen for the sensitivity analysis the cost of a day of hospital-at-home care remained greater than that of an inpatient bed day in all cases in scheme 1, while a day of home care remained cheaper than an inpatient bed day in all cases in scheme 2. In scheme 3, however, the relation of costs per day was sensitive to changes in the allocation of overhead costs. If hospital overhead costs in fact proved to be lower than originally estimated, such that the total costs of the ward were reduced by more than 5%, an inpatient bed day might prove to be cheaper than a day of home care.

While hospital-at-home care appeared to enjoy favourable costs per day in two of the schemes studied, total care

Table 1 Comparison of total costs and activity levels

		Total cost	Cases	Bed days
Scheme 1	Hospital-at-home	£206 686.60	139	959
	Orthopaedic ward	£1782 285.54	NA	9300
Scheme 2	Hospital-at-home	£204 033.75	364	2069
	Orthopaedic ward	£935 420.76	NA	8866
Scheme 3	Hospital-at-home	£351 172.60	351	2712
	Orthopaedic ward	£1118 249.92	NA	8418

NA=Not applicable

**Table 2 Comparison of cost of 1 day of care between inpatient and hospital-at-home care in the three study districts.**

	<i>Cost of 1 day of care in:</i>	
	<i>Orthopaedic ward</i>	<i>Hospital-at-home</i>
Scheme 1	£191.64	£220.10
Scheme 2	£105.51	£98.61
Scheme 3	£132.84	£129.49

costs are also determined by a patient's length of stay. The results of the comparison of hospital-at-home lengths of stay with those of the prospectively selected inpatient care comparison group in districts 1 and 3 are reported in Table 3. This table displays total length of stay for both groups, i.e. inpatient stay plus at-home stay for hospital-at-home patients. For all three procedures, observed mean total length of stay was lower for comparison group patients receiving standard inpatient care only than for hospital-at-home patients. Only in the case of hip replacement, however, was mean total length of stay statistically different at the 95% level.

The excess of hospital-at-home length of stay over standard inpatient length of stay apparent in the case of hip replacement, and suggested by the data on other procedures, is explained when hospital-at-home lengths of stay are broken down between the hospital portion of the episode and the 'at-home' portion. Table 4 displays this breakdown for hip replacement, and also shows total costs per episode (based on costs per day and length of stay). The breakdowns in Table 4 are themselves means, and so do not sum to precisely the same values as the mean total lengths of stay presented in Table 3.

In scheme 1, hospital-at-home care appears to shave nearly 3 days off a patient's inpatient stay, but replaces this with 6 days of care at home. In scheme 3, hospital-at-home appears not to reduce inpatient stay at all, and thus effectively adds 5½ additional days of care at home. In both

schemes, this net increase in total length of stay has the effect of making a full episode of hospital-at-home care more expensive than a standard inpatient stay. While statistically significant differences in length of stay were not identifiable for the other procedures observed, the same pattern was nevertheless visible in each—namely, that reductions in inpatient length of stay were achieved only by the addition of a greater number of days spent under hospital-at-home care, leading to a higher cost per episode for the latter.

**DISCUSSION**

Any attempt to interpret or generalize from the results presented above must take account of the limitations inherent in the study. The standard inpatient care patients who form the basis of the comparison of lengths of stay were not selected by random allocation between hospital-at-home and inpatient-only care. While hospital-at-home staff members prospectively identified comparison patients whom they perceived to be suitable for hospital-at-home in all respects but district of residence, it is entirely possible that their selections were biased. The likely direction and impact of any such bias is, however, not at all clear. Comparison was only possible in two of the three districts, and the possible existence of a quite different pattern of length of stay in scheme 2 cannot be ruled out.

It is also possible that the hospital-at-home schemes studied were not operating at their full potential output. Anecdotal evidence was presented by programme managers to the effect that substantial increases in patient numbers and throughput could be achieved within the resources currently allocated to hospital-at-home. Were this true, this would clearly reduce the cost per day of hospital-at-home care, and, more questionably, might also tend to reduce the number of days spent at home as staff perceived a greater pressure to discharge from hospital-at-home itself. It was certainly the case that scheme 2's hospital-at-home treated roughly twice as many patients as did scheme 1's at a slightly lower total programme cost. It was also suggested by

**Table 3 Comparison of total lengths of stay (LoS) and 95% confidence intervals for standard inpatient care and hospital-at-home groups**

