

Economic evaluation of nurse led intermediate care versus standard acute care for post-acute medical patients: cost minimisation analysis of data from a randomised controlled trial

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Abstract

Objective To undertake an economic evaluation of nurse led intermediate care compared with standard hospital care for post-acute medical patients.

Design Cost minimisation analysis from an NHS perspective, comprising secondary care, primary care, and community care, using data from a pragmatic randomised controlled trial.

Setting Nurse led unit and acute general medical wards in large, urban, UK teaching hospital.

Participants 238 patients.

Outcome measure Costs to acute hospital trusts and to the NHS over six months.

Results On an intention to treat basis, nurse led care was associated with higher costs during the initial admission period (nurse led care £7892 (\$14 970; €11 503), standard care £4810, difference £3082 (95% confidence interval £1161 to £5002)). During the readmission period, costs were similar (nurse led care £1444, standard care £1879, difference –£435, –£1406 to £536). Total costs at six months were significantly higher (nurse led care £10 529, standard care £7819, difference £2710, £518 to £4903). Sensitivity analyses suggested that the trend for nurse led care to be more expensive was maintained even with substantial cost reductions, although differences were no longer significant.

Conclusion Acute hospitals may not be cost effective settings for nurse led intermediate care. Both inpatient and total costs were significantly higher for nurse led care than for standard care of post-acute medical patients, suggesting that this model of care should not be pursued unless clinical or organisational benefits justify the increased investment.

Introduction

Intermediate care comprises a range of services at the interface between secondary care and primary care.¹ These services may reduce avoidable hospital admission and improve the transition from hospital to home.¹⁻³ Several models of intermediate care are in operation, and yet no consensus exists on the most effective or cost effective approaches. One increasingly popular model is nurse led care of patients recovering from acute illness. Early evaluations suggested that this model of care, when compared with standard care in acute hospital settings, could improve patient outcomes and reduce costs.⁴⁻⁵ More recent, rigorous evaluations found no improvement in patient outcomes with this model of care; rather, they consistently report increased hospital stay compared with standard care.⁶⁻⁸ This raises questions about the cost effectiveness of

nurse led care at a time when this type of care is being more widely implemented.⁸ Proponents of the model may assume that the altered working environment and staffing patterns will reduce costs despite an increase in length of stay. We carried out an economic evaluation, using cost minimisation analysis, based on a pragmatic randomised controlled trial⁶ comparing inpatient care in a nurse led unit with standard care of medical patients recovering from acute illness. The evaluation was designed to take an NHS perspective, including secondary care, primary care, and community care.

Methods and participants

We undertook an economic evaluation of nurse led care for post-acute medical patients, based on a randomised controlled trial.⁶ The trial was intended to detect moderate differences in length of stay, physical functioning, and destination after discharge. In total, 238 patients were allocated to nurse led care or standard care. Patients were followed up for six months. No differences were observed in any outcomes other than length of stay in the acute trust, which was significantly longer in the intervention group. Inpatient costs and costs after discharge were calculated from randomisation to six months using an intention to treat analysis. We calculated costs (pounds sterling; not discounted) for the financial year 1998-9. When we could not isolate data for attributed costs, we obtained aggregated cost estimates from the trust.

Data collection

We collected data on utilisation of services retrospectively. The unit of analysis for length of stay was one day. We abstracted data on use of hospital resources (by location and by day) from the Patient Administration System database. Data on use of physiotherapy and radiology were collected from each department's database. We identified participants by their hospital registration number. General practice staff collected the data on primary care at the end of the study. Interviews with patients provided information on changes in residence, specifically to institutional settings.

Cost specifications

Most cost estimates for the hospital came from the centralised contracts and costing department and estimates of costs per occupied bed day by ward from the relevant directorate finance department. The estimates comprise direct staff costs (for each ward) and indirect costs including pathology, occupational therapy,

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clerical support, and hotel and laundry services (apportioned between wards in a directorate). Estimates exclude outpatient attendances.

We measured hospital stay by ward for the admission period (period 1: from randomisation to first discharge home to any destination other than a hospital), and the readmissions period (period 2: subsequent days spent in hospital during the study period). Physiotherapy input was identified for both time periods from the specialty database. We measured contacts by the day, and we assumed that they lasted 20 minutes. Radiology input was established on an individual patient basis. Other contacts with therapy services, hospital doctor and nurse time, and inputs from pathology were embedded in trust estimates of cost per occupied bed day in each ward.

Episodes of short term care, such as attendances at outpatient clinics, were measured by attendance or procedure. Other NHS resources included community hospitals (both periods), contacts with surgery based general practitioners and community nurses, home visits by general practitioners and community nurses, and telephone contacts with community nurses and general practitioners. Contacts with general practitioners in surgery were assumed to last 10 minutes. Other contacts, and days spent in new institutional care, were costed according to units provided in *Unit Costs of Community Care* (see bmj.com for costs of resources).⁹

Output specifications

We found no significant differences in the primary outcomes of the randomised controlled trial,⁶ other than length of stay. In that analysis of effectiveness, hospital days were taken as an outcome, whereas in the economic analysis here, hospital days are treated as an input and therefore no output specifications are required.

Analysis

We have assumed no clinical gains from the nurse led unit and therefore we carried out a cost minimisation analysis. To calculate costs per category of resource use we multiplied utilisation data by unit costs, then aggregated the result to produce costs for period 1 and period 2 and total costs for the study period. We used two sample *t* tests to compare mean costs between the two groups, with 95% confidence intervals. Groups were also compared using a regression model controlling for referring ward and sex.⁶

For our sensitivity analyses we focused on inpatient and total costs because this was the only area in which costs differed between groups. The analyses were

Table 2 Readmission (period 2) costs associated with nurse led care or standard care of post-acute medical patients

Resource item	Mean cost (£)*		Difference (95% CI)
	Nurse led care group (n=117)	Standard care group (n=121)	
Acute hospital:			
General medical ward	604	500	103 (-286 to 493)
Nurse led unit	296	64	231 (-161 to 624)
Other acute wards	390	1184	-794 (-1531 to -57)
Community hospital	155	131	24 (-224 to 272)
Total costs for period 2	1444	1879	-435 (-1406 to 536)

£1 (\$1.9; €1.5).

*Costs rounded to nearest pound.

carried out to test the effect of varying the cost per occupied bed day for the nurse led unit, as this was the cost with the highest leverage and also the estimate most vulnerable to questions about accuracy. We recalculated inpatient costs during period 1 and period 2 and total costs for the study period according to four assumptions: nurse led unit cost per occupied bed day 15% lower (£213.08); nurse led unit cost per occupied bed day 20% lower (£200.54); and nurse led unit cost per occupied bed day 25% lower (£188.01). These values are higher than the mean for acute general medical wards (£146.19, or 42% lower than the nurse led unit cost per occupied bed day) but consistent with the higher grade of staff in the nurse led unit. Cost reductions of 15%, 20%, and 25% equate to reductions in length of stay of 5, 6.4, and 8 days, respectively.

The fourth assumption, that nurse led unit cost per occupied bed day was equivalent to a general practitioner led community hospital (60% lower, £100.50), allowed comparison with the least expensive feasible alternative to care in a nurse led unit.

Results

Overall, 240 post-acute medical patients were randomised to receive either care in a nurse led unit or standard post-acute care. Two patients refused data collection for the economic evaluation. Outcomes and resource use were measured at six months and, as there were no significant differences in primary outcomes, we carried out a cost minimisation analysis (see bmj.com for costs of resources). Most comparisons were not statistically significant, although some important exceptions occurred (see bmj.com and tables 1 and 2). In period 1, medical directorate costs for the nurse led group were £1920 lower on average than those for the standard care group (see table 1). In addition, community hospital costs for patients in the nurse led unit were £1013 lower on average. During the same period, however, the costs within the nurse led group were £6560 higher on average, resulting in overall inpatient costs during period 1 that were £3082 higher. With the exception of a decrease in other acute ward costs for the nurse led group, we found no significant differences in costs during period 2 (see table 2).

Total costs for the six month study period were significantly greater in the nurse led group (see bmj.com), with a difference in means of £2710. Costs after discharge were similar between the two groups.