		<i>Standard inpatient care</i>			<i>Hospital-at-home</i>		
		<i>Total LoS</i>	<i>95% CI</i>	<i>n</i>	<i>Total LoS</i>	<i>95% CI</i>	<i>n</i>
Hip replacement	Scheme 1	10.5	1.7	10	13.7	0.7	42
	Scheme 3	9.8	1.9	6	15.4	3.2	61
Knee replacement	Scheme 1	12.4	3.5	5	15.8	0.9	25
	Scheme 3	12.7	10.1	3	16.6	3.4	27
Fractured neck of femur	Scheme 3	20.7	4.2	11	29.6	5.3	54

CI=Confidence interval

Table 4 Breakdown of episode length and cost per episode for hip replacement

		Length of stay—hip replacement		
Group		Inpatient days	At-home days	Cost per episode
Scheme 1	Hospital-at-home	7.6	6	£2789.13
	Standard inpatient	10.5	—	£2012.22
Scheme 3	Hospital-at-home	9.8	5.5	£2023.26
	Standard inpatient	9.8	—	£1306.22

various individuals working in scheme 1 that local hospitals were obstructing the identification and early discharge of patients to hospital-at-home, thus depressing the scheme throughput and keeping costs per day and per episode high. To estimate the limits of the different schemes' capacities and to estimate their position on their respective cost functions would have required a substantially longer period of observation (possibly several years).

Even if hospital-at-home were able to operate at very much lower costs than those observed in the course of this study (e.g. due to higher activity volumes), it is not clear that the three West London schemes could have yielded real long-term resource savings to the NHS. Hospital capacity and costs tend to be 'lumpy', with fixed and semi-fixed costs predominating. Thus, much of the cost of running a ward is relatively fixed, given staffing requirements for continuous care, so that a 20 bed ward costs little more to run in total than a 19 bed ward. Savings tend to be realized only when a substantial 'chunk' of capacity (such as a ward) can be closed in its entirety. Even allowing for throughput improvements, it is unlikely that the hospital-at-home schemes studied would have had the capacity to cope with an entire ward's workload. Furthermore, the closure of a ward is likely to release only those resources directly related to the ward itself (primarily the ward staff). The fixed costs of central hospital services would, at least in the medium term, simply be spread across a smaller number of remaining cases. As a minimum, this suggests that future experiments in hospital-at-home should take place on a substantially larger scale than those undertaken in West London, if they are to offer any realistic prospect of releasing resources from the acute sector. In the longer run, however, when the employment of resources is not fixed, hospital-at-home may well offer better opportunities for transferring resources from the acute sector—critically, when decisions are being made

about the development of new hospitals and sites. None the less, a better performance by hospital-at-home in terms of costs and efficiency than that observed in West London would need to be demonstrated for this to be true.

**CONCLUSIONS**

This study of the costs of early-discharge hospital-at-home care for orthopaedic patients in West London showed that, while the cost per day of hospital-at-home care was lower than that of comparable acute care in two districts, in another it was more expensive than equivalent hospital care. Hospital-at-home certainly has potential for reducing costs per day relative to inpatient care, but these results caution against any assumption that care delivered at home must necessarily be cheaper than that delivered in a conventional hospital ward. Critically, the two hospital-at-home schemes which were open to prospective comparison failed to demonstrate net reductions in resource use as a result of earlier discharge from hospital. Where inpatient length of stay was reduced, it seemed to be replaced by a disproportionate stay under hospital-at-home care, so that total episode costs were actually increased relative to standard inpatient care. In effect, a day of inpatient care was being averted by expending more resources than the cost of the bed day itself. For early-discharge hospital-at-home to offer a cost-effective alternative to conventional inpatient packages for orthopaedic care (in the absence of large differences in clinical outcome), it will need to offer costs per day that are lower relative to hospital costs than those observed in this study, shorter 'at-home' stays, and a greater impact in reducing inpatient length of stay than was the case in West London. If this cannot be achieved, hospital-at-home is unlikely to offer an economically superior alternative to acute orthopaedic care.

*Acknowledgments* We are grateful to Nigel Edwards, Brian Hughes and Diana Braithwaite of the London Health Economics Consortium for their advice and assistance, and to the staff of the six NHS trusts who participated in this study. The work was undertaken with funding from North Thames RHA Research & Development Directorate.

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