Given that the major cost drivers were cost per bed day and overall length of hospital stay, our sensitivity

Table 1 Costs from randomisation to discharge home (period 1) for nurse led care or standard care of post-acute medical patients

Resource item	Mean (median) cost (£)*		Difference in means (95% CI)
	Nurse led care group (n=117)	Standard care group (n=121)	
Acute hospital:			
General medical ward	602 (146)	2502 (1462)	-1920 (-2486 to -1314)
Nurse led unit	6560 (5264)	0 (0)	6560 (5429 to 7692)
Other acute wards	626 (0)	1192 (0)	-566 (-2014 to 883)
Community hospital	102 (0)	1116 (0)	-1013 (-1573 to -453)
Total period 1 inpatient care	7892 (6100)	4810 (2631)	3082 (1161 to 5002)

£1 (\$1.9; €1.5).

*Costs rounded to nearest pound.

analyses focused on the cost per occupied bed day (table 3). The mean difference in total costs remained higher for the nurse led unit under the first three assumptions, although differences were not significant. At no point, even when the least expensive community hospital rate was assumed, did nurse led care become significantly less expensive than standard care.

Discussion

Both inpatient costs and total costs were significantly higher for nurse led inpatient care compared with standard care of medical patients recovering from acute illness. This finding holds true whether the acute trust perspective or wider NHS perspective is taken and in a range of cost estimate situations. The only cost saving was a reduction in the costs associated with using a community hospital. Conventionally, when a trial produces no significant differences between treatment and control outcomes, the option with the lower cost should be the preferred choice. In this case, the nurse led model of care should not be pursued.

Differences in estimates from different sources raised concerns over the accuracy of costs attributed to the nurse led unit and the acute ward. The evaluation was strengthened by the inclusion of costs for community care and residential care. By using sensitivity analyses, we overcame the potential problem of inaccurate estimations or unusual costs; the analyses include values similar to the lower costs reported in the only other study with costs for this model of care.⁸

Sensitivity analyses showed a clear trend for higher costs with nurse led care, although the differences were not significant; at no point did the option of a nurse led unit become significantly less expensive than standard inpatient care. Even assuming that the nurse led unit could reduce costs by as much as 25%, the equivalent of reducing length of stay by eight days on average, treatment costs would not be lower than those from standard care. Cost implications are not, however, the only guide to practice in the NHS. The continued growth of this model of care suggests that acute trusts

What is already known on this topic

Nurse led intermediate care for post-acute medical patients is becoming increasingly popular

Such care does not seem to improve patient outcomes, raising the question of whether the model of care is cost effective

What this study adds

Costs for acute trusts and total costs are higher with nurse led intermediate care, even under generous assumptions about cost reductions

Investment in intermediate care in community hospital rather than acute hospital settings may be more cost effective.

are willing to pay more to maintain an intermediate care option under their own management control, perhaps especially during periods of high demand for beds. When making decisions on the development of nurse led intermediate care it is necessary to consider whether indirect care costs are apportioned fairly; where the medical directorate fits in the larger context of secondary care; what the opportunity costs are of the resources used in the model's implementation; and the effects of economies of scale. Given that patient outcomes are satisfactory, and such units reduce pressure on acute beds, a certain overall increase in cost may be acceptable.

It is possible that the costs of the nurse led model could be reduced, not only by increasing bed numbers but by setting boundaries on length of stay. Setting boundaries on stay seems to be favoured by the UK government.¹⁰ However, costs or length of stay would have to be reduced substantially for nurse led care to be less expensive than standard care, and the changes we outline could have a negative effect on patient outcomes. Given that, in this evaluation at least, a part of the stay on a nurse led unit seems to be substituting for a period of stay in a community hospital,⁸ investment in intermediate care in the community hospital setting may be a more appropriate way forward for some trusts. Finally, increased efficiency might be possible through education of staff on the ideal model of care delivery. Currently a high grade (more expensive) mix of skill seems to substitute for such education, but without improving quality of nursing above that in standard care settings.^{11 12} Training would require additional investment, but could prove cost effective if the mix of skills could be altered or outcomes improved in the nurse led unit. The decision, however, must take into consideration the wider context of intermediate care; other models of care may be feasible and more cost effective.¹³

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Table 3 Sensitivity analyses comparing costs for nurse led inpatient care and standard care of post-acute medical patients

Cost assumption for inpatient period	Mean (median) cost (£)*		
	Nurse led care group (n=117)	Standard care group (n=121)	Differences in means (95% CI)
Nurse led unit costs per occupied bed day (15% lower):			
Period 1	6908 (5273)	4810 (2631)	2098 (266 to 3930)
Period 2	1399 (0)	1870 (0)	-470 (-1416 to 476)
Total	9525 (6817)	7827 (5184)	1698 (-407 to 3804)
Nurse led unit costs per occupied bed day (20% lower):			
Period 1	6580 (4997)	4810 (2631)	1770 (-36 to 3575)
Period 2	1385 (0)	1866 (0)	-481 (-1420 to 457)
Total	9182 (6675)	7824 (5184)	1359 (-718 to 3435)
Nurse led unit costs per occupied bed day (25% lower):			
Period 1	6252 (4721)	4810 (2631)	1441 (-338 to 3221)
Period 2	1370 (0)	1863 (0)	-493 (-1425 to 439)
Total	8839 (6633)	7820 (5184)	1094 (-1031 to 3069)
Nurse led unit costs per occupied bed day equivalent to general practitioner led care in community hospital (60% lower)			
Period 1	3961	4810 (2631)	-849 (-2495 to 798)
Period 2	1267	1841	-574 (-1466 to 318)
Total	6446	7798	-1352 (-3255 to 551)

£1 (\$1.9; €1.5).

*Costs rounded to nearest pound.

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Depression and anxiety in women with early breast cancer: five year observational cohort study

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Abstract

Objective To examine the prevalence of, and risk factors for, depression and anxiety in women with early breast cancer in the five years after diagnosis.

Design Observational cohort study.

Setting NHS breast clinic, London.

Participants 222 women with early breast cancer: 170 (77%) provided complete interview data up to either five years after diagnosis or recurrence.

Main outcome measures Prevalence of clinically important depression and anxiety (structured psychiatric interview with standardised diagnostic criteria) and clinical and patient risk factors, including stressful life experiences (Bedford College life events and difficulties schedule).

Results Nearly 50% of the women with early breast cancer had depression, anxiety, or both in the year after diagnosis, 25% in the second, third, and fourth years, and 15% in the fifth year. Point prevalence was 33% at diagnosis, falling to 15% after one year. 45% of those with recurrence experienced depression, anxiety, or both within three months of the diagnosis. Previous psychological treatment predicted depression, anxiety, or both in the period around diagnosis (one month before diagnosis to four months after diagnosis). Longer term depression and anxiety were associated with previous psychological treatment, lack of an intimate confiding relationship, younger age, and severely stressful non-cancer life experiences. Clinical factors were not associated with depression and anxiety at any time. Lack of intimate confiding support also predicted more protracted episodes of depression and anxiety.

Conclusion Increased levels of depression and anxiety in the first year after a diagnosis of early breast cancer highlight the need for dedicated service provision during this time. Psychological interventions for women with breast cancer who remain disease free should take account of the

broader social context in which the cancer occurs, with a focus on improving social support.

Introduction

Earlier diagnosis of breast cancer in women and the use of systemic adjuvant therapy have increased the likelihood of long term, disease free survival. Although the psychological effect of diagnosis and treatment is well documented, less is known about the prevalence of, and risk factors for, clinically important depression, anxiety, or both after the first year. A better understanding of this among women in long term remission from breast cancer would tell us who might benefit from a psychological intervention, and inform service provision.

We assessed the prevalence of clinically important depression and anxiety in women with breast cancer in the five years after diagnosis using a clinical interview, and identified risk factors over that time. We also examined the prevalence of, and risk factors for, depression and anxiety around recurrence.

Participants and methods

A consecutive series of 222 women, aged 60 years or younger, with a diagnosis of early breast cancer at Guy's Hospital were invited to participate in our study between May 1991 and July 1994. Exclusion criteria included previous or concomitant malignancy, pregnancy, and age over 60. The women were treated surgically by lumpectomy, axillary clearance, and radiotherapy or by modified radical mastectomy followed by adjuvant therapy.



Diagnostic criteria for depression and anxiety are on bmj.com



